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SCIENTIFIC CANADIAN
MECHANICS' MAGAZINE
AND
PATENT OFFICE RECORD

Vol. 8. DECEMBER, 1880. No. 12.

THE DUTY OF THE EMPLOYER TO THE EMPLOYED.

WE have frequently, during the past four years that we have edited this magazine, urged upon the employed the advantage to be gained by their working faithfully for those under whom they have engaged, and, also, endeavoured to impress upon them the propriety, when they feel themselves agrieved, to try, as far as possible, to obtain a redress of their greivances by calm remonstrances and reasoning, instead of resorting to strikes, which are sure to end disastrously to both the employer and employed; although, in most cases it falls heavier upon the workmen, as the greater portion of them have families, and by their weak and helpless wives and children the misery is felt the keenest. We do not mean to say that there are not grievances that a body of operatives are not justified in resisting, for instance, when a prosperous corporation endeavours to grind down the wages of their workmen to the very lowest rate, not as a matter of necessity, but simply because they think the men must either submit to their hard terms or starve, whilst it grows rich on the sweat of the mechanic's brow. In such cases, strikes, however they may be deprecated, become a necessity—a struggle for justice and fair play, against greed and oppression. But, on the other hand, the combination of a body of men to strike for higher wages, or for certain rules or changes, simply because, by so doing, they think they can enforce compliance, and if this is done without ever considering whether the business of their employers could afford to pay a higher rate of wages is equally unjustifiable.

There is a certain duty that the employed owe to the employer, but it is with the duty of the employer to the employed that we desire to treat at the close of the present year.

Employers, or managers of companies, hiring many operatives, stand almost in respect to them, as far as authority goes, in the position of a colonel commanding a regiment of soldiers; and, therefore, according to the manner in which he wields this power, he may become a gentle ruler or a tyrant — either loved or hated. Every kind-hearted employer, who is a just man will always treat his men with fairness, and feel an interest in their welfare. He would naturally look upon them as a busy hive of human beings, whose social comforts and welfare, formed many links in the chain of his own success, by returning, in labour and skill, a fair value for what they receive from him in money.

Now, too often, employers are apt to consider that because they give employment to a body of men, the men so employed are under an obligation—whereas if we look at it in a proper light, the workman who faithfully fulfils his obligation to his employer, is under no obligation whatever—he simply renders back that to his employer, by the skill of his hands, which not only pays back his wages in cash, but a handsome profit besides. It has of late years been found a profitable rule to treat those we employ with kindness and justice. This is the system that has worked so admirably in the United States, where skill and talent is appreciated, and coarse words are not allowed to be used in their workshops. If men are found to be inefficient, idle, or careless, they are quietly admonished, and if they do not improve, are discharged. We are pleased to know that in these days the force of education has checked, to a great extent, the swearing at, and personal abuse, workmen were subject to for the slightest offence—thanks to education we feel more pride now in being a gentleman than a bully. Nothing is ever gained, or is more aggravating to a mechanic than constant finding fault, without cause, with his work, and it too often happens that this is done by a foreman who is not so skilful as the workman, simply to show his authority. This habit, unfortunately, grows upon those who have command over men, and they make it a rule to find fault with everything, and never acknowledge, by even a gracious word, the efforts of a skilful workman to excel and please. The consequence of such action, on the part of an employer is, that the man feels disheartened and offended, and ceases to exert himself to excel in that for which he receives no thanks. Nothing jars more on the nerves of working-

men (for they have nerves, perhaps as keenly sensitive as their employers), than the harsh voice of a foreman, or superintendent, constantly heard in angry scolding and nagging at the men above even the noise of the machinery.

Let the employer, therefore, always study the welfare and interests of his men, let him not look down upon them as if they only formed a part of the machinery of his establishment, but feel for them a real interest, encouraging the young mechanic to habits of industry and sobriety, by kind words and by his own example. When he finds a workman superior to another in ability, if that man considers he is entitled to some increase in his wages over that of another, far inferior to him in skill, let him have it. Never abuse your men with harsh words, and never approach them with familiarity, for once a foreman forgets his proper position inside the factory, he has lost his influence, respect, and power over those he employs. On the other hand the employed should cherish a desire to do their work cheerfully and honestly, and if they feel they have a grievance, represent it in a dignified and respectful way, which will go far to have it investigated and remedied; for there are, after all, few employers so blind to their own interests as to part with really deserving and skilful workmen without just cause, or who would not remedy a grievance if brought respectfully before them.

As this article closes the editor's connection with the SCIENTIFIC CANADIAN, he trusts that the efforts he has made during the past four years to improve it, as far as it was personally in his power, and his responses to the numerous calls for scientific and technical information (which were given gratuitously), has been appreciated by the subscribers. There is, however, still a wide scope for improvement, which he sincerely hopes will be realized by its future supporters. He tenders them his best wishes for prosperous times, a Merry Christmas and a Happy New Year.

PRACTICAL VALUE OF SCIENCE.

Our obligations to the branch of physics are almost unlimited, but we will mention only two or three applications of a single agent in this wide field. It would seem to roll back the world into the dark ages to take from it now the benefits of electricity in its multiplied and yet rapidly multiplying applications.

It seems incredible, from our present standpoint, that so short a time ago, in our congressional halls, the electric telegraph was almost ridiculed and voted into oblivion, from which it could never rise. When a bill was presented, appropriating $30,000 to be expended, under the direction of the Postmaster-General, in a series of experiments to test the merits of Morse's electric-magnetic telegraph, one member moved an amendment requiring half the appropriation to be used for the encouragement of mesmerism. Another proposed to include Millerism in the benefits of the appropriation; others to appropriate part of the sum to a telegraph to the moon. And when the bill came to a final vote, this was so close that a change of three votes would doubtless have left us till this day without the benefits of the telegraph. After his invention was in working order, and transmitting messages between Baltimore and Washington, Mr. Morse offered it to Congress, to be attached to the Post-Office Department, for the sum of $100,000. But it was declined, on the statement of the Postmoster-General, who reported that, while the invention was "an agent vastly superior to any other ever devised by the genius of man," he was not satisfied that "under any rate of postage that could be adopted its revenue could be made to equal its expenditures." By this short-sighted want of appreciation of science, the United States Government deprived itself of a source of revenue sufficient, doubtless, to liquidate the entire national debt in a single decade.

The application of electricity, now attracting world-wide attention, enjoys a vastly more hearty reception than did the telegraph. The *telephone* is constructed on the principle of the human ear. It consists of an elastic diaphragm to receive vibrations of air from the human voice or from other sources, so connected with the wires of a battery (or even with wires without a battery) as to communicate the same vibrations in every respect to another membrane or diaphragm situated at a distance. The two diaphragms of a telephone in distant places correspond, in every practical sense, to the two membranes of the human ear, and the connecting wire to the chain of bones between the two membranes. Probably no invention has come more rapidly into popular favour. Already many thousands of them are in practical use in this country and abroad.

The speaking phonograph is also copied from the human ear. The vibrating diaphragm, in this case, has a stylus connected with it, which impresses the peculiarities of vibration, due to any particular sound, upon a roll of tin foil arranged to receive the impression. By reversing the process, the indentations and prominences of the tin foil cause the stylus to fall and rise, which results in vibrations of the membrane, and these reproduce the original sound. These impressed sheets of tin foil may be preserved or mailed to any part of the world, and by putting them into a similar instrument, may be made to reproduce the pitch, tone and quality of the original sound thousands of miles or of years distant. By this instrument, voice may be phonographed, as the face is photographed, and we may listen to the veritable voice of the dead, or preserve for future comparison the voice of a person from the first infant prattle and the manly utterances of mature life even to the feeble speech of old age. Public speeches and songs may thus be preserved and delivered indefinitely or till the tin foil wears out. In public libraries may be preserved languages of different nationalities spoken from century to century "with all the peculiarities of pronunciation, dialect and brogue."—*Prof. Towbridge in the Advance.*

HARDENED STEEL.—The well-known fact that steel is of less specific gravity after hardening has given rise to varied explanations as to the cause, but it seems no unnatural result when viewed in connection with the general experience with other metals under heat treatment. It is indeed a matter of some surprise that so much doubt and difference of opinion should exist. In tempering or hardening, the steel is heated to the required temperature, and then dipped into the hardening fluid, and thus undergoes a rapid cooling process. The effect of the rapid cooling is to hastily set the outer surface of the steel with a slight contraction around the hotter and still expanded metal within, leaving the volume of the steel a trifle greater than if all the molecules had been cooled simultaneously, and allowed their own share in contraction, which would have the effect of a gradual cooling of the steel, when the metal would have returned to its original constitution prior to heating. It is for the same reason that a steel bar, being heated and one face only dipped into the cooling or hardening fluid, will be longer on the tempered or cooled face than on the untempered face, demonstrated in the bending the bar, the hardened portion being the outer or longer surface of the bend. The tempered face is cooled suddenly, and "set" while the bar is still of nearly a length due to the expansion of heat, and the rest of the bar cooling gradually has a tendency to shrink or contract normally, but is affected by the set condition of the tempered portion. The bar, if of wrought iron, would not show as great a bend as if of steel, owing to the fact of wrought iron being a somewhat better conductor of heat, and to the greater freedom of action in the molecules of wrought iron than those of steel. The result of a similar treatment of copper (gold or silver) would be much less marked than in either steel or wrought iron, with correspondingly less variation in specific gravity, the heat conducting powers and freedom of molecular action of the former metals being much greater than of iron and steel. Glass or porcelain being very poor conductors of heat, and the molecules having little freedom of action, snap asunder under the same treatment. To recapitulate: The specific gravity, under the circumstances mentioned above, would vary inversely as the power of heat conduction and freedom of molecular action of the various metals and substances experimented upon.—*American Engineer.*

TO CLEAN MARBLE.—An equal quantity of fresh spirits of vitriol and lemon-juice will remove stains from statuary marble. Put in a bottle and shake up well, wet the spots with the mixture, and in a few minutes rub with a soft linen cloth till they disappear.

A RAILWAY IN THE ROCKY MOUNTAINS.

A correspondent of the Denver *Times*, describing the extension of the Denver and Rio Grande railway from Conejos westward toward the San Juan country, gives these picturesque bits. He says: For miles the railway curved among the hills, keeping sight of the plains and catching frequent glimpses of the village. Its innumerable windings along the brows of the hills seemed, in mere wantoness, as loth to abandon so beautiful a region. Almost imperceptibly the foothills changed into mountains and the valleys deepened into canyons, and winding around the point of one of the mountains it found itself overlooking the picturesque valley or canyon of Los Pinos creek. Eastward was the rounded summit of the great mountain of San Antonio; over the nearest height could be seen the top of Sierra Blanca, canopied with perpetual clouds; in front were castellated crags, art like monuments and stupendous precipices. Having allured the railway into their awful fastnesses, the mountains seemed determined to baffle its further progress. But it was a strong hearted railway, and, although a little giddy 1,000 ft. above the stream, it cuts its way through the crags and among the monuments and bears onward for miles up the valley. A projecting point, too high for a cut and too abrupt for a curve, was overcome by a tunnel. The track layers are now busy at work laying down the steel rail at a point a few miles beyond this tunnel. The grade is nearly completed for many miles further. From the present end of the track for the next four or five miles along the grade, the scenery is unsurpassed by any railroad scenery in North America. Engineers who have traversed every mile of mountain railroad in the Union. assert that it is the finest they have seen. Perched on the dizzy mountain side, at an altitude of 9,500 ft. above the sea—greater than that of Veta Pass—1,000 ft. above the valley, with battlemented crags rising 500 or 600 ft. above, the beholder is enraptured with the view. At one point the canyon narrows into an awful gorge, apparently but a few yards wide and nearly 1,000 feet in depth, between almost perpendicular walls of granite. Here, a high point of granite has to be tunneled, and in this tunnel the rock men are at work drilling and blasting to complete the passage, which is now open to pedestrians, The frequent explosions of the blasts echo and re-echo among the mountains until they die away in the distance. Looking down the valley from the tunnel, the scene is one never to be forgotten. The lofty precipices, the distant heights, the fantastic monuments, the contrast of the rugged crags and the graceful curves of the silvery stream beneath them, the dark green pines interpersed with poplar groves, bright yellow in their autumn foliage, that crown the neighboring summits—height, depth, distance and color—combine to constitute a landscape that is destined to be painted by thousands of artists, reproduced again and again by photographers, and to adorn the walls of innumerable parlors and galleries of art. Beyond the tunnel for a mile or more the scene is even more picturesque, though of less extent. The traveller looks down into the gorge and sees the stream plunging in a succession of snow-white cascades through narrow cuts between the perpendicular rocks.

CONSTIPATION.

It is doubtful if consumption numbers as many victims as are stricken down by the various diseases that result from habitual constipation. True consumption is an inherited disease. It may remain always dormant, but when aroused to action, decay commences at a point circumscribed, and gradually extends—unless arrested—until so much of the lungs become involved that vital action ceases. The evils of constipation result from inattention to the calls of nature, and usually commence with children whose habits are not closely looked to by their parents.

The processes of nature are always active while life lasts. When effete matter is retained a moment beyond the time its expulsion is demanded, the system commences its efforts to get rid of it. When the natural egress in checked, the absorbents carry the more fluid portions of the poisonous mass into the circulation, and it becomes diffused throughout the body. The more solid or clay-like portion is forced into the lower rectums where it becomes firmly impacted, thus cutting off the circulation in the small blood vessels, causing painful engorgements known as piles and hemorrhoids. A continuance of these troubles often results in fissure, fistula, or cancer. The trouble is seldom confined here. As a result of the blood poisoning we almost invariably find more or less dyspepsia, with decided derangement of the functions of the heart, liver and kidneys, accompanied by headache and nervous debility, often verging on paralysis.—*Hall's Journal of Health.*

TRAPS ON MAIN DRAINS.

The Journeymen Plumbers' Benevolent Protective Society of New York has sent us the following card for publication:

To the Public:

In consequence of so many different plans and opinions of sanitarians in regard to the best means of protecting the public from sewer gas poison and infectious diseases entering their dwelling and business offices through their connections with the public sewer, we, the Journeymen Plumbers, feel called upon to give as our practical experience the necessity of a trap in the front of cellar with the proper ventilations as shown in cut, which we respectfully submit with the following reasons:—

First—Because practical experience has taught us that it requires a safeguard between dwellings and the public sewer, which has to receive the filth of thousands of people often afflicted with contagious diseases.

Secondly—Because it is an admitted fact that every inch of sewer, soil and waste pipes generates sewer gas, and therefore, air which has to travel through miles of public sewers becoming impregnated with different diseases and poisons, cannot but be dangerous to health.

Thirdly—Because we know by experience that pipes, traps under fixtures, etc., do not last forever; and that the moment an opening occurs, the public sewer relieves itself into dwellings, and too often the first warning we have is when one of the family is stricken down.

Fourthly—Because we know that when the trap of a fixture becomes empty by evaporation or other means, as when people go to the country, the furniture, carpets, etc., becomes saturated with sewer gas, which too often more than counterbalances all the vigor gained by country and sea-side air.

Fifthly—Because we have had opportunities to learn that when a trap is placed on a house drain and properly ventilated, it is impossible to have stagnant air in it, because the temperature in the inlet pipe and in the soil pipe is never the same, and, having only a short distance to travel, the foul air is never dangerous.

Signed,

JOHN GALLAGHER, *Pres't.*
PETER J. CARPENTER, *Sec'y.*
JOSEPH GREEN, *Treas'r.*

New York, Oct. 15, 1880.

WHEN TO CUT TIMBER.—July and August are the best months for cutting timber, that it may be the most durable. The growth of the year is then well nigh over, and if the trees are allowed to lie until the green foliage dries upon them, the greater portion of the sap is thereby withdrawn from the wood, and the seasoning is rapid and perfect. Cut in mid-summer, insects are much less liable to attack the wood, which is an important point with some kinds of timber, like hickory.

A NEW CANADIAN INVENTION.

Architects will appreciate the neat and excellent device for fastening the shank of a door knob to its spindle, so that without the aid of screws or spring catches, it will not become detached from its spindle as those otherwise secured frequently do:—

This object is attained in the following manner:—Fig. 1 is a perspective view of the door knob, shank and spindle, put together. Fig. 2x and Fig. 2z, are longitudinal sections of the shank showing the corrugated socket E. Fig. 3 shows the two sections of the shank laid together as they appear when cemented into the door lock knob. Fig. 4 represents an end view of the shank and its excentric G, with the nut (F. Fig. 5), placed over the ends of the two sections binding them together. Fig. 6 shows a sectional view of the knob, shank, nut and rose, or washer, combined, as they appear when put together. Fig. 7 represents the lock spindle, showing its corrugated ends C C. Fig. 8 represents the method of entering both sections of the shank into the nut. Fig. 9 is a rose or washer, having a boss shaped face and counter sunk socket.

The excentric end I of the shank (Fig. 3) is made of a dovetail shape, in order to form a shoulder, over which the nut P (Fig. 5) is placed. The object of this form, or dovetail, is to keep the nut from coming off after it has been placed in position. The manner in which this is done is by placing the nut over the shank in the following way. First take that section of the shank E (Fig. 8) upon which the excentric commences and

place it in the nut F, and then take the other section, and insert its end obliquely into the nut, as shown by the dotted lines; in this way the upper half section is easily inserted into the nut, and will close on its mate, this done, the shank is ready to be attached to the knob, which is done in the usual way, with melted lead or cement.

For the purpose of better securing the shank to the knob, there are projections formed on the end of the shank, shown at B, (Fig. 3), which are intended to rest against the inside of the socket of the knob to prevent the two sections of the shank from spreading should it be necessary to tighten the shank in the socket of the knob by expanding the lead. This projection also forms a dovetail to prevent the shank from drawing out. The small holes shown at N, (Fig. 2), are to allow the cement to run into them to secure the shank still more firmly to the knob.

To secure the two sections of the shank firmly to the lock spindle, place the spindle in the socket of the shank, and turn the nut, (See Fig. 4), firmly to the right, as indicated by the arrow, which closes the two sections of the shank firmly to the lock spindle, this done, pass the spindle through the lock in the door, and having previously adjusted the spindle to the shank length required, according to the thickness of the door, I repeat the operation, as above described, and secure the spindle to the opposite door knob. Both door knobs are thus securely attached to the spindle without the use of screws or spring catches.

To loosen the handles or knobs from the spindle, it is simply done by turning the nut F the reverse way, which can be done with an adjustable wrench.

The inventor of this device, is Charles A. Pettet, machinest. Address P. O. Box 27, Belleville, Ont.

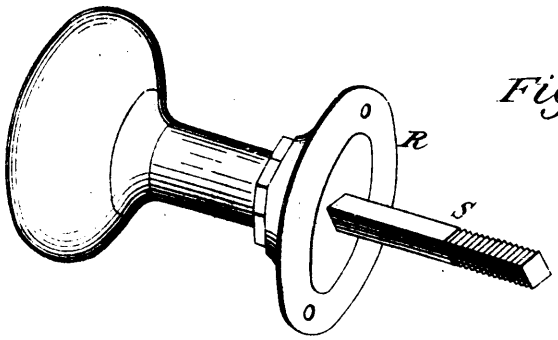


Fig. 1.

Fig. 2x Fig. 2z

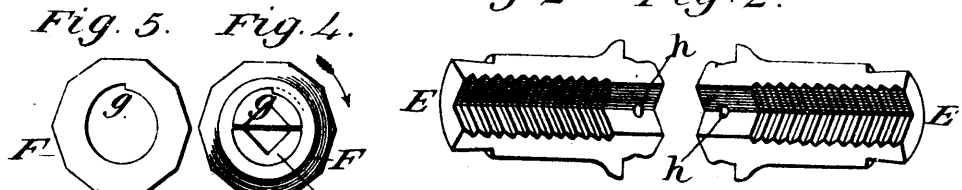


Fig. 5. Fig. 4.

Fig. 8. Fig. 3.

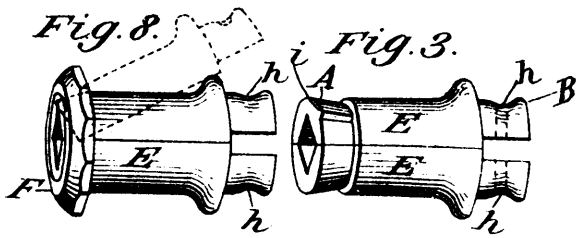
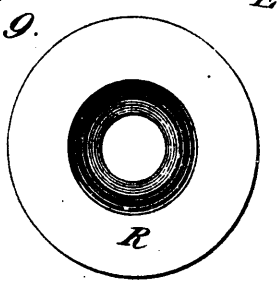


Fig. 9.



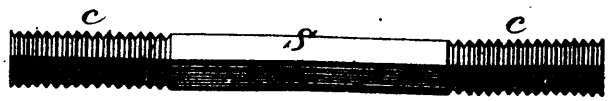


Fig. 7.

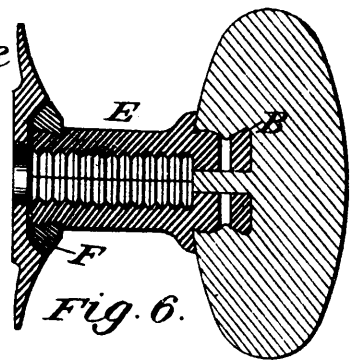
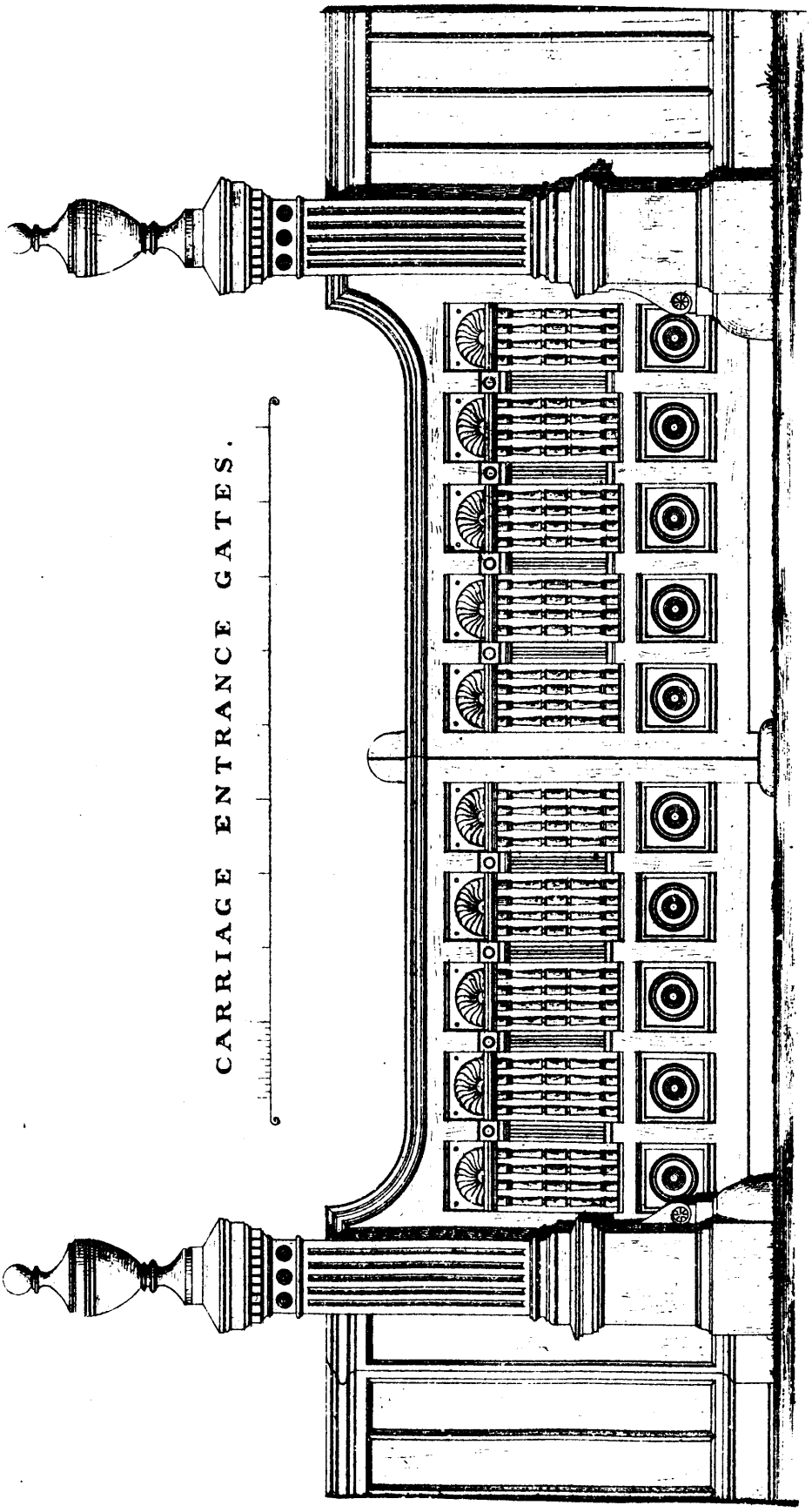


Fig. 6.

DOOR KNOB ATTACHMENT.



CARRIAGE ENTRANCE GATES.—From a design in the *Builder and Woodworker.*

Miscellaneous Items.

MECHANICS AS WRITERS.—There is no department of productive business in which a larger proportion of actual brain work is employed than in the building and working of machinery, and there is no class of our producers who offer so little of their experimental knowledge and observant wisdom to the world in printed form. The agricultural papers teem with communications which frequently contain valuable hints, exact information, and suggestive facts. But the publications devoted to mechanical matters and the interests of workers have far less of these voluntary contributions. One of the reasons for this is, undoubtedly, that practical mechanics may be properly considered one of the easiest sciences, and statements that in other departments of industry would pass for mere personal opinion, become of great importance as elucidations of mechanical law or demonstration of facts, which are, too often, deemed by the experimenters as mere tests, lacking the authority of practical use. Yet, in many cases, these tests are more than experiments, and frequently carry with them their own demonstration. The mechanic deals with material substances and mechanical processes that are continually presenting new problems for solution, and are capable of being solved by more than one method. At least, this solution invites attempts in more than one direction. So the mechanic dislikes to provoke criticism and invite comparison, when he knows the field is so large and the cultivators so many. There may be another reason why the mechanic does not "rush into print" as some others. He is not given to talk. His work requires, largely, concentration of attention that leaves little time to talk. Indeed, the mechanic generally prefers to illustrate by sketch or work rather than to elucidate by words. In fact, this method is easier than talking. It is not easy to convey a proper idea of a machine and its operation by words alone. The choice of language and the avoidance of mere "shop talk," necessary to convey to the general reader mechanical ideas, demands a very thorough knowledge of the English language, and some acquaintance with cognate tongues. It is not meant that the writing mechanic must necessarily be a college graduate, or even to have borne off the honors in a high-school class; but choice of language in mechanical writing is a necessity—not a mere convenience. The writer on mechanical subjects ought to know that "rotary" and "revolving" are not synonyms, and that "force" is not necessarily "power"; these, and similar errors, being quite common. There may be other reasons why mechanics are not fond of writing for publication. But it is a fact that the number of really practical workers who are writers on their specialty are very small indeed. The number of practical mechanics who are regularly employed on mechanical papers in this country is so insignificant, when compared with the value of our mechanical interests, as to surprise one who takes the trouble to inquire. There can be no doubt that the welfare of working mechanics would be greatly enhanced by a greater willingness on their part to present the results of their own experience to their fellows, through the medium of the special papers devoted to their interests.—*Canadian Industrial World.*

THE PIEDBOEF BOILER.—This boiler, which has been brought out in Germany and has been exhibited recently at the Duesseldorf exhibition, consists essentially of two cylinders, one above the other, in both of which there is a steam space, instead of the upper one only. The lower cylinder is in this case an ordinary Cornish boiler, with internal furnace exactly as usual. At its back end it is freely connected, by a short pipe of large diameter, with an upper cylinder not quite so long as itself, through which pass, from end to end, a number of ordinary boiler tubes. Inside the Cornish boilers just in front of the vertical connecting pipe, is fixed a diaphragm plate, extending downward from the top of the shell about eight inches, and so coming within four inches of the furnace top. The upper space in front of this diaphragm plate is connected with the steam space of the top cylinder by a pipe having in it a plain single beat valve opening freely upward. As a matter of precaution this valve is connected with a float on the lower cylinder, which opens it as steam is formed and the water level lowered, but this is not an essential part of the system. By this arrangement, as can readily be seen, it is possible to have steam in both the lower and upper cylinders. As it is formed in the lower one it passes quietly off through the stand pipes into the upper steam space, there being always a certain unbalanced head of water in the back part of the boiler (where the two cylinders are connected), to insure the right motion of the steam. The gases are carried up from the bank of the Cornish boiler and to the front through the tubes of the upper cylinder and then back again to the space surrounding the shells, so that there is apparently no danger or the shells being externally burnt. This arrangement also makes the danger of accident from low water a very small one, as the furnace itself cannot be uncovered unless the water level actually falls about seven feet, the water entirely leaving the upper cylinder, which could hardly happen without notice. The boiler has a total heating surface of 1,570 square feet of which 1,100 square ft. is eternal surface and 33.3 square ft. of grate, the ratio of total surface to grate being therefore 47 to 1. It has been used for supplying steam for an engine under trail working at 100 effective horse power and was working nominally at six atmospheres.

RUST-PROOF IRON.—Mr. George Bower has invented, and his son has improved a process for iron with an indestructible surface of magnetic oxide, which is said not to be open to the Barff process.

The Bower process, which is not secret, consists in heating the articles to be coated in a closed chamber by means of carbonic oxide, heated air being made to enter the chamber for the double purpose of burning the gas and for combining with the iron. The excess of air, after burning the carbonic oxide, heated air being made to enter the chamber for the double purpose of burning the gas and for combining with the iron. The excess of air after burning the carbonic oxide gas, combines with the iron, forming first the magnetic oxide, and then the hydrated sesquioxide, or common iron rust. By shutting off the supply of air until only enough is admitted to burn the carbonic oxide, the rust is converted into the magnetic oxide. The process is repeated until the film is sufficiently thick for the purpose of protection. When complete the film has a beautiful French gray tint.

The London *Times* stares that the application of this invention has been undertaken on a large scale, the chamber where the oxidation is now carried being large enough to contain about a ton of miscellaneous articles. The value of the invention, and of the method of applying it, is no longer a matter of doubt, the severest tests having been made of the iron coated. The earliest experiments only produced a film that would peel from the metal; but by the new method a coating is made which is inseparable from the metal; but by the new method a coating is made which is inseparable from the metal. Inasmuch as the cost of oxidation is less than that of a cost of paiut, it has become evident that the next generation, at least may be happy with cheap and indestructible iron.

TO IMITATE MAHOGANY.—This could be best effected with burnt sienna and vandyke brown, ground in water and thinned with weak size, so as to flow very freely. Then take a damp cloth or rag and wipe off the way of the grain. The depth of the color will be given by the appearance after wiping. When the rag gets wet squeeze it out into the color, and so effect a great saving of it; when dry, size and varnish, or polish. In some cases the color must be left on, and softened with a badger, instead of wiping off. For oak; 7 lb. yellow ochre, 1 lb. English umber, and little Venetian red, as above. A more difficult process is as follows: Upon an orange ground rub in with Vandyke brown, burnt sienna, and rose pink (ground in water), thinned with beer to about the depth of color required. Soften it slightly all over with the badger's hair softener, then take a piece of Turkey sponge, and wipe some light streaks the way of the grain of the wood, and let them slightly fold over each other so as to have somewhat of an Honduras appearance, then soften up and down rather smartly at first, and gently after, to give somewhat of a finished appearance, and when to be left for Honduras stipple all over with the ends of the badger, and it is done. But if Spanish is intended, after wiping out with the sponge, and softening gently the way it is sponged, then very gently soften across, then take a chisel-edged camel-hair mottler, well-soaked and wiped clean on the dry sponge, and dot it with the corner down the edges of the sponge marks, and here and there; then holding the mottler between the thumb and fingers, roll it between two or three of the dotted parts, and soften immediately, and observe the effect, avoiding the objectionable parts next time, but keep the figure towards the centre of the panel and the sides plainer. Take care that it is all left soft. When dry take a mahogany hog's hair overgrainer, about 4 in. wide, and a little of the same color, thinned with water, and work up together in a saucer, and pat it at the side so as not to take too much color, then with a coarse hair comb comb the overgrainer out, and draw over the work, carefully following the sponging; then very slightly soften towards one side, so as to raise the grain very slightly, and when dry it is ready for varnishing.

How the Russians Keep Warm.—The Russians have a great knack of making their winter pleasant. You feel nothing of the cold in those tightly-built houses where all doors and windows are doubled, and where the rooms are kept warm by big stoves hidden in the walls. There is no damp in a Russian house, and the inmates may dress indoors in the lightest of garbs, which contrast oddly with the mass of furs and wraps which they don when going out. A Russian can afford to run no risk of exposure when he leaves the house for a walk or drive. He covers his head and ears with a fur bonnet, his feet and legs with felt boots lined with wool or fur, which are drawn over the ordinary boots and trowsers, and reach up to the knees; he next cloaks himself in a top coat with fur collar, lining and cuffs; he buries his hands in a pair of fingerless gloves of seal or bear-skin. Thus equipped, and with the collar of his coat raised all around so that it muffles him up to the eyes, the Russian exposes only his nose to the cold air; and he takes care frequently to give that organ a little rub to keep the circulation going. A stranger, who is apt to forget the precaution, would often get his nose frozen if it were not for the courtesy of the Russians, who will always warn him if they see his nose "whitening," and will unbidden, help him to chafe it vigorously with snow.

In Russian cities walking is just possible for men during winter, but hardly so for ladies. The women of the lower order wear knee boots; those of the shopkeeping class seldom venture out at all; those of the aristocracy go out in sleighs. The sleighs are by no means pleasant vehicles for nervous people, for the Kalmuck coachmen drive them at such a terrific pace that they frequently capsize; but persons not destitute of pluck find their motion most enjoyable. It must be added that to be spilled out of a Russian sleigh is tantamount only to getting a rough tumble out of a soft mattress, for the very thick furs in which the victim is sure to be wrapped will be enough to break the fall.

The houses and hovels of the Russian working-classes are as well warmed as those of the aristocracy. A stove is always the principal item of furniture in them, and these conveniences are used to sleep on as well as cook in. The mujick, having no bed, curls himself up on his stove at his time for going to rest; sometimes he may be found creeping right into the stove and enjoying the delights of a vapor bath.

Economic Production of Steam.—The *American Manufacturer* states that for 35 years persistent efforts have been made to run steam generators inside the fire-box or furnace of steam boilers. All, however, proved signal failures until Mr. Good hit upon the true principle of keeping up a steady and continuous supply of water from the boiler into the generator. No matter how intense the heat to which the latter is subjected, the water cannot be driven from it into the boiler, but can only escape in the form of steam, which is rapidly generated and forced into the boiler. In the days of prosperous manufacturing, few men paid much attention to their fuel bills, but the close margins to which all are now subjected through competition, makes the consumption of fuel a matter of serious consideration. It has been practically demonstrated that this appliance—placed in the furnace and connected with the boiler—will save from 30 to 40 per cent. in fuel. The time consumed every day in getting up steam will also be reduced about one-half. And what is equally important with the saving of fuel is that the working capacity of the boiler will be increased nearly one-half in power by the additional area of heating surface exposed to the flames in a position where the heat will be most effective, and by the rapidity with which the steam is generated. Hundreds of boilers, now unable to do the work required of them, may be retained by their owners if this device is used. There can be no question as to durability, for experience has shown that the circulation of water being maintained through the pipes they will not burn out any more readily than the flues of a boiler. It can be as easily attached to marine or locomotive as to tubular boilers. The low cost for which this apparatus can be furnished will, it is claimed, make its use universal, as it soon pays for itself.

Speed of Telegraphic Work.—The *Electrician* refers to the new edition of McCulloch's *Dictionary of Commerce* as authority for the statement that a good operator can send 2,000 words per hour, but remarks that the conditions are not given. The same journal cites a statement from an American contemporary concerning the recent transmission of a campaign speech from New York to Cincinnati, by the Phillips system of steno-telegraphy, in five hours and five minutes, the number of words being 16,000, or over 52 words to the minute, or say 3,147 words an hour. The utterance of the speech consumed three hours and forty minutes; and although the work of transmission did not begin until the speaker had been under way for fifteen minutes, the entire speech was in the Cincinnati printing-office in one hour and twenty-five minutes after its conclusion in New York. The wire was worked without a "repeater," and the matter transmitted fully equal to what would be the average by the Morse system on three wires, by three senders and three repeaters. The process is entirely by hand, the despatches being received by an ink recorder of great simplicity, which pays out a narrow strip of tape, on which the matter is plainly printed in linear characters. Despatches printed by Mr. Phillips' method require no preparation, the operator reading from the manuscript.

The recent smothering of five workmen in the Paris sewers has called attention to the frightful condition of the city's sewerage. Thousands of houses have no pipes leading to the sewers, but accumulate their slops to be emptied by night wagons, as it was two or three hundred years ago. Other thousands of houses even in modern quarters, have small pipes connecting with the street-mains through which the sink-slush and other waste in a liquid form is allowed to pass, while only the solid matter is impeded by an iron sieve. The openings through which the surface waters enters the sewers under the curb stone along all the streets are large enough for a child to fall through, and have no trap or other protection, so that the odors from the putrid contents of the sewers naturally rises as through so many draughts built especially for that purpose.

Influence of Venus on the Earth.—Mr. R. J. Jenkins, F.R.A.S., has endeavored to show a very remarkable effect of the planet Venus upon the earth. The present British Astronomer Royal proved, many years ago, that the disturbing effect of this planet was so great that the earth was materially pulled from its orbit. Mr. Jenkins shows that it is to this action that we must look for an explanation of the cold waves, which occur on an average every eight years—as in 1829, 1837, 1845, 1855, 1863, 1871, 1879—and that for the next 40 years the temperature will be below the average. He states that a heat wave has been observed to pass over the earth every 12 years, nearly cotemporary with the arrival of the planet Jupiter at its perihelion, such a wave being now close at hand.

Staining Mahogany Table Dull Black.—Remove the old varnish with alcohol, then sand paper the legs of the table; next give them a coat of logwood water, hot; when dry, brush copperas water over the legs. This will turn them black. Now mix a little drop black with alcohol and rub every part of the legs with a pad of flannel moistened with the spirits in which the black has been mixed; wipe clean. You will be amply paid for the trouble. Logwood stain is made by boiling 1lb. logwood chips in two quarts of water for one hour. Copperas water is made by dissolving 1 oz. of green copperas in water. The logwood produces a dark red stain. On applying the copperas water the article turns black.

Refuges in Collieries.—As an amendment to the methods outlined in a letter to the London *Times* by Mr. Latimer Clark, another correspondent recommends that the pipes, in distant workings of the mines, through which it was suggested that a supply of air should be conveyed, descend directly from the surface immediately over each refuge, by means of bore-holes lined with iron pipes, instead of carrying them along the underground roads and up the working-shafts. Explosion would be less likely to injure the pipes in this position, and they could be used to commuuicate readily, by telephone or otherwise, with the surface, and, being vertical, food and water could also be transmitted through them.

New Discoveries on the New England Coast.—The United States Fish Commission's steamer *Fish Hawk* has made two dredging trips the past summer along the New England coast. The dredging was done chiefly between 150 fathoms and 325 fathoms, and the yield was immense. More additions were made to the marine fauna of New England than in the previous six years. The discoveries during the two trips were 30 crustaceans and 70 mollusks, more than half of them entirely new; also 33 species of fish, of which 12 are entirely new to science, representing four or more new genera; and 27 were strangers to the fauna of New England.

Sunlight.—Dr. Carpenter says the entire absence of sunlight on the deep-sea bottom seems to have the same effect as the darkness of caves in reducing to a rudimentary condition the eyes of such of their inhabitants, as fish and crustacea, which ordinarily enjoy visual power, and many of these are provided with enormously long and delicate feelers or hairs, with which they feel their way about, just as a blind man does with his stick.

A HUGE VACUUM PAN.

We give an engraving of a monster vacuum pan recently made by Messsrs. R. Deeley & Co., of New York city, for Mr. C. Spreckles, proprietor of the California Sugar Refinery, San Francisco, Cal.

The pan, besides being unusually large, possesses several points of novelty. The shell, which is 12 feet in diameter, is made of cast iron, and consists of three horizontal sections—the top, the belt, and the bottom. The top and belt are each made in six sections, for convenience in transportation. The several pieces are flanged and carefully fitted, so that when they are bolted together the joints are solid and tight. The pan will hold about 7,600 gallons, which will yield at every strike about 250 to 260 barrels of dry sugar.

The heating surface of the enclosed copper coils is about 1,000 square ft. The lengths of the five coils, beginning with the top coil, are respectively 189, 194, 203, 206, and 208 feet. Each coil is divided into four sections, and each section is provided with an inlet and outlet, so that the longest stretch of the pipe is about 50 feet. This arrangement insures an effective heating surface and avoids anything like dead and inefficient pipe.

The inlets are connected by brass valves to 10-inch trunks, one trunk being placed on each side of the pan. The outlets, twenty in number, are connected with steam traps, which take off the water of condensation.

The curved overflow pipe at the top is 5 feet in diameter, and the condenser which joins it reaches through the floor is of the same diameter and 18 feet high. It is provided internally with eight scattering plates for distributing the water used in condensing the steam discharged by the vacuum pan.

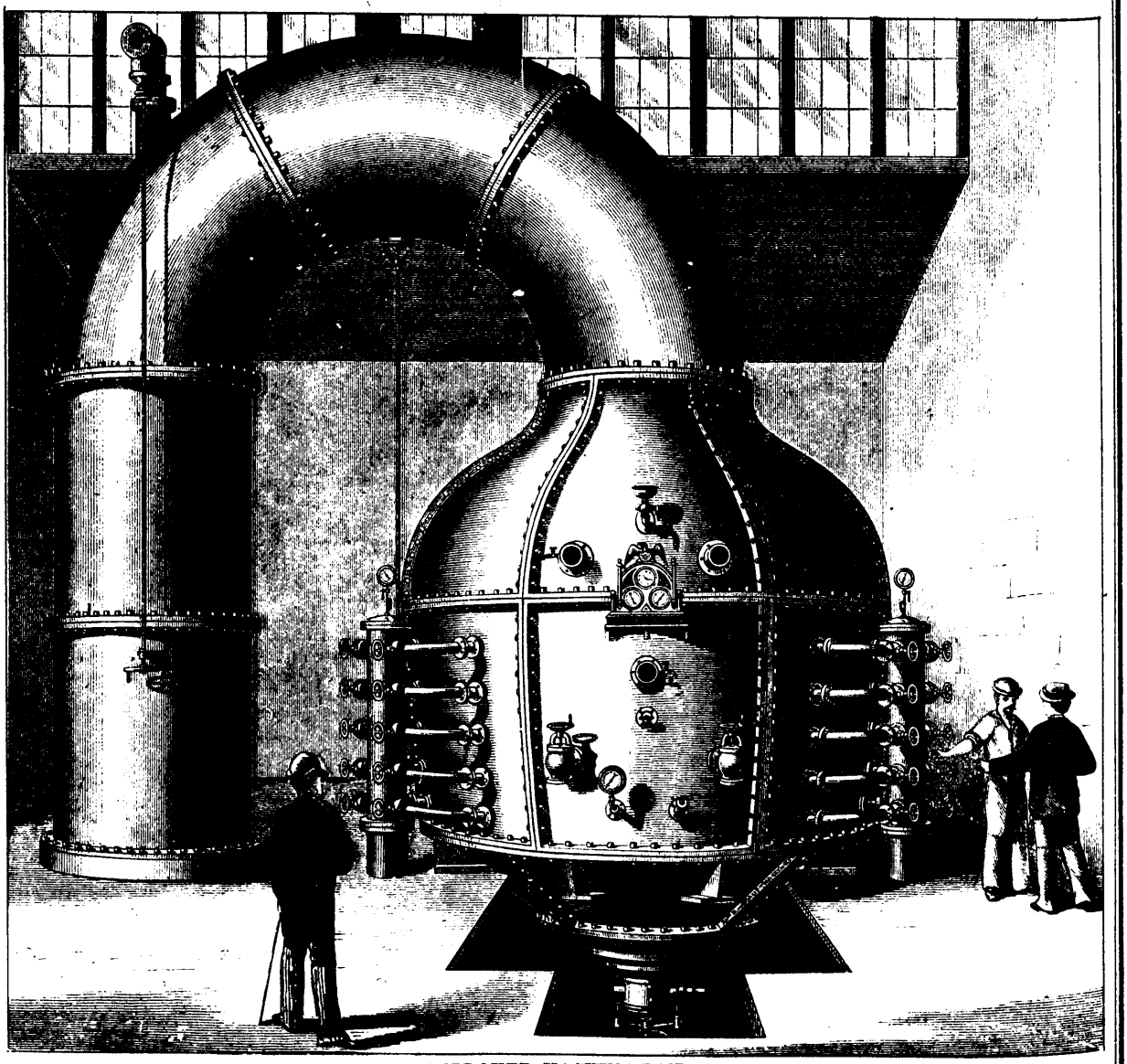
There are two thermometers for indicating the temperature of the liquid in the pan, one being placed near the top at the side of the clock to show the temperature of the upper portion of the liquid, the other being placed near the bottom to show the temperature of the lower stratum of liquid.

The pan is provided with two proof sticks for removing a small quantity of the syrup from the pan from time to time for the purpose of testing it. These proof sticks are not what the name might indicate, for they are in reality tubes with nicely fitted valves and a piston for removing the syrup without destroying the vacuum.

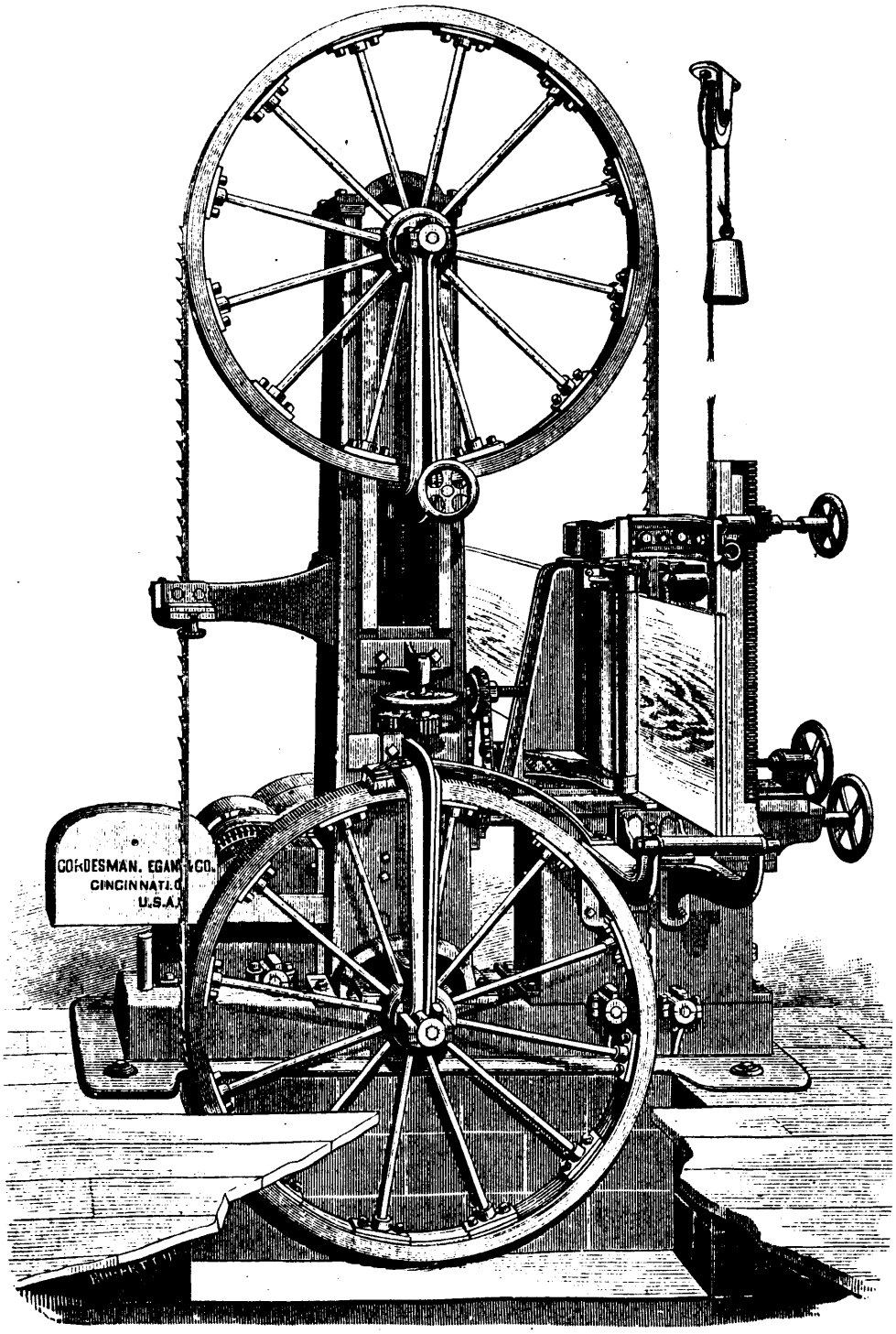
Six 5-inch eyeglasses are arranged in different positions for viewing the inside of the pan. The pan is provided with two 4 inch charging valves, which communicate with the interior through two copper pipes reaching nearly to the bottom.

The steam trunks, which supply the heating coils, are each 10 inches in diameter, and each is provided with a steam gauge and with a supply valve, which is connected with a receiver that takes exhaust steam from the engines and steam pumps used in the refinery.

The pan has a 4-inch valve for admitting air in breaking the vacuum. This is one of the largest vacuum pans ever made.—*Scientific American.*



IMPROVED VACUUM PAN.



BAND RE-SAW FOR LUMBER.

The firm of Cordesman, Egan & Co., Cincinnati, deserves great credit for the large number of newly-designed machines put on the market of late years. Having just doubled their former capacity by the erection of new buildings, they are enabled to keep pace with their numerous orders, and we take pleasure in calling attention to their new band re-sawer which created such great interest during the late Exposition.

"Band re-saws" for re-sawing lumber are no longer an experiment, and a great portion of the work in our large mills is now done on them. The use of these machines has increased year by year, and we perdict the time when all our wood will be cut on these great timber-saving machines.

The "band re-saw" illustrated on this page is the design and patent of the well-known Cincinnati manufacturer of improved wood-working machinery. The claim made for this machine is, that it is original in design, and has less machinery and complicated parts than any "re-saw" yet put on the market. The aim has been to make a machine that can be handled by any ordinary mechanic capable of running wood-working machinery. This "re-saw" has six feed rolls and a positive feed, with three changes of speed on cone, an extra heavy frame, and is well proportioned for strength and strain. The loose and tight pulleys are 24 inches in diameter, 8½ inches face, and the driving shaft is of 2 inch steel. This machine splits lumber up to 30 inches wide, the blade being 18 or 20 gauge, so that a kerf, or 1-32 or thereabouts, is taken out.

For parties, such as car builders, planing-mills, and furniture and box factories, who wish to hold their lumber up to a thickness, this machine will be invaluable. This machine was on exhibition at the late Exposition, and its merits were such that it was declared entitled to a special gold medal, which was struck off and awarded to the manufacturers.

Miscellaneous Items.

CHROME-TANNED LEATHER.—It is stated by *Engineering* that an important improvement in tanning leather has been brought out in Germany which promises to be of great importance, as it dispenses with the ordinary materials. Dr. Christian Heinzerling, of Frankfort-on-the-Main, is the inventor. His process involves the use of inorganic chemical compounds only, the special member of which is bichromate of potash. Generally speaking it may be said that the other compounds, all of which are readily soluble in water, have as their function the decomposition of the bichromate of potash, so as to set free its contained chromic acid, which is really the chemical agent that exerts the tanning effect on the tissue forming the corium or lower layer of the animal hide. There are many considerations which seem to justify us in expecting great results from the adoption of the Heinzerling process. One leading fact is, that it requires for its completion a period of from four to five or six weeks, whereas the bark-tanning process requires from 12 to 20, or occasionally, even 30 months for its completion. It has already been adopted in 14 tanneries in Germany, and is being introduced into Russia, Belgium, France and Italy.

It is claimed that chrome-tanned leather has several properties which render it superior to the bark-tanned, the upper leather being more elastic, tougher, and very endurable. It is closer and finer in the grain than bark-tanned leather, the weight of the two descriptions being equal. It is also said to be much more impervious to water than any other. A prominent citizen of Biedenkopf says: I have given the leather a trial, and now beg to state my opinion of its quality. I have been able to test them in the heavy snow, through which we have been obliged to walk through the forests, etc., and never had wet or damp feet, as was invariably the case with bark-tanned ox leather and calf leather. I must draw attention to the fact that during the whole time I never used any sort of grease, and to-day the boots are as soft as at the beginning. I then tried, after walking long distances through snow and rain water, putting the boots before the warm stove to dry, and found to my great surprise that the leather did not get hard, as it does in the case of bark-tanned leather. I may just add that I never had a pair of boots that kept out all dampness and were as strong as those made of chrome-tanned leather."

DRYING UP.—Few, if any, of our readers would have suspected the fact, but it is nevertheless probable, that the earth is gradually losing her superficial water, or, in other words, is drying up. This inference, which seems to be well substantiated, has been drawn by many geologists, who have given special study to the metamorphoses which the rocks comprising the earth's crust have undergone in the past, and are now undergoing. It is generally assumed that the evaporation of water from the surfaces of our oceans, lakes and rivers, is balanced by the amount of the various forms of aqueous precipitation—rain, snow, hail, etc.—from the clouds, by which the water finds its way back again to the earth. This is strictly true in the sense that not a particle of water passes beyond the limits of our atmosphere, and that all that finds its way into the atmosphere by evaporation, sooner or later is returned again. Nevertheless, the water supply of the earth is slowly but steadily diminishing. It is not destroyed, but is so modified as to be no longer available for the sustenance of animal and vegetable life, since it is absorbed and bound up in the rocks. This disappearance of water is accounted for partly by mechanical absortion; partly by the chemical union of water with the constituents of certain of the rocks called hydration, and which is one of the phenomena generally attending the superficial weathering of the rocks; and partly by the crystallization and re-crystallization of many of the constituents of the rocks, and other extensive chemical changes going on at unknown depths in the bowels of the earth. In the course of time, though necessarily many ages from the present, it is argued, the combined result of these several cause of dessication must be the complete absorption of all the water, and its disappearance from the surface of the earth. The estimate has been made, though such an estimate can be little more than a guess, that one-seventeenth of the quality of water with which the earth was originally provided, has already been bound up chemically in the rocks, or has been absorbed beyond the possible reach of the organisms living upon her surface.

MARK TWAIN, RUSKIN, AND TURNER.—"What a red flag is to a bull, Turner's 'Slave Ship' was to me, before I studied art. Mr. Ruskin is educated in art up to a point where that picture throws him into as mad an ecstasy of pleasure as it used to throw me into one of rage, last year, when I was ignorant. His cultivation enables him—and me, now—to see water in that glaring yellow mud, and natural effects in those lurid explosions of mixed smoke and flame, and crimson sunset glories; it reconciles him—and me, now—to the floating of iron cable chains and other unfloatable things; it reconciles us to fishes swimming around on top of the mud—I mean the water. The most of the picture is a manifest impossibility—that is to say, a lie; and only rigid cultivation can enable a man to find truth in a lie. But it enabled Mr. Ruskin to do it, and it has enabled me to do it, and I am thankful for it. A Boston newspaper reporter went and took a look at the Slave Ship floundering about in that fierce conflagration of reds and yellows, and said it reminded him of a tortoise-shell cat having a fit in a platter of tomatoes. In my then uneducated state, that went home to my non-cultivation, and I thought, 'Here is a man with an unobstructed eye.' Mr. Ruskin would have said, 'This person is an ass.' This is what I would say now."—*Mark Twain's Tramp Abroad.*

AZOTINE—A NEW PRODUCT FROM WOOL.—The *Annales Industrielle* notes a new discovery by M. Heddebault, which consists in the separation of wool from cotton in rags and waste products in which these two textiles are mixed, by treating them with steam at a 150° C. under a pressure of five atmospheres. Under the influence of this temperature the wool is decomposed, fuses, and flows off into a lower receptacle, while the cotton, flax, and in fact all vegetable fibre, are unattached. It is then only necessary to pound and wash the latter to obtain products containing no longer any traces of wool, and which are admirably adapted for bleaching and manufacturing into paper. The solution of wool, evaporated by dryness, has been named by the inventor *azotine*. Owing to the increase in value of mixed cotton and woolen rags thus treated, especially for paper making, the cost of the operation is virtually covered, and the new product—*azotine*—costs really nothing. This material which is completely soluble in water, and which contains all its nitrogen in a soluble form, is to be used, mixed with dried blood, as a fertilizer. The invention is said to be an important one, both for the paper-making industry and for agriculture.

DON'T BLOW INTO YOUR WATCH.—A correspondent of a German paper calls attention to the injudicious practice of blowing dust off the watchwork. He says that the operation looks so harmless that but few ever think of the destructive consequences attendant on the contact of humid breath with polished steel surfaces and springs. At lower temperatures a kind of veil covers the parts at once after blowing, which gradually disappears again, but it is in fact nothing else than a watery deposit, or steam reduced to water. Generally the deposit evaporates as the object gets warmer, but this is not always the case. Many watchmakers must have observed that polished steel surfaces are sometimes dotted over, apparently with particles of dust, which on closer examination are found to be rust. Perhaps many have been puzzled to account for rust spots between the coils of a spring, very minute, but still sufficient to render the article useless. These serious defects, says our authority, may in most cases be put down to the evil influence of warm breath, microscopic particles of water, for want of sufficient heat to evaporate, having remained on the surfaces and done the mischief described.

WOMEN'S HEADACHES.—The New York *Herald*, which devotes most of its space to news, has published a brief editorial on women's headaches, which is certainly more suggestive than many of the articles in that paper. One principal reason why women suffer more than men with headache, is the fact that their life is largely indoors, and they are not able to take so much physical exercise. There is very little complaint of headache at summer resorts, where the windows are always open, and games and excursions constantly tempt people into the open air. Girls who ride, row, sail and shoot, seldom have headaches, and the same is true of those who work in the fields, as women in many countries do. Headaches might almost be banished from civilized society by a wise and careful system of physical training, and a rational system of diet. We ought to be ashamed of having a headache as of being unable to read or write, or speak our language correctly.—*Herald of Health.*

NEW USES FOR SAW-DUST.—The *Lumberman* says: We have been shown a model of a car wheel consisting of an iron rim of seven inches outward diameter by one-half inch thick, fitted with a well-proportioned hub, the space between the hub and rim filled with pine saw-dust, pressed in so solidly that we are ready to believe the assertion that resting the iron rim upon bearings, a pressure equal to 23 tons applied to the hub failed to develop any signs of weakness. We hesitate in these days of progress to assert that anything is impossible, and we begin to think that even saw-dust possesses elements of value hitherto unsuspected, and that the day may come when the filled grounds adjacent to all saw-mills may be seen to have a great value in the mechanical development and utilization of the now useless debris placed upon them to get it out of the way. Saw-dust car wheels, saw-dust brick saw-dust, fence posts, railroad ties, and even saw-dust window and door frames, wainscoating and moldings, begin to appear among the possibilities of the immediate future.

COLORING DRAWINGS.—Use the best colors only; do not mix with too little water; if the first coat is not dark enough, wait till dry, and give another coat.. Make up your mind what portion you are going to color before applying a drop of paint; do not stop in the middle of a wash, but when once the brush touches the paper, go straight through with the portion you begin. If obliged to leave the job for a minute, paint up to a line; a dotted line will do if there is not a "full" one handy; this will hide the join between the two patches of color. Do not let your brush be too wet, nor yet too dry; a few trials will soon show you the right amount of color to take up. Use the best English drawing-paper; if you then find any trouble a little prepared ox-gall mixed with the color will do wonders. Clouded drawings, as a rule, are caused by letting the work dry and going over the edges again when starting afresh. No piece of coloring should be left until finished.

SMOKING IN GERMANY.—It appears that the German Government has taken the matter of smoking seriously in hand, the practice being carried to so great an excess by the youth of that nation that it has been considered to have damaged their constitutions and incapacitated them for the defence of their country. In certain towns of Germany, therefore, the police have had orders to forbid all lads under 16 years of age to smoke in the streets, and to punish the offence by fine and imprisonment. Moreover, a Belgian physician has ascertained, during a journey of observation and inquiry made at the request of the Belgian Government, that the very general and excessive use of tobacco is the main cause of color blindness, an affection which has occasioned very considerable anxiety, both in Belgium and Germany, from its influence upon railway and other accidents, and also from the military point of view.

UNFIT FOR HUMAN FOOD.—At the regular session of the Health Board yesterday, Dr. Ewing, executive officer of the Night Medical Service, reported that during the month of October thirty-eight persons had been treated by twenty-five physicians. Assistant Sanitary Superintendent Dr. Janes informs the Commissioners that on the 11th inst. he visited two slaughter houses on First avenue and seized several quarters of beef which was unfit to eat. In closing his communication Dr. Janes stated that he understood that the cattle were weak and sickly before being killed, and that the butchers were in the habit of selling the meat to Bologna sausage-makers for two or three cents a pound. A committee of the leading cattle slaughterers in this city asked the Board to appoint a veterinary surgeon as an inspector of cattle and slaughter houses.—*New York Daily Herald, Nov.* 17.

BLEACHING GUTTA PERCHA.—Dissolve the gutta percha in twenty times its weight of boiling benzole, add to the solution plaster of very good quality, and agitate the mixture from time to time. By reposing for two days the plaster is deposited and carries down with it all the impurities of the gutta percha insoluble in benzole. The clear liquid decanted is introduced by small portions at a time into twice its volume of alcohol of 90 per cent. agitating continually. During this operation the gutta percha is percipitated in the state of a pasty mass, perfectly white. The desication of the gutta percha thus purified requires several weeks' exposure to the air, but may be accelerated by trituration in a mortar, which liberates moisture which it tends to retain.—*Journal de Pharmacy.*

PREPARATION OF WAX PAPER.—This is usually prepared by melting wax in the water-bath, heated to over 100 deg. C. (over 212 deg. F., which temperature may be exceeded by dissolving some salt in the water), and rapidly passing fine white paper through the liquid. But paper prepared in this way is very brittle. An improvement consists in adding to the wax certain softening ingredients. One part of bleached caoutchouc is melted in two parts of white Venice turpentine, and this mixture melted together with twenty parts of wax. The hot liquid is applied to the paper with a brush. The waxed surface, when cold, may be made highly lustrous by polishing with a fine rag. Raw umber, with white and a little chrome yellow, makes a soft, delicate shade of yellowish drab.

THREAD FROM WOOD.—The manufacture of thread from wood for crochet and sewing purposes has, it is said, recently been started at the Aby cotton mill, near the town of Norkoping, in the middle of Sweden. The manufacture has arrived at such a state of perfection that it can produce, at a much lower price, thread of as fine a quality as "Clark's," and has, from this circumstances, been called thread "*a la Clark.*" It is wound in balls by machinery, either by hand or steam, which, with the labeling, takes one minute twelve seconds, and the balls are packed up in card-board boxes, generally ten in a box. Plenty of orders from all parts of Sweden have come in, but as the works are not yet in proper order, there has hardly been time to complete them all. The production gives fair promise of success, and it is expected to be very important for home consumption.

TREATMENT OF BURNS.—Various are the modes of treatment proposed for burns. The last, which appears to come from "good authority," we give below. There can be no question about the carbolized water—although salycilicate of soda—one to 20 or 30—would undoubtedly be more useful. Dr. Shrady, of New York, recommends that burns be treated by applying a paste composed of three ounces of gum Arabic, one ounce of tragacanth, one pint of carbolized water (one part to sixty), and two ounces of molasses. The paste is to be applied with a brush, renewed at intervals, and is stated to be a successful method. Four applications are usually sufficient, the granulating surfaces being treated with simple cerate or the oxide of zinc ointment, as indicated.

MOUTH DISINFECTANT.—A lady asks us to name some harmless mouth disinfectant. It is not a good sign to have a mouth that needs disinfecting. There must be some fault with the stomach, or liver, or bowels. The first remedy should be to regulate the diet and other habits, so that the functions of excretion shall be perfectly established. Then if the mouth needs cleansing with any thing more than pure soft water, a harmless lozenge may be made by rubbing 24 grains each of permanganate of potassa and hyperoxydate of barium into a mass with sugar and glycerine, and dividing it into 14 parts. A very ill-smelling mouth will be thoroughly disinfected by its occasional use.—*Herald of Health.*

NEW METALLURGICAL PROCESS.—According to the Philadelphia *Public Ledger*, a new process for using up old metal has been invented by an Englishman named Drake. The resultant is a new metal which is said to possess extraordinary strength and ductility. The process consists in mixing up old steel with a patent compound, and subjecting the whole to an intense furnace heat, when the particles amalgamate. Steel made on this plan has been turned out at the Hunslet Works, and sold readily for £45 per ton. The process is said to be second only in importance to Bessemer's invention, and it will be especially valuable as finding use for old Bessemer steel rails.

STEEL FOR BOILER PLATES.—The tensile strength of steel for boiler plates should not greatly exceed 60,000 lbs. per square inch; above 70,000 lbs. the plates are apt to be brittle; below 50,000 lbs. they are likely to be spongy. No plate should be used which, after heating to a cherry red and plunging into cold water, will not allow bending over cold until the sides touch, and without breaking.

CAN BREATHE THROUGH HIS EARS.—Samuel Bremley, a barber of Mystic River, Conn., can breathe for a time without the use of mouth or nostrils, as communication is kept up between his lungs and the atmosphere through his ears. That this is the case, he gives demonstrations when indulging in a cigar, by exhaling the smoke through the same channel.

INJURIOUS TO THE EYES.—Medical investigation has shown that some of the occupations for children at Kindergarten schools are calculated to injure the eyesight. Among these are the pricking holes over a tracing on paper, braiding bright coloured bands of paper, or sewing fine silk upon tracings.

NOVEL METHOD OF PRECIPITATING RAINFALLS.

A patent has recently been issued to Daniel Ruggles, of Fredericksburg, Va., for a method of precipitating rain storms, which, judging from a well-known precedent, is not entirely chimerical. It has frequently been noticed that heavy cannonading is followed by a fall of rain. Profiting by this suggestion, Mr. Ruggles has invented a method of producing a concussion or a series of concussions in the upper regions of the atmosphere which he believes will induce rain.

The invention consists in brief of a balloon carrying torpedoes and cartridges charged with such explosives as nitro-glycerine, dynamite, gun cotton, gunpowder, or fulminates, and connecting the balloon with an electrical apparatus for exploding the cartridges.

Our engraving represents an individual in the act of bringing down the rain.—*Scientific American.*

BEARD'S WRENCH.

The object of this invention is to provide an inexpensive and effective wrench adapted for both pipes and nuts.

The invention consists of a wrench having a circular or nearly circular, eye in its head for the reception of a pipe or nut, which head is traversed by a slot, through which an adjustable tapering toothed key is entered to any desired extent to press upon and hold said pipe or nut.

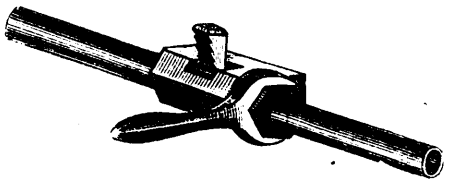
The head of the wrench is provided with an eye and the handle thereof, that may be screw-tapped into said head, or otherwise secured thereto.

The device as shown is adapted for operation on a pipe, and therein the said head is represented as being constructed in two parts, the fixed or lower portion, and the upper semi-circular portion, hinged or bolted at its ends to the horns of the lower part, so that it may be thrown open for the purpose of grasping a pipe and provided with a transverse slot, through which slot the tapering toothed key is passed with its teeth downward that they may engage upon the pipe and press and hold said pipe firmly down in the eye. In all instances the key is to be forced into the slot far enough to hold the pipe or other objects with sufficient firmness in the eye ; and if necessary to adapt a larger wrench to a small pipe, a curved block may be placed in the bottom of the eye to raise the pipe or other object, or a "liner" may be inserted over the key to press it farther down.

The key may be held in place, if necessary, by a set-screw, wherein a block on which the wrench is secured as a vise by bolts. When this wrench is applied to a pipe or other object and turned, the key is entered through the eye, and if the wrench is turned in the opposite direction the key will be entered from the opposite side, so that its teeth shall properly engage in said object, and so that movement of the wrench shall cause the said key to bite or take hold more firmly.

The head of the wrench may be made in one piece, or designed for nuts and other objects that can be readily seized without throwing the top of the head open, and the tapering toothed key is driven or inserted in the slot, that is preferably formed in the lower portion of said head. The wrench-head being set over and on a nut or stud, and the key being properly tightened, an ordinary wrench may be applied to serve as a handle by which to turn said head.

Mr. A. Beard, of Cincinnati, Ohio, is the inventor.



PIPE AND NUT WRENCH.

A MODEL HOME FOR THE WORKING-MAN.

In the illustrations on the opposite page are presented perspective and floor plans of a model home for the workingman, from designs by R. Rosenstock, of 215 West 132d street, New York. It is one of a group of four houses which were erected at Sterling, N. J., for Mr. F. S. Winston, President of the Mutual Life Insurance Company, of this city.

In designing the houses, the architect endeavored to combine comfort, simplicity and artistic effect at a moderate outlay, and an examination of the illustrations will show that he has succeeded in securing these essentials for dwellings of this character, to a remarkable degree. The roof starts about four feet above the level of the second floor, and is carried up very steep, thereby not injuring the rooms on that floor, and being a saving of that much material, which otherwise would have to be used to carry up the story to the required height.

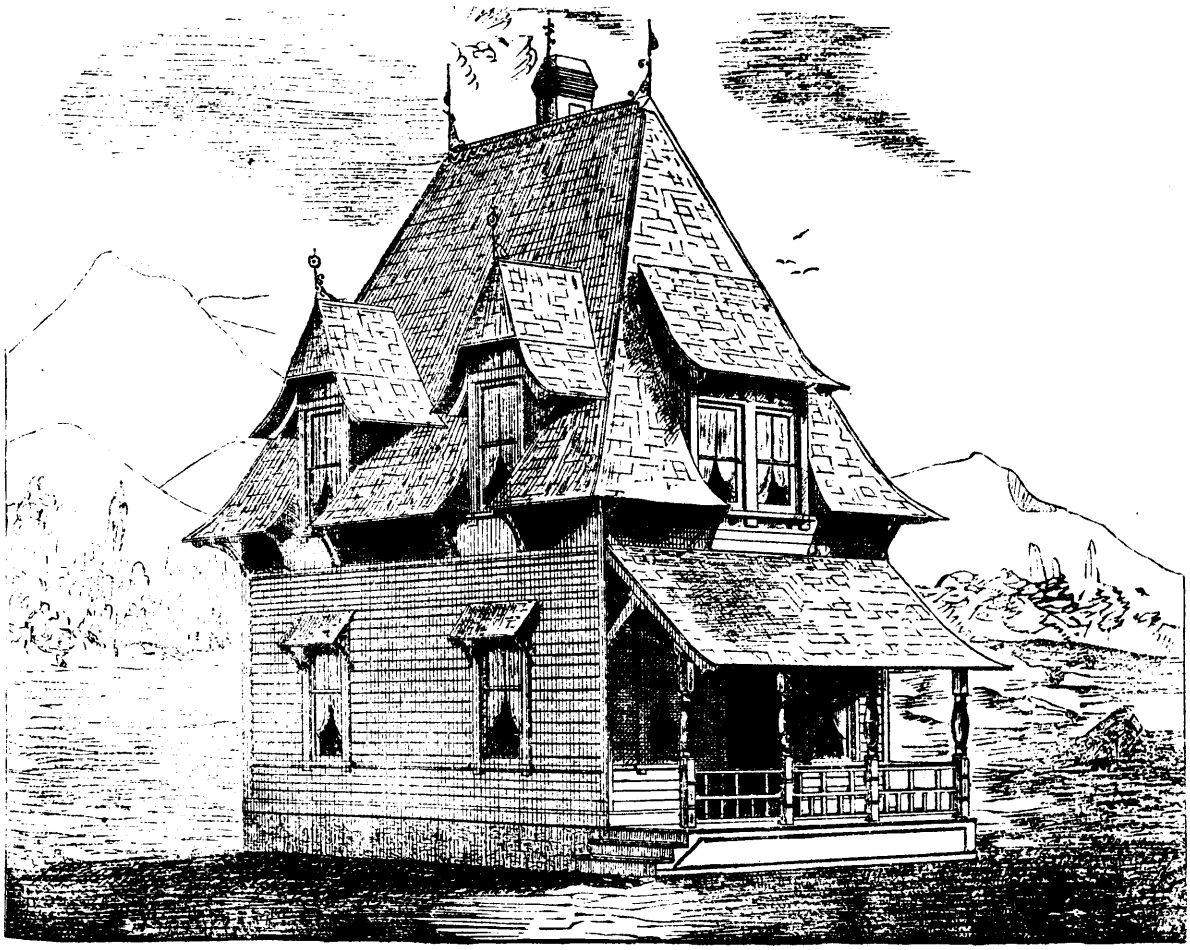
It will be seen by the floor plans that rooms of comfortable size are provided, also a sufficient amount of closet room, which is not very often found in a house of this kind. The first floor contains but two rooms—the parlor or sitting-room, provided with a sink and water, also a china dresser. Water is supplied from an artesian well. From the kitchen, the stairs lead to the cellar, which is of the full size of the house. Access to the upper floor is had by the stairs direct from the parlor.

The second floor consists of one large and two smaller bedrooms, with closet room.

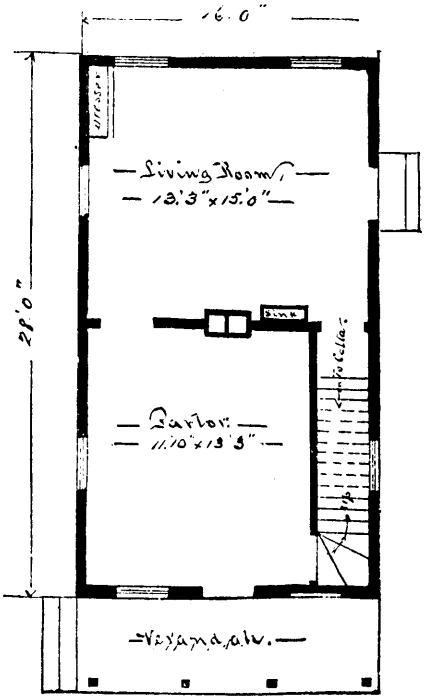
The interior is finished in a neat and substantial manner, neat cornices and center pieces being in the main rooms. The exterior is painted a deep French-gray ; brackets, window-sash, chamfers, and roofs painted in Indian-red ; and outside shutters in deep olive-green, thereby insuring a harmonious blending of colors.

This cottage was built at the small outlay of $900, including the artesian well. If any further information is desired relative to this cottage, it will be cheerfully furnished by the architect, who may be communicated with at the address above mentioned.—*Manufacturer and Builder.*

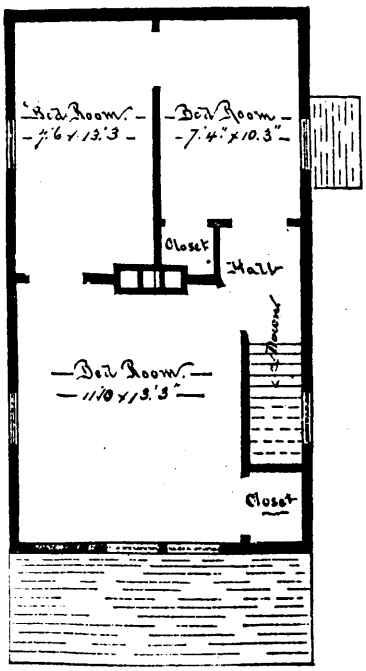
THE Russians keep fish perfectly sweet for a long time in the hottest of weather by dipping them in beeswax, which forms an air-tight covering for them.



DESIGN FOR A WORKING-MAN'S HOME, COSTING $900.



Plan of First Floor.



Plan of Second Floor.

DR. SCHLIEMANN'S DISCOVERIES.

The new book on the excavations at Hissarlik will be published early in November, by Mr. Murray. The title will be "Ilios, the City and Country of the Trojans," and it will contain many engravings. It is anticipated that the evolution of the author's ideas, especially with regard to the historical stratification of the Hissarlik Mound, cannot fail to cause surprise.

The present state of the case has been thus described by a writer in *The Times*:—Homer's Troy, which, at the outset Dr. Schliemann had identified with the first city ever built upon the site, that beneath which there was nothing but the virgin rock, while his discovery of what he called Priam's treasures in the next overlying layer of ruins clinched what had long been his conviction that this must have been the gold-bedight metropolis of the King, has now become the third of seven successive cities, instead of the first or second of five. The Homeric archæologist has, in fact, adopted the view of his friend, Professor Sayce, of Oxford, who during his visit to the Troad, in the autumn of last year, discovered the two cities, both built of stone, preceded the brick city then, as now, identified by Dr. Schliemann with Homer's Troy, and not one stone city only, as had hitherto been thought. The evidence, reserved until now, for thus dividing into two the undermost bed of stone *débris* at Hissarlik (a bed about seven yards thick stretching from the same height above the level of the plain to eleven yards below the top of the hill), will be given at large in "Ilios." Whether the people of the second of these cities were driven thence by an enemy or voluntarily abandoned the site Dr. Schliemann could not find out from the ruins. Of a great fire, he writes us, he saw no trace; three burnt houses only turned up here. The site seems to have lain waste for a long time, for the rain had had time to scoop out a great number of large holes shaped like funnels. These and other inequalities of the ground the new settlers filled up with stones or cakes of clay, shooting the superfluous rubbish down the steep slopes of the Mound. Their own new town they reared of very large bricks baked slightly and mixed with straw and grass. In a few instances only the walls of the ground floor were of small stones with clay cement, but the upper stories were always built of bricks joined together with brick-earth. As the old rampart of the south side could be easily scaled, they erected just in front of it another wall sloping at an angle of 15 degrees. On this and the adjoining old walls they built a large double wall of brick, with an interior passage and surmounted by many towers. The stupendous masses of brickwork with which the gateway was covered to the depth of 8 feet and even 10 feet leave no doubt that this portal was crowned with a huge tower. Where the new city shrunk far within the lines of the old, as on the east side, or overlapped it, as on the south-east, the old ramparts could not be used as substructions. Hence in these places the new settlers either built fresh ramparts to support their brick walls, or else laid on the *débris*, single or double courses of large flags, which they then covered with double or treble layers of clay cakes, and on these latter erected the brick walls. Of these brick walls, with the interior passage, large segments may still be seen on the north-east, south-east, and south sides. With tiny saws of silex or chalcedony and stone axes the builders could neither cut nor cleave planks, but used beams covered with brick-earth to floor their houses, each of which had also a clay-paved terrace. Besides the large street leading to the gateway there was but one other, about 6 feet broad and paved with great flags, which is to be seen to the east of Dr. Schliemann's great north and south trench. This city, the discoverer holds as firmly as ever, must have been fired by the hand of an enemy. It fell suddenly, as is clear from the skeletons found helmeted and with arms in their hands, as well as by the ten treasures of gold and other jewels, plainly left by hurrying fugitives. Nine of these he picked up in or hard by the royal house, near the gateway, from which it was only separated by what was plainly the Agora, which the "Iliad" locates before Priam's doors (ii. 788; vii. 346). Yet, as visitors may satisfy themselves, the south-east corner of the city was spared by the flames, so far verifying the local tradition attested by Sarabo (xiii. p. 600), that Troy was not utterly destroyed by the avenging Greeks. From the prophecy which Homer (ii. xx. 307-8) puts into the mouth of Poseidon, that the sons of the sons of Æneas should rule over the Trojans, Dr. Schliemann infers the currency of this tradition in the bard's own time. The Homeric archæologist seems now to think, in spite of some appearances to the contrary, especially the difference in architecture, that out of this remnant of the third city sprang, like a phœnix, the fourth. His principal arguments are the striking resemblances between the pottery of both (notwithstanding the emergence of new types in the latter stratum) as well as in the idols, particularly those of the owl-faced Athene, and in the votive whorls dedicated to her. Again, he says:—"The supposition that the people of the fourth city was identical with that of the third—the burnt city—seems likewise confirmed by the configuration of the layers of *débris* above the road which leads from the gate to the plain. In fact, as visitors will convince themselves by a glance at the strata of the large blocks of *débris*, 40 feet high, which I have left *in situ* on the gateway road, the very same road, though covered to the depth of 8 feet or 10 feet by the *débris* of the burnt city, continued to be used by the inhabitants of the subsequent city for going in and out." As to the striking architectural difference, that not a single brick was found by him in this latter city, it is urged that the conflagration may have convinced the Trojans of the unsafeness of that material. Hence "they agreed by common consent to abandon it, and to build thenceforward only stone house-walls, such as visitors see above the burnt city."

Dr. Schliemann concludes the long letter whence the above brief extract is taken by resuming the arguments for his identification of the Homeric Troy—no new point, however, being made—and by answering the objections drawn from the "Iliad" itself against his theory. The bulk of the stumbling-blocks, scorning to fall back on the bard's poetic license at the cost of his historical fidelity, he evades by what the lawyers call the plea of confession and avoidance. He frankly owns that, with the above exception, the third Hissarlik city was not broad-streeted, as Homer calls Ilios. Nor was it either well-built or populous, great or flourishing. It had no Acropolis, the meanly built brick town on the hill being its own Pergamos, with no lower city on the table-land beneath to defend. Its area was about that of Trafalgar square, and its population 3,000 at the utmost—say a tithe of that of Torquay. But we are reminded that when Homer visited the site, about the middle of the ninth century before our era, the Ilios of the Æolic Greeks had supplanted not only the rebuilt Troy of the Æneadæ, but a couple of other cities besides, and was itself in the third century of its age. It had long outgrown the sacred site, which had now become only its citadel, where its gods were housed in their temple, and which centuries afterwards Xerxes climbed to sacrifice to Athene. This was the Pergamos Homer described as Priam's—which was really at the time seven yards below the soil—and the Troy of which he sang so loftily was that which lay at its feet on the plateau, a city truly great, broad-streeted, populous, and flourishing, so as to be well able to sustain, with the help of its powerful allies, a siege of ten years. A still stronger objection against regarding Hissarlik as the site of Troy has always been drawn from the hydrography of the plain. For, according to all the indications in the "Iliad," the Simois falls just in front of Ilios into the Scamander, whereas Dr. Schliemann's river Simois (the Doumbrek Su) falls into the Kalifatli Asmak, not into the Mendere Su, which he agrees with others in identifying with the Homeric Xanthos, or Scamander. Moreover, the Scamander undoubtedly flowed between the Greek camp and Ilios, whereas the course of the Mendere is really on the west side of the Plain of Troy, so that the hostile armies in their movements between the Hellespont and Troy need not even have approached it. It is but fair to Dr. Schliemann to say that from the very outset he has insisted (in meeting these objections) that in the time of Homer the Scamander, as far as the modern village Koum Kioi, filled the immense bed of what has now dwindled to the little rivulet known as the Kalifatli Asmak; that from that point it turned eastward; and that it flowed into the Helle pont by the broad bed of the dead, and, in the rear, blind watercourse called the In Tepeh Asmak. It will be shown in detail in "Ilios" that this hypothesis of a change in the bed of the Scamander is triumphantly borne out by the geological investigations of Professor Virchow. His numerous and deep dredgings in the bed of the Kalifatli Asmak and in that of the In Tepeh Asmak, have brought to light in those ancient channels the tell-tale scour of disintegrated syenite brought down aforetime by the Scamander as it flowed through the stratum of that mineral, through which the Homeric river breaks just above Ewjilar, at the foot of Ida. From the In Tepeh Asmak fragments of brick have also been fished up. They have belonged to brick-built Ilios itself, which, from this point of view, may not improbably have descended towards the river, a site very suitable for a suburb. The ancient estuary marked by the In Tepeh Asmak seems to bear the name Old Scamander, in Pliny, H. N., v. xxxiii. 1—a passage plausibly cited by Dr. Schliemann as throughout supporting his view of the hydrography of the Troad.

"The *débris* of the fifth city," writes Dr. Schliemann in his last descriptive letter, "is characterized by a complete absence of stone weapons and implements, which occurred in such immense abundance in the preceding towns. But as to the pottery, I have not noticed any great change. Though wheel-made vases are more abundant here, yet by far the greater part of the pottery is still hand made. There occur here some new types of terra-cotta vessels, but most of the old forms remain, and the mass of terra-cotta whorls, ornamented or plain, is here just as great as before. The small marble idols with an incised owl-head are here even more abundant than in any of the preceding cities. But the architecture of this fifth city must have been totally different, because there are here neither brick nor stone walls. Hence I cannot help thinking that this last pre-historic city was of wood." This wooden Troy he thinks must have been succeeded by a Lydian settlement, mainly on account of the very strong resemblances between its pottery and that of the Etruscans, whose migration from Lydia to Italy, as reported by Herodotus, he unreservedly accepts. The plantation of this Lydian colony on the Hissarlik Mound he dates long before this westward movement. Besides the marked Etruscan affinities of the pottery found in the layer of ruins next below those of the Æolian city, as contrasted with the ceramic remains of the older strata, attention is called to another very interesting point. Dr. Schliemann affirms that in the ruins described by him as Lydian are repeatedly found the same strange written character which figures above the doors of the ancient hut urns said to have been found below the *peperino* at Marino, near Albano, as published by Sir John Lubbock and Signor Pigorini. As this written character is common to the Lydian with the third, fourth, and fifth cities, Dr. Schliemann has submitted to Professor Sayce, who writes for "Ilios" the appendix on the score or so of short inscriptions which have turned up in the pre-historic strata at Hissarlik, his idea that the Lydian language must have been identical with that of the three cities in question. Professor Sayce replied as follows:—

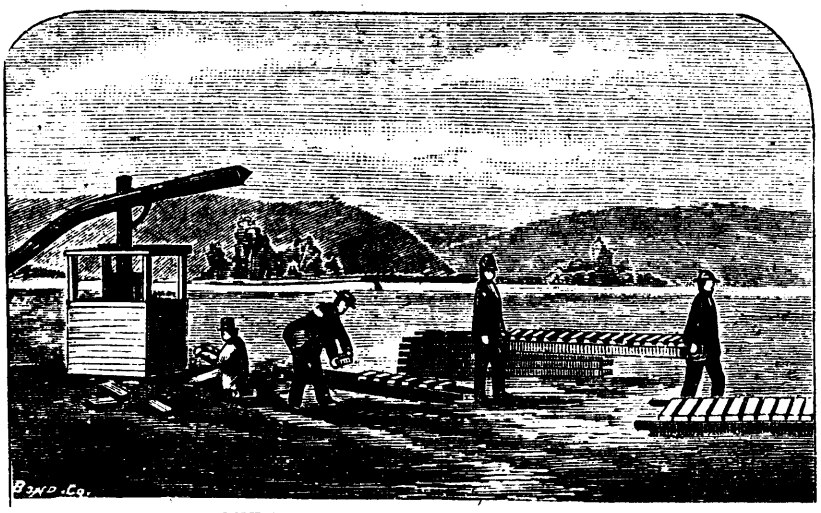
"You are right in thinking that the Trojan language was akin to that of the Lydians, and that both Trojans and Lydians used the same syllabary. I have been brought to exactly the same conclusions by my researches. The most important fact acquired is the one derived from Mr. George Smith's discovery of a clay cone inscribed with Kypriote characters under the floor of Assurbanipal's palace at Kouyunjik. This cone is almost a duplicate of the two cones you discovered inscribed with the Kypriote character which I read *mo*, and the Kypriote characters upon it belong to the Trojan form of the Kypriote syllabary. Now, Gog or Gyges, King of Lydia, sent tribute to Assurbanipal, who states that the very name of Lydia had previously been unknown to the Assyrians. Indeed, we learn from the Assyrian monuments that up to that time the Assyrians had never penetrated westward of the Halys. You see, therefore, what important consequences follow. 1. The cone must have been brought to Nineveh by the Lydians, and either there was a close and intimate connection between Lydia and Troy, or else the Lydians used exactly the same form of the Kypriote syllabary as did the Trojans. 2. This syllabary was in use in the Troad (and Lydia!) at least down to about B. C. 650. 3. The painted archaic vase-fragments, with the character signifying *mo* thereon, found by you in the Æolic Ilion, would belong to about the latter period, from which we may gain some idea of the great age of the inscribed objects you found at greater depths, and of the objects associated with them. I do not hesitate to say that the discovery of the Trojan inscriptions constitutes the most important contribution that has been made of late years to the science of palæography. And, what is more, it reveals a new and unexpected chapter in the history of Asia Minor. If only we possessed some Lydian inscriptions we might be able to determine the age of Troy and its relations to Lydia."

The seventh city—that of the Æolian Greeks—has already been touched upon. Dr. Schliemann thinks it was built soon after their expulsion from the Peloponnesus by the Dorians—an events usually dated about B. C. 1100. Formerly the Homeric archæologist followed Strabo in dating the foundation of the Greek Ilion some four centuries later.

EARLY RISING.—Of course the majority of the busy members of the community have been "away for change of air and scene," and, equally, of course, the majority have derived substantial benefits—not at the moment apparent, perhaps, but to be evidenced, in better health or more energy, presently. This is, therefore, a good time to speak of such reforms in the management of self as may be expedient. We venture to suggest that those who have not made a fair trial of the practice of early rising should do so. With a cup of tea, and perhaps a single slice of bread-and-butter, to wake him at 6 or 6.30 in the morning, a fairly healthy man may go to his study, and enjoy the priceless luxury of two or three hours of work when his brain is clear and the distractions of the day's ordinary business have not begun to assail him. The practitioner of an applied science, such as medicine, is especially in need of time for reading and quiet thought. In the active hours of the day this is denied him. At night he is, or ought to be—but for the bad habit of reading by night, probably formed in student days—too weary in mind and body to do good work. In the early morning, with his brain recuperated by sleep, and his whole system rested, he is especially fit for labour. Those who do not feel thus on awakening are either the subjects of some morbid state, or the slaves of a habit which, however common, is essentially unnatural. Some of the difficulties which beset the task of early rising are due to want of method in the act of "getting up." It is comparatively easy to rouse one's self instantly, but to not a few of us it is extremely irksome, and almost impracticable, to rise slowly, that is, taking time to think about it. The man who really wishes to rise early should get up the instant he wakes, and, if weakly or over forty years of age, instead of plunging into cold water or applying cold to the head to rouse himself, he should, as we have said, take a cup of tea or milk to stimulate the organism before expecting to elicit a reaction by a powerful depressant such as the cold bath or douche. Many persons make a mistake in this matter, and by taking their bath immediately after getting out of bed, lower the vitality instead of raising it. In certain cases it is better to leave the bath until after a walk or a spell of work has thoroughly awakened the organism and called out its energies. Experiences in relation to this and other matters must differ as widely constitutional peculiarities diverge; but, speaking generally, the early morning is the time for serious work, and those who do not so use it find a poor substitute, and one which is by no means hygienic, in the late hours forced upon them. A man cannot get up early if he goes to bed late; but as between the two extremities of the day, the morning is, on all accounts, the best for brain exercise.—*Lancet*.

STEEL-MAKING AT MIDDLESBROUGH.—Semi-official statements in our English exchanges assert that the metallurgical process carried on at Messrs. Bolckow, Vaughan & Co's steel works at Eston, near Middlesbrough, has proved successful. Although it is now some time since this firm began the manufacture of steel from Cleveland iron-stone by the Thomas-Gilchrist process, securing good results, there was a mechanical difficulty, and it was decided to extend the works at Eston, and to erect two new converters, each of 15-ton capacity. After a short trial of one of these with hematite iron, the two were turned to the production of steel from Cleveland iron. The working, witnessed by the officials of the company and by engineers and eminent metallurgists, it is stated, has yielded mechanical, chemical, and commercial results beyond the expectations of the promoters. Rails and steels in other shapes have borne satisfactorily all the tests applied, and the process will be continued regularly. It is believed that, by keeping the phosphorus to a percentage about equal to that found in ingot iron or steel made by the regular process, with the silicon reduced to a nullity, the breaking strain of plates, for instance, made from such ingot iron will increase, and thereby add to the advantages of ingot iron manufactures as against puddled irons in structural work. At the same time, steel manufacturers have complained of the tendency of late years of engineers to require greater toughness in the metal, which is obtained at the expense of hardness. Steel rails as now made do not show the same resistance to abrasion as they did ten years ago, when in the test clauses the "monkey" was lighter, the fall less, and the distance between the bearings narrower. Messrs. Bolckow, Vaughan & Company are reported to have an intention to roll plates, angles, tees, and bulbs from ingot iron at an early date.

TUNNELS AS PRODUCERS OF DISEASE.—M. E. Perroncito has been investigating a dangerous anemia, which prostrated a considerable number of the workmen engaged in boring the Saint Gothard tunnel, and found that all those affected by it were also troubled with parasitic worms, the presence of which alone was sufficient to account for the development of disease. Dr. Giaccone, in the employ of the Saint Gothard Company, states that the same disease appeared during the boring of the tunnel of Fréjus.



OFF-BEARING BRICK CASES.

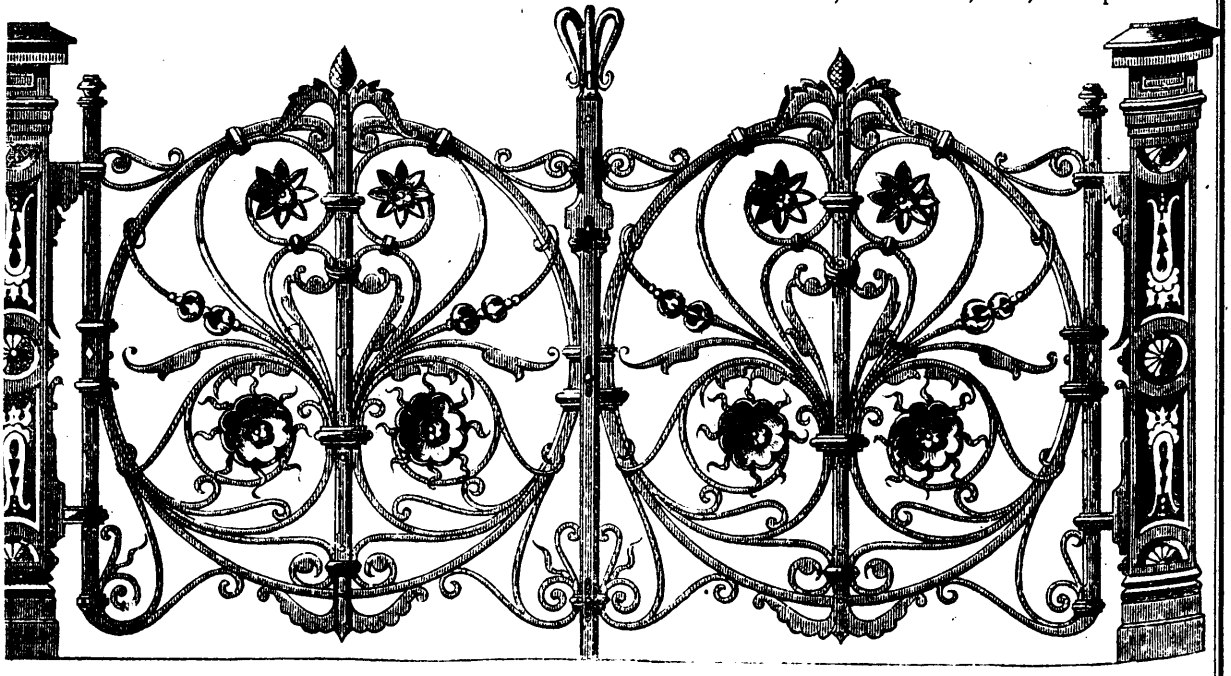
LUDLOW'S OFF-BEARING BRICK CASES.

The idea seems to be common and prevalent that the manufacturer of brick especially must resign himself to great losses annually from rain storms upon his unprotected brick, and in many instances there are thousands lost with a great loss of labor, incurring a heavy expense from which he seems to have no remedy and thus annually millions of dollars in material and labor are wasted in the United States alone, all of which, we are happy to say, can be saved, thus giving the manufacturer better margin on his labor.

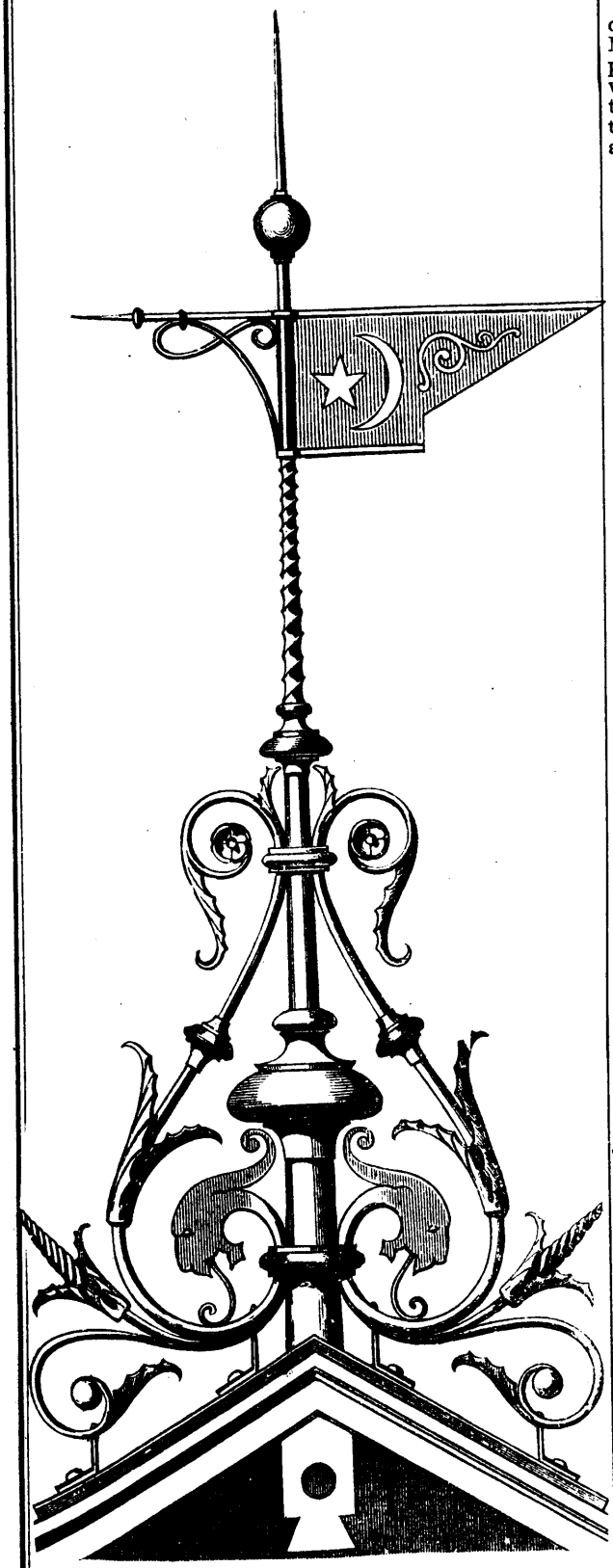
This protection is to be found in this invention. To handle the cases in the event of a coming storm, one man at each end of a case can lift and place them evenly over each other, five in a pile or as many more as convenient, place on the top an empty case and put in the end covers; they are now safe from injury from storms for any length of time, and this can be done by two men after a little practice at the rate of 1,000 per 8 minutes, and placed back on the ground for drying again in the same short length of time. This can be done without injury to the brick though soft from the molds, for to that class of brick they are especially adapted, but for all others equally as good; to save yard room the cases may be placed on each other, just from the mold and be shaded in drying, placing five times the number of brick on the same space of yard and may be doubled when a little dry on cases, thus a case holding thirty-six brick will hold seventy-two, you have only to increase the number of cases on piles, as before stated, to put out 75,000 or 100,000 brick before setting in the kiln. The off-bearing cases are adapted to any kind of brick, sand, slop or pressed.

The cut shows the off-bearer turning out brick on the case. He can lay the case under the molder, or place a number of them just outside of his mill sweep, and turn out his molds alternately until all are filled; this will let the brick harden and save settledge while green, and as each case is filled they may be carried and replaced by others. By these means there is no delay, the work goes on steady and smooth. The figure in front shows the cases being carried and placed on the yard in regular rows until ready to be edged, or, if desired, an place them in piles five or more in height, leaving the ends open for the air to pass through and dry in the shade, always closing the ends in damp or rainy weather. The cases are laid in rows on the yard covered with brick; this is the best way to do in fair weather. Let them harden sufficient to edge them, set them in piles and double them on each case, and cover them when necessary. This method places ten times as many brick on the same space of ground as are put on after the old method.

Mr. Wm. H. Ludlow, of Red Cloud, Neb., is the patentee.



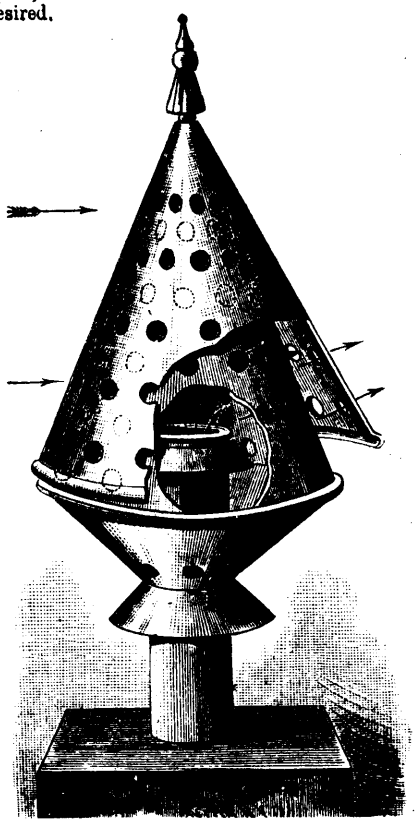
WROUGHT-IRON GATE IN THE ALTAR RAILING IN THE CHURCH OF ST. MAURICE, RHEIMS.



A WROUGHT-IRON FINIAL, DESIGNED BY C. DOLLINGER.

NEW CHIMNEY CAP AND VENTILATOR.

We give an engraving of a novel and simple chimney cap recently patented by Mr. William D. Bartlett, of Amesbury, Mass. It is designed to meet all the conditions necessary to the perfect working of a chimney or ventilator, and works equally well in a high wind or perfect calm. In this respect it is claimed that this device has great advantage over others intended for the same purpose, and in its construction it is certainly as simple as could be desired.



BARTLETT'S CHIMNEY CAP AND VENTILATOR.

The chimney cap consists of a perforated cone closed at the top and forming a housing around the escape flue, which cap is fitted with a perforated conical hood that is slightly larger than the fixed cap, and is hung loosely at its apex, so that it may swing freely. The holes in the hood do not register with those in the fixed cap, so that as the hood is pressed by the wind against the cap the openings are closed on the windward side, while there is free exit at the opposite side.

The cones are broken away in the engraving to show the internal construction.

The device is adapted equally well to chimneys and to ventilating shafts or flues.

LUBRICATING QUALITIES OF OIL.—The lubricating qualities of an oil are inversely proportional to its viscosity; the endurence of a lubricant is, in some degree, proportional to its adhesion to the surface forming the journal. An ideal lubricant in these respects, would be a fluid whose molecules had a minimum cohesion for each other, and a maximum adhesion for metallic surfaces. Viscous oils adhere more strongly to metal surfaces, hence it is obligatory to use such thick lubricants on heavy bearings. With light pressures more fluid oils are admissible, and in all cases the oils should be as limpid as possible. Oils with great endurance are likely to give great frictional resistance, and in the endeavour to save gallons of oil, many a manager has wasted tons of coal. The true solution of the problem of lubricating machinery is to ascertain the consumption of oil and the expenditure of power, both being measured by the same unit, namely, dollars. Mr. Woodbury detailed his experiments in measuring the fluidity of oil; omitted their endurance, because consumption of oil varies with temperature, and gave the data for determining the safety and efficiency of a lubricant.

Mechanics.

IRON VS. STEEL FOR BOILER PLATES.

The question of iron *vs.* steel for boiler plates continues to be the subject of an animated discussion in England and on the Continent. Both sides of the controversy are being conducted with considerable skill, and some facts of interest are elicited from various sources. It will be remembered that attention was again directed to the subject by the failure of the steel boilers of the "Livadia." After the plates had been passed as excellent in quality by the shipbuilders, by the Russian inspectors and by the officials of Lloyd's, the finished boilers broke down under a test which was by no means severe. It was naturally included that there was something radically wrong. The case does not, however, by any means sufficiently justify a wholesale, indiscriminate condemnation of steel as a material for that purpose, nor would it, on the other hand, be wise to pass by such a failure in absolute silence. The present and great prospective value of steel is fully admitted by all who have had occasion to test its merits. We have, however, the testimony of too many intelligent and disinterested constructors as a proof that the new material, "ingot iron" or "mild steel," is subject to sudden and, apparently, unaccountable failures. The interests of producers of steel and of their customers are not well served by any attempt to pass by these failures in silence, and it is certainly a poor argument on the part of the friends of steel to urge that iron is worse. What is wanting is a full and clear statement of facts, so that it may become possible to fix with certainty the dangers to be avoided and settle upon the best treatment to be adopted. Whether and under what circumstances open-hearth or Bessemer steel is permissible or preferable, is also a matter which will come up for early decision. As yet there is—justly—an inclination to adhere to the milder qualities of metal turned out by the open-hearth process, and, as we have had occasion to state the result has been very favourable to it in this country. It has been argued that the favor which steel has been gaining in England is due, to a large extent, to the liberality of the steel-making firms in the matter of credits and the promptness with which they are willing to replace defective plates by new ones. As a business measure, in introducing an unknown material, such a course is evidently a wise and prudent one, but we doubt whether an attempt to keep occasional failures as quiet as possible, by taking back rejected plates, is still the correct one. Boiler-makers have sufficient confidence in the new material, and consumers will not now be frightened off by a free discussion of matters relating to its use. Little can be gained, and much lost, by undue reticence, and we hope that in the next few years the questions relating to the treatment of steel boiler plates will be freely and fully entered into. The failure of the "Livadia" boilers is a case in point. All that can now be said can only be general in character, until specific and detailed facts are forthcoming to form a sound basis for argument.—*The Metal Worker.*

PRACTICAL VIEWS ON HORSE-SHOEING.

Do you value your horse, and wish justice done to his feet by the smith? If you do, assist the smith by paying a little attention to the horse's feet yourself. Any one who has observed the paring of horse's feet is aware of the excessive hardness of some feet. They plainly see a considerable amount of physical exertion used by the smith, and note that the instruments become dull by the hard resisting horn which they have to contend with, causing a loss of time in preparing the hoof for the shoe.

A careful and observing man who has fine horses to take care of, thinks it but little trouble to stuff the feet for the purpose of softening them. This may be done by oiling the sole of the foot, and by saturating loose cotton waste with oil and embedding it against the sole of the foot. Then with a sharp knife cut pieces of stiff whalebone the proper length, and spring them in place between the hoof and shoe for the purpose of keeping the waste in its place. The whalebone is no source of danger in case of accidental removal. This can be done the night before shoeing. When the horse is taken to be shod, the material can be removed. A foot thus prepared will be clean of all hard spots, and easily shaped to suit the smith, while the sole, naturally elastic, will be rendered more so, to the benefit of the sensitive laminæ of the inner part of the foot, between the coffin bone and the sole.

Cow manure will answer the same purpose as the oil and waste with little or no trouble, the only preparation required being a shovelful placed where the horse stands. This will also remove soreness after a severe day's labour, and the moisture from the manure has a tendency to check the heating and drying nature of the straw bedding.

A great number of fine driving horses have very hard feet. Any one who will pay attention to keeping the feet properly softened will observe a marked increase of activity in the horse's movements.

Heavy dray horses in hot weather should have their feet well cleansed of all gathered material, such as loose earth, sand and sticks, which sometimes get between the shoe and the sole of the foot. After being properly cleansed they should be painted with oil. A fifteen cent. brush and a pot of oil, costing twenty-five cents, will last two months. This tends to prevent the heat absorbed from the sun's rays that arises from cobble stones and earth, from drying the feet. The benefit of this little hint, if acted upon, will be found inestimable. The dumb brute who contributes his strength for the benefit of man, at the end of the day should have his limbs washed, his feet cleansed and oiled, clean water to drink, and a generous supply of wholesome food, as well as good clean bedding, so that he may become refreshed for the following day's labour.

CHAS. SMITH.

BLOWERS FOR BOILERS.—A correspondent of the Boston *Journal of Commerce* has been investigating the subject of blowers for steam boilers and gives the following as the result: from my investioations and experience I have arrived at the following conclusions: Upon inquiry of the largest manufacturers, I found that there are more blowers now being used for boilers purposes than ever before, and that there use for that purpose is steadily increasing; that the power required to run a blower for such purpose is small as compared with the benefits obtained in increasep boiler capacity and the ability to use a cheaper class of fuel; that there is small risk from fire if properly put up and used. During several years' use of a blower, and from inquiries made of those used for the same purpose, I can learn of no instance of back draught occasioned by its use. (The mill adjoining me using no blower was set on fire by back draught). There will be no blow-pipe action if the air is properly put into the ash pit and regulated by a gate, and the effect on the crown sheets will be the same as with strong natural draught. It is not an uncommon occurrence to be obliged to renew the crown sheets when blowers are not used. Certainly something must be wrong and out of the usual course to be obliged to renew them on new boilers in so short a time. In conclusion, my own experience demonstrates that to offset the disadvantages of a blower, if any, a saving is made of fifty per cent. in fuel expenses by my ability to use a cheaper class of fuel although I have a good natural draught from a 100-foot brick chimney."

A CIVIL engineer writes thus trenchantly in the London *Building News*:—One would imagine, after the perusal of a modern fashionable building specification, that its framer and the concoctor of its details had the most perfect knowledge of the materials on which that document so glibly descants. If, however you take the trouble to follow up the work it pretends to control, you, in the majority of cases, find that the whole thing is a mere sham, not so much from the desire to do wrong as from the incapacity to do right. A clerk of the works is, as a matter of course, appointed, whose duty is supposed to be of a protective character; but even the most experienced of that class is unable to cope with the difficulties with which, even in an ordinary building, he is surrounded. Unfortunately, in these times, both engineer and architect prefer the luxurious office to the building they have undertaken to construct, and have no pride in looking after the details on the ground—unlike, in that respect, Wren and Smeaton, the former of whom, it may be safely affirmed, knew every stone in St. Paul's, and the latter had an equally intimate acquaintanceship with every member in the scheme of his great work—the Eddystone lighthouse."

THE CORROSION OF IRON.—Air alone does not corrode iron. Therefore, by the elimination of aqueous vapor and carbonic acid from the interior of closed iron vessels, the iron is preserved. The principle can be utilized in many ways for preserving unused steam boilers by thoroughly closing all orifices, and by heat causing the aqueous vapor to evaporate. Burslyn proposes a cheap and simple method, by taking advantage of the affinity which calcium chloride has for moisture. He lays a flat, open vessel, containing the calcium chloride in the iron vessel, and the air is soon freed from all moisture. As soon as the calcium chloride is saturated with moisture, it is useless and re-

quires renewing. Water alone is also harmless in contact with iron, and if the ordinary water of commerce were evaporated in a vessel properly arranged to allow the escape of the air driven from the heated water, and then condensed before being allowed to enter the steam generator, corrosion would be almost completely retarded. This is, of course, assuming that the water was free from all injurious ingredients liable to deposit. But even with water highly chargad with suspended matter in solution, it would be well purified by the preliminary evaporation and condensation.

SPONTANEOUS COMBUSTION OF CHARCOAL.—Among the substances subject to spontaneous combustion, according to the *Fireman's Journal*, pulverized charcoal is said to be one of the most remarkable. Incidental to this phenomenon a story is told that a load of charcoal was delivered in an outhouse of a clergyman in Leipsic, and showed no signs of burning until the door by accident was left open, when the wind blew sprinklings of snow on the charcoal. The rapid absorption of oxygen from the melting snow caused the charcoal to ignite, and as the day was windy the whole range of buildings was burned to ashes. In this connection a fruitful and unsuspected source of fire suggests itself to those of our American housekeepers who burn wood as fuel, and who store the ashes in boxes or barrels. The accidental disturbing of such ashes, even after years, will cause them to ignite, provided the air is damp or foggy. The phosphuret of potash from decayed wood renders wood ashes highly inflammable, and mysterious cellar fires in the rural districts are, no doubt, in some cases, caused by this form of spontaneous combustion.

WIRE ROPE TRANSMISSION.—Among the recent improvements in the way of transmitting power for long distances, is the substitution of belts by endless wire ropes running at a high speed. Just where the belt becomes too long for economy there the rope steps in. In place of a flat-faced pulley a narrow sheave, with a deep, flaring groove, is used, the groove being filled out, or lined rather with leather, oakum, India rubber, or some other soft substanee, to save the rope. The essential points are a large sheave, running at a considerable velocity, and a light rope. When the distance exceeds 400 ft., a double-grooved wheel is used, and a second endless rope transmits the power 400 ft. further, and so on. The loss by friction is said to be only 8 per mile. If it is required to transmit 300 horse power by means of a wire rope, the size of rope required will be one inch in diameter, running 4,920 ft. per minute over a wheel 14½ ft. in diameter, making 180 revolutions per minute. One is thus enabled, at a small expense, to transmit power in any direction.

A NOVEL RAILWAY DEVICE.—M. Haureg, a French inventor, proposes a method of boarding railway cars without stopping the train. A "waiting carriage," fitted with a steam engine with special gear, and space for passengers and luggage, is placed on a siding at the station, and picked up by the train as it goes past. The latter, by means of a hook on its last carriage, catches a ring supported on a post, and connected with a cable wound on a drum in the waiting carriage. Thereupon the drum begins to unwind, and in doing so compresses a system of springs, while the carriage is moved at a rate gradually increasing to that of the train. The engine of the carriage then winds in the cable, the train and carriage are connected, passengers are transferred from the joined carriage to the train, and *vice versa;* then the two are disconnected, and the engine of the carriage, working on the wheels, brings it back to the station whence it was taken.

HIGH-SPEED MACHINERY.—The speed of a cutting machine should be regulated by the number of feet per minute travelled over by the cutting face and the quality of the material cut From 15 to 18 ft. per minute may be allowed for wrought or cast iron, and twice that speed for gun metal, whilst for steel the speed must be reduced in proportion to its hardness. As a rule, these speeds are seldom approximated to, and thus it becomes a matter of serious loss to the engineering manufacturer that a certain cost of plant is not producing its full equivalent of work in a given time. In the same way, with reference to the prime movers or engines, their development of power is exactly proportionate to their speed; indicated horse power being the product of the gross pressure multiplied into the number of feet per minute, through which the resistance is overcome. About 300 ft. piston speed per minute is the average speed for which most commercial engines are designed.

A GLUE for ready use is made by adding to any quantity of glue common whisky instead of water. Put both together in a bottle, cork it tight and set for three or four days, when it will be fit for use without the application of heat. Glue thus prepared will keep for years, and is at all times fit for use, except in very cold weather, when it should be set in warm water before using. To obviate the difficulty of the stopper getting tight by the glue drying in the mouth of the vessel, use a tin vessel with the cover fitting tight on the outside to prevent the escape of the spirit by evaporation. A strong solution of isinglass made in the same manner is an excellent cement for leather.—*Builder and Wood-Worker.*

THE BASIN OF THE GULF OF MEXICO, AND THE CORAL REEFS OF YUCATAN AND FLORIDA BANKS.—At the session of the National Academy of Sciences, held recently in the lecture-hall of Columbia College, New York, Professor J. E. Hilgard illustrated his paper on the basin of the Gulf of Mexico by a sectional drawing and a model showing the bed of the gulf. The model, formed from data furnished by the United States Geodetic Survey, was constructed to a scale of forty miles to the inch. The area of the gulf is estimated at 600,000 square miles, one half of which has a depth of 100 fathoms. The deep basin, more than 55,000 miles in area, has a depth of 12,000 feet. In a paper read at the same session, by Professor Alexander Agassiz, on the origin of the coral reefs of the Yucatan and Florida banks, it was asserted that Darwin's theory of subsidence would not fully account for the great reefs. There are no traces of subsidence on so vast a scale; indeed, the signs are those of elevations, for which subterranean disturbances furnish the best explanation. The old coral reefs enable us to infer with tolerable accuracy the ancient courses of the ocean. The theory of subsidence does not account for the immense accumulations of matter on the gulf plateau, since the coral deposits are going on where there are no signs of subsidence.

COAL DEPOSITS IN NATAL, SOUTH AFRICA.—Mr. Frederick W. North, mining engineer, who set out from England some time ago to explore the coal-fields of Natal for the Colonial Government, estimates that within the colony of Natal he has already inspected 200,000,000 tons, suitable for house, steam-locomotive, marine, or gas purposes. The best workable coal, as far as known as present, begins between Helpmakaar and Dundee, and very important coals, from 6 to 10 feet thick, extend over many miles of almost uninhabited country up to Newcastle. The coal, lying in nearly horizontal strata, is believed to correlate with the Permian and New Red Sandstone of Great Britain. It is bituminous, semi-bituminous, or fat-caking coal. Mr. North thinks the deposits surveyed by him will be of no service until about 150 miles of railroad are constructed. Coal at present brings £4 per ton at Pietermaritzburg, and at Durban, £3; while these coals could be put on the banks or into waggons at 10s. per ton. Mr. North describes this coal as "the only deposit, together with iron ore, with which nature has endowed Natal."

WHY A PUMP WILL NOT LIFT HOT WATER.—The suction pump depends for its action on atmospheric pressure. When the piston of such a pump is raised, a vacuum is formed beneath it, and the water from the well or reservoir is forced to follow the piston up to the top of its stroke, by the atmospheric pressure on the water surface with which the pump is connected. When the attempt is made to lift very hot water, however, the rise of the piston causes an abundant evolution of steam or vapor from the water surface, which fills the space beneath the piston. This steam or vapor has considerable tension, and exerts a sufficient back pressure to counterbalance and equalize the atmospheric pressure. On this account, the lifting of hot water, save for very small lifts, is impossible. When hot liquids are to be pumped, therefore, the point of supply should not be below the pump, but rather a little above it, so that the liquid may flow into it.

THE TAY BRIDGE.—We commend to Mr. Haskin, of Hudson River tunnel notoriety, and to the coroner's jury who "sat upon" the victims of the disaster connected with it, the report of the experts employed to ascertain the cause of the Tay Bridge calamity. The bridge, says the experts, was bad in design and construction, and was badly maintained, and tumbled down because of defects of structure that were apparent and were merely patched up before the happening of the casualty. Sir Thomas Bouch, the designer and constructor of the bridge, is charged with the initial blunders. General Hutchinson, the Board of Trade Inspector, bears the blame of allowing the bridge to be used when he had full knowledge of its dangerous condition.

Fig. 1

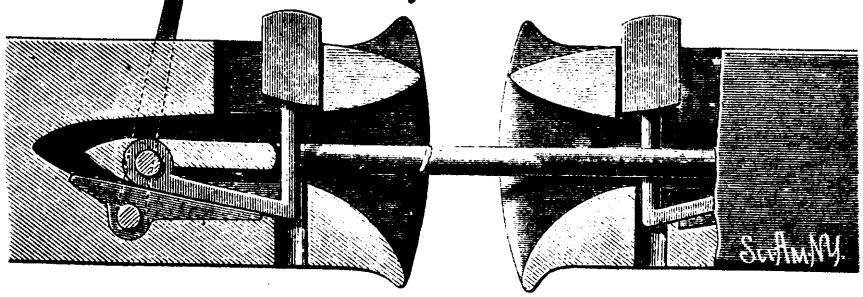
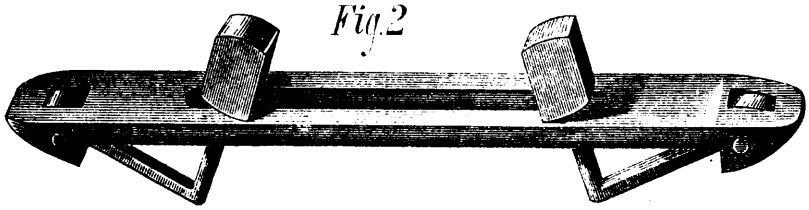


Fig. 2



IMPROVED CAR COUPLING.

We give an engraving of a novel car coupling, which is automatic in its action, and is almost as simple as the common link and draw bar. It seems well adapted to freight cars, and may be used with advantage on passenger cars. The link or coupler consists of a bar of iron having in each end mortises, in which in which are pivoted the arms of drop bolts, which extend through a mortise in the middle of the bar. These bolts have large square heads fitted to corresponding recesses in th. draw head. The lower part of the bolt drops into a slot in the lower part of the draw head.

In the operation of coupling the cars the pivoted arm of the bolt acts as a guide to the link, and at the same time raises the bolt so that it enters the end of the draw head readily When the link has entered the draw head far enough the hinged pin drops into its place and the coupling is secure.

To release the coupling, the hinged pin is raised by means of a short lever on the inner end of a rock shaft, which extends to the side of the car. Here the rock shaft is provided with a hand lever, by means of which the coupling may be operated. The hand lever is provided with a ratchet arrangement by which the uncoupling lever may be held in position to prevent the coupling from acting.

Fig. 1 shows the draw head in section, and gives the position of the link and of the uncoupling lever. Fig. 2 is a perspective view of the link detached from the draw head.

It will be noticed that no springs or parts liable to get out of repair are used in this coupling. The inventor provides a pin with a square head, which may be used in this draw head in connection with an ordinary link.

We are informed that this coupling is in practical use on one of our principal railroads, and that it is endorsed by eminent railway engineers.

The invention has been patented by Mr. J. C. Cope. Dr. Fred Vernetti, of Montgomery City. Mo., is agent.

THE STONER AUTOMATIC SCALE.

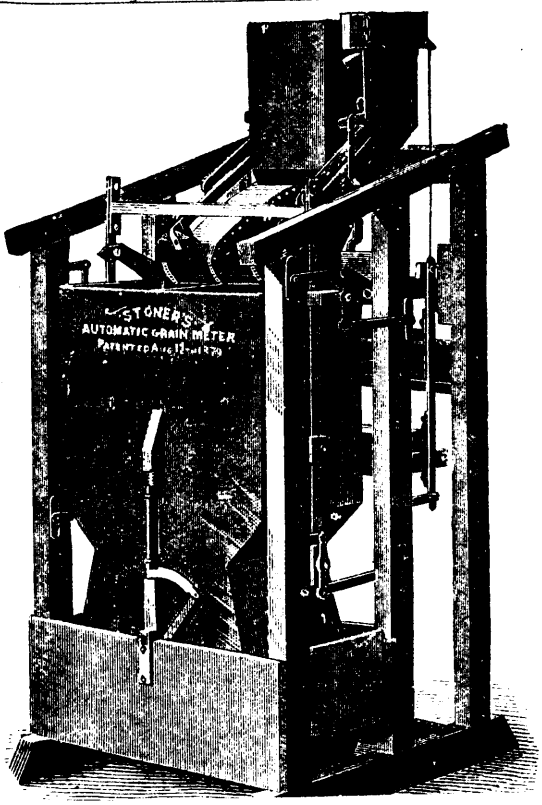
Among the ingenious devices which have been attracting public attention at the American Institute Fair this year, the Stoner automatic scale, an illustration of which is here given deserves especial attention. It is made under two patents granted to J. B. Stoner, August 12, 1878, and June 1, 1880. These scales are intended for use in warehouses, mills, and stores, or for putting up packages of flour, spice, corn starch, cracked wheat, or any dry substance that it may be desired to have in packages of uniform weight. They are made of different sizes, according to the work to be done, so that they will weigh from one pound to twenty bushels at a time. The twenty bushel scale will weigh at the rate of three thousand bushels an hour. The weighing is effected pound for pound, according to the weights shown on the scale beam, so that it is absolutely impossible for the machine to make a mistake, and it can be operated by delivering the exact weight which it has been adjusted to give. At the Institute Fair it has been running for the purpose of showing its operation with cup elevators, which deliver the grain in a continous stream into the scale ; each time the receptacle in the scale has received the required weight, the grain is quickly tipped out, and the filling again commences, but as the grain is tipped out an automatic register records the fact, so that the work done for any particular length of time may always be known by a glance at the register. The machine is so simple in its details that it cannot possibly get out of order with any ordinary use, and it cannot make a mistake in giving exact weight and a true count.

In the same section in which the automatic scale is shown may also be seen the pneumatic grain elevator patented by Mr. B. Stoner. This is worked by an exhaust, and, while it dries, cools, and cleans the grain, does away with all shoveling, saving four-fifths of the cost of that item, and will reduce the cost of annual insurance one per cent. from the fact that no machinery need be located in the warehouse, so there can be no fire from friction. It will also largely reduce the cost of warehouse building, as with this system, no heavy framework is needed to bear heavy machinery.

For particulars in regard to both the above inventions, apply to or address E. L. Hayes, 243 Broadway, New York. These inventions have also been patented in Canada, England, France, Germany and Belgium.

To Preserve Wooden Vessels.—Wooden vessels, which, especially in chemical works, are quickly destroyed, should, according to Herr Schasl be well dried in hot air, and then painted twice or thrice with a solution of paraffine in six parts of petroleum ether. Vessels in which boiling is effected with steam should further be coated with linseed-oil varnish, or with water-glass ; after drying, the water-glass coating should be removed by means of dilute muriatic acid. Paraffine is also well adapted for packing stuffing boxes, especially in stirring apparatus exposed to vapors of fuming and English sulphuric acid.

Notes on Steel.—Steel merely hardest is hardened on the surface, while in steel that has been tempered the exterior is the softest. In the one case because the surface was cooled in advance, in the other because it was heated in advance. Steel which has rusted can be cleaned by brushing with a paste composed of ½oz. cyanide potassium, ½oz. Castile soap, 1 oz. whiting, and water sufficient to form a paste. The steel should first be washed with a solution of ½oz. cyanide potassium in 2 ozs. water.



IMPROVED SEWER GULLIES.

The National Ventilating Company, of 941 K street, Washington, D.C., are engaged in introducing a new form of sewer ventilating apparatus, for which they claim great advantages. The accompanying illustration shows the features of their invention. By an inspection of the cut, it will be seen that the bottom of the gully consists of a large pan or box, into which all the street-washings, &c., are poured. Instead of bailing the contents out with pails or buckets as is common practice, the whole pan or box is hoisted out by means of a tackle and loaded upon a cart. How this is done is shown in the smaller sketch. An empty box of course takes the place of the one moved. It is intended by the inventors to establish a perfect ventilation of the sewers by means of pipes carried from the gullies to ventilating flues in the houses. These flues or pipes are carried up and only enter the chimney just beneath the roof. The flue shown in the engravings is, apparently, one constructed especially for ventilating purposes. It is claimed that by the use of this system all this annoyance in emptying gullies may be avoided, and that the air of the sewers may be kept perfectly sweet and fresh. Practically, to keep the sewer sweet, it is only necessary to make openings into them at frequent intervals, and they will provide for their own ventilation. In addition to the improvements in sewer ventilation, the company have a system which is applicable to houses, and is intended to furnish cool air in summer and warm air in winter.

IMPROVED SEWER GULLEY.

Scientific Items.

OBSTINATE NEURALGIA.—*La France Médicale* mentions several obstinate cases of neuralgia of the fifth nerve rapidly and completely cured by the administration of ammoniacal sulphate of copper. The formula employed is the following: Distilled water 100 grains; syrup of orange flower or peppermint 30 grains; ammoniacal sulphate of copper, 0.10 to 0.15 of a grain—to be taken in the course of twenty-four hours, especially after meals, in order to avoid irritating the stomach. The dose in question is the medium one, and is to be continued for from ten to fifteen days, even after the complete disappearance of the pains.

A SUBSTITUTE FOR WICKERSCHEIMER'S FLUID which is said to be an equally efficacious preservative, and to have the advantage of being non-poisonous, is suggested by Hager in the *Pharm-Ztg.*, as follows:

Salicylic acid	20 parts.
Boracic acid	25 "
Potassium carbonate	5 "
Dissolve in hot water	500 "
Glycerine	200 "
Then add: Oil of cinnamon, oil of cloves, each 15 parts, dissolved in alcohol	500 "

HYDRATE OF CHLORAL AS AN ANTIDOTE FOR STRYCHNIA.—In the *British Medical Journal*, Dr. George Grey reports a case of poisoning by strychnia successfully antidoted by administrations of chloral hydrate. The patient had swallowed 20 grains of strychnia, and was saved by the administration of two drachms of chloral hydrate in solution. In two days the patient was doing his usual work.

SALICYLIC acid, in contact with wood fibre, is soon absorbed and decomposed. When used, for example, as an addition to drinking water or to wine as a preservative, in wooden tanks or casks, its preservative influence speedily ceases, and no trace of the acid can be detected. For such purposes, therefore, casks and other vessels intended to receive salicylized water, wine and other liquids, should first be coated with pitch.

THE RECENT COMET.

The spectrum of this comet, known in Europe as Hartwig's comet, from its discoverer, was examined with a spectroscope, at the Royal Observatory, Greenwich, on the evening of Oct. 7th, and was found to consist of three bright bands, and a continuous spectrum corresponding to the nucleus. The position of only of those bands—the middle and brightest—could be ascertained, and that is no very satisfactory manner. The positions of the other bands were not measured at all, owing to the unfavorable nature of the weather, the comet being low and involved in haze and cloud.

The opinion is expressed by Prof. Winecke, of Strasburg, that this comet is identical with one seen Sept. 29th, 1506, and its position roughly described by European observers of that date. Mention is also made of the same comet in Chinese annals of that date. The Professor also remarks that early Chinese observations have been found of much assistance in enabling astronomers of the present century to approximate the orbits of comets. Two appearances, one in 568 and another in 1337, are particularly referred to, in addition to the present one. The Chinese have the record of a very remarkable comet that appeared A. D. 178, which, from the long tracks it described in the heavens, must have passed very near the earth.

The following paragraph may be interesting as showing the manuer in which such observations were placed on record in those early days. The comet described is supposed to have been the one to which attention is now being directed: "As regards European observations of the comet of 1506, Pingre tells us (on the authority of the Chronicles which, according to his excellent custom, are named in his margins) that a comet was seen in the month of August in the north, or between the north and east, or lastly between the west and north, and as the comet was not distant from the pole, so that it appeared in the evening after sunset, and in the morning before sunrise, it may have had at different hours of the night the various positions mentioned by the historians. It had a long and bright tail which extended 'between the fore and hind wheels of the chariot.' On August 8th, a Polish historian, an eye-witness, says it was seen near the pole above 'the seven stars or the stars of the great chariot;' on the following night it was situated amongst the same stars, and later, on several nights, it was seen below them; declining by the signs Cancer, Leo and Virgo, it attained the northern part of the horizon and disappeared on August 14th. Some writers limit its appearance to eight days; others say it was visible for three weeks, or even a month."

The same comet was described in the Chinese annals, and translated by Biot and Williams, as follows: "We read that in the first year of the epoch Ching Tih, in the region of Woo Tsung, on the day Ke Chow of the seventh moon (1506, July 31st), a star was seen to the west without the boundary of Tsze Wei (the circle of perpetual apparition). After some days it had a short tail. It was seen between the sidereal divisions Tsan (determined by *delta*, Orionis) and Tsing (by *mu*, Geminorum); (the Chinese sidereal divisions, it must be remembered, being intervals of right ascension with wide limits of declination reckoned from the determining star of the division.) It gradually lengthened, extending in a nortwesterly direction towards or to Wan Chang (*theta*, *upsilon*, *phi*, Ursæ Majoris). On August 10th it was bright, and moved to the southeast, it lengthened to about 5° and swept the upper of the stars Hea Tac (*nu*, *xi*, Ursæ Majoris), and entered within the space Tae Wei Yuen (Biot's *Thai-Wei*); (a space between stars in Leo and Virgo, to which, as also to Tsze Wei; the circle of perpetual apparition mentioned above, constant reference is made in the Chinese cometary observations.")

THE LOST CONTINENT—ATLANTIC.

From *Science for All* we glean the following interesting article: According to the ancients, there once existed in the Atlantic Ocean, opposite Mount Atlas, a great island adorned with every beauty and possessing a numerous population. Its princes were powerful, so that they invaded Europe and Africa, but by an overwhelming catastrophe the island was swallowed up in a day and a night. This legend is said to have been related to Solon by the Egyptian priests, and is given by Plato in "Timæus." It probably had its origin in the existence of the Azores or the Canary Islands, which may have been visited by the Phœnicians. Our purpose is to prove that this fable has been far exceeded by the reality—that there once existed in the area now covered by the North Atlantic, an Atlantic of continental size, and of an antiquity compared with which Plato's island is but of yesterday. Some geologists are of opinion that North America was connected by land with Europe in middle tertiary (Miocene) times. The evidence upon which this theory is based is the resemblance of the existing plant life of North America to that which flourished in Western Europe in the Miocene epoch. The plants are supposed to have migrated from east to west by way of this imagined Atlantic land. It seems extremely unlikely, however, that so great changes in the physical geography of the globe should have taken place within times comparatively so recent. The deeper parts of the Atlantic are from 12,000 to 16,000 feet, and we require very strong evidence to convince us that such enormous depressions have occurred since a comparatively recent geological period. The migration of the Miocene flora may be more easily explained. The land connection between Europe and North America by way of Asia is broken only by Behring's Straits, which are very shallow; and a slight elevation would make it complete. That the migration has been from west to east, across Europe and Asia, receives confirmation from the fact that a flora similar to the North America has been discovered in Japan. It is, therefore, unnecessary to create an Atlantic continent to account for the migration of the Miocene flora. The continent of which we speak is of incomparably greater antiquity. No traces of it now remain, unless the submarine ridge, which runs down the Atlantic valley in about 50 degrees west longitude, be its denuded foundations. This ridge represents a great mountain range rising 4,000 feet above the valley to the west, and 8,000 feet above the valley to the east; and reaching to within about 4,000 feet of the surface of the ocean. The Atlantic islands are not in any way connected with this ancient land. They are of volcanic origin, rising steeply out of a deep ocean, and are of comparatively modern date, the oldest strata contained in them being of middle tertiary age. The destruction of the old Atlantis strikingly illustrates the instability of the land. At an epoch inconceivably remote the Atlantic rolled as it is rolling now. Then a huge island raised its back above the waters, and, despite the hammering and grinding action of the waves, grew up into a continent, with river systems and great mountain chains. Rain, frost, ice and carbonic acid, were all the time at work upon its surface, coroding, filing, sawing, dissolving, softening, and washing down, till, after it had braved the elements for many

successive epochs, it gradually wasted away, broke up into islands, and finally disappeared. The ocean reclaimed its ancient sovereignty, and its shores gradually assumed their present outline.

RECENT DISCOVERIES CONCERNING THE CURRENTS OF THE PACIFIC.

Thomas Gray, of the London Board of Trade, has recently published some observations on the equatorial currents of the Eastern Pacific, which not only concerns the navigator, but are of general scientific interest. From the *Herald's* account of his paper we learn the following facts: These observations were taken by Captain McKirdy, of the steamship "Peruvia," plying between Peru and China, and their results show, as Mr. Gray says, that some of the currents of the Pacific Ocean are not what they have hitherto been thought to be. The Admiralty charts, and almost all ocean charts, delineate a counter equatorial current north of the Equator, and between the meridians of the Sandwich Islands and South America, and running eastwardly, instead of obeying the general impulse of all equatorial waters. In order to prove whether it exists or not, Captain McKirdy ran his ship from Callao to Honolulu on a straight line course, and repeatedly found that the supposed counter current had no existence in the spring within the limits assigned to it by the charts, but, on the contrary, a steady current setting westward was met day by day. On the third survey of the ocean area, in which hydrographers have generally placed the equatorial counter current, when in latitude 2 degrees north, longitude 122 degrees west, an extraordinary change took place. In a four-hours' run the temperature of the sea went "down with a jump from 79 to 71 degrees, and the water changed color from a deep bluish-black to a dark, dirty green"—the former color and high temperature indicating unerringly the presence of the great westerly equatorial current, and the latter with the low temperature, the sweep of Humboldt's current, a vast flow from the Antarctic basin which penetrates to the Equator and curves to the west of the Galapagos Islands. The able observer on the "Peruvia" had now conclusive evidence that his ship, to use his own words, "had been contending with a mighty river running partially through the Pacific Ocean to the westward."

Many years ago Lieutenant Maury said: "There are some of these equatorial currents in the Pacific which I do not understand, and observations are insufficient." The present results of McKirdy's explorations go far to clear up the long-felt mystery. That an equatorial counter current does exist somewhere in the broad Pacific is unquestionable, and Captain McKirdy recognizes its existence, though his researches necessitate a reconstruction of the charts which locate it. But the chief results of his labors is the discovery of the powerful westerly current of "deep, deep blue," easily distinguished from the bright, beautiful blue waters of the surrounding North Pacific, and detected by its temperature, but marked geographically by its irregular "horn-shaped" extension (one end pointing to Panama and the other to the Sandwich Islands). The explanation of this remarkable current is found in the southerly drift along the Californian and Mexican coasts of a body of water, possibly a continuation of the Japan stream, or Kuro Siwo. "This body of water," he says, "gets pent up in the Gulf of Panama; it cannot get south on account of Humboldt's current, which is constantly flowing north along the coast of Peru. It follows, then that these two streams, each striving for the mastery, change their course to the westward, and rushing along side by side to the Equator until they meet the equatorial counter currents which splits them like a wedge, the northern one preserving its 'deep, deep blue,' and the southern its 'dark, dirty green,' which clearly proves it to be of extreme southern origin." This would explain the case of a Japanese junk cast upon the Sandwich Islands after a ten months' drift, moving on the great circle track of the "black stream," or Kuro Siwo, across the Pacific to the Californian and Mexican coasts, and thence westwardly. The newly noted stream will be of great value to the mariner, as in it the "Peruvia" made over 325 miles a day.

SANITARY ERRORS.—It is a popular error to think that the more a man eats the fatter and stronger he will become. To believe that the more hours children study the faster they learn. To conclude that if exercise is good, the more violent it is the more good is done. To imagine whatever remedy causes one to feel immediately better is good for the system, without regard to the ulterior effects.

THE CULTIVATON OF VACCINE VIRUS.

Dr. Martin, of Boston, was the first American physician who, in view of the danger attending the use of vaccine virus taken from the human body, experimented successfully upon a return to Dr. Jenner's original method of using the bovine virus. Dr. Foster, of New York, and in 1867 Dr. Robbins, of Brooklyn, followed Dr. Martin's example, and Dr. Robbins, with his associate, Dr. Lewis, is now engaged in the production on a large scale, of virus derived from Beaugeney stock, upon which they have "ingrafted" the celebrated Vincennes stock, to procure which Dr. Robbins made a special visit to France. It is worthy of note, however, that the original stock is just as potent as ever, though its powers vary according to the constitution of the animal from which it has been obtained. The *modus operandi* is to select the best calves—heifers being preferred—at an age varying from a few days to a year or even more, but the younger the better, the animals being the more easily handled. If the subject is a small one it is thrown upon its side upon a table, and its fore feet and head being secured, its hind legs are stretched apart and spots upon the belly six or eight inches wide are shaved, and if necessary the epidermis or skin is thinned down. After this vaccination as in the ordinary manner is proceeded with, the animal being retained in the one position for six or seven days, when the matter is ready for removal either into tubes or quills, and must be as clear as water or else rejected. Calves of the Jersey breed are preferred. Drs. Robbins and Lewis have sent the vaccine to France, to Egypt, to China, Japan, and to all parts of North and South America. The greatest care is taken to provide that the calf which is to be vaccinated shall be in the best possible health. It is said that the calves do not appear at all inconvenienced by their confinement, but munch their food with zest and in fact get fat. During the summer animals which are "under process" are kept in the country, it being found that they thrive better than in town.—*New York World.*

A MOST novel proceeding occurred recently in the forests of Canada which, if found efficacious, should be hereafter universally adopted. At the terminus of the St. Lawrence, Lower Laurentides & Saguenay Railway, which is intended to connect Three Rivers with Lake St. John, and is being built in the Saguenay country, an audience of over a thousand people were assembled to witness the ceremony of blessing the new enterprise by the Bishop of Three Rivers. The scene is said to have been impressive. The people, mostly of the laboring class, stood in silence before the venerable prelate, the iron track and the train of cars were the mute subjects of the service, and the whole was overshadowed by the sombre forest, whose leaves were already tinted with autumnal splendor. The Bishop alluded to the fall of man, the necessity for toil and the obstacles encountered by all in the efforts for advancement. He spoke of the undertaking before them, its bright future of usefulness and, in conclusion, proclaimed the Angel Raphael to be the Guardian of the new line and besought a blessing upon the enterprise and all concerned in it. If it be found that this road is signally favored and its interests advanced by this ceremony and invocation, we venture the prediction that all railway managers and owners will be anxious for a similar blessing for their roads and will eagerly seek for an ecclesiastic to confer the boon.

COPPER-PLATING ON ZINC.—The use of cyanide baths for plating on zinc has the double disadvantage of being poisonous and expensive. A recent discovery has overcome the objections by rendering the cyanide bath unnecessary. This is accomplished by the use of an organic salt of copper, for instance a tartrate. Dissolve 126 grammes sulphate of copper (blue vitriol) in 2 litres of water; also 227 grammes tartrate of potash and 286 grammes crystallised carbonate of soda in 2 litres of water. On mixing the two solutions a light blueish-green precipitate of tartrate of copper is formed. It is thrown on a linen filter, and afterwards dissolved in half a litre of caustic soda solution of 16° B., when it is ready for use. The coating obtained from this solution is very pliable, smooth, and coherent, with a fine surface, and acquires any desired thickness if left long enough in the bath. Other metals can also be employed for plating in the form of tartrates. Instead of tartrates, phosphates, oxalates, citrates, acetates, and borates of metals can be used, so that it seems possible to entirely dispense with the use of cyanide baths.

ENCOURAGING SCIENTIFIC RESEARCH.—M. Pasteur has received from the French Government the sum of $8,000, to assist him in continuing and completing his valuable investigation upon the *contagious diseases* of animals.

Fig. 1.

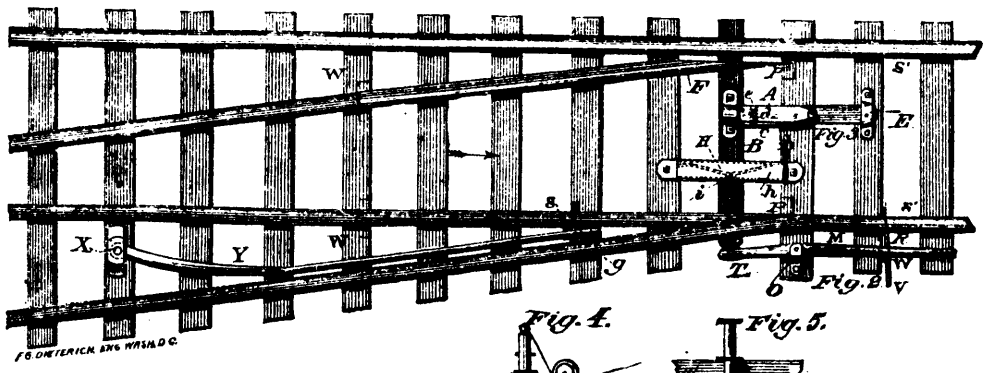


Fig. 4.

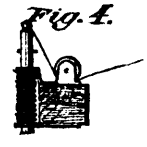


Fig. 5.

NICKUM'S IMPROVED RAILWAY SWITCH.

We call attention to a new railroad switch which is so constructed that it can be operated by the engineer or brakeman, and is now owned by Messrs. Nickum & Hudson of Marion, Indiana.

Fig. 1 is a plan of a switch.

Fig. 2 is a side lever to operate said switch from the ground.

Fig. 3 is the centre lever pivoted in the centre of the track and operated by the lever on the engine or cars.

Fig. 4 is the lever that operates on the engine under the cow-catcher; the works are attached to the cross pieces in front of the wheels. The lever is operated by a cord or rod attached to the top of the pin and runs down under the pulley and is attached to a little lever in easy reach of the engineer.

Fis. 5 is the lever that works on the cars. This lever is very near the same as Fig. 4, except the cord and pulley.

The object of this invention is a railroad switch that is operated by the passage of the engine or cars over it.

A is a lever pivoted to a fixed tie with a cap plate E over its end, the other end secured to the movable tie B. C is a side plate or spring bar attached to lever A to make it work more smoothly and without strain. H is a spring enclosed in a casing *h* with the centre bearing against a pin projecting up from movable tie B, which keeps the switch rails F F closed as is now represented. X and Y represented a long lever pivoted at X to a fixed tie, having its other end fastened to the main line at S. When an engine or car or train approaches the switch, the lever on the front one thrown down will engage against plate *c* on the side of lever A, and push the rails over and hold them till the wheels are on the switch line rails, the rim of the wheels will run on through between lever X and Y, and the outside track which will allow a vacation enough that there will always be wheels on the switch until the whole train has passed over, then the spring H takes effect and closes the switch. All cars will go of the switch just simply by backing off or running off to the main line. In Fig. 2 is a side lever adapted for any switch. In this it is not really necessary that it should be used, only to switch from the ground if desired.

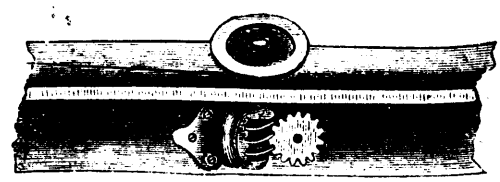
A CURIOUS HORSESHOE.

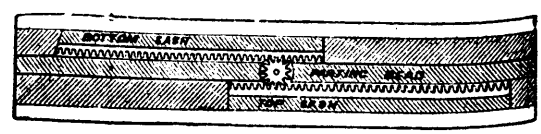
A German manufacturer has invented a horseshoe composed of iron and hemp, which is said to be meeting with considerable favour. The shoe is of malleable iron, having a deep wide groove, into which tarred hemp is firmly wedged. The rope protrudes beyond the rim of the iron, and the whole is said to form a light and serviceable shoe. We wish some German friend would favour us with a sketch from which to make an engraving for publication.

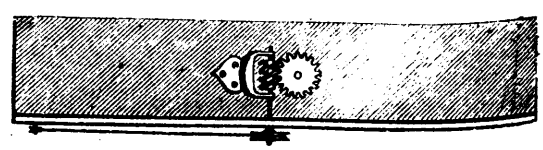
FROM sawdust, ground-up twigs and like materials, pails, mouldings for buildings, doors, sashes, blinds, etc., are now manufactured at Great Falls, Windham, Me.

PATENT WINDOW SASH LIFTER.

The Keighley Timber and Saw Mills Company, of Keighley, Yorkshire, are the sole manufacturers of an improved window sash lifter, constructed on the principle of Riley and Taylor's patent, which supplies a ready means of opening and closing windows, and which, while costing no more than the usual weights, cords, and pulleys, will obviate many of the objections which attach to the method ordinarily used. The Patent Sash Lifter, of which we show sectional drawings, it is claimed, possesses the requisites of cheapness, simplicity, and durability, and it might well be added, *security*. It is worked by means of an endless cord and pulley at the side of the window, or by a removable key in connection with a very simple and effective arrangement of worm, gear and racks. It is almost impossible to get it out of order, while it is capable of being operated with the greatest ease. It is an exceedingly useful contrivance for cottages and dwelling houses, but especially adapted to heavy sashes used in large buildings, as churches, chapels, municipal, and other public buildings, or where there is any inconvenience in opening or closing high and heavy windows. For shops, stores, and warehouses, where it is desirable to have an efficient and safe means of ventilation, the device answers perfectly. It can also be advantageously applied to bay windows, as it saves the notching of the stone work or mullions where the weights in the ordinary windows hang, thus economising space, besides effecting a great saving in the joiners' work.







IMPROVEMENT IN KITCHEN SAFES.

The nature of this invention consists in the construction and arrangement of a combined flour and meal chest, drawer, and safe, as will be hereinafter more fully set forth.

Figure 1 is a perspective view of the invention closed. Figure 2 is a perspective view of the same opened.

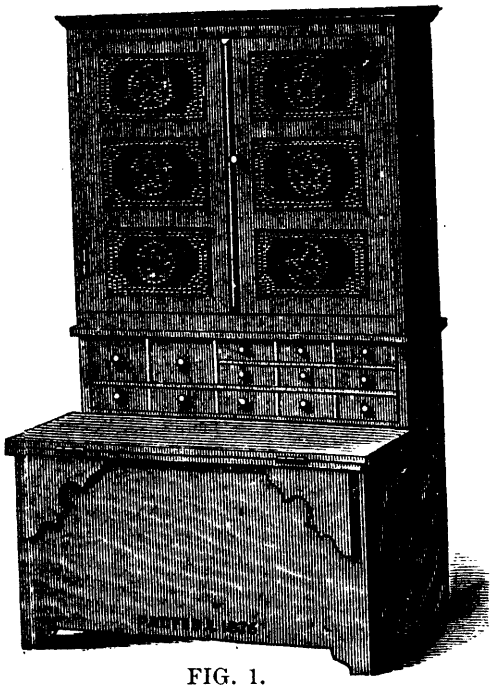


FIG. 1.

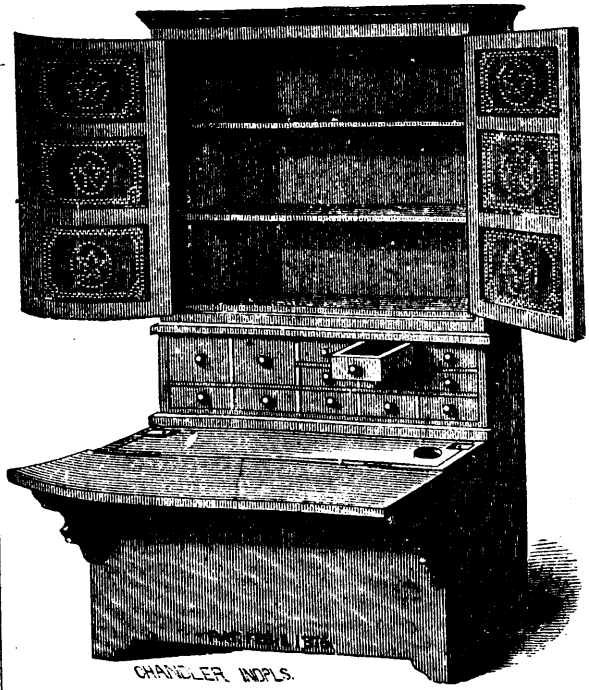
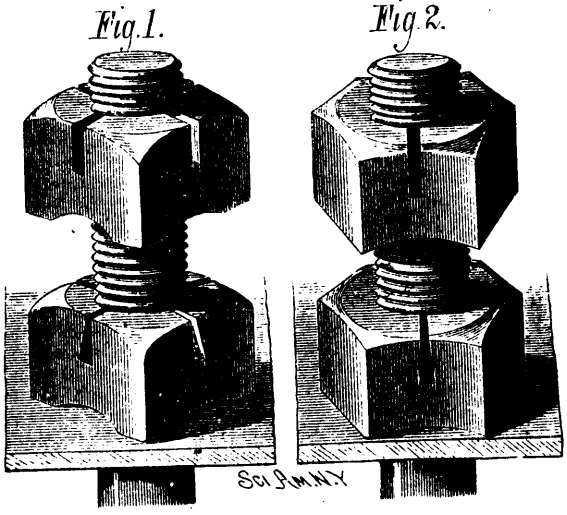


FIG. 2.

There is a chest, of any suitable dimensions, divided by means of a central transverse partition into two compartments, one for flour and the other for meal. The bottom of the chest is made inclined forward, so that the scoop can easily be used to take up even to the last remnants of the contents therein. In the bin is a grating upon which to place the scoop, and hooks to receive the rolling pin. In the other bin is a trough or box to receive such articles as may be desired to be placed therein. Over the rear part of the chest, and extending the entire length thereof, is a case containing large drawers for coffee and sugar, and a series of small drawers for knives, forks, spoons, spices, and such other articles as may be desired to be kept therein. The top of the chest in front of the case of drawers is provided with a hinged lid or top, which, when opened, is supported upon hinged leaves. Under the lid or top in the top of the chest is a cake board resting upon cleats, in the chests, and which can be moved under the drawer case to gain admittance into the bins below, or be moved forward to close the same and then form a part of the table, of which the opened lid forms the other part. When thus placed, the board is held in position by a sliding bolt at each end. On the top of the drawer case is a safe, constructed in any suitable manner, and made entirely separate from the chest and drawers. Mr. G. W. Bollenbacher, of Bloomington, Ind., is the patentee.

IMPROVED SAFETY NUT.

That a safety nut so simple and so obviously efficient as the one shown in the annexed engraving should be among the recent inventions in this line instead of being among the first, is a curious example of the manner in which inventors often overlook the simplest means of accomplishing an end. The principle on which this nut operates will be understood by referring to the engraving. Two nuts are represented on each bolt, simply for the purpose of showing the difference between the nut when loose and when screwed down. In practice only one nut is required to each bolt.



The square nut shown in Fig. 1 is concaved on its under side, so that it touches its bearings only at the corners and in the outer face of the nut there are two slots at right angles to each other. When this nut is screwed home the outer portion is contracted so as to clamp the bolt tightly.

The hexagonal nut shown in Fig. 2 has but a single transverse slot, and the nut is made concave on the under surface, so that when the nut is screwed home it will contract the outer portion and so clamp the bolt.

This nut may be removed and replaced by means of the wrench, but it will not become accidentally loosened, and the bolt to which it is applied will always remain tight, as the nut possesses a certain amount of elasticity. The action of this nut is such as to prevent stripping the threads of either bolt or nut.

As only one nut is used with each bolt, and as no washer or other extra appliance is required, it is obvious that a great saving is effected by this invention.

We are informed that several of the leading railroads have adopted this nut, and use it on the tracks, engines, cars, and machinery. The Atwood Safety Nut Company manufacture this article in a variety of forms.

EXTENSIVE glaciers, as large as the largest of those in the Alps, have been discovered on Cotopaxi, Chimborazo, Sincholagua and other less prominent Andean peaks.

THE USE OF VARNISH ON INTERIORS.

There seems to be a general lack of care or intelligence on the part of the house-painter in the use of varnish for a finish or final coating on the wood-work of buildings, and it is my purpose to give some facts connected with this much-abused material, based upon an experience of some thirty years in varnishing carriages, railway-cars, and interiors: the work of the former being, as is well known, one which requires great skill in the manipulation of the tools, and a certain amount of knowledge of the action of the material used, when changed from a bulky mass to a thinly spread out sheet or layer. The carriage varnisher is required to produce with varnish a mirror-like surface: and the care with which he performs his work, the temperature of the place, and the choice of materials and tools, are as important to the varnisher of interiors, though seldom if ever thought of. In order to present the matter in a proper light, we will first look at the varnishes best adapted for the work.

Carriage varnish, which is compounded with the greatest care and skill from the best copal gums and pure linseed oil, is the standard, while common resinous mixtures are ignored; the former giving results, if the work be properly done, which cannot be secured in any case by the use of the latter. The copal being melted and mixed with the oil, it is boiled for a while, and when slightly cooled, spirits of turpentine is gradually added, until the proper consistency is secured, when it is run off into large tanks to settle and become "ripe" with age before it is fit for use. The addition of turpentine to the mixture while the latter is quite warm, is the only means of causing a perfect assimilation of the component parts, while, if it be added after the oil and gum are cold, a partial separation of the ingredients takes place.

Here is a particular point for the house-painter to remember. He invariably thins varnish with turpentine or oil to enable him to make a small quantity of the varnish cover a large surface, or to render it easier of application, and by so doing, he destroys a large share of its durability, much of its lustre, and nearly all of its binding or adhesive properties.

The varnish maker puts his goods upon the market ready for use; no mixing, no thinning is necessary, and the carriage painter knows that to do good work he must not tamper with the varnish furnished him by a reputable manufacturer.

For interiors, particularly on those parts frequently handled, the varnish should be of that character which possesses elasticity and yet is capable of drying sufficiently hard to give a surface which is not easily softened by the warmth of the hand. A hard, inelastic varnish is liable to crack and flake from the ground on which it is spread, and to show a gray or white mark where bruised or scratched; but an elastic varnish, such as is used on carriages, will furnish a yielding surface for the change made in the ground by atmospheric influences, and consequently adapt itself to the case and not crack; and at the same time be unaffected by the slight warmth of the hands.

Such varnish may be applied "flowing" and present a smooth glass-like lustre, or the gloss may be removed by rubbing the surface with a rag dipped in wetted pulverized pumice-stone. The former is known to the trade as a "gloss finish," the latter as "dead" or "oil finish."

The application of varnish, the tools necessary for doing the work, and the temperature of the apartment in which the work is to be done, are of importance. We often see varnished work which has a rough or corduroy appearance, or it is covered in parts with "festoons" and "heavy flows," and although there may be such evidence of bad work coming from the hands of an experienced workman, it is seldom the case. The first-mentioned fault, *i. e.*, streakedness or "corduroy," is brought about by working the brush over the varnish after it has begun to "set"; or by applying the varnish too sparingly, whereby the material has no opportunity to "flow" or spread out evenly into a glassy surface. The second fault "runs" and "flows" is caused by want of care in "wiping up," or neatly laying the varnish; while both of these troubles may rise from adding oil or turpentine to varnish before applying it. Varnish should be laid on "full," that is, a good supply must be spread on, then carefully leveled down with the brush before it becomes thickened or "set." Unlike paint, the least working of the brush to lay it level, the better; while paint is best when well laid by repeated passing over with the brush.

The tools best adapted for laying varnish are flat, bristle brushes, the size being governed by the size of the work, although for very small panels, a flat badger's hair brush is best, owing to its soft yet elastic properties. Round and oval shaped brushes answer a very good purpose on some parts of the work, but he who accustoms himself to the use of flat brushes will, as a general thing, make the best work.

The temperature of the room in which varnishing is to be done should never be below seventy degrees nor above eighty-five degrees Fah. If the room be cold the varnish will probably "crawl" or go in patches, "work stiff" and give an endless amount of trouble. If too warm, it will "flatten" or dry with a subdued lustre. Where the best results are desired a mean temperature of about seventy-five to eighty degrees should be maintained.—*American Architect.*

Pain in Animals.—Prof. J. Rymer Jones is authority for the statement that crustaceans and certain other animals are not susceptible to pain. He says, in a paper on this subject:—"Pain, 'Nature's kind harbinger of mischief, is only inflicted for wise and important purposes—either to give warning of the existence of disease, or as a powerful stimulus prompting to escape from danger. Acute perceptions of pain could scarcely, therefore, be supposed to exist in animals deprived of all power of remedying the one or of avoiding the other. In man the power of feeling pain is indubitably placed in the brain; and if communication be cut off between this organ and any part of the body, pain is no longer felt, whatever mutilations may be inflicted. The perception of pain depends upon the development of the encephalic masses; and, consequently, that as this part of the nervous system becomes more perfect, the power of feeling painful impressions increases in the same ratio; or, in other words, that inasmuch as the strength, activity and intelligence of an animal, by which it can escape from pain, depends upon the perfection of the brain, so does the perception of torture depend upon the condition of the same organ.

Dangers From Volcanic Plates in Dentistry.—In a recent paper in the *Medical Journal of American Sciences*, Dr. Sexton states that volcanic plates (worn in the mouth) produce diseases that are often the source of reflex aural disease. These plates have been in use over twenty years, and are largely adopted. The constituents are caoutchouc, the sulphur required in the vulcanizing process, and vermilion or sulphide of mercury, used as coloring matter. The gradual disintegration of the plate in the mouth liberates a salt of mercury, whose poisonous effects are well known. And the plates are otherwise injurious. At least one-third of all those who attempt to wear them experience great irritation of the mouth, often accompanied by hypersecretion of saliva. The sufferer usually lays aside the plate till informed of the necessity of growing accustomed to its presence by uninterrupted use. Vulcanite is a non-conductor of heat, and the effect of its contact with the highly sensitive tissues of the mouth is to produce hyperæmia and inflammation. Another source of injury is the very close contact of these plates, which is maintained by atmospheric pressure, and may favor the absorption of their substance.

A Ready Poison Remedy.—If a person swallows any poison whatever, or has fallen into convulsions from having over-loaded the stomach, an instantaneous remedy, most efficient, and applicable in a large number of cases, is a heaping teaspoonful of common salt, and as much ground mustard, stirred rapidly in a teacupful of water, warm or cold, and swallowed instantly. It is scarcely down before it begins to come up, bringing with it the remaining contents of the stomach; and lest there be any remnant of the poison, however small, let the white of an egg or a teaspoonful of strong coffee be swallowed as soon as the stomach is quiet; because these very common articles multiply a large number of virulent poisons.—*Medical Brief.*

To Make Good Vinegar.—Some one asks the *Phrenological Journal* why it is so difficult to get good cider vinegar now-a-days. The editor replies as follows: "The main reason is that genuine cider vinegar can't be made in a hurry. A good article of cider will be two or three years in becoming vinegar, unless kept at a high temperature, when a few months may suffice. The larger portion of that sold as cider vinegar is as innocent of apple juice as possible. Better not use the sour stuff anyway; but eat fruit which will supply a form of acid more suitable to your stomach."

Lobsters are cultivated in a salt water pond on the New England coast. The pond covers 30 acres, and is so arranged that the water is partially changed at each tide. The food supply consists of refuse from the Boston fish markets, and during the first year 15,000 marketable lobsters were sold.

REMOVAL OF STAINS AND SPOTS.

STEARINE.—In all cases, strong, pure alcohol.

GUM, SUGAR, JELLY, ETC.—Simple washing with water at a hand heat.

MATTER ADHERING MECHANICALLY.—Beating, brushing, currents of water either on the upper or under side.

LIME AND ALKALIES.—White goods, simple washing. Colored cottons, woolens, and silks are moistened, and very dilute citric acid is applied with the finger end.

ALIZARINE INKS.—White goods, tartaric acid, the more concentrated the older are the spots. On colored cottons and woolens, and on silks. dilute tartaric acid is applied, cautiously.

OIL COLORS, VARNISH, AND RESINS.—On white or colored linens, cottons, or woolens, use rectified oil of turpentine, alcohol lye, and their soap. On silk, use benzine, ether, and mild soap, very cautiously.

VEGETABLE COLORS, FRUIT, RED WINE, AND RED INK.—On white goods, sulphur fumes or chlorine water. Colored cottons and woolens, wash with lukewarm soap lye or ammonia. Silk the same, but more cautiously.

IRON SPOTS AND BLACK INK.—White goods, hot oxalic acid, dilute muriatic acid, with little fragments of tin. On fast dyed cottons and woolens, citric acid is cautiously and repeatedly applied. Silks, impossible.

BLOOD AND ALBUMINOID MATTERS.—Steeping in lukewarm water. If pepsine, or the juice of Carica papaya, can be procured, the spots are first softened with lukewarm water, and then either of these substances is applied.

GREASE.—White goods, wash with soap or alkaline lyes. Colored cottons, wash with lukewarm soap lyes. Colored woolens the same, or ammonia. Silks, absorb with French chalk or fuller's earth, and dissolve away with benzine or ether.

SCORCHING.—White goods, rub well with linen rags dipped in chlorine water. Colored cottons, re-dye if possible, or in woolens raise a fresh surface. Silks, no remedy.—*Muster Zeitung fur Faerberei, Druckrei, etc.—Chemical Review.*

TANNING FROM CHESTNUTS, GREEN WALNUTS, ETC., OR LEATHER.—White goods, hot chlorine water, and concentrated tartaric acid. Colored cottons, woolens, and silks, apply dilute tartaric acid. Colored cottons, woolens, and silks, apply dilute chlorine water cautiously to the spot, washing it away and re-applying it several times.

TAR, CART WHEEL GREASE, MIXTURES OF FAT, RESIN, CARBON, AND ACETIC ACID.—On white goods, soap and oil of turpentine, alternating with streams of water. Coloured cottons and woolens, rub in with lard, let lie, soap, let lie again, and treat alternately with oil of turpentine and water. Silks the same, more carefully, using benzine instead of oil of turpentine.

ACIDS, VINEGAR, SOUR WINE, MUST, SOUR FRUITS.—White goods, simple washing, followed up by chlorine water if a fruit color accompanies the acid. Colored cottons, woolens, and silks are very carefully moistened with dilute ammonia, with the finger end. [In case of delicate colors, it will be found preferable to make some prepared chalk into a thin paste, with water, and apply it to the spots.]

CURING DISEASE BY FASTING.—It appears that Dr. Tanner is not the first person who has practiced upon the idea of curing disease by fasting. The North Adams, Mass., *Transcript* gives the following: "Apropos to the experiment of Dr. Tanner, who, in New York, attempted to live 40 days without food of any kind, the experience of Mr. John F. Arnold, of this town, may be interesting. Mr. Arnold, as is generally known, is a radical upon the subject of health and medicine, and advocates theories which, to the majority of the people, appear dangerous and unwise. His story is in substance as follows: In 1839 he was very ill, and his physicians gave him little hope of permanent recovery. This fact led him to study medicine and the care of himself. About that time Dr. Graham, the well-known founder of the Grahamite system, came here to lecture, and Mr. Arnold attended the lectures and became a thorough convert. He afterwards studied books supporting Dr. Graham's views, and from that day to this he has been a consistent believer in the doctor's theory. In 1847, Mr. Arnold studied the books of Dr. Jennings, of Oberlin College, and embraced his theory that disease was not an enemy of the human system, but was simply nature's method of repair, and was right under the circumstances. "The first opportunity to put his theory to practical test was in 1865, when, after a season of hard work, and being thoroughly exhausted, he was prostrated with bilious fever. Dr. Hawkes was summoned, and said that escape from the usual 21 days' sickness was impossible. The doctor called regularly and left his medicines, but Mr. Arnold did not take a drop of them, and allowed no nourishment to pass his lips, except pure water, for 24 days. For over three weeks he existed without a particle of food, and then he began to eat and regain his strength rapidly, increasing 15 lbs. in 18 days. Not until he was entirely cured did he reveal his course to the doctor. "Again, in 1872, after the fright and exhaustion caused by the burning of the Fifth Avenue hotel in New York, where he was stopping at the time, Mr. Arnold was again prostrated with bilious fever. This time he called Dr. Lawrence, and told him that he intended to fast again during the three weeks of the illness, and the doctor consented to watch the progress of the case. The result was the same as before, Mr. Arnold coming out of the fever stronger than ever, having taken nothing into his system for 24 days except water. Mr. Arnold's theory is that nature, if left to herself, if the system be not broken down by previous excesses, will 'repair the machine' better than if hindered by drugs and medicines and other unnatural things." It may be remarked in this connection that, while Dr. Tanner commenced his experiment in perfect health, Mr. Arnold was, in both instances, exhausted to begin with; but, in his case, the time of fasting was only about one-half that which Dr. Tanner endured.

THE WILLOW AS A PREVENTIVE OF MALARIA.—Mr. Von Lennep, the Swedish Consul, writes from "Mahazik, near Smyrna," to the London *Times*, as follows: "Before the eucalyptus was ever heard of in Asia Minor, I had seen the bark of the willow used as a febrifuge. I had remarked the easy and inexpensive reproduction of this tree, its quick growth in damp places, its excellent qualities for fuel and for agricultural implements, and its great advantages for strengthening the banks of capricious streams, and had thence taken every opportunity after the winter floods to stick willow cuttings along the banks of streams and in other damp places in my property; also to scatter plane-tree seeds in marshy spots. The result has been that, whereas 20 years ago the full-grown trees in this neighborhood might have been counted, a luxurious growth of willows and plane-trees marks my place, fuel is abundant, fever is steadily decreasing, the meandering propensities of the streams are checked, my neighbors have come to me for agricultural implements, and I have not had to go for timber for rough purposes." It may be interesting to observe in this connection that the comparatively new but well-known antiseptic preparation known as solicene is derived from the bark of a certain species of the willow. It is of a pure, bitter taste and highly febrifuge in quality. It is largely used in various solutions, in surgical operations, and is the most effectual preventive of putrefaction in the system known.

ARTIFICIAL BLACK WALNUT.—Our correspondent may find the following recipe to answer his purpose. It is said to be much used in Europe for that purpose. By this procedure, it is claimed, ordinary white woods have imparted to them the appearance of the most beautiful specimens of walnut, and are adapted to the finest cabinet-work. With this last statement we are disposed to disagree, since we hold that no imitation can ever perfectly substitute the real thing, and should not therefore be used for the finest class of work. The procedure is as follows: The wood, first thoroughly dried and warmed, is coated once or twice with a strong aqueous solution of extract of walnut peel. When half dried, the wood thus treated is brushed with a solution compound of ½ part (by weight) of bichromate of potassa in 5 parts of boiling water; and after drying thoroughly, is rubbed and polished. By this treatment, the color is said to be fixed in the wood to the depth of one 12th to one-6th of an inch, and in the majority of cases the walnut appearance is declared to be very perfectly imitated.

CEMENT FOR JOINTS.—When rubber plates and rings are used for making connections between steam and other pipes leakage of joints may be prevented by using a cement prepared by dissolving shellac in ammonia. The pulverized gum-shellac is soaked in ten times its weight of strong ammonia, when a slimy mass is obtained, which in three or four weeks will become liquid without the use of hot water. This fastens well both to rubber and to metal or wood, and becomes, by volatilization of the ammonia, hard and impermeable to either gases or fluids.

THE VISE.

The vise should vary in size, form, strength and height from the floor, according to the kind of work it is required to hold, and amount of grip with which the work requires to be held. For ordinary machinists' work vises of cast-iron are sufficiently strong, and these may be made with swiveling and other motions that are a great convenience upon some kinds of work, but for work requiring heavy chipping the wrought-iron, and what may be termed the legged vise, is necessary in order to withstand, without moving or breakage, the heavy blows of the full-weighted (1¾ lbs.) chipping hammer.

Strictly speaking, the height of the top of the vise-jaws should, for heavy filing work, be nearly equal in height to the operator's elbow, so that the lower joint of the arm may be about horizontal when filing. For light work the jaws may be higher, so that the operator may conveniently view how the filing proceeds without requiring to stoop. It is usual, however, to make the vises in a shop stand of about an equal height.

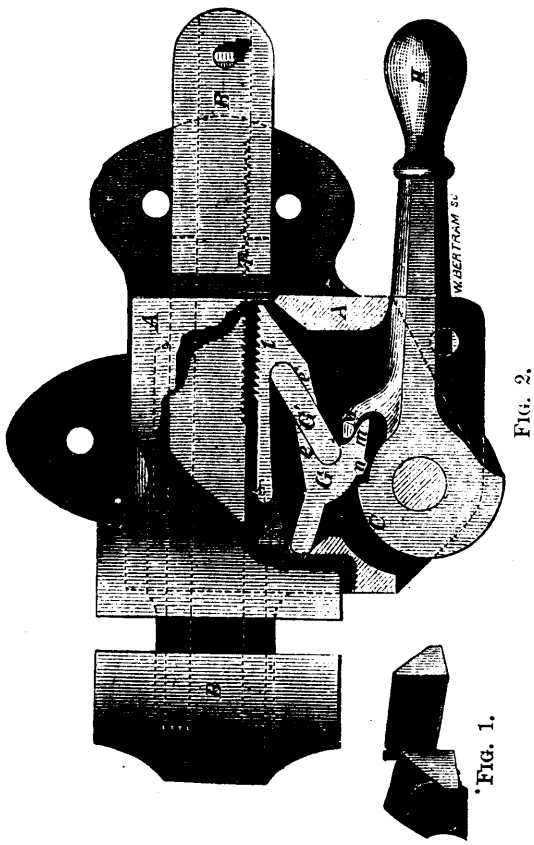


FIG. 2.

FIG. 1.

The teeth upon the gripping surface of a vise should be kept sharp, so that work receiving heavy blows may be gripped so firmly as not to move in the jaws. The jaw-gripping surfaces should, when close together, meet at the top so that they may grip their pieces close to the top and enable them to be cut off with a chisel without bedging. Usually these faces stand parallel or vertical when the vise-jaws are open to about one-quarter of their opening capacity. The top surfaces of the jaws should be quite level one with the other when the jaws are closed. The jaws are made thinner as the kind of work is lighter. Thus for wood-workers, jaws such as shown in Fig. 1, are used.

In Fig. 2 is shown a plan view, partly in section, of the Stevens Patent Swivel Vise. *A* is the fixed jaw, in one piece with the body of the vise, and *B* is the movable jaw, being the one nearest to the operator. The movable jaw is allowed to slide freely through the fixed one (being pushed or pulled by hand), or is drawn upon and grips the work by operating the handle or lever, *H*. The means of accomplishing this result are

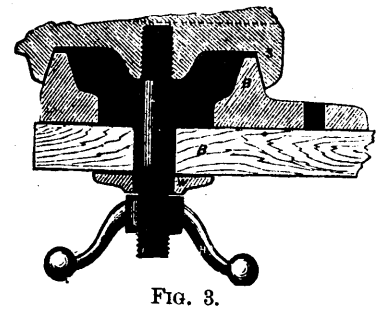


FIG. 3.

as follows:—As shown in the cut, *B* is free to be moved in or out, but if *H* be pulled away from the vise, the shoulder, *C*, meeting the shoulder, *N*, will move the toggle, *G*, and this, through the medium of *G*¹ moves the tooth bar, *t*, so as to engage with the teeth on the side of the movable jaw bar shown at *T*. As soon as the teeth, *t*, meet the teeth, *T*, the two travel together, to the work bench, but in others having a similar tightening mechanism the fixed jaw is so attached to the bench as to allow of being swiveled. The method of accomplishing this is shown in Fig. 3, in which *S* is the foot of the vise bored conical to receive a cone on the casting, *R*, which is fastened to the bench *B*. *W* is a washer and *H* the double arm nut. Loosening this nut permits of the vise being rotated upon *R*.

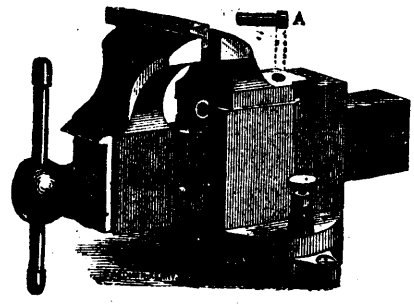


FIG. 4.

Fig. 4 represents Prentiss' Patent Adjustable Jaw Vise, which is also shown in Fig. 5 with the adjustable jaw removed. From the construction it is apparent that the groove *G*, being an arc of a circle of which *C* is the centre, the jaw is, as it were, pivoted horizontally, and can swing so as to let the plane of the jaw surfaces conform to the plane of the work; hence a wedge can be gripped all along the length enveloped by the jaws, and not at one corner or end only. When the pin, *A*, is inserted the jaw stands fixed parallel to the sliding jaw. The pin, *B* engages in a ratchet in the base below it to secure the back vise jaw in position when it is set to any required angle.

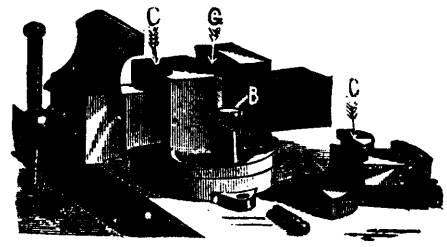


FIG. 5.

Fig. 6 represents a form of vise for heavy work, made by Fisher & Norris. In the ordinary forms of this class of vise the two gripping surfaces of the jaws only stand parallel and vertical when at one position, because the movable leg is pivoted at *P*; but in that shown in the figure the movable jaw is supported by the arm, *A*, passing through the fixed leg, *L*, which carries a nut, *N*. A screw, *S*, having journal bearing in the movable leg, screws through the nut, *N*, and is connected to the upper screw by the chain, *C*, which passes around a chain wheel provided on

each screw, so that the movable leg moves in an upright position and the jaw faces stand parallel, no matter what the width of the work. This is a very substantial method of obtaining a desirable and important object, and greatly enhances the gripping capability of the vise.

Fig. 7 represents a sectional view of Hall's patent vise. *A* is the sliding and *B* the fixed jaw. *P* is the bed plate carrying the steel rack plate, *H*. Attached to each side of the base of the jaw *B*, closes on and grips the work. But as the motion is small in

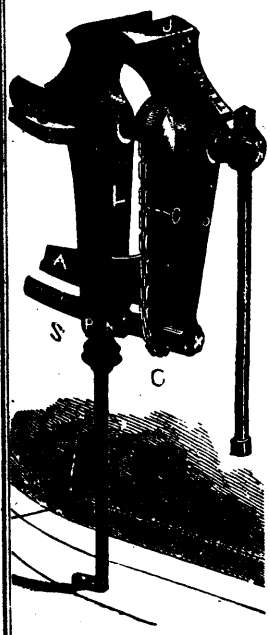


FIG. 6.

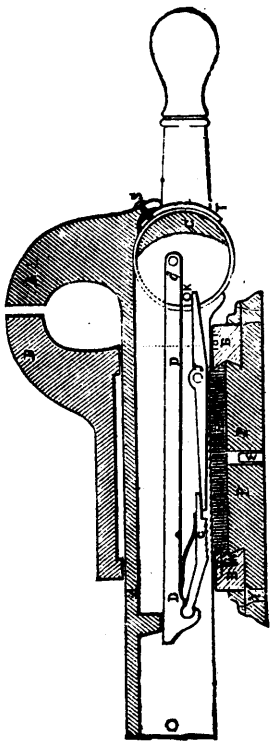


FIG. 7.

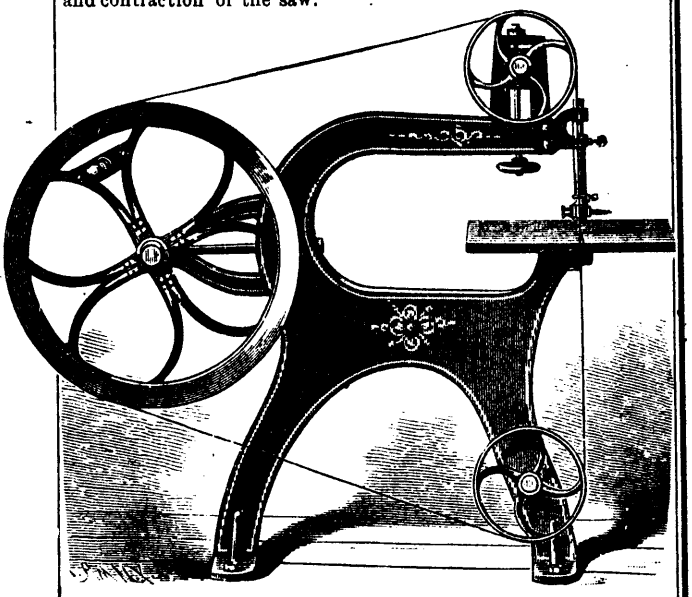
amount, the jaw, *b*, should be placed so to nearly or quite touch the work before *H* is operated. To unloose the work, the handle, *H*, is operated in an opposite direction, and the hook, *M*, meets *m* and pulls *t* to the position shown. The spring, *S*, operates upon a hook at *u*, to engage the teeth, *t*, with the rack, *T*, as soon as the handle, *H*, is moved in the tightening direction. The vise grips with great force, because during the tightening the toggle, *G*, is nearly straight, and its movement less than would be the case with a screw-vise having the ordinary pitch of thread and under an equal amount of handle movement.

In this vise the fixed jaw is made to fasten permanently. There are discs carried on the outer end of the movable jaw, *A*, and are held in place by the friction straps, *T*, adjusted by the screws, *S*. On the radial face of the disc is the pin, *K*, which, when the handle or lever is lifted or raised, depresses the end of lever, *J*, which at its other end raises the clutch, *G*, disengaging the same from the rack, *H*, as shown in the engraving. The jaw *A*, is thus free to be moved by hand, so as to have contact with the work. To tighten the vise the handle is depressed, whereon *K* releases *J* and the latter permits the toothed clutch, *G*, to engage with the teeth of *H*. At the same time the bar, *D*, which is pivoted to the discs is drawn outward. The end of the bar, *D*, meeting the surface of the lug shown on *A* acts (in conjunction with the toothed clutch, *H*) as a toggle fulcrum from which the discs may force the movable jaw to grip the work.

This action may be more minutely described as follows: The end, *d*, of *D* is pivoted upon the discs, as shown, hence when the handle is depressed the effort of the end, *d*, is to move to the right, but *D* being fixed at the other end the pressure is exerted to force the movable jaw to the left, and therefore upon the work. The amount of jaw movement due to the depression of the handle is such that if that jaw is pushed near or close to the work the handle will stand about vertical downward when the vise firmly grips the work.—*Blacksmith & Wheelwright.*

THE HAND POWER BAND SAW.

The engraving shows a new hand power band saw made by Frank & Co., of Buffalo, N. Y., and designed to be used in shops where there is no power and where a larger machine would be useless. It is calculated to meet the wants of a large class of mechanics, including carpenters and builders, cabinet-makers, and wagon-makers. It is capable of sawing stuff six inches thick, and has a clear space of thirty inches between the saw and the frame. The upper wheel is adjusted by a screw pressing against a rubber spring which compensates for the expansion and contraction of the saw.



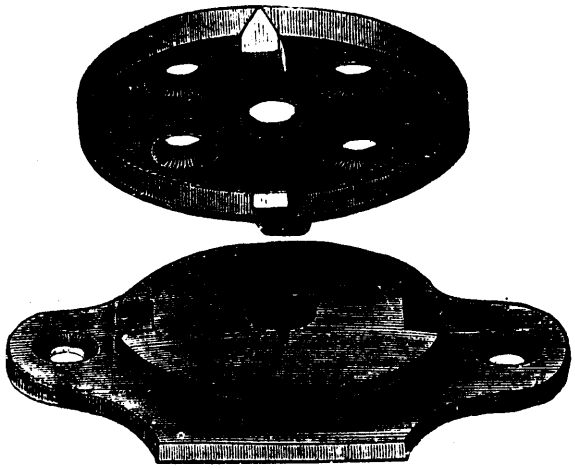
The machine has a very complete device for raising, lowering, and adjusting the wheel, and all of the parts are made with a view to obtaining the best results in the simplest and most desirable way.

The machine is six feet wide and five feet high, and weighs 380 lb. The wheels are covered with pure rubber bands well cemented.

Further particulars may be obtained by addressing Messrs. Frank & Co., 176 Terrace street, Buffalo, N. Y.

IMPROVED WHIFFLETREE PLATE.

Our illustration represents an Improved Whiffletree Plate patented by Mr. Peter Black, carriage builder, 133 Broadway, Cleveland, Ohio. Its simplicity and effectiveness will commend it to the trade. The cut shows the plate full size. It is packed with sole leather, which has been proven to be superior to any other packing for this purpose. It is claimed that there is no rattle or strain on the bolt; and no friction or creaking. Its cheapness and many good qualities seem likely to ensure for it a large sale.



ARCHITECTS ARE OFTEN "BEATEN" AND PLANS SECURED WITHOUT COST.

(*From the California Architect and Building Review.*)

As the representative journal of the profession on this coast, it is right and proper that we should notice and reprove wrongs of every nature appearing in connection with the planning and erection of buildings; and in doing so, we shall seek to avoid all statements, arguments, and reasonings, which can possibly be constructed as special pleadings, desigted to unfairly defend or uphold architects in any practice, rules, or acts, not in conformity with every reasonable principle of right and correctness.

We have repeatedly presented good advice to owners, cautioning them against the too common error of employing as architects, parties in no right sense qualified to perform architectural duties, and urged discrimination in this particular, and also in reference to letting contracts to irresponsible and incompetent contractors; and making the matter of an apparent saving of 5 or 10 per cent. on cost of building, the chief and controlling aim and object.

But our purpose in this article, is to refer to the very questionable means and measures adopted by a certain class of owners of real estate, to secure plans for buildings contemplated by them, without cost to themselves. We use the term questionable, as a modification of those more expressive, yet fully justified by facts, within the experience of every competent architect of any considerable practice.

The business values of architects consist far less in material things which may be handled and protected by locks, bars, and bolts, than in matured conceptions, and mind products, which when delineated by pencil, pen and paper, or more fully by mechanical construction, are no less the rightful possession of him who by mind and hand labor produces them in tangible form, than they were prior to delineation on paper. Nor does the erection of a building under and in conformity with plans so produced, lessen the producer's rightful ownership therein, nor render his productions common property for general or special use, beyond the purposes of their creation. In this defensible view of the case, we think that we are fully justified in condemning and rebuking a too general practice existing among certain classes of owners of real estate, who use every possible means to obtain the benefits and advantages of architectural skill and knowledge, without cost to themselves.

To accomplish, this, schemes, measures and devices are resorted to, to secure as nearly as possible the duplicate of plans of buildings produced by some competent architect, without paying for them, and in this sense cheating and wronging those whose professional skill may have matured plans so desirable as to excite the admiration and appreciation of such persons, who from motives of meanness, ignorance of what is right between man and man, or positive dishonesty of purpose, prefer to filch and abstract from resources to which they are in no way entitled, the advantages and benefits which fair-dealing and right-minded owners obtain legitimately, by the proper payment of money.

It is unnecessary at present to recite the numerous ignoble and mean methods adopted by this class of persons, to "beat architects." Suffice it to repeat, that plans originated and produced by an architect, are his rightful values, and to which no one has the right of use or application without the consent of him who creates the value, any more than one neighbour possesses the right to appropriate to his use the property or values of another. Every man, in fairness and justice, is entitled to the enjoyment of all the advantages contained in things produced by him, whether made of metal, wood or other materials, or the less tangible and material product of mind and brain; and those who secure either for their own uses and purposes, without fair and proper compensation to the producing party, are defenceless under any rule of equity or honest dealing.

Not unfrequently such owners express satisfaction at their success—their "smartness!"—in managing to "get ideas" from architects and builders, and by "copying from other buildings" sufficient for their purposes. If the practice alluded to was set up and recognized as a right rule in all classes of professional and business pursuits, it would require but a short period of time to divert all present conceived legitimate operations into systems of filching, advantage-taking, and every mean, and unworthy, and selfish resort, which presented the possibility of gain or personal profit or advantage.

"Plan stealing" may not be legal dishonesty, but its legal destitution fails to remove the moral irregularity, or create a virtue in those who prefer to secure by stealth, that which honorable and right-minded owners obtained in a regular business way, by the payment of money.

In subsequent issues of this journal, we shall again refer to the subject-matter of this article in unmistakably plain terms, as it furnishes good grounds for complaint upon the part of architects, and is so condemnable in every business sense, that it should be severely rebuked, particularly in view of the fact that people of considerable means, and some who possess large wealth, pursue the course complained of; preferring to obtain plans by unscrupulous means rather than engage and pay an architect for his services.

TASTELESS COD LIVER OIL.

Dr. Peuteves, in *La France Médicale*, recommends, in order to render cod liver oil tasteless, to mix a tablespoonful of it intimately with the yolk of an egg, add a few drops of essence of peppermint, and half a tumbler of sugared water, so as to obtain a *lait du poule*. By this means the taste and characteristic odor of the oil are entirely covered, and the patients take it without the slightest repugnance. Besides, the oil, being thus rendered miscible as the water in all its proportions, is in as complete state of emulsion as the fats at the moment they penetrate the chyle vessels, consequently absorption is better assured.

THE UTILIZATION OF SAW DUST.

The saw dust, which has become such a nuisance at Minneapolis and along the river below that growing city, offers a promising field of enterprise for whoever will utilize it. Several applications have already been made of it, and now arrangements are being made by a French manufacturing chemist for the establishment, at Minneapolis, of a laboratory to make from the saw dust an acid, now imported from France, and largely used by dyers, chemists, and druggists. It is to be hoped that the enterprise will be successful.

PLATE GLASS CRACKED BY THE SUN.—Any one passing not long ago along the main street of a busy town in the West Riding of Yorkshire, might have observed a very curious fact:—the lower halves of several large plate glass windows were rent from side to side. A single glance was sufficient to show that the cracks were not produced by the stray missiles of certain street Arabs, for they had not that radiating or starlike arrangement which is generally seen in such cases, but, instead, consisted of one large rent proceeding from one side to the other, with one or two minor cracks branching therefrom. To account for this curious and highly inconvenient phenomenon was a sore puzzle to many of the good folks about; some there were, however, more knowing than the rest, who arrived at a sensible and satisfactory explanation, thereby proving what is demonstrated every day, nay, every hour,—that science is only, to use the words of Huxley, trained and organized common sense. It was midsummer. The windows of the shops where these cracks were to be seen faced the south, and were therefore, exposed to the full glare of the sun's light and heat. The lower have of the windows,—*i. e.*, the cracked parts,—were painted on the inside, of a dun color, and by two in the afternoon had become quite hot to the touch, whereas the upper and unpainted halves were only slightly warmed. Herein lay the secret. The glazier fixed the windows as if they had been small panes, where the amount of expansion is very minute indeed, and they were fixed in a rigid framework that would not give way. The painter, on his part, in his ignorance of certain principles, put on a color which led to the glass being strongly heated in the sun's rays. This followed: the plate glass was heated, and it expanded; the frame of the window tried to resist that expansion, and in the struggle the weaker has to give way; not doing so, however, until it was irremediably injured.—*Science for All.*

A GEORGIA SAPPHIRE.—The Gainsville (Ga.) *Eagle* reports the finding in the Sequah Creek, that State, of "a large deep-blue sapphire, perfectly transparent, in size nearly an inch square, but wedge shaped, and weighing 37½ carats, and claims that according to Professor J. D. Dana's method of determining the value of precious stones, it is worth $51,200.

SOUNDS IN THE SUN.—Prof. Graham Bell has been endeavoring to apply the photophone to the study of such sounds as may occur at the surface of the sun. This extension of the use of his late invention was suggested by Mr. Jansen. As yet Prof. Bell has not secured very striking results, but he has obtained enough to warrant further effects.

THE HERCULES BEETLE.

In the handsome engraving herewith are shown the male and female of the Hercules beetle (Dynastes hercules) of Brazil. The family of the Dynastidæ comprises some of the largest and most beautiful of the beetle race, all of them are remarkable for enormous development of the thorax and head. They are all large bodied and stout limbed, and by their great strength abundantly justify their generic name, Dynastes, which is from the Greek and signifies powerful. The larvæ of these beetles inhabit and feed upon decaying trees and other rotting vegetable matter, and correspond in size with the mature insects. Most of them inhabit tropical regions, where they perform a valuable service in hastening the destruction of dead or fallen timber.

An admirable example of this family of beetles is the one here represented. In the male of the Hercules beetle the upper part of the thorax is prolonged into a single, downward curving horn fully three inches long, the entire length of the insect being about six inches. The head is prolonged into a similar horn, which curves upward, giving the head and thorax the appearance of the enormous jaws, resembling the claw of a lobster. The real jaws of the insect are underneath the lower horn, which projects from the forepart of the head. The under surface of the thorax-horn carries a ridge of stiff, short, golden-yellow hairs, and the under surface and edges of the abdomen are similarly ornamented.

The head, thorax, and legs are shining black; the elytra, or wing-covers, are olive-green, dotted with black spots, and are much wrinkled. The wings are large and powerful.

The female Hercules is quite unlike the male. It is much smaller, being not more than three and a half inches long, is without horns, and is covered with a brown hairy felt.

These beetles are nocturnal in habit, and are rarely seen in the daytime, except in dark hiding-places in the recesses of Brazilian forests.

SKILLED AND UNSKILLED LABOR.

A writer in one of our mechanical exchanges, says: The wisdom and value of the old apprentice system are to-day very apparent. A consciousness begins to prevail that the hasty and superficial methods of later years have resulted in widespread and unmitigated evil. Young men once were bound for a suitable term of years in order that they might slowly and thoroughly learn a trade. Nowadays they do not find it necessary to gradually climb up from the bottom rounds of their vocations before they can claim work as regular mechanics. They get a smattering knowledge in some shop, and if offered good wages elsewhere leave and make the most of what they have learned, instead of waiting and mastering all details of their pursuit before setting out as regular workmen. The country is thus filled with men who are not competently trained and completely fitted for doing the best mechanical work. As a consequence skilled workmen are in great demand, but so few are they in number that enough of them cannot be had.

A foolish notion has arisen that it is degrading for a youth to regularly bind himself as an apprentice for a considerable period of time. He is signing away his privileges as a free being; and besides, so impatient a desire to rush ahead within a short time to great lengths has been bred in Young America, that his restless mind regards the apprentice system with high disdain. He can do wonders while he is young. He can make five thousand dollars before the age at which his slow-going father had laid up two hundred dollars as the result of hard work. He doesn't intend to waste his time in acquiring a lot of mere routine knowledge.

Yet the apprentice system is the only one under which a master mechanic can give a youth a thorough training. Unless the former can have some surety that an apprentice will remain with him for several years, it is no object to him to spend time and pains in teaching the unskilled hand. For at first the master may even lose money by having the apprentice in his shop; but if the latter, at a low rate of wages, is obliged to remain a year or two with his master, after he has acquired dexterity in his trade, he makes more than good, so to speak, the trouble and expense previously borne in his behalf by his employer.

It is also important that mechanical knowledge should be thoroughly acquired in youth; for the fingers become stiff and awkward with advancing years, and one at thirty or forty cannot well become so manually dexterous as if he had given his hands skilled training when he was young. If a mechanic half learns his trade during the first years he is engaged upon it, it will be a hard, if not impossible, matter to fully remedy the early defects resulting in carelessness.

In view of the promise that good mechanics of all kinds are likely to be in great demand during coming years, it is highly desirable that young men who intend to depend on the skill of their hands for a livelihood, learn a chosen trade as it should be acquired—from beginning to end, and in all details. The outlook for skilled labor is excellent. Many manufactories are now flourishing throughout this country, and many more like establishments will doubtless be erected. Americans bid fair to occupy a leading and commanding position among the nations of the world as manufacturers of all kinds of labor-saving machines, implements, fabrics of every variety, &c. Consequently men who are masters of their respective trades are likely to secure steady and remunerative employment; but as the country becomes more thickly populated and competition greater and more narrowed down, the unskilled mechanic will find himself at a discouraging distance below par. The reasons are weighty why the old apprentice system should be vigorously revived.

Was Iron Before Bronze?—Professor Huntington, of King's College, London, holds that, from a metallurgical point of view, there is no reason why iron should not have been used before bronze, although it depends on other circumstances whether it was so not. Dr. Percy—than whom, says Professor Huntington, there has never yet lived a more learned and trustworthy metallurgical author—says: "From suitable ores, of which abundant and readily accessible supplies exist in various localities, nothing more easy can be conceived than the extraction of malleable iron. Of all the metallurgical processes, it may be regarded as among the most simple. Thus, if a lump of red or brown hematite be heated for a few hours in a charcoal fire, well surrounded by or imbedded in the fuel, it will be more or less completely reduced, so as to admit of being easily forged, at a red heat, into a bar of iron. The primitive method of extracting good malleable iron directly from the ore, which is still practiced in India and in Africa, requires a degree of skill very far inferior to that which is implied in the manufacture of bronze." The professor characterizes as erroneous the statement that copper was more likely to have been first used than iron, because the latter is difficult to reduce from its ore and the former is found native. Considering the great quantities of copper which must have been used, we know of no locality whence at that time it could have been obtained. From Pliny's description of the methods of obtaining metallic copper, it is evident that the principle was the same as that of our own day. We have every reason to suppose that, in pre-historic times, copper was obtained from its ore, on the large scale, by the dry process. If we grant that copper was obtained in the uncombined condition, we must not forget the tin, and tin does occur native, and the reduction would imply the use of charcoal, aided by a high temperature. Considerable skill is required, even at the present time, to obtain copper and tin from their ores and alloy them successfully. We ought not, therefore, finally to decide that bronze was known before iron. "It is very possible it was, but we do not as yet know the reason why." Professor Huntington concluded the lecture of which the preceding statements and reasonings formed a part by some very sensible words concerning the study of science and of literature. "Literature gives to the mind weight, dignity, and all those characteristics which, blended, constitute true civilization and a cultured intellect. Let me urge, then, that those who are engaged in scientific pursuits should seek in literature their recreation. And those whose daily occupations are of a literary nature should make science their pastime." Our acknowledgements are due to Professor Huntington for a report of the lecture, from which we have made the proceeding incomplete abstract.

A boy recently applied for a situation in Fitchburg, Mass., in a commission house. He had received a diploma from the High School of that place. The proprietor of the house examined him in book-keeping, reading, writing and spelling, and found him so deficient that he was forced to refuse to hire him. The boy said they did not teach these branches in the high school, and that it was such a long time since he had been to the grammar school he had forgotten nearly all he had acquired there. The boy was simply useless. He had a smattering of French, chemistry, natural history, algebra, English literature, physiology, ancient history, natural philosophy, astronomy, geometry, trigonometry, moral philosophy, civil government, rhetoric. In some of our Canadian schools these matters occupy altogether too much the attention of our children. They should be set aside until more useful branches are acquired, and the sooner our educationists are made to understand this the better for all parties concerned.

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