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OBSERVATIONS

ON THE SANITARY CONDITION OF CITIES—THE WATER-CARRIAGE SYSTEM THE CHIEF CAUSE OF DISEASE.

ALTHOUGH many of the most eminent engineers and physicians who have written on this subject, endorse the assertion we now make, that the water-carriage, or sewage system for cities, is the most objectionable that could possibly be devised for removing excreta and all other sewage matter, yet, for large cities that system is attended with so many conveniences, which, from habitude, have become so necessary to the comforts of the wealthy and to all those who become habituated to it in early life, that it would be almost an impossibility, particularly in a cold climate like Canada, to prevail upon a community to submit to any other system which would entail upon it less personal comfort; the preference would be given to it, even at the risk of disease; all that can be done then, where such systems are in full operation, or about to be adopted, is to devise means to stop, as far as possible, the evils arising therefrom. The most prominent of these evils arise from gases evolved from putrid matter which accumulate from different causes and to which the water-carriage system is always liable; these gases find access to our dwellings either through imperfect workmanship, imperfect traps, or inferior materials used in the construction of house drains.

Next in importance is the contamination of the atmosphere in our streets from the gases rising up in large volumes through the gratings of the catch-basins.

It would be a work of mere supererogation in a short dissertation on this important subject, to go over the different arguments used by professional men of the highest standing, in favor of one system over another, or, to enter into a disquisition on the deadly character of the different gases which are evolved from putrid sewage, these being facts well established in chemical science. We need therefore, only confine our remarks to the water-carriage or sewer system, which will include also all connections with dwelling-houses. The pros and cons regarding this system have been already so ventilated in scientific papers, that the public are, in a general way, pretty well informed about these matters; the principal errors they are likely to fall into being the supposition that, because a certain system has been found to work well in one locality, it will answer equally well in all; or, that pure water constantly passing through sewers and drains must wash out of them all impurity; or that if the street sewers are large and well built there ought to be an exemption from disease—such is not the case.

It is a popular error to suppose that good sewers are all that is necessary to ensure the freedom of a city from zymotic diseases. That good sewers and house drains are essential to carry off the sewage in so short a period that they can have no time to putrify, is patent to all, and that drains imperfectly constructed are a curse to a city it is almost unnecessary to assert; all statistics, carefully taken, go to prove the fact that, since the introduction of water-closets, the mortality in cities has increased.

Dr. Stewart, who was one of the first to point out the difference between typhoid and typhus, states that, "*in Edinburgh typhoid fever was unknown* (1838 to " 1842) *before the water-closet system was introduced.*" This is confirmed by Dr. Murchison, in the second edition of his work on Fevers, pages 443 and 444, in which he states that, "*typhoid fever did not exist in* " *Edinburgh until the introduction of water-carriage.*" He also says: "*It is remarkable that the increase of* " *enteric fever in London was contemporaneous with* " *the completion of the main drainage scheme.*"

Dr. Fergus, the President of the Health Section of the Glasgow Philosophical Society, points out the startling fact that, "*according to the returns of the Registrar* " *General, the death rate of Britain from cholera,* " *diarrhœa and dysentery, which are recognized as* " *diseases more or less arising from excremental pollu-* " *tion, was nearly four times what it was thirty-five years* " *ago.*"

The water-carriage system a few years back was looked upon as the great triumph of modern science; it was a system which it was supposed would bear rapidly away from us every impurity. But the faith in it has, of late years, received a great check, experience proving the fact that the sewers of a populous city are mere arteries of corruption, infecting with disease the busy world residing above them. Says an authority (R. Car. Harris, associate member of the Institute of C.E.): "*The occupant of a city mansion would do well to* "*plug up the outlets of his marble baths and wash basins,* "*and seal up his water-closets if his object is health.* "*Better the primitive inconveniences of our ancestors* "*than the gilded death traps of modern cities.*"

Dr. Littlejohn, medical officer of health for the city of Edinburgh, made a statement that, "*in the new town* "*(Edinburgh)*, which is inhabited by the better classes, " and is pre-eminently a water-closet town, *typhoid-fever* "*and diphtheria are never entirely absent and are fre-* "*quently endemic*, and it is noticed that these diseases " have been "*the greatest in the best houses.*" *But in the* "*old town, which is badly ventilated and which is crowd-* "*ed with very poor people living in close rooms, and* "*where they still make use of pails for the reception* "*of excreta which are emptied daily into carts provided* "*by the authorities, typhoid fever and diphtheria may be* "*practically said to be unknown.*"

We might quote numerous, and equally reliable authorities, to prove that the water-carriage system has been an entire failure, and instead of bearing off *in toto* the impure matter, forms a bed in which the germs of disease are bred, nursed, and scattered through numerous arteries into every dwelling.

In further corroboration of these statements, history itself bears out their truth. Among aboriginal tribes, unless infected by communication with the whites, zymotic diseases are entirely unknown. The earth is to them the deodorator and disinfector of all excreta. But in our rural districts we cannot say so much; the wells are becoming poisoned from the percolation of foul matter into them from cess pits, and cases of typhoid fever and diphtheria, of a very malignant kind, now frequently occur.

It may naturally be asked, is not the great supply of water that we possess sufficient to carry off every impurity that is conveyed into the drains? What can possibly rest in the smooth lead pipes, and the smooth glazed tile pipes which lie within the house, fresh water constantly passing through them? Surely the immense body of water which flows constantly through the sewers must bear with it to the river, in a very short time, all that passes into them. Reader, have you ever entered into any of the main sewers of a city and examined them? have you ever seen a sink pipe cut in two when being repaired after it has been in use for even only one year? Probably not, but we have in the performance of our professional duties—and what we state is no theoretical idea to the truth of which we cannot attest—but we can positively assert from personal observation that the common sewer and house pipes are lined with a most foul and slimy mucus, that adheres to them like birdlime, which no flushing of water will totally carry away; that the bottom of these sewers, when the fall is slight, is always more or less covered with the more solid parts of sewage, which lies there and putrifies until the sewers are flushed with a heavy rain, which then only carries off a portion of their contents; that, at the connection of the side drain with all the branches of the main sewers, where the flow of sewage of the side drain is interrupted by coming in contact with the current of the main sewer, a deposit of sewage matter, as a consequence, is not only formed there, obstructing the passage, but adding, if possible, more putridity for the emanation of noxious gases.

We have no conceivable idea of the quantity of foul gases bred in the whole area of city drains; we can, however, form some idea of it when, on certain atmospheric changes, we find an almost choking effluvia arising through the gratings of the catch-basins in the streets, or when, on a frosty morning, we can see the damp hot vapours rolling out of them and condense in the cold pure air.

So long as the street gratings keep open there is some safety valve, during the night particularly, to the city resident, but when in winter these gratings are frozen up and closed, where is this immense body of bottled up gas which is always accumulating to go to? It must have some escape, and that escape undoubtedly is through the house drains. The water in the trap absorbs it, and every time the water in the water-closets and sinks pass through the traps, there is a flow of gas into the house. The most important sanitary question of the day is to devise a proper system of street and house drainage which will carry off the whole of the sewage before it has time to putrify. Cities that have already adopted the system have sunk too much capital therein to abandon it and venture on another way of disposing of excreta, which might not, after all the additional cost, turn out satisfactory. This being the case, corporations are bound to do everything in their power to check the evils of the system, and that only can be done by exacting the most stringent regulations in the execution of work for house drains and plumber's work, which should be looked upon as a sanitary duty that does not concern the individual who builds a house, but the citizens at large; therefore the planing and the execution of the work should be taken out of the hands of private individuals, wherever these plans are likely to be detrimental to public health. A strict surveillance over the construction of the house drains and plumber's work and the connection of the tile drains with the water-closet pipes, to prevent the possibility of leakage, is absolutely necessary, and also the introduction of traps so perfect in their construction that gases, under no amount of pressure, can pass through them—simple water traps being only a partial preventive. There should also be a proper system of ventilation to all street drains and water-closets to carry off the gases as fast as they accumulate, and further, the most stringent regulations should be enforced to prevent the wooden paved yards of the poorer classes from being saturated with impurities thrown into them, from which the boards and the earth beneath them become saturated and sodden with putrid vegetable and animal matter.

The foregoing remarks naturally lead us to the main point for consideration as to what immediately concerns us, and that is the sanitary condition of Montreal.

It is now an undisputed fact that Montreal is the most unhealthy city in North America; why it is so is entirely owing to its imperfect street and house drains; in every other respect it has great sanitary advantages, being surrounded with a pure atmosphere, free from any marshes, which breed malaria and ague. A large and rapid river flows past the whole line of its front, with a current varying from 6 to 8 miles an hour, which is sufficient to carry off the sewage miles away in the course of a day, never to be returned back as in tidal ports—subject to no inundations except, perhaps, once in seven years, in Griffintown,—few cities, in fact, have more natural sanitary advantages in her favor—and yet, with all these advantages, she has an annual death rate greater than any city or town on this continent. Other cities, from uncontrolable causes, have periodical returns of sickness caused by climate and the malaria arising from the overflowing of rivers, or from contiguous marshes, but none have, from year to year, the same average amount of deaths, arising from zymotic diseases which are the outbreedings of sewer gases, and, consequently, can only be attributed to imperfect drainage and defective ventilation of houses, there being no other cause, local or otherwise, to which these classes of diseases can be fairly set down. The reason why Montreal is so particularly unhealthy may be summed up in one general clause, and that is, from an imperfect system of drainage, imperfect workmanship in its construction, imperfect plumbing and imperfect ventilation. The principal cause of all, however, is the generation of gases in the imperfect sewers; these gases pass through the water-traps into our houses.

That many sanitary errors, serious and costly, and of great magnitude, have been committed in the construction of our city sewers is a palpable fact, and will hardly be denied by that body under whose administration they were done. Many of these faults arose from mere experiments from the want of practical professional knowledge, but it is no use grieving over what has been done; it is to avoid such costly errors for the future that we now write, and therefore we will merely allude to one of them—the McGill street sewer—a very costly affair, and which has never answered the purpose intended.

That this expensive sewer has been of no use to the city, experience has fully proved to be the case; but the evil that has resulted from it is that, not only has it been a breeding place for gases, but it discharges its putrid matter into the quiet waters of one of the most central basins in the harbor, instead of into the strong current of the river. That the water in that basin must be polluted in the highest degree may be realized from the fact that there was dredged out of it last summer about 15,000 yards of sewage sediment. A more pest breeding arrangement could scarcely have been conceived.

When the water-carriage system was introduced, it was claimed as a crowning point in its favor, the supposed certainty that the constant flow of water through the sewers and small drains would carry every particle of sewage away, and that from occasional flushings from heavy rains they would become thoroughly cleansed.

The assumption for such a theory was undoubtedly correct, presuming every portion of the system was made perfect; but herein, principally, has it failed; that is, in the practical working of the machinery in its most minute details:—so many different trades are employed in connection therewith, that the failure of one party to perform his part of the work properly, would render inoperative the success of the whole system, and so, instead of proving a blessing, it has, we might almost say, been a curse, *i. e.* if the statistics given by the eminent authorities quoted, and of many others we could mention, are to be relied upon. If far more deaths from zymotic diseases have occurred in cities since the introduction of the water-carriage system than before, what other inference can be drawn from it, than that to the gases arising from the sewage in drains these diseases emanate?

It takes but a very short space of time in warm weather for the bottoms and sides of sewers, tile drains and traps to become lined with a foul mucus matter which slow running water will not detach, particularly after it becomes thickened with excretion and the greasy fluids from sinks; this fluid as it flows gently through the pipes, day after day, attaches more and more of its greasy and sedimentary substance to their sides, which, during the night time, when the flow of water is stopped, gives out the most offensive odours.

As such drawbacks to the water-carriage system must always exist to a greater or less degree—according to the smoothness or roughness of the interior of the drains or pipes, and obstructions within them—there are some points of protection particularly necessary to look to.

1st. To adopt a trap that shall be a better safeguard than the mere interposition of water, so as to effectually prevent gas from being forcibly passed through it.

2nd. Perfect workmanship in every department of the work, even to the most minute details.

3rd. Ventilation to the main sewers in the streets (but never from the main sewers through the houses), and ventilation to the house drains, water-closets and traps, particularly at their highest points.

In considering this subject we should first commence with the *house drains*, from which all sewage originates, for we have always advocated in this Magazine that the house drains are of the first importance, and no matter what amount of money may be spent in the construction of expensive sewers, all is thrown away, as far as the sanitation of the city is concerned, if the house drains and the plumber's work are not *made perfect in every respect*. Upon the care bestowed upon them will, in a great measure, depend the ultimate success of the whole.

To ensure perfect drainage to a city, and perfect ventilation, the following requisites are essentially necessary:—

No organic decomposition should be allowed to take place in any drain within a dwelling, or within any pipe connected with it. No refuse matter or foul water should be thrown into yards. In order to secure the perfect cleanliness of the closets, sinks, pipes and house drains, we recommend that there should be an arrangement by which they could be mechanically cleansed, and scoured out by the pressure of water being sent through them—this should be done at times under an official appointed for the purpose. There should also be a periodical flushing of the street drains. The pressure of water in a pipe of course ceases as soon as it leaves it, and therefore what flows from water-closets, pans and sinks, has not sufficient force to clean out excreta or sediment from the traps, until after several times being applied, and will not purge the pipes of their foul mucus lining.

The rain that falls on house tops should not be allowed to fall into the streets and yards—by falling into the streets it washes into the sewers a large quantity of sand and other substances which settle at their bottom in a sort of concrete, which necessitates frequent removal, and that which falls into boarded yards keeps them damp and fœtid, and a breeding place for germs. It would be much better if carried direct into the house drain and made to act as a scourer and ventilator at the same time.

Sewers should be egg shaped, and constructed of the very best materials, built with uniformity of design, and in the best practical manner, with a smooth interior face and made perfectly water tight.

They should also be frequently flushed and constructed so as to carry off, as rapidly as possible, all excreta and sink water, and whenever practicable, made to discharge their contents into deep and rapid running waters.

They should be designed with regard to economy, not only as regards the first cost, but their future maintenance, and made of just sufficient dimensions for the drainage required of them. Many drains are made unnecessarily large and costly.

If a 12 or 15 inch drain tile pipe were used instead of a three foot sewer, it would be found to be equally as cheap and, when well laid, perform its work much more satisfactorily. Their capacity is ample for the heaviest storm for a length of several squares, and are easily cleansed by flushing. When well laid they always give perfect satisfaction. They are always water tight when properly jointed and carefully laid to proper grades and curves, and owing to their smoothness rapidly receive and carry away all sewage. They admit of a smooth and neat connection with the house drains, thereby increasing their velocity. Another reason for adopting these pipes whenever practicable is, that they are much more easily ventilated than brick sewers, which require to be made of a larger capacity. The manhole being the same, a 12 inch drain pipe would stand a much better chance of having its air renewed, as it requires only one ninth as much as a three foot sewer, and, as the flow is more rapid, it would draw the air with it, and help the exchange; and further, as there is a quicker discharge and a smaller surface exposed to the air, there will be less to decompose and vitiate therein.

There should be a proper system of ventilation. A great deal has been said about ventilating drains from shafts carried up through the centre of a house and through the roof, thus made to answer the treble purpose of rain conductor, drain, and ventilator. This method of ventilation, although it has been found to answer well in some instances, we fear would, if generally adopted, be attended with bad results. So long as there is a strong upward current, no gases would enter through the closets or wash-basins, which, under any circumstances, should be trapped, but they have not been found to answer in all cases, being subject to downward draughts from different causes; but if these ventilating shafts were generally introduced, the result would be such an alteration in the atmosphere of the sewers, that there would be an equilibrium of temperature established, and the consequence would be little or no draught up them, so that the sewer gases, instead of being carried rapidly up into the air, would linger in the pipes and issue out of any imperfections in the traps or the shaft itself.

At present the principal ventilation to the sewers is through the gratings of the catch-basins, which is very objectionable to foot passengers, and far too near to dwellings. It would be better to trap the catch-basins and have in the centre of the streets strong perforated manholes every two hundred feet apart. Double ventilating shafts, one longer than the other, might with great advantage be placed over sewers in certain positions. The necessity of the latter in winter is particularly obvious when all the gratings are closed with ice and snow; it is then that a greater pressure of accumulated gases is forced against the water-traps, and is sure to pass through them. In every house, however, there should be a ventilating shaft to carry off the gases that accumulate at the traps.

PLUMBERS' WORK.

Here we have a host of imperfections. There seems to be a mystery about plumbers' work that must not be enquired into at all. The plumber (?) seems to have it all his own way, and there are no regulations laid down to guard against his imperfect workmanship; the consequence is that, after a house has been built, the closets and pipes are constantly getting out of order. There should be municipal regulations in accordance with the latest information that science affords us, and plumbers should have to obtain certificates of qualification before being allowed to do work, and their work should be inspected by an intelligent and honorable inspector.

To remedy the existing evils arising from bad drains in any city or town where an erroneous system of sewage has been adopted, is a matter of great importance; it is one that has for a long time been under discussion in Montreal and elsewhere, with very unsatisfactory results to the public.

One of the principal points, however, to which we desire to draw public attention, is to the absolute necessity of a strict superintendence over all new sanitary work performed in this city, either in street drains or the drains inside of dwellings. It is an undoubted fact that the most vital requisite in the construction of a new house is the adoption of a proper system of drainage and ventilation—these two should go hand in hand together—and then when a system has been decided upon, the next important step is to have the work so strictly superintended that the gross negligence and faults that have been so frequently complained of cannot again occur. The loose way in which tile drains have been laid and connected, and the plumbers' work has been performed, would almost lead one to suppose that the health of the people was the last consideration to be thought of, instead of the first. In fact, a large proportion of this important work is trusted to laborers' and plumbers' apprentices. No such thing as a system is ever devised, the principal object seems to be to stow away the pipes into holes and corners, where, when they get out of order, it is almost impossible to get at them to make repairs.

Of the loss arising from the want of a proper system of street and house drains in many cities, we have ample examples; thousands of dollars have been literally *drained* out of their treasury in what may be called mere experiments; and private citizens have been equal sufferers in paying large sums for a great deal of unnecessary and imperfect work in the construction of their house drains and other sanitary requisites.

There seems to be an entire absence of municipal regulations governing the details of house drainage and house plumbing. Proprietors and builders seem to do as they like, and carry out their own ideas; proprietors, governed by a feeling of economy, generally accept the lowest tender, however incompetent the party may be to perform the work; builders naturally follow the same system, if the drainage forms a part of their contracts; and plumbers endeavour to do the work as imperfect as possible to save themselves from loss by having contracted at too low a figure.

We have so far, in these observations, endeavored to impress upon the reader the fact that, although wherever the water-carriage system of sewage can be carried out, it will always, from its convenience to the public, have preference to any other, it is the most dangerous of all the systems, and the safety of the public in a sanitary point depends entirely on the following conditions:

1st. Street sewers well designed and built so that they will carry off rapidly the sewage.

2nd. House drains and their connections with the sewers so perfectly made that it will be impossible for gases to escape through the joints.

3rd. Perfect plumbers' work.

4th. Perfect ventilation to the street sewers and at all the highest points in a dwelling—and, lastly, a thorough superintendence, by a competent and trusty person, over the most minute details of the construction of all sanitary works.

To a great many of the sanitary evils from which we suffer, there are several simple cheap and effectual remedies, but it would occupy too much space here to point them out.

Before, however, concluding these remarks, there is one thing we would wish to impress upon the public mind, which is, that very poisonous gases may exist in drains without giving out any perceptible odour, and, also, that people get so accustomed to odour of foul gas as not to recognize it, and are thus lulled into security until death knocks at the door.

The principal dangers to be apprehended are from leakages in soil pipes, from imperfect joinings or from corrosion, and from gases passing through traps which have no other interposition to their entrance to a dwelling than the water contained in them. No greater error exists than the supposition that because a pipe is trapped it is a preventive to gases passing through it. Even the trap itself, if not kept constantly cleaned out, becomes the receptacle of a filthy sediment which, as before stated, the mere flow of water running into it from a sink cannot remove. There is not a sink pipe in this city that, after one year's use, is not thickly coated, a quarter of an inch thick, with a vile smelling, poisonous, and glutinous substance formed from soapsuds, grease, and other substances. Nor is it to be supposed that whenever such evils exist, fevers always follow; but where they do not, the pale face and debilitated state of health of the weaker inmates of a family tell the story.

Of late years a great sanitary reform has taken place in England and North American cities; but at no period has it ever received more attention than at present. Sanitary societies have been formed in every section of the country, and meetings held by eminent engineers to discuss the most important questions submitted to them by public authorities. It is after all not so much a matter for wonder that London, with a population of nearly four millions, is one of the healthiest cities in the world, when public interest is so marked in favor of sanitary improvements and regulations — but it is, indeed, a matter of surprise and a crying shame that Montreal, with a population of only about 150,000 inhabitants, and with far superior sanitary advantages to London, should be the most unhealthy city in North America.

There is one point which we desire particularly to impress upon our readers and that is, wherever the system of drainage is perfect (when we speak of a perfect system we mean every part of it within or without a house), the inhabitants of a town will be comparatively free from zymotic diseases, if no other cause prevails.

It has often been a matter of surprise to wealthy residents in Montreal that, after spending so much money to secure good drainage, some of the most virulent cases of typhoid fever or diphtheria have occurred in their houses. The reason for this, however, can be easily explained. Sewer gases being much lighter than the atmosphere, will always ascend and seek to escape at the highest point in the sewer or house drain. When diseases, such as described, exist in the lower parts of a town, the gas produced from the decomposition of excreta discharged in the sewer will ascend to the highest point, and thus the sewer becomes a powerful duct for the conveyance of disease from the lower parts of a town to the highest localities, and, consequently, the inmates of the finest houses in the otherwise most healthy and elevated positions in a town, are actually in greater danger than those living in the low lying districts. We have a frequent example of this fact in tenement houses, where, for the sake of economy, one water-trap only is often placed in the cellar, which is made to answer for the whole house, and what is the consequence? why the drain pipes in the upper tenement become most perfect ventilators to the lower tenement, the latter being always free from the smell of gases, the upper hardly ever so. In this case, a single water-trap in the basement is simply a reservoir of filth, which the mere flow of water through it has no power to remove.

Sewer gases are looked upon, unfortunately, with too much indifference; in fact people become so accustomed to the odour, where it exists, as to be unable to detect it; its presence, however, is quickly felt by those unaccustomed to it. It is only when too late, when two, three, and four sometimes of a family are borne off to the grave, that we awaken to the fact that this indifference had destroyed the lives of our children.

When a tenant perceives the odour of sewer gases in his house, he should endeavor to get his landlord to visit the residence, when these offensive odours are prevalent, for it frequently happens that gas is forced through the traps or defective pipes under certain atmospheric circumstances only, and what was intolerable one day, may not be felt the next. This has been the cause of litigation in this city already, and in a case where a tenant abandoned his house, on account of bad drains, he lost his case because his landlord was able to prove, by witnesses, that they had examined the premises and found no bad smell therein; had they called in to examine them at a favorable time, they would have had a different tale to tell. In all such cases the proper way is to call in a professional person who will find out the cause and *prove it*.

Another important matter in connection with health is the ventilation of rooms in public buildings and dwelling houses. The atmosphere of a house becomes impure from other causes besides sewer gases, sufficiently so to cause, in time, great debility to those who have to live much of their time indoors. The air we have inhaled is not fit to be used again, and should be constantly replenished from a pure source.

In concluding these observations, we would remark that the principal reason why mistakes occur in the construction of sewers in towns, is either because it is not perfectly understood, or that architects cannot give, and should not be expected to give without extra remuneration, that close attention to it which is required. But even supposing that the system adopted was, to a certain extent, faulty, no system, however good, will answer its purpose if the construction of sanitary work is entrusted to ignorant men. When the laying and cementing of tile pipes are entrusted to mere labourers, and the plumbers' work to tinsmiths, what can the public expect but a total failure of any system of drainage adopted?

It seems rather paradoxical that when thousands of dollars are spent in the erection of a beautiful villa, and no expense spared to fill it with every comfort that a home should have to make it a place desirable to live in for many years, too often the lowest mechanical ability is employed to do that which will give life or death to its occupants.

The whole subject of city sewerage, and especially house drainage, needs earnest, sincere and early attention. It is indeed to be regretted that all the efforts that have hitherto been made by our Health Society have not resulted in any permanent benefit. Complaints are constantly made of bad drains. Much has been written by eminent physicians and engineers, and the technical imperfection of our drainage pointed out as we have done in this article to-day; but *without action being taken by those who have it in their power, the evil will remain unremedied until some dreadful scourge appears in our midst and carries off thousands to the grave.*

VICK'S ILLUSTRATED MONTHLY MAGAZINE,

Published by JAMES VICK, *Rochester, N.Y.*

We continue to receive the numbers of this excellent floral publication, which is replete with practical information to all to whom floral culture is a pleasure or a business.

WE have received a copy of the *Scholastic News* for July. It is a journal which will prove of great value, not only to the teachers, but to the public generally, and will afford an excellent medium for discussing very important subjects relating to education. We have frequently called the attention of teachers to the necessity of technical instruction forming an important branch in the education of boys, particularly in country schools. The *Scholastic News* should be supported by every teacher and made the channel of useful suggestions and friendly discussions on all subjects tending to the advance of education in the Dominion and its practical application.

VARIOUS PRACTICAL USES OF ASBESTOS.—The uses to which asbestos can be employed are multiplying steadily; it is not only in the United States that this movement is going on, but also in many foreign countries. At the head of all stands Italy, which country, since its emancipation from priestly government, has made giant strides in the road to progress, practically as well as scientifically. Its practical industrial progress was lately shown in an interesting exposition of asbestos, which was recently held in Rome, the material being exhibited under all forms, from the crude state as mined, to its highest industrial preparations. There were samples of thread made from the mineral which were stronger than the best English cotton; cloth, from coarse bagging to a fabric as fine as linen; paper for writing, printing, sheathing and building, and pasteboard. The asbestos paper is made at Tivoli, and costs about forty cents per pound. It is especially useful for important documents which it is desired to preserve from fire. In the space of five minutes the unprepared pasteboard box and its entire contents were wholly consumed, while to that period the asbestos box remained uninjured. Much of the asbestos mined in Italy finds a market in the United States, where, thus far, only asbestos of short fibre, and unfit for spinning, has been found.—*Manufacturer and Builder.*

REMOVING NUTS FROM CLIPS AND BOLTS.

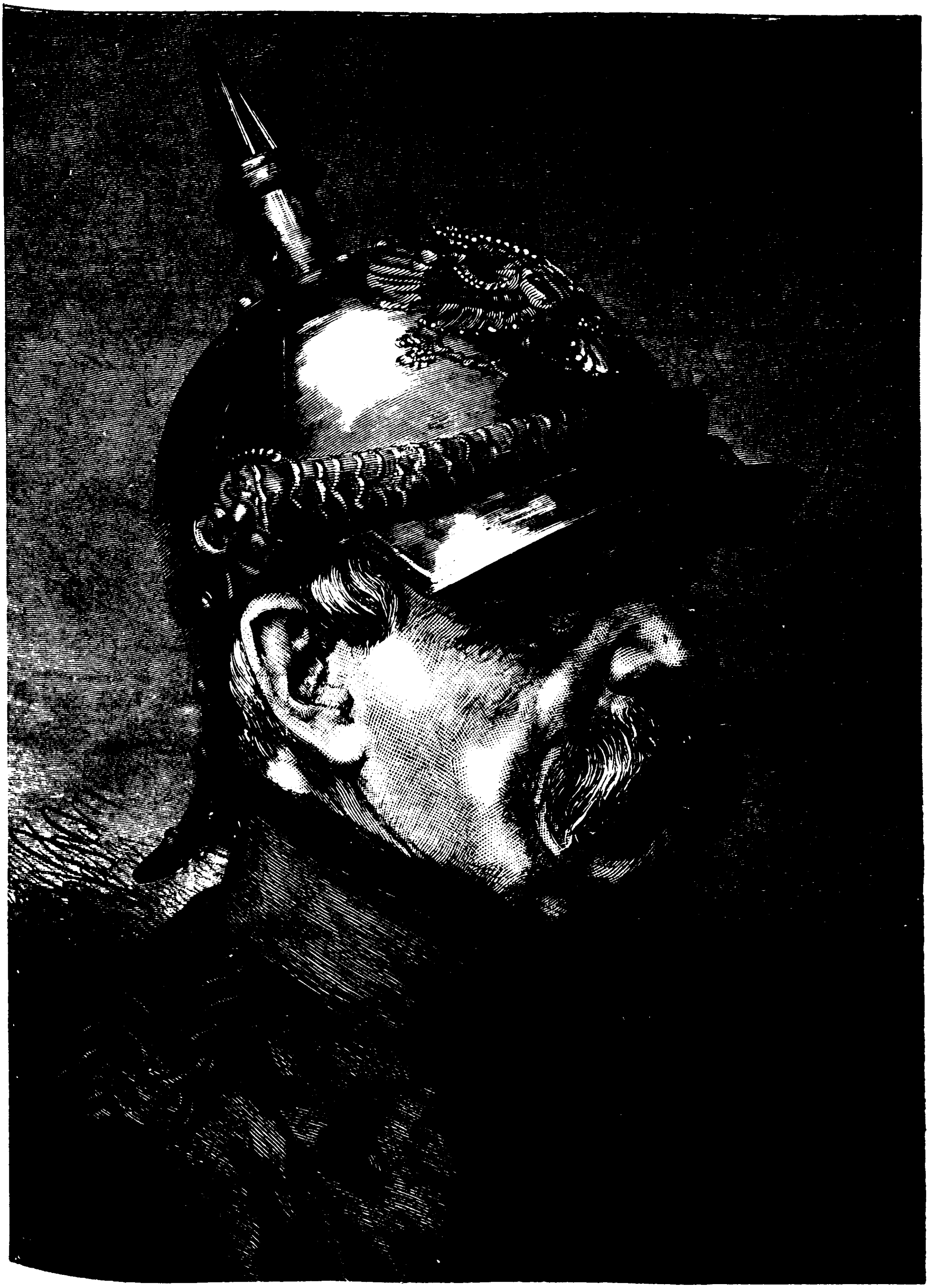
The London (England) *Carriage Builders' Gazette*, in answer to a writer who asks as to the best means of getting off the nuts of bolts and clips, and of driving up bolts and clips without destroying the screws, gives the following reply:

When the clips twist ever so slightly in trying to unscrew the nuts, cease to try until you have enlarged the nut by holding it for a minute or two with a pair of red hot tongs. If the clip has an extra point on it file it round and oil it; then try. If still firm, cut the nut in halves with a chisel, having another long chisel or iron bar held against the opposite side of the nut to take the force of the blows of the hammer. Be sure to use a light bolt hammer, which is more effective than a heavy hammer—it is better to cut off twenty nuts than to break a clip. For driving up bolts so as not to bruise or burr up the screw, unscrew the nut one turn only, or enough to cover the point of the bolt; then drive the bolt back by striking the nut; if immovable, get somebody to hold a heavy hammer on the nut while you strike forcibly the iron on each side of the head; if set fast, apply the end of a hot iron bar to the side of the head of the bolt to expand the iron. If you cannot start the bolt for the want of room to strike a fair blow on the bolt point, get somebody to hold the edge of a long piece of heavy tire iron on the bolt point; then with a heavy hammer strike the bar as near the bearing as you can get at. Sometimes if the bolt is through a scroll iron, and where the spring is in the way of the hammer, a peculiar shaped drift pin has to be used—it is something like a tuning fork; the fork being put on the driving bar at right angles, the bar is struck to drive the drift pin up the bolt hole.

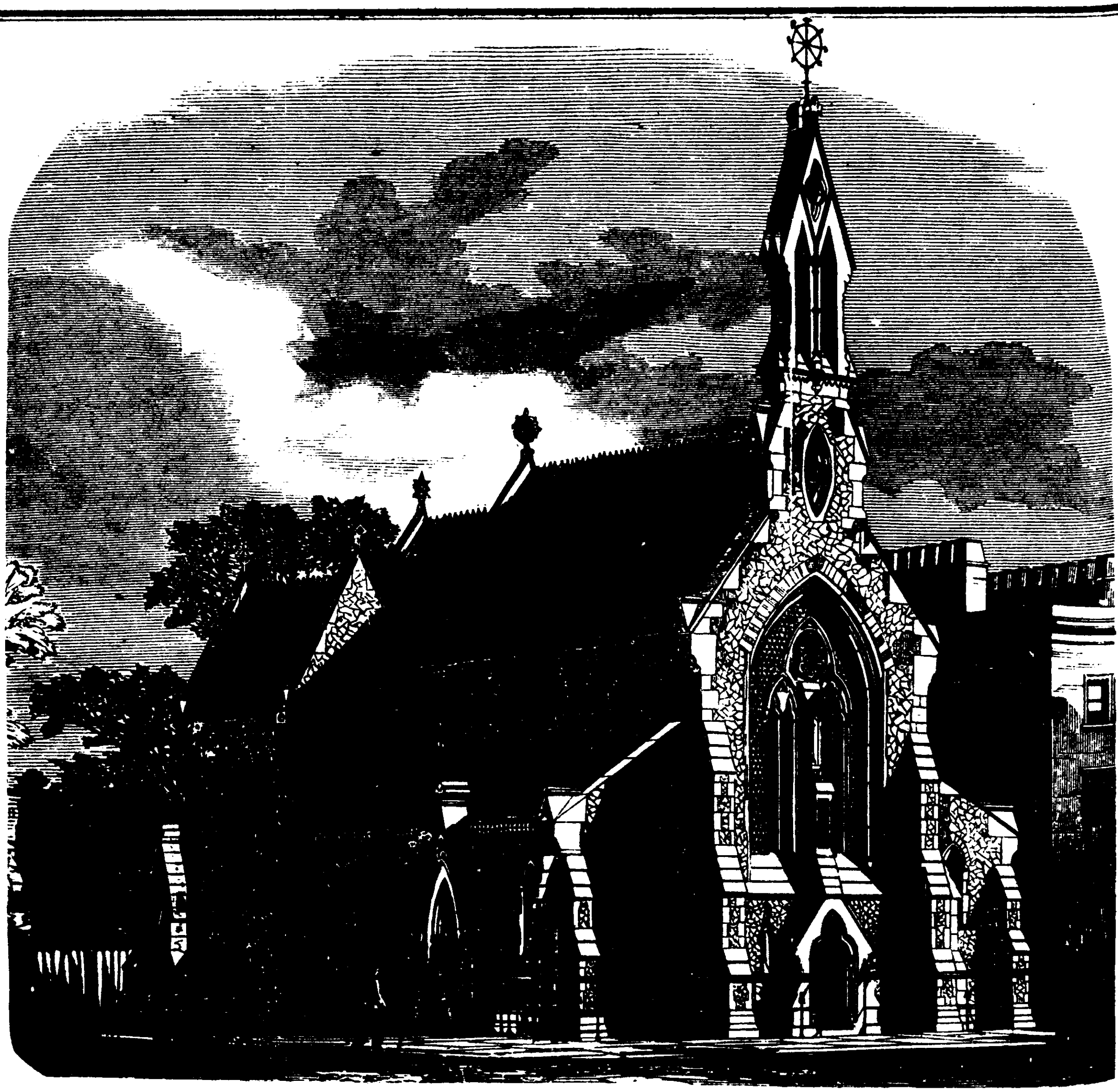
HOW TO STUDY SCIENCE.

Prof. F. W. Clarke has an article in the *Popular Science Monthly* for June, in which allusion is made to the true method of studying science; every student of science should meet nature at first hand, and learn to observe her phenomena for himself. Lectures and text books are but minor accessories to study; in the sciences they play a wholly subordinate part; in the laboratory, the field and the museum, the chief work is to be done. No matter what branch of science is to be pursued, the student from the very first must meet it face to face. The biological sciences ought to be studied in the field, collecting; in the museum, classifying; in the laboratory, with the microscope and the scalpel. Far too often is the study of natural history degraded into a mere memorising of classifications; as if the transitory part of the science were more valuable than the permanent! The student must see, handle and investigate for himself. He is to study the phenomena of life, and not merely the external appearance of a lot of stuffed specimens. Chemistry, and physics also, is to be studied chiefly in the laboratory. It is not enough for a student to see experiments, he must perform them. Thus only can he learn the true scope of these great sciences. By a proper drill in qualitative analysis, he learns to observe closely, and to reason from his facts to their interpretation. Quantitative analysis gives him accuracy of manipulation, and an insight into the *absolute* value of experiment. This insight also results from delicate practice with instruments of precision in physics; a kind of exercise of the very highest educational value. If the course of study in any science can be capped by an original research leading to the discovery of new facts, so much the better. In a German university the candidate for a doctoral degree in science is absolutely required to carry out such a research, and to submit a dissertation upon it. This is not a severe requirement—every student who has been decently trained is able to come up to it, all the popular notions about mysteriousness of scientific research to the contrary notwithstanding. Why should we not aim to equal the German standard?

A RAT-TAIL FILE, the teeth of which are cut on spiral ribs, with grooves between to facilitate clearing, is the subject of a recent patent. It is made by twisting a fluted bar of steel, and then cutting teeth on the spiral ribs so formed.



PRINCE VON BISMARCK.



ST. SIMON'S CHURCH, CADOGAN-TERRACE, CHELSEA.

Petroleum as War Materials.—Now that England and Russia are on the ragged edge of war, it is interesting to notice that the English Naval Architects are busily discussing all kinds of war construction and material. At the last meeting of their association a member read a paper "On Crude Petroleum Experiments for Purposes of Naval Warfare." There are various petroleum equipments, the best known of which consists of a steam cylinder, 15 feet long by 12 inches in diameter, to which is attached a pipe terminating in a nozzle at the bow of a torpedo boat. From this cylinder the Greek fire is ejected with great force, under a pressure of about 500 ℔ to the square inch. The writer believes that instead of counciling "no quarter" as a corrective of the use of Greek fire in modern war fare, it should be reckoned as a factor in hostilities, and that steps should be adopted to provide our warships with means of defence against it. It was intimated in the paper that there are grounds for the belief that Russia has already recognised the validity of petroleum in war and would probably have used it in the late contest if the experiments which led up to its adoption had been concluded in time. Admiral Selwyn, who expressed an ardent hope that warfare would eventually become so scientific as to be impossible, questioned whether a launch in attacking an iron-clad under cover of the smoke of burning petroleum would not suffer most. He hoped the matter would be gone into in this country, for it was being well considered on the Continent. Mr. McIntosh went into a long description of what might be done by attacking land fortifications by the aid of lighted petroleum in a favourable wind. Dense fumes would drive the men from the casemates, while a small vessel with long range guns could destroy all the shipping in the harbour. Petroleum could also be used in shells, but he could not recommend crude petroleum.

Cement for Aquariums.—½ lb. best white lead, ground in oil; ½ lb. red lead, dry; ½ lb. litharge, dry; the two last kneaded into the first. You have now 1½ lb. of the best of putty for resisting water. It will soon become hard and continue so. The glass should be bedded in it, and when neatly finished, put away for a fortnight; then varnish with shellac, dissolved in methylated spirits—say 1½oz. to half a gill—put into a bottle and shaken, will be ready in an hour. It may be coloured, if need be, with a little vermilion. One coat, wherever there is any putty or metal exposed, will be sufficient, and will dry in a few minutes. Your tank will never leak after this if the frame and glass are strong; or 10 parts by measure litharge; 10 parts plaster of Paris; 10 parts dry white sand; 10 parts finely powdered resin, and mix when wanted for use into a pretty stiff putty with boiled linseed oil. This hardens under water, but it is better not to use the tank till about three days. It resists the action of salt water. Another: Mix 3lb. finely powdered Venetian red, well dried, with 1 lb. oxide of iron, and add as much boiling oil as will reduce it to a stiff paste.

Brain Stimulant.—The best possible thing for a man to do when he feels too weak to carry anything through it to go to bed and sleep as long as he can. This is the only recuperation of brain power, the only actual recuperation of brain force, because during sleep the brain is in a state of rest—in a condition to receive and appropriate particles of nutriments from the blood, which take the place of those which have been consumed by previous labor; since the very act of thinking burns up solid particles, as every turn of the wheel or screw of the steamer is the result of consumption by fire of the fuel in the furnace. The supply of consumed brain substance can only be had from the nutritive particles in the blood, obtained from the food eaten previously, and the brain is so constituted that it can best receive and appropriate to itself those nutritive particles during the state of rest, of quiet, and stillness of sleep. Mere stimulants supply nothing in themselves; they goad the brain and force it to a greater consumption of its substance, until it is so exhausted that there is not power enough left to receive a supply.

Selection of Eggs.—A recent paper by a German scientist contains the following relative to a proper selection of eggs for setting:—To get good, strong birds, eggs from a two-year-old hen by a one-year-old male bird should be chosen, as these yield far larger chickens than eggs from a very young hen by an older male. The eggs should be regular in shape, and the largest should be chosen, except, of course, when a double yolk is suspected. In dwarf breeds, when the object is to get as small birds as possible, the smaller the eggs the better. The notion that pointed eggs always produce male birds is incorrect; this is only the case when they are from a hen that usually lays round eggs, while similarly round eggs from a hen that usually lays pointed ones, generally yield female birds. Where, however, a hen always lays eggs of one shape, whether pointed or round, the young birds will be of both sexes.

Blackboard Paint.—The following is a good recipe for blackboard paint: One quart of shellac dissolved in alcohol, three ounces pulverized pumice stone, two ounces pulverized rottenstone, four ounces lamp-black; mix the last three ingredients together, moisten a portion at a time with a little of the shellac and alcohol, grind as thoroughly as possible with a knife or spatula; after which pour in the remainder of the alcohol, stirring often to prevent settling. One quart will furnish two coats for 80 square feet of blackboard not previously painted. The preparation dries immediately, and the board may be used within an hour, if necessary. No oil should be used.

Over-Eating.—If the food is wisely chosen there is not much danger of over-eating. Dr. Beard says: "It is fallacy to suppose that people, as a rule, eat too much, and that most of the diseases of the world come from over-feeding. The truth is that among all decent or civilized people the tendency is directly the reverse. In this country, and especially in our large cities, far more are under-fed than over-fed. Throughout our land thousands and thousands die every year from actual starvation. Some of those unfortunates are little children whose parents are too ignorant or too poor to give them what is necessary to sustain life. But many of them are adults, whom hard poverty or sad ignorance has forced into a habit of systematic though undesigned starvation. Day after day the vital powers slowly fade, the strength grows less, the spirit becomes morbid, and the face wan and dejected. Disease now steps in, attacks and carries by force some important citadel of the body, and death follows. The process is a slow one—sometimes very slow—extending perhaps over many years, but it is oftentimes as sure as it is slow. An injudicious choice of the kind of food, either from whim or avarice, may also produce results equivalent to starvation."

A Good Preparation of Veal.—This being the "veal season," the following is an excellent mode of preparing it to be eaten cold, and for keeping it on hand for several days, ready for immediate use: Take say 3½ lbs., the thick part of the leg is preferable, with the tough tendonous part removed, chop it fine without cooking; mix well with it 4 soda crackers rolled fine, 3 well-beaten eggs, 1 tablespoonful of salt, 1 teaspoonful of pepper, ½ nutmeg, 2 tablespoonfuls of cream, or a small piece of butter. Make it into a loaf, and bake in a dripping-pan without water, with quick heat at first, to close the outside and retain the juices, and continue the baking about 1¼ to 1½ hour. Serve cut in thin slices. An excellent lunch in traveling.

A Good Cement for Glass.—Orange shellac, bruised, 4 ozs.; rectified spirits, 3 ozs. Set this solution in a warm place, and shake frequently until the shellac is dissolved. This cement will stand every contingency but a heat equal to that of boiling water.

Iron Bolts.—Iron bolts in wooden structures are always attacked by rust, which diminishes their size and loosens their hold. A simple remedy is now discovered. Bolt holes are coated with a mixture of zing filings and grease. The iron is thus galvanized and thus preserved from oxidation. It is a French invention.

To Polish Watch Wheels without Injuring Them.—Take a flat burnishing file, warm it over a spirit lamp, and coat it lightly with beeswax. When cold, wipe off as much of the beeswax as can be readily removed; and with your file thus prepared, polish the wheel, which should rest on a piece of cork. The finish will be of the finest kind, there will be no clogging, and the edges of the teeth, etc., will remain perfectly square.

Cement for Kerosene Lamps.—The cement commonly used is nothing but plaster of Paris. But this is porous and quickly penetrated by the kerosene. Another cement is highly recommended which has not this defect; it is made with three parts of resin, one of caustic soda, and five of water. This composition is mixed with half its weight of plaster of Paris. It sets firmly in about three quarters of an hour. It is said to be of great adhesive power, not permeable to kerosene, a low conductor of heat, and but superficially attacked by hot water. Zinc white, white lead, or precipitated chalk may be substituted for the plaster, but they harden more slowly.

Gold Leaf.—Lay a sheet of writing paper on glass and rub it all over with beeswax. It will then, if pressed on the gold, sufficiently adhere to allow its being cut into strips; but for white paper I should imagine bronze powder would answer equally well and would be much cheaper and easier of manipulation. The best way to letter paper for gilding, either with leaf or powder, is from type, and the best ink is prepared from linsed oil boiled down to a consistency of treacle, with perhaps a suspicion of resin in it to give it body and "tack." If powder is used it should be dusted on with cotton wool; if leaf, it should be allowed a few hours to set before being rubbed off with a wool pad, otherwise the edges are not nice and sharp.

Sale of Patent Rights.—The peculiar institution of auction sales of patent rights inaugurated some months ago by Mr. G. W. Keeler, at Nos. 53 and 55 Liberty street, New York, appears to be meeting with singular success. We have before us the "Catalogue of Valuable Patent Rights, entire or in part, to be sold at auction on Thursday, March 7th, 1878, etc.," with a schedule of the number of patents sold and the prices realized thereon. From its contents and accompanying memoranda, we glean that the number of patents offered for sale was 60, of which 36 were sold at prices which varied from $30 to $5,000; the average selling price being about $500. A nut-lock brought the highest price, $5,000; a cross-cut saw went for $2,500; a machine for separating fur from hides, and a car-starter, each $1,200; a wash bend and an improvement in brushes, brought $1,100 each; a money box and a bale tie, each $600; a large number went at prices varying from $500 to $350, and several, as an ink-stand and a signal lantern, brought only $30. These sales are held by Mr. Keeler at the auction rooms, 53 and 55 Liberty street, on the first Thursday of every month.

Dangerous Boilers.—The *American Machinist* says: Since competition in boiler-making has brought down prices of first-class work where there is very little margin for profit, a great deal of poor material has been used in boilers in order to save a small percentage of the cost of safe and reliable material. Plates intended for marine boilers are required by law to be stamped with the tensile strength the iron or steel will stand; but plates for stationary boilers may be weak and unreliable, yet the government does not interfere to prevent their use. A rigid inspection law, applying to land as well as marine boiler material, would considerably lessen the danger incurred in the use of steam, if properly enforced. Some boiler-makers are criminally careless in the employment of material, well knowing it to be dangerous to place in a boiler, yet working it in so as to save a few dollars. We learn, on good authority, that several manufacturers of boilers have openly expresseed themselves as utterly indifferent as to the strength or safety of the boilers they made, after they had been sold and the money obtained.

TEACHING SCHOOL.

We have often referred to the pernicious custom of making the memorizing of lessons from books and their recitations the main occupations of pupils, and also the illusion of many teachers that teaching consists simply of giving the pupils passages from books to memorize, because many think that they do their duty, when they only make them do this and hear their recitations.

All who closely observe this system will perceive that in this way, a mere training of the memory for words is achieved, that not one in ten perfectly understands the lessons that are being recited, while recitations therefore soon degenerate into a parrot-like repetition of sounds without meaning for the pupil, because in most cases that which was intended to be impressed upon the mind has not been brought forward by the teacher. This is unfortunately often the case, for the simple reason that the teacher himself does not understand the subject, or if he understands it, he lacks a most important requisite, which is the capacity to convey new ideas to others in such a way as to make a lasting impression. When this is done the pupils do not forget so soon as they do when they have only recited a lesson, of which the meaning is not clear to their minds. We have often heard recitations in schools given in such a way as to satisfy us that the pupils were equivalent to unconscious machines which were wound up beforehand, and ran down when started by the touch of some spring at the command of the teacher

When considering all this it is not surprising that so few really thinking men and women are sent out into the world from our schools, and that public opinion always runs in certain narrow ruts, out of which it is difficult to raise it, and that the amount of useful, practical information possessed by the great majority is very small, as to be often deficient even from their own wants and interests.

A most unfortunate circumstance is that the principals of some private schools of high standing in the community, and in which parents pay high prices, so as to secure superior instruction to their children, patronize and encourage such a system, and allow it to be followed by their assistants, and even disapprove of another course. We had a conversation recently on this subject with a few conscientious and able teachers, one of whom considered it to be a duty to teach and explain to the pupils the things to be learned, and not to confine the teachings to recitations. This teacher had been engaged in one of the best patronized private schools, to teach a certain branch of science, and finding there was no blackboard, asked for one, when it was answered that they never used them in that institution, and that the new teacher could do without one as well as the others. When the teacher took pains to explain the subjects to the class, the principal remarked, after a while, that the teacher wasted too much time with explanations, and consequently did not make the scholars recite enough. This teacher was wise and honest enough to resign in disgust, when it was found that the principal did not desire any other method of teaching.

There is another pernicious abuse which is a downright deception upon pupils and parents. Some schools possess philosophical apparatus, usually in bad order, as there is nobody who knows anything about it. Once in a while, after the pupils have recited lessons in physics or chemistry, some pieces of apparatus are occasionally shown them, and if possible some attempt at practical experiment is made. The purpose of this is not to impress anything like real knowledge or understanding of the subject upon their minds, but the real object is best illustrated by the following incident, communicated to us by a teacher who had taken charge of this department in a first-class private school.

The principal told him to use the electric machine, and air pump, to illustrate lessons in the book. The teacher, after examination, found that the electric machine was not in working order at all, the leyden jars cracked, the air-pumps dilapidated, and reported that it was of no use to take them out of the closets, much less to try any experiment; the principal answered that this did not make any difference, that the main thing was that pupils could tell afterwards that they had seen experiments on electricity, the use of the air-pumps, etc.

We maintain that in this way much harm is done to the pupil, the charm of the novelty is taken away, and the illusion substituted in his mind that he knows all about it. When, however, at the time of the exhibition of the apparatus, the principal laws of nature, which it is intended to demonstrate, are exhibited, real information is given to the mind, and such a lasting impression produced as possibly cannot be conveyed by merely memorizing sentences from books.

We saw the demonstration of the above during the period of five years that we occupied the chair of Natural Philosophy in the Cooper Institute, in New York. Young men who never before saw philosophical apparatus, were much more interested in the lectures and the experiments illustrating the teachings, and learned much more than those who had seen apparatus exhibited before, and who imagined that therefore they knew all about the subjects it was intended to demonstrate.

—*Manufacturer and Builder.*

How to Distinguish Natural from Artificial Amber.—M. Rehoux mentions, in the *Annales de Chimie*, the following ways in which natural amber may be distinguished from artificial amber, or other substance, especially copal, resembling it. Copal is yellow, and of the same color throughout, and has on its surface a few yellow points somewhat like crystallized sulphur. Amber, however, is always of a different shade at different ends. Pure amber, when rubbed with the palm of the hand for a few seconds, will exhale a strong aromatic odor; this is not the case with artificial amber or copal. The fine dust formed by scraping amber with a knife-blade will fall directly downward; if copal is scraped in the same way, the dust is lighter and will generally rise. Amber, when gently heated, may be bent without breaking; this is not the case with artificial amber or copal. Natural amber is harder than the artificial, and can not, like it, be indented by the nails. Copal melts at 100° C., and keeps its yellow color when liquefied. Amber requires a heat of 400° C. for fusion, and blackens, and gives off sulphurated hydrogen.

Why Nuts Work Loose and Bolts Drop Out.—The following answer to an important question in machine construction is given by "J. R.," in the *Scientific American*:

"Can you explain why it is that nuts come off, which they will do when subject to rapid motion or vibration, though they may be a tight fit upon the bolts and screwed tightly home with the wrench? Why, indeed, should it take two nuts to lock one bolt?

The tendency of a nut to unwind and recede from the pressure upon its radial face is proportionate to the pitch of the thread and the diameter of the bolt, and the finer the thread upon a given diameter of bolt, or the larger the diameter of bolt with a given pitch of thread, the less is the tendency of the nut to move back. In the case of ordinary bolts and nuts, a given diameter of bolt is given a standard pitch of thread, and these pitches are not so fine as to prevent the nuts from unscrewing in many cases unless checknuts are used.

It would appear that if the nut thread fits unreasonably tight upon the bolt, and the nut is screwed well home, it should remain there, but there are palpable explanations why it does not do so. Of these the principal are the errors which ensue from the alteration of form which takes place in the screw-cutting tools during the hardening process. As a rule, all steel increases in dimenstions from being hardened. What the amount of increase or expansion is we have at present no very definite knowledge, because it varies considerably; although it is probably equal under equal conditions. Suppose, then, that a tap is made of the correct diameter to a vernier gauge, and that it increases in diameter and in length (as it almost invariably does) during the hardening, the pitch, the thickness, the depth and the diameter of the thread will be altered and "out of true."

Unless both the tap and the die are tempered to precisely the same shade of color, the amount of the contraction will vary. As a result of these at present irremediable errors, taps are made to suit existing solid dies, or adjustable dies are set to suit the taps, and though the nut may fit closely to the bolt so as to be just movable by hand, or under a moderate pressure of a wrench, yet the sides of the thread do not fit properly, nor can they be made to do so under any ordinary conditions. The result is that under vibration the threads give way on the contact sides, for vibration is a number of minute blows. Under reciprocating motion the result is precisely similar, for the whole pressure upon the nut is supported by that part of the surface of the thread which is in contact, which compresses or recedes. Any machinist who desires to test this matter may do so by taking a nut that fits very tightly upon a bolt, and striking upon the sides, he will find it will lose the fit to the bolt.

A good acid-proof cement is made by mixing a concentrated solution of silicate of soda with powdered glass, to form a paste. This is useful for luting joints in vessels exposed to acid fumes.

ANSWERS TO QUERIES.

The following replies to questions asked through the *English Mechanic* may prove of interest to many of our readers:

IMITATION SNOW.—The best for this would be powdered mica, dusted on hot glue.

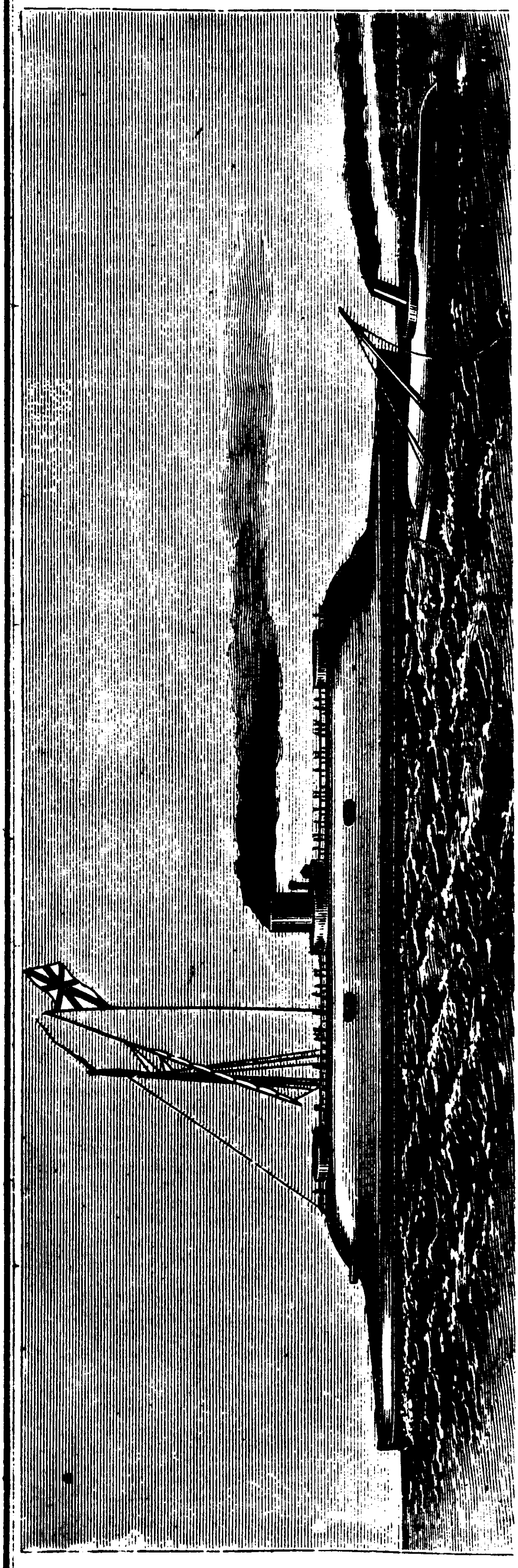
PAPER SLATES.—Can any correspondent tell me how I can prepare paper so as to be written upon with slate pencil, and the writing afterwards rubbed off?

COATING WIRE WITH GUTTAPERCHA.—Will some reader kindly inform me how to coat wire with guttapercha? I want to coat about 200 yards of No. 14 iron wire.

THE SWISS HOUSE AT THE PARIS EXPOSITION.

Our engraving, which we take from the London *Graphic*, represents the *façade* of the Swiss house on International street, in the Paris Exposition The building itself is thoroughly Swiss in its construction, being of wood tastefully colored and ornamented with the arms of the various cantons. The front is composed of three arches, that in the center serving as the entrance, and those at the sides being filled with stained glass. Above the center arch is a clock, above which stand two figures of men in armor, who strike the hours, half hours, and quarters. The illustration shows the usual large crowd which gathers whenever the clock strikes, to witness the movements of the automata.

THE SWISS HOUSE AT THE PARIS EXPOSITION.



UNSINKABLE STEAM VESSELS.

UNSINKABLE STEAM VESSELS.

We take from the London *Graphic* the annexed engraving of a new steel vessel devised by Mr. Edmund Thompson, and claimed to be "unsinkable." This he proposes to accomplish by constructing a cellular frame of thin flanged steel plates, so arranged as to form a series of cells not exceeding 6 feet in dimensions, forming, in fact, a "honeycomb" side, which, when plated over on the inner and outer face, and properly strengthened by longitudinal ties or braces, will afford the greatest strength, with the least possible weight of material, and, in addition, from the inclosed air spaces surrounding the vessel's hull, will give such an enormous lifting power that armor plate of greatly increased thickness may be safely carried, if placed, as proposed by the inventor, within the inner frame, and not, as at present, external to the vessel's side. The advantage of this plan is equally applicable to merchant vessels, as the cargo will be kept free of the sides of the vessel, whereby the tendency to roll or capsize will in both cases be reduced to a minimum. The trunking up of the hatchways, and carrying the transverse bulkheads up to the upper deck, are also proposed, and therefore the effect of an accident either from fire or water would be localized to the compartment affected.

Mr. Thompson's plans of building are applicable either to double or to single ships, or to a modification proposed by him of having a single forward hull, but the after-end tunneled so as to form a double body, between which the screw could be placed about one fourth the ship's length from the stern, completely securing it from injury from shot or wreckage, as well as obviating "slip" and "racing" of the propeller.

Our illustration shows a raft, supported on two pontoons, built on the "cellular" principle, carrying a heavy battery (three feet in thickness where requisite) and an armament, consisting of one 100 ton gun and two 38 ton guns, propelled by two or four screws working between the pontoons, which will only draw six feet of water, the dimensions of the vessel being 400 feet in length by 80 feet in breadth. By reversing either the forward or after screws, the vessel would turn on her own "center," affording that special desideratum, an "all round fire."

The other vessel shown in our illustration is a torpedo boat, with cellular sides, and the screw placed in a tunnel, as before described. This boat would be fitted with noiseless engines, and, by filling the air tubes of the cellular sides with water, could be submerged almost to the water line, to enable her to approach an enemy with slight risk of detection.

FISH AS FOOD.

There is much nourishment in fish, little less than in meat, weight for weight; and in effect it may be more nourishing, considering how, from its softer fiber, fish is more easily digested. Moreover, there is in fish a substance which does not exist in the flesh of land animals, namely, iodin—a substance which may have a beneficial effect on the health, and tend to prevent the production of scrofulous or tubercular disease, the latter in the form of pulmonary consumption, one of the most cruel and fatal with which civilized society is afflicted. Comparative trials have proved that in most fish the proportion of solid matter—that is, the matter that remains after perfect digestion, or the expulsion of the aqueous part—is little inferior to that of the several kinds of meat, game or poultry. If we give attention to classes of people—classes as to the quality of food they principally subsist on—we find that the ichthyophagous class are especially strong, healthy, and prolific. In no class except that of fishers do we see larger families, handsomer women, more robust and active men, or a greater exemption from the maladies just alluded to.

PROPOSED SINGLE-ARCH BRIDGE OVER THE THAMES.

SINGLE ARCH BRIDGE OVER THE THAMES.

This involves the construction of an arch of 850 feet, the largest in the world, the bridge thus crossing the river at single span. To those unfamiliar with the progress of modern bridge work the scheme is a startling one, but it is pronounced by good authority to be perfectly practicable. Although enormously expensive, to offset this such a bridge would be correspondingly substantial and lasting, would not obstruct navigation, and would dispense with the space required for the anchorages of a suspension brige.

Rope Driving Gear.—The *Textile Manufacturer*, of Manchester, England, says: We have in these pages frequently called attention to a movement which is now assuming considerable proportions, and which in many districts finds great favor with mill owners and engineers. We allude to the system in which the power is transmitted from the engine to the shaftings by means of ropes. This plan, unlike the one in which the transmission is by means of leather belts, is one of comparatively recent introduction. The fly-wheel is made to serve as driving drum also; it is 22 feet in diameter, and weighs about 20 tons. It is grooved for the reception of 12 hempen ropes, each six inches in girth, six of the ropes being intended to drive one line of shafting and six the other. The rope drums or pulleys on the shafting are five feet in diameter: the rims are made heavy and are grooved as is the driving drum, but of course for only six ropes. The width of the grooves is 2 7-16 inches; total depth, 3¼ inches; the radius of the bottom curve, one-half inch; and the inclination of the two sides to each other is about 49°. It will be apparent from these particulars that the ropes do not, even when pressed somewhat out of shape when doing full duty, rest upon the bottom of the groove, but on the sides, and the wear is, therefore, at the points of contact. At the time of our visit, although the engine had been running more than 18 months, the ropes exhibited very trifling signs of wear, the wear being uniform all around the section, thus indicating that the ropes do not, as some might suppose, present the same parts of their circumference to be continuously gripped in the grooves.

Rudder Power of Steamships.—A paper lately read before the British Institute of Naval Architects described an easy and effective method of ascertaining the rudder-power of steamships. Steamships, after being equipped, are usually subjected to certain trials to ascertain the diameter of the smallest circle in which they will turn round with the rudder in any given position; but this system of experiment is open to several objections. To obviate these the writer proposed a new plan, viz., pulling a boat into and retaining it in the wake of the ship, and from the boat observing with a sextant the angle subtended at the eye by two extreme masts of the vessel. The angle so obtained was constant, and afforded sufficient time for making the observation with accuracy. This observation having been made at a preconcerted signal, the angle of the rudder may be changed, and a fresh observation made from the boat, which may be repeated as often as necessary. The diameters of the different circles can then be easily calculated from the data at hand.

Beware of Flies.—Among the different methods of conveying contagion, says a writer in the London *Sanitary Record*, the feet of flies and their proboscis must not be underestimated especially during those portions of the year when flies are usually most numerous. The sublime indifference to consequences, says this journal, exhibited by flies in passing from the surface of the most odious substances to that of material for human consumption, is complete. But even if the flies themselves are uninjured by contact with putrefying matter, the next article of food they rest upon may be influenced by the previous contact, and may be thus either induced to undergo putrefactive changes more readily, or may even become a carrier of material of an eminently sceptic character. And not only this, but flies pass quickly from surfaces on one organism to another, and it must therefore be considered as highly probable that the communication of septic poisons by their agency is not by any means rare.

This suggests the question whether the cause that flies are not seen, or are scarce during the prevalence of cholera or other contagious disease, is not due to their having been killed off by the septic matter to which they expose themselves, instead of being regarded as purifiers of the air, which prevents contagion.

An anonymous friend of humanity offers a prize of 6000 francs to be awarded in 1880, for the most useful application to the healing arts of M. Pasteur's discoveries. The Academy of Sciences will make the awards.

THE SCENE OF THE MINNEAPOLIS DISASTER.

A—Washburn Mill A.
B—Washburn Mill B.
C—Pettit, Robinson & Co.
D—Zenith.
E—Galaxy.
F—Guilder's Shop.
G—Diamond Mill.
H—Butler's Shop.
J—Humboldt Mill.
K—Planing Mill.
L—Dry Shed.
M—Palisade Mill.
N—Round House.
O—Anchor Mill.
P—Elevator.
R—Woolen Mills.
S—Empire Mill.
V—Pillsbury Mill.
W—Covered Canal.
X—New Morrison Mill.
Y—Paper Mill.

We furnish an illustration of a scene of destruction, devastation and death, caused by an explosion in the Washburn Mill, Mineapolis, on the 2nd May last. The origin of this disaster has never been fully ascertained, but is supposed to have originated from gases generated in the dust rooms.

MISCELLANEOUS.

Aluminium is proposed as a coating for telegraph wires, because its electric conductivity is about twice as great as that of iron.

The Chinese are adopting the telephone. The absence of an alphabet in their language had prevented the use of the telegraph by them.

In the province of Nassau, Prussia, the common nettle has been treated like hemp, and found to yield a fibre as fine as silk, and quite as durable as hemp. A new industry is the result.

Electricity has the effect, according to the results of a series of experiments by M. Mascart, of doubling or greatly increasing the amount of evaporation from water or moistened earth.

The English war vessels Monarch, Alexandra, and Temeraire are to be provided with an electric light capable of illuminating the sea around them, so that the approach of torpedoes may be detected.

The examination by Mayencon of the efflorescences round the fumeroles of coal-pits that had been on fire in the valley of the Loire, disclosed ammoniacal compounds, arsenic, aluminium, iron, chlorine, and sulphur.

Bank of England Notes, which make a poor showing compared with our more gorgeous greenbacks and national bank notes, are better than they look. These notes are made from pure white cuttings only, never from rags that have been worn. They have been manufactured for nearly 200 years at the same spot—Laverstoke, in Hampshire— and by the same family the Portals, who are descended from some French protestant refugees. So carefully is the paper prepared that even the number of dips into the pulp made by each workman is registered on a dial by machinery, and the sheets are carefully counted and booked to each person through whose hands they pass. The printing is done by a most curious process within the bank building. There is an elaborate arrangement for securing that no note shall be exactly alike any other in existence. Consequently, there never was a duplicate of a Bank of England note, except by forgery.

Spontaneous Combustion of Coal Cargoes.—*Engineering* for March 22nd contains an account of the report of the Board of Trade of Liverpool as to the cause of the loss of the bark Annie Richmond. It has transpired that 300 tons of the cargo of coal carried by the bark came from a colliery in West Lancashire, which furnishes a material particularly liable to spontaneous combustion, and that 80 tons of this material were shipped in a wet condition. The liability of the coal to undergo spontaneous combustion was, it seems, increased by the method employed for loading, viz., dropping the coal from the waggons into the hold. By this means the coal became broken and afterwards consolidated, in which state it is more liable to spontaneous ignition. No thermometer was on board to test the temperature of the hold. The ventilators of the vessel were choked up and therefore were useless. The committee, in conclusion, express the opinion that a thorough system of surface ventilation should be made compulsory in all vessels carrying coal cargoes.

Imitation Snow.—First put your birds on the tree firm, melt Russian glue rather thick, brush the glue on one little spray at a time; put plenty on, then sprinkle plaster of Paris all over it, leaving it much thicker on the top; in fact, let the tree be upright while doing this. Put it on as thick as you can. You will soon see the damp from the glue go all through the plaster of Paris. Let it remain till the next day, then it will be very hard. Now for the secret. Get some clean alum, powder it very fine, as fine as possible, in a mortar, sift it through a piece of fine muslin; get some very clear gum arabic, buy it dry, and sort out the whitest and dissolve it. It must be thick. Brush a good coat all over the plaster of Paris—don't do much at a time, pile on the powdered alum as thick as you can, put it in a dust-proof place for a day at least, blow off all you can with a pair of bellows, then just brush it over with a rather soft leather, clean your birds and you will be proud of your job. You can buy glass frosting in Birmingham (and it looks very natural) powdered and mixed. There are many first class bird-stuffers that use nothing but plaster of Paris, as they know of nothing else.

The Smithsonian Institution is preparing a series of plaster casts of the reptiles of North America.

A Novel Method of Inlaying Wood.—The following is an interesting process recently patented in England: A veneer of the same wood as that of which the design to be inlaid consists—say sycamore—is glued entirely over the whole surface of any hard wood, such as black walnut, and allowed to dry thoroughly. The design is then cut out of a zinc plate, about 1-20th of an inch in thickness, and placed upon the veneer. The whole is now subjected to the action of steam, and made to travel between four cast-iron rollers of eight inches diameter by two feet long, two above and two below, which may be brought within any distance of each other by means of screws. The enormous pressure to which the zinc plate is subjected forces it completely into the veneer, and the veneer into the solid wood beneath it, while the zinc curls up out of the matrix it has thus formed, and comes away easily. All that now remains to be done is to plane down the veneer left untouched by the zinc until a thin shaving is taken of the portion forced into the walnut, when, the surface being perfectly smooth, the operation will be complete. It might be supposed that the result of this forcible compression of the two woods would leave a jagged edge; but this is not the case, the joint being so singularly perfect as to be unappreciable to the touch; indeed, the inlaid wood fits more accurately than by the process of fitting, matching and filling-up with glue, as practiced in the ordinary mode of inlaying.

DANGERS OF A CHILL.

The *Herald of Health* gives pointedly the results of cooling off too rapidly when one becomes heated by extra labor. It enumerates the following diseases as traceable to this cause: Rheumatism, consumption, Bright's disease, pneumonia, bronchitis, stiffness of the joints, wry neck, pleurisy, catarrh, etc. The following is the method of the evil: The coolness of the evening air is very refreshing to a laborer after a hard day's work in the hot sun, but it is as dangerous as it is agreeable. During the day his garments have probably been wet with perspiration, and if still damp or wet when the cool of the evening comes, he experiences a chilliness and arrest of further perspiration. The blood does not circulate freely near a chilled surface, and congestions or undue accumulations in internal organs are the consequences. From such congestions of important organs come arrest of secretion; the liver, for example, when engorged with blood, ceases to separate bile from the circulating fluids, and an attack of jaundice follows. Or congestion may occur in the respiratory organs, and pneumonia, bronchitis, or pleurisy may result. An arrest of the secretions of the skin or kidneys may terminate in inflammation of the joints, lumbago, sciatica, or some other rheumatic affection. Furthermore, the diarrheal affections so common in the summer season, are frequently caused by exposing the body to a cool current of air after having been heated, although they are usually ascribed to the heating of some food that is supposed to disagree with the digestive organs. While the latter is true in some cases, the most frequent cause is undue exposure of the body, especially at night, by going to sleep in front of an open window on a hot night, without sufficient covering, forgetting that it constantly becomes cooler toward morning; and so the surface of the body is chilled, and the blood retreated to the internal organs produces congestions that result in diarrhea, dysentery, etc., etc.

When to Paint Houses.—Paint applied to the exterior of buildings in autumn or winter will endure twice as long as when applied in early summer or in hot weather. In the former it dries slowly, and becomes hard like a glazed surface, not easily affected afterward by the weather, or worn off by the beating of storms. But in very hot weather, the oil in the paint soaks into the wood at once, as if into a sponge, leaving the lead nearly dry, and ready to crumble off. This last difficulty, however, might, in a measure, be guarded against, though at an increased expense, by first going over the surface with raw oil. Furthermore, by painting in cold weather the annoyance of small flies, which invariably collect during the warm season on fresh paint its avoided. As an offset to this, there is trouble with slow-drying paint—it is that the dust, which always will collect upon exposed surfaces, will keep collecting as long as the paint is not dry, and stick to it, so that to obtain a smooth surface free from adhering dust, it is necessary to secure quick drying. This is especially the case when varnishing; we have often been disappointed, and no doubt so have many others, that the varnish used dried so slowly that dust had time to settle on it before it became hard.

Variorum.

WHAT is termed a bank-note album, with leaves of asbestos-paper, has been invented in Germany, and is claimed to possess valuable protective qualities. Cheques, bank-notes, or valuable documents, on being placed between the leaves, will, it is asserted, remain legible, even after exposure to fire, which reduces them to a cinder, especially if the book be firmly clasped.

A BALLOON is being constructed for the Paris Exhibition which will carry fifty people to a height of 500 metres. It will contain 25,000 cubic metres, and will be 36 metres in diameter, and will be inflated with hydrogen gas, made on the spot from iron borings, shavings, &c., with sulphuric acid. The cover will be of alternate layers of linen and indiarubber, and a gallery of 18 metres in circumference will be arranged for the receipt of experimental apparatus. The cable by which the balloon will be held captive in the Tuileries will be capable of sustaining a strain of 15,000 kilogrammes.

STEAM FOR HEATING PURPOSES.—A company has been organised in Lockport, New York, which supplies citizens with steam for heating purposes. Three miles of street mains have been laid, and at present upwards of forty large buildings are heated by the system of pipes, which derive their steam from one boiler 5ft. by 16ft. in size. The pipes run through fifteen streets, and over 1,000,000 cubic feet of space is warmed by the steam, which is supplied at a pressure of 30lb to the square inch. The steam, in addition to heating purposes, can be used for cooking food, washing clothes, and extinguishing fires. In addition the hot water from condensed steam is furnished to the houses through the same pipes. The cost is said to be much less than that of ordinary fuel.

IMITATION EBONY.—The following recipe, which we take from the *Revue Industrielle*, will answer to turn oak black so as to cause it to resemble ebony. The wood is immersed for forty-eight hours in a hot saturated solution of alum, and then brushed over several times with a logwood decoction prepared as follows:—Boil 1 part of best logwood with 10 parts of water, filter through linen, and evaporate at a gentle heat until the volume is reduced one half. To every quart of this add from 10 to 15 drops of a saturated solution of indigo, completely neutral. After applying this dye to the wood, rub the latter with a saturated and filtered solution of verdigris in hot concentrated ascetic acid, and repeat the operation until a black of the desired intensity is obtained. Oak thus stained is said to be a close as well as handsome imitation of ebony.

TESTS OF METALS AT THE NAVY YARDS.—The Secretary of the United States Navy having made a careful test of some specimens of iron manufactured in the navy yard at Washington, is investigating the question of the cost of fitting up the necessary smelting apparatus there for the purpose of making iron both scraps and ore. There is a vast accumulation of scrap iron yearly at all the navy yards which is said to be usually sold at about 1-10th its value, and which might be readily utilised if the necessary furnaces were erected. The secretary has also ordered tests to be made of a new composition which the inventor claims will neither corrode nor change its colour, and which is almost the hue of gold. It is claimed that it can be substituted for sheathing copper with great advantage, as it is many degrees lighter than copper; that it can be utilised for a vast number of purposes on shipboard where other metals cannot be so well used, as the composition will also retain its bright, rich appearance.

THE HEAT VALUE OF FUEL.—With regard to the important question of the heat value of fuel it has been proved that conclusions from the results of elementary analysis are very uncertain, and also that little reliance can be placed on direct vaporisation experiments. In a recent paper to *Die Chemische Industrie*, Dr. Weyl points out the faults of these methods, and recommends, as preferable, decomposition of the fuel by dry distillation, and analytical determination of the solid, liquid, and gaseous products of decomposition. In this method the accident of too small a sample being used is avoided, as also too great pulverisation and drying at high temperature, and the decomposing action of atmospheric oxygen, which is therewith connected;

THE commercial statistics of the U. S. for 1877, show that imports and exports have both increased.

REMOVAL OF STAINS FROM WOVEN FABRICS.

MECHANICALLY ATTACHED PARTICLES may be removed from all fabrics by beating, brushing, and allowing water to fall from an elevation upon the wrong side of the goods.

MUCILAGE, MUCUS, SUGAR JELLY.—Washing with lukewarm water will clear all goods.

FATS.—From white goods: Wash out with soap and lye. Colored cottons: Wash with lukewarm water and soap. Colored woolens: Lukewarm soap and water, or ammonia. Silks: Clean carefully with Benzole, ether, ammonia, chalk, clay, or yolk of eggs.

OIL COLORS, VARNISH, ROSIN.—From all fabrics, except silks: Oil of turpentine, alcohol, benzole, and then soap. Silks: Benzole, ether, and soap very carefully, and in a very weak solution.

STEARINE can be removed from all goods with strong, pure alcohol.

VEGETABLE COLORS, RED WINE, FRUITS, RED INK.—From white goods: Sulphurous vapor or hot chlorine water. Colored cotton or woolen goods: Wash in lukewarm water and soap, or ammonia. Silk may be treated in the same manner, but very cautiously.

ALIZARINE INKS. — From white goods: Tartaric acid; the older the spot the more concentrated. Colored cottons or woollen goods: If color permits, dilute tartaric acid. Silks: As before, but with great caution.

BLOOD AND ALBUMINOUS SPOTS.—Simply washing out with lukewarm water, for all kinds of goods.

RUST, AND SPOTS OF INK MADE OF NUTGALLS.—From white goods: Hot oxalic acid, dilute hydrochloric acid, and then tin filings. Colored cottons or woollens: Citric acid may be tried. White woollens: Dilute hydrochloric acid. Silks: Nothing can be done without increasing the evil.

LIME, LYE, AND ALKALIES IN GENERAL.—From white goods: Simply wash in water. Colored cottons, woollens, or silks: Much diluted citric acid, drop by drop upon the moistened spot, to be spead around by the finger.

ACIDS, VINEGAR, SOUR WINE, FRUIT JUICES, &C. — From white goods: Simply washing; in the case of fruit also with hot chlorine water. Colored goods, either cotton, wool, or silk: According to the delicacy of the material and the color, more or less diluted ammonia, to be spead around on the spot, moistened, drop by drop, with the tip of the finger.

TAR, WHEEL GREASE, AS ALSO FAT, ROSIN, CARBONACEOUS PARTICLES AND WOOD VINEGAR. — From white goods: Soap with oil of turpentine, varied with the action of falling water. From colored cotton or woollens: Hog's lard to be rubbed on, and then soaped, and allowed to remain quietly; then washed alternately with water and oil of turpentine. From silks: As in the preceding, but more carefully, and instead of turpentine, benzole and a continual current of water falling from a height, and only upon the reversed side of the spot.

For cleaning silks soiled and greased, but not thoroughly discolored by acids, etc., the best agent is ox-gall diluted with lukewarm water and strained. Blood and albumen should simply be soaked in *cold* water.

SUPERFICIAL LOSS OF SUBSTANCE BY SCORCHING.—For white goods: Rub over thoroughly with a pad dipped in hot chlorine water. Colored cotton or woollens: Whenever possible, color over, or raise up the nap. With silks nothing can be done.—*Boston Journal of Chemistry.*

FIRE-PROOF CONSTRUCTION. — Captain Shaw, head of the London Fire Brigade, writes: "No fireman has ever seen a stone stair escape when subjected to much heat, and no internal wall supported on iron can be relied on where there is much heat. At the present moment may be seen at the corner of two streets a new building supported entirely on iron columns without any wall, wood on brick work reaching to the ground along the whole line of the front. At the ordinary temperature of from 600 to 700 degrees Fah., the whole building must inevitably fall, and such a temperature could easily be created by the combustion of a small quantity of furniture." The conclusion seems to be that brick, or iron covered with brick and plaster, which has been subjected to fire, are the only fire-proof materials really deserving the name.

LABRADOR TEA.—(*Ledum latifolium.*)

THE LABRADOR TEA PLANT.

There are several plants that are rarely to be found, save in the damp cold peat swamps, and dark moist wood of our Northern States. Comparatively few have seen this aspect of vegetation, where the sphagnum or peat moss covers the surface for acres, the upper portion of the moss alive and growing, while the lower portion is decaying, and undergoing a gradual change into muck or peat. In this wet mass a number of plants find a congenial home, one of which is the Labrador Tea, *Ledum latifolium*, a shrub which generally reaches five, but is commonly not more than two feet high. It belongs to the Heath Family, with the Rhododendrons, Azaleas, American Laurels, and Andromedas. Its alternate evergreen leaves are oblong, on very short leaf-stalks, entire, and of a pale, dull green : as looked at from above they present no remarkable appearance, but the under surface shows a remarkable contrast; in the first place the edge is neatly turned over all around, *revolute*, as the botanists call it, though a lady might compare it to a hem, and the whole lower side is covered with a thick brownish or rust-colored coating of down or wool, reminding one of a piece of felt; we do not think of any other native plant that presents in its leaf such strong contrast of color and texture; the new growth of the stem has a similar down which soon disappears. The flowers appear in May and June in umbel-like clusters at the ends of the branches, and proceed from large scaly buds, which are formed the previous season. The engraving shows the end of a flowering branch of the natural size. The corolla consists of five white petals, and the stamens, usually of the same number, are sometimes six or seven; the fruit is a dry oblong pod. The plant, though not so showy as some of its relatives, is an exceedingly neat and interesting one, and is much prized in England in collections of "American Plants," as the hardy plants of this family, and some others are there called. When found in deep peat swamps, a plant that shows only a foot or two above the moss, will be found to have a stem five or six feet long beneath the surface, throwing off, at wide intervals, a few straggling root fibres; such plants will not live if transplanted, but it is not difficult to find those on the margins of the swamps, that are rooted in the soil; such, if cut back, are quite likely to succeed. All shrubs taken from their respective localities should be severely cut back; this is especially important with evergreens. Like the Rhododendron and related plants, this would no doubt reach greater perfection in a specially prepared peat soil, but we have on two occasions removed the plant from its native locality to a very sandy garden soil, with very satisfactory results. In European nurseries the plants are raised from seeds and by layering. A much narrower leaved species, *L. palustre*, is found far north in British America. The name Labrador Tea refers to the use made of its leaves (which are slightly fragrant when bruised) by the people of Labrador as a substitute for tea.—*American Agriculturist.*

PROF. TYNDALL is taking a rest, necessitated by overwork.

A FOSSIL fungus was recently discovered in Beaver County, Pa.

THE *Botanical Directory*, previously announced, has been published.

A NEW journal is announced—*Brain*—devoted to practical psychology.

THE value of American silk used in various ways during 1877 was $12,105.095.

MASSACHUSETTS and New Jersey are putting the new metric measure into use.

THE tallest living man is over nine feet high; the smallest about one and a half feet.

NEW YORK CITY statistics show that three fifths of her people live in tenement houses.

A PAIL of clear water in a freshly-painted room will remove the sickening odor of paint.

A RIVAL to the famous Missouri Iron Mountain has been discovered in New Mexico, 10,500 feet high.

A CHICAGO journal complains that more than one fourth of her people are victims of the opium habit.

A ROAD SCRAPER.—A light road scraper would be found very valuable on every farm for repairing the private roads. It may also be used, when necessary, for running over the public road in front of the farm. The appearance of the farm is greatly improved by the neat condition of the road in front of it, and as the road is actually the property of the owner of the land by which it passes, the public having only the right of using it for traveling, it is very proper that the real owner should keep it in good condition. A light, easily made scraper is shown in the accompanying illustration. It consists of a frame of stout timber, in which the scraper is pivoted. The scraper may be 4 or 8 feet wide, as it is to be drawn by one or two horses. It is raised or depressed by the handles attached behind. To run over the road for a few minutes with such an implement, after it has been cut up in bad weather, would save much repair at other times, and thus lighten the road taxes. If the use of a road scraper were general, the roads would be in much better order, and the beauty of the country would be much increased.

BLACK FINISH FOR BRASS.—Optical and philosophical instruments made in France often have all their brass surfaces of a fine dead black colour, very permanent and difficult to imitate. The following obtained from a foreign source, is the process used by the French artisans: Make a strong solution of nitrate of silver in one dish, and of nitrate of copper in another. Mix the two together and plunge the brass into it. Remove and heat the brass evenly until the required degree of dead blackness is obtained.—*St. Louis Review.*

COUNTRY HOMES.—Under the title of *Modern Dwellings*, the *Harpers* have just published a work which treats of a subject specially interesting to the American people. As a nation we rival the ancient Romans in devotion to his Lares and Penates, and the preparation of a suitable shrine for them is a subject which occupies much of our thoughts. Whether in town or country, we would have our dwellings as attractive and convenient as our means will allow, and any work that contains suggestions which will enable us to improve our present surroundings is sure to be warmly appreciated. Mr. Holly, the author of the present volume, is himself an architect, and one who has made a careful study of every detail of his profession.

ISLAND MONUMENT IN GLEN CAÑON.

The following United States patents were granted to Canadians during the month of April last:

F. Fitt, of Ottawa, Ont., April 2, 1878, No. 202,012, "Watch Barrels."

W. F. Wilkins, of Montreal, Que., April 16, 1878, No. 202,391, "Washing Machines."

H. and J. Harrington, Woodstock, Ont., April 23, 1878, No. 202,722, "Fence."

R. Armstrong, of Portland, N.B., April 30, 1878, No. 202,975, "Sleds."

W. Dunn, of Hamilton, Ont. April, 30, 1878, No. 203,012, "Seal Locks."

R. W. Semple, of Toronto, Ont., April 30, 1878, No. 203,202, "Doors."

A. M. Smith, of Drummondville, Ont., April 30, 1878, No. 203,205, "Crate."

Driving Piles in Sand.

The contractors who had charge of preparing the sheet piling which was to protect the hospital at Berck-sur-Mer, in France, were much troubled in driving the piles by the compactness of the wet sand, and finally made use of tubes which were driven at the same time with the pile, their lower ends being a few inches below the points of the piles; through these tubes water was forced by small hand engines, and so loosened the sand that the advance of the pile was easy and rapid. In the case of the panels of sheet piling, the benefit was even more marked. Careful observations showed that by the ordinary process it took, on an average, 185 strokes to drive a ten inch pile ten feet, while 900 blows were needed to drive the panels. The hammer weighed 1,320 pounds, and had a fall of six and one half feet. The average time required to drive a pile and panel was eight hours and a half. After the device of loosening the sand by the pressure of water was adopted it was found that the average time required to accomplish this was one hour and nine minutes, while to drive a pile and a panel more than fifty blows were never required, and often the mere weight of the hammer was enough to sink the pile.

BUTTES OF THE CROSS IN THE TOOM-PIN WU-NEAR TU-WEAP.

TO STRAIGHTEN WARPED WOODS.—Of all the trials and vexations that beset the beginner, there are none more annoying than the tendency of wood to warp. He sends to his dealer for a small assortment of fine woods, and expects to receive them perfectly true and flat. Perhaps the woods are flat when they leave the dealer, but in transit they are very likely to twist out of shape, reaching their destination badly warped. The expressman may not be aware of the subtile nature of these woods, and in not a very gentle manner lays the package on a damp, cold floor. The dry wood sucks in the moisture on one side, swells and curls. It should not be a difficult manner to cure this. If the wood is in a large piece, the convex or hollow side should be steamed or moistened a little, and then laid upon a dry floor, holding it down with a smooth, flat board, upon which weights are placed. When quite dry, it will be found to have regained its original shape. If the wood is in small pieces, it can be easily straightened by gently steaming the convexed side over a tea-kettle, and then holding the other side toward the heat until it becomes straight, when it can be left in a press or under weights for a few hours. Almost any warped woods will yield under this treatment.—*Leffels' News.*

BIRD'S-EYE VIEW OF THE TOOM-PIN WU-NEAR TU-WEAP, LOOKING TO THE NORTHEAST.
Showing the Sierra La Sal on the right, the Cañons through the center, and lines of Cliffs on the left.

[We publish the following description of the telephone which has been communicated by a correspondent to the *American Agriculturist*. The simple words in which it is described will render the working of this interesting instrument easily understood by our young readers.]

"When in answer to several letters I promised to tell you about the telephone, I knew that I had undertaken a difficult job. I, last month, told you something about sound, and how it could be sent to a distance. Sound is produced by the air, which, though we can not see, we can weigh, measure, and study it. But in the telephone we have to do with the electricity—something that can not be weighed and measured as air can be. Much is known about the *effects* of electricity, but just what it is and many other things about it, even the most learned are in the dark. In describing such difficult things as the telephone to young people, we can only tell what is done, for it would take a volume to tell all that is known about matters concerned in it. You know a little about one kind of electricity; when you stroke the cat's back on a cold *dry* day, you hear a crackling, and in the dark see sparks. You have known the same kind of electricity—on the grandest scale, when you see the flashes of lightning and hear the thunder. Nearly all of you have seen the telegraph poles, and the wires stretching from one to another, and know in a general sort of way that messages are sent along that wire somehow by electricity. The electricity used in the telegraph is not the same kind that we get by rubbing the cat's back, or that crackles, when you suddenly pull off your silk neck-tie on a cold clear night, but a very quiet and manageable kind. If you are near a telegraph station, you may have seen several glass jars partly filled with a liquid in which are some bright pieces af metal. These jars together are called a battery, and here is produced the electricity to work the telegraph. If we have a plate of copper, and another of zinc, and place them in a jar in which is some sulphuric acid (oil of vitriol) made weak with 12 or more times as much water the acid will soon begin to dissolve the zinc, but it will not appear to trouble the copper very much. Now let us attach a wire to each, the zinc and the copper (and for this purpose it is best to use wire wound with fine cotton thread), as in Fig. 1. If we bring the two ends *A*, *B*, of this wire together in the dark, a tiny spark may be seen; if we put between the ends of these wires a bit of very fine *platinum* wire, the platinum will become so hot that you can not touch it, perhaps hot enough to light a match, or even red-hot. If you join the ends of the copper wire, and bring a compass near it, you will find the needle pays no attention to the North Star, but will place itself at right angles to the wire. All these show that these copper wires are unlike ordinary wire, that something is happening in them, and if you think that this has something to do with the action of the acid on the zinc, you will be very near right. But here is something still more curious. Take a bar of soft iron, and having one of the wires *A*, *B*, long enough, coil it around the iron bar, and then unite the two ends as before. Fig. 2 shows this arrangement. Nothing will appear to have happened to the bar, but if you bring a compass needle near to one end of it you will see that it is very much disturbed, and will dance about, as you move it from side to side, in the wildest manner. Now bring a shingle nail, a small key, or other bit of iron, to the end of this bar; when very near it will jump towards it, and be held there with considerable force. Very likely the nail, or key, already on the bar, will hold up another, and perhaps several. You have no doubt seen a magnet—boys often have their knive-blades magnetized, and they amuse themselves by picking up needles, tacks, etc.—and you will at once say that this iron bar has been made a magnet, or has been magnetized. You may think that now you have a very nice large magnet that will be very amusing to have, so you unhook your wires *A*, *B*, and down goes your nail, or key. You apply the bar to it—it behaves nothing like a magnet, and cares nothing at all about the nail. Hook together your wires again, and you have the bar as good a magnet as before. Bring together, and separate the wires *A*, *B*, as rapidly or as often as you please, and the bar changes from no magnet and to a magnet every time. Now we must have names for these curious acts, and the articles used to produce them. The glass jar with the two metals and acid is called a "Galvanic Battery," and frequently, only a "Battery." To increase the power, 10, 50, or more, may be joined, and it is still a battery. In practice, the metals are so arranged that the action only goes on when the battery is in actual use, and this is a great saving of materials. You have seen that, when the wires *A*, *B*, are joined, something happens in them—it appears as if something was passing through the wire from the zinc to the copper, and it is very convenient to call it a "current." Whatever it is, it is a form of electricity, and to distinguish it from "frictional electricity," produced by rubbing other things besides the cat's fur, it is called "Galvanic Electricity." As it passes along a wire, that is called a conductor, and the ends of the two wires, whether that may be a foot or 100 miles long, are the poles. Here is one point I wish you especially to recollect: the wire was coiled around the bar of *soft* iron, and when the current passed through the wire, it did not touch the iron at all, as the thread around it prevented, so no electricity passed *into* the bar, but only *around* it—yet this bar behaved in a most unusual manner, it picking up nails, etc., and it was for the time a magnet. There are many cases in which an electrical action in one body, causes a similar action in a body near by. If you will recollect that the wire coiled around the bar *induced* it to act like a magnet, you will not forget the philosopher's name for it—as they call it *induction*, that is, magnetism—which is still another form of electricity, is induced in the bar of soft iron. Recollect about induction, for it is a most important matter, as upon it depends the working of the telegraph as well as the telephone. But you know that some magnets stay active, and not like this iron bar, come and go. If we prepare a very strong "electro-magnet," as this kind, like the iron bar is called, and then properly rub it against a bar of *steel*, that steel will become a magnet, *and remain so*. This may be a small bar like a needle, or a large one, a foot or more long. If we hang the needle by a very fine hair, or stick it through a bit of cork and float it on water, one end will point north, and the other south; the end that points north is the north pole, and the other the south pole of the magnet—names applied to a magnet of any size. If the magnetic bar is straight, its north and south pole are far apart; if bent up like the letter U, it is called a horse-shoe magnet, and its poles, though close together, are still north and south. Now, suppose you have a bar magnet, and a coil of wire, as in Fig. 3; pass the magnet within the coil, and immediately there will be a disturbance set up in the wire; a compass needle, if surrounded by the wire, will at once dance about and take a position, and when the magnet is removed from the coil, the needle will go back to its former place, and as often as this is repeated, just so often will the compass be disturbed. If the coil were a sufficiently large one, made of a very long wire, and the bar magnet very strong, we would take away the compass needle and bring the two ends of the wire of the coil near together; then, on passing the magnet into the coil, we should get a spark! Now you have this wire acting just as the wire did in No. 1, when a current of electricity was passing through it. You have seen that a current of electricity passing through a coil of covered wire, can *induce* magnetism in a bar of soft iron placed with the coil, and in this last case, a permanent—or steel-bar magnet—can induce electricity when placed within a similar coil of covered wire. Most wonderful, indeed, is this matter of induction; and I have given some space to telling you about it, as, until it was discovered, it was not possible to have either telegraph or telephone—and it is not possible to understand the telephone, unless you have a general notion of this. More than this—it shows how closely magnetism and electricity are related, as we see that either can produce the other. In the next paper I hope to get to the telephone itself, so keep in mind this talk about induction."

QUICKLY DRYING INK.—Rub good India ink with water until too thick to flow well from the pen, then add alcohol until it flows readily, and it will dry quickly by the rapid evaporation of alcohol. If you use anilin black it is still better; being most intensely black it may be largely diluted and made very thin, but you must use a very little mucilage, to prevent it from rubbing off. Being nearly pure carbon it will resist any acid.

MAKING PAPER TRANSPARENT.—Artists, designers, decorators, architects, land surveyors, and all who have occasion to make use of tracing-paper, in their professional duties will be glad to know that any paper capable of the transfer of a drawing in ordinary ink-pencil, or water-colors, and that even a stout drawing-paper can be made transparent as the thin yellowish paper at present used for tracing purposes. The liquid used is benzine. If the paper be damped with pure and fresh distilled benzine, it at once assumes a transparency, and permits of the tracing being made, and of ink or water-colors being used on its surface without any "running." The paper resumes its capacity as the benzine evaporates, and if the drawing is not then completed, the requisite portion of the paper must again be damped with the benzine.

Tests for Vision.

Dr. B. Joy Jeffries, 15 Chestnut street, Boston, Mass., is desirous of ascertaining what proportion of people with normal eyes, that is, who do not wear glasses for distant objects, and also of those who have their focus perfectly corrected for distant objects by glasses, are gifted with a visual power above what is now considered good average vision, called vision *one*.

The following letters are selected as nearest in size to the test letters used by oculists all over the world. The letters should be hung up in a good light; and those of our readers who are able to see them distinctly, further off than

B

100 feet.

C P

80 feet. 60 feet.

V F D B

50 feet. 40 feet 25 feet. 18 feet.

the number of feet marked against each (which would be normal vision), are kindly requested by Dr. Jeffries to send him as above this information on a postal card, simply stating which letters were read and at what distance. From this he hopes to compile and publish some important data.

Pouring Lead.—Many mechanics have been sorely tried when pouring lead around a damp or wet joint, to find it explode, blow out, or scatter, from the effects of steam generated by the heat of the lead. The whole trouble may be stopped by putting a piece of resin, the size of the end of a man's thumb, into the ladle and allowing it to melt before pouring.

MANUFACTURING AND INDUSTRIAL NOTES.

Nearly 70 British steamers conduct almost the entire trade of Peru.

Coal gas has a deleterious effect upon books on the upper shelves of libraries.

Council Bluffs petitions Congress for a free pontoon bridge across the Missouri.

It has been shown that the physical effort of thought raises the temperature of the head.

The United States fisheries yielde in 1876 nearly 130,000,000 pounds, worth over $75,000,000.

The Portuguese African Exploring Expedition left Lisbon for Loanda on the 7th instant.

Another vessel has sailed with supplies for the construction of the Collins Railroad in Brazil.

The Lowell (Mass.) Machine Shop have received an order for spinning machinery to go to Russia.

The value of imports of the United States during 1877 was $504,012,000, exports $671,632,366.

The eyes of the students of Harvard University were examined and 1 in 13 were found to be color-blind.

The N.Y. *Lumberman* published recently full statements of the lumber business, covering 11 pages.

A hemlock tree was lately cut down, in Ontario, 5½ feet in diameter, containing 12½ cords of wood.

Plans have been ordered for additional spans to the Pennsylvania Railroad Bridge at New Brunswick.

The Edgar Thomson Steel Company have contracted for delivering this year 47,000 tons of steel rails.

The Royal Geographical Society of Great Britain will soon issue a new edition of their "Hints to Travelers."

The "ills that we know not of" are to be increased by Edison's phonograph. Its advantages are untold.

Upward of 500 tons of zinc ore are shipped each week from Joplin, Mo., for which is paid an average of $12 a ton.

An iron vessel is now being built at a shipyard in Baltimore. It will be the first iron vessel constructed at that city.

The German name of the greatest novelty, the telephone, has not yet come to hand ; we may have to report it in sections.

The entire rolling stock and motive power of the Gilbert Elevated Railroad is to be equipped with the Eames air-brake.

A new zinc rolling-mill has just been opened at LaSalle, Ill., which is prepared to turn out 55,000 to 65,000 pounds of sheet zinc daily.

The death-rate in England for the 36 years previous to 1873 was greater among the males than among the females—a difference of nearly two per cent.

Australia exports about $240,000,000 a year, and imports nearly as much, and almost this entire trade is carried on with England and her dependencies.

The Knowles Steam Pump Works, at Warren, Mass., are engaged upon one of the heaviest pumps ever constructed there. The steam cylinder if forty-two inches in diameter.

English telegrams report that, owing to the refusal of cotton operatives in Lancashire to accept a 10 per cent reduction in wages, strikes and lockouts are expected, throwing idle 120,000 hands.

The Eagle Reaper and Mower Company are running their works at Albany every evening until ten o'clock on account of large orders, some of which are from Russia, Australia and New Zealand.

By discharging electricity of high tension through a perfectly dry mixture of equal volumes of sulphurous acid and oxygen, Berthelot has obtained a new acid of sulphur, to which he gives the name persulphuric acid.

The Burleigh Rock Drill Company, Fitchburg, have recently made an estimate for a pair of air compressor engines of 600 horse-power, which will cost $50,000. The estimate was made for an extensive gold-mining company.

A mammoth lathe, weighing over twenty-tons and requiring three cars for its transportation, has been placed in the B. C. F. and N. B. R.R. machine shop in Taunton, Mass. It was built by the Putnam Machine Company, of Fitchburg.

PARIS EXHIBITION OF 1878.

"THEY manage these things so much better in France" is an old and somewhat worn saw; and to those Englishmen who have been lately called upon to await the arrival of goods intended for exhibition on the Champ de Mars this year, goods which were in most cases despatched last month, and which the railways of France have proved inadequate to convey to their destination in anything like a reasonable time, the saw referred to cuts the other way.

But for this the British section would long before now have been complete; as it is, England and Canada are by far the most advanced. Japan, China, America, Norway, and Sweden follow closely, and France last of all. With the advantages of being nearest, and of having the choice of position—the Plan of the Building her own—France is so backward that it will be necessary to close the Exhibition again for fifteen days, after the farce of an official opening at the time fixed. Of empty spaces, in the greater part of the French sections, even the glass cases of the various Chambers of Commerce are in many instances not glazed as yet.

It will be of interest to your readers to know the effect of the French Patent laws at present; and as several attempts have been made to induce the Legislature to modify the existing law with only very partial success, and that only as applicable to the forthcoming Exhibition, I give you the result of the numerous interviews, at the last of which I was personally present, and your readers may therefore accept it as reliable, especially as the English papers have given rather incorrect items of intelligence on this subject, and even the official circular of the Royal Commission is a little vague and indefinite.

The whole bearing and tenour of the Law of Patents is protective to the last degree, and to an impartial observer seems framed with a view to give to Frenchmen the benefit of the inventive faculties of other nations.

In order to obtain a Patent for France, either a native or a foreigner deposits drawings to a *metrical* scale—accompanied by a complete specification—and his invention is then protected, but *without any guarantee of the Government*, and every article made under such patent must bear the words "Breveté S. G. D. G." (sans garantie du Gouvernement), which means that the Government assumes no responsibility, leaving it open to other inventors to dispute the claim upon any points of priority of invention, &c., in the French Law Courts.

The conditions upon which the patent is granted are: that within two years of the deposit of the specification and drawings, the article so patented shall be *made* or manufactured in France; that the annual tax shall be paid upon it; that the manufacture of the articles shall not be entirely discontinued in France for a period of more than two years during the time the patent is in force; that no patented article made abroad shall be imported into France for sale except at Exhibitions under the sanction of the French Government, and then only upon written permission from the Minister of Agriculture and Commerce—for each separate article—which permission must be applied for in writing, accompanied by a translation in French, of the original patent, and by complete drawings of the article to a metrical scale in each case. In fact, to exhibit 50 specimens of any patented article—50 separate written (not lithographed) copies of the specification and drawings must be sent in, and 50 separate permissions obtained.

The penalty for non-compliance with any or all of the above conditions, is that the patent becomes null and void, and that the invention becomes public property. Any Frenchman can, if he likes, upset a patent and make the article himself if he can shew in a court of law that any of the above conditions have been broken.

Mr. P. Cunliffe Owen, upon these facts being brought before his notice, immediately commenced a correspondence with M. Krantz, Minister of Agriculture and Commerce, with a view to obtain some modification of these harsh conditions, pointing out that in England any foreigner was permitted to import any patented article, irrespective of where it was made.

A "project-de-loi" was then laid before the Legislature to modify the conditions, and the result is simply this—that any foreign inventor desirous of exhibiting, may, without obtaining permission, exhibit *one* specimen of his invention at any Exhibition in France, held under the sanction of Government, on condition that he re-exports such article within a month of the close of such exhibition; if he desires to show more than one, or different modifications or applications of his patent, he must, for every such other specimen, obtain (by depositing as heretofore drawings and specifications) written permission to do so from the Minister of Agriculture and Commerce, otherwise his patent becomes null and void.

This concession is all that the Government can be induced to allow to the exhibitors of inventions, unless they choose to have the articles they exhibit made in France, which means that they must go to great expense and trouble, and pay perhaps twice as much as they would at home for the making of such articles in France.

With regard to the correspondence in the journals of the English press, as to the superiority of American locks and other hardware, I notice several exhibits in the American section which I purpose to illustrate as soon as they are sufficiently complete, and to obtain as much information as possible as to wholesale and retail prices, weight, &c.—comparing them with Canadian, French, and other foreign productions, and by this means shall be able to give your readers reliable information to enable them to judge for themselves on this very important and vital question.

I would also take the opportunity of suggesting that at the close of the present French Exhibition, samples of everything really worthy of attention might be purchased and removed to Birmingham—to form a museum of reference of a permanent character, where manufacturers of hardware could readily compare for themselves their productions with those of othernations.

A small subscription, set on foot by those who are most heavily interested in foreign competition, would at any rate form the nucleus of a very valuable institution, and so far as I can I shall be most happy if this suggestion or any modification of it is adopted, to assist in carrying it out, being on the spot and in daily contact with the foreign exhibitors, I can, at any rate, ascertain by enquiry, the cost of purchasing the most worthy exhibits, and afterwards open up the preliminary negociations, if desired. I have already ascertained that the general feeling of the Canadian and American exhibitors is that they will, if possible, sell all their goods,—their respective Governments having undertaken merely to defray the cost of conveyance *here* and not their return, so that in preference to re-shipping the goods and paying freight back again, the exhibitors would probably refuse no reasonable offer. Many of the packing-cases arrived in such a broken condition that they could not be used again—an additional reason for selling cheap.

In ornamental casting in brass and electro-plate for door furniture and general house and shop fittings, I notice in the American section one very fine collection, including locks, which was also exhibited at Philadelphia, by Messrs. Mallory, Wheeler, and Co., New Haven, Connecticut, and another equally fine in the Canadian section, exhibited by E. Chanteloup, Craig Street, Montreal, who also sends some very chaste and beautiful gasaliers, lamps for ships' cabins, and locomotive head lamp, which as soon as they are completely installed I shall illustrate.

A large share of space in both the American and Canadian sections is occupied, as might be reasonably anticipated, by stoves and ranges for cooking and heating purposes, and these are I think also worthy of illustration, although few are at present unpacked—one in particular has a coal reservoir or feeder which, if once filled every 24 hours, will keep the stove constantly burning during the whole of the Canadian winter, supplying the fire with fuel by a self-acting and ingenious arrangement, whilst the ashes and dust can be readily removed without any escape of dirt or dust into the room. This stove in various sizes is exhibited by Messrs. Stewart and Co., Hamilton, Ontario.

Other highly interesting exhibits I must defer notice of for the present, for the simple reason that they are as yet not unpacked.

AMERICAN COMPETITION IN HARDWARE.

To the Editor of MARTINEAU & SMITH'S HARDWARE TRADE CIRCULAR.

SIR,—In January last you kindly inserted a letter of mine on the above subject. As you deemed the matter worthy of a leading article, I make no apology for recurring to it.

A few days ago appeared a letter signed "Merchant," in the *Birmingham Daily Post*, containing extracts from his correspondence from various parts of the world, as follows :—

"AUCKLAND.—'Indent this month is very small. Your American competitors have taken nearly all our lines.'

"SYDNEY.—'Our market is full of American agents and representatives of American houses. They are swarming here, and all seem satisfied, so I presume they are getting plenty of orders. You see how large a part of my monthly indent goes to America.'

"MELBOURNE.—'We are exceedingly pleased with the American electro-plated ware—the articles are much dearer than English plated ware, but the design and finish are infinitely superior, and we find the goods sell as soon as opened out. At present we shall continue our indents for this make of electro-plate.'

"MONTREAL.—'I have just arranged for purchase of all my shot—both chilled and soft—of United States make. It is the finest shot and of the most perfect form I have ever seen. No English make that has come under my notice can compare with it. I mention this to show you how much English trade the United States is quickly absorbing. Look too at the order for 800,000 Martini rifles which was given out by the Turkish Government and which order was first offered in England. The Providence Tool Co. agreed to make them at a lower figure, and got the contract. I have just been through the Union Metallic Cartridge Co.'s works at Bridgeport, Conn., and there I saw cartridges being made for both Turks and Russians. Twenty-five tons lead is there daily melted into bullets. The opinion is very freely expressed in the States that they will soon be shipping pig lead to Europe. The Americans have certainly made gigantic strides in manufactures and in machinery for manufacturing purposes. The goods they turn out are no longer rubbish, but strong and beautifully made and exceedingly well finished. They excel any other country in the way they parcel and box up their goods. Even supposing they cost more, hardware dealers here would willingly pay the difference for the convenience gained by the neat manner in which all goods are papered up and labelled. Moreover it is quite an exceptional case for a manufacturer to charge for packing cases—so the manufacturers of England may imagine the competition they have to contend with here. Trades Unions have set Yankeedom on its feet, and given it a start which is not to be arrested.'"

As these extracts have been copied into the *Ironmonger*, and will probably appear in many other papers, I take the opportunity of the appearance of your valuable journal to combat some of the conclusions that might be arrived at by readers not conversant with the whole state of the case.

In my last letter I took the ground that much of the success of the American manufacturers was due to the gratuitous advertisements given to their goods by English writers in the press, who full of desire to fill their columns with startling information swallowed wholesale the amazing statements made by American manufacturers, without attempting to verify them. I then expressed my opinion (with an apology to you) that gentlemen of the press generally wrote about matters they did not understand, with an assurance that complete ignorance could only give.

But I have ever been alive to the fact that American competition has always been perfectly prepared for, and the way for it been carefully paved by the English merchant, who has strictly adhered to the old trade customs and fictions, careless whether those customs and fictions were understood and appreciated by his customers and the general consumer.

Were I prepared to enlarge on the subject, I should enlighten you, sir, and your readers, as to the customs and fictions I speak of, and many a wealthy firm here would have to confess that examined by the bright light of honour and truth, its customs are dirty and its fictions are monstrous.

Referring to the only letters quoted above which make definite statements about certain goods, *viz* : those from Melbourne and Montreal, I would say as regards the former, that for many years there lived in Birmingham an electro-plater, who made the most beautiful designs and whose work was excellent. He was his own draughtsman, and from his fertile brain, patterns and designs, always new and elegant, were being continually developed.

His goods were nearly all sold in America, and the orders he received were always for new designs. It will perhaps be hardly credited but it is a fact, nevertheless, that his goods were exported to America to some of the principal electro platers there, and the designs which are exciting such admiration now, were the work of this curious, kind-hearted, eccentric old gentleman. He is now dead, so that our friends on the other side of the water must find some other way of obtaining new patterns.

As regards the letter from Montreal, it is a fact that the American company obtained the order for the rifles, but there was another reason besides that of price. In the American gun all the interchangeable parts are made to fit loosely. On this account it can easily be put together or repaired; but its durability is not very great, and the constant escape of gas renders it less accurate in its fire. The English gun is a much more durable weapon, because its parts are so truly fitted, but on that account it cannot be so easily set right if any slight mishap occurs.

If English merchants would keep their eyes open and be willing to assist manufacturers to send out their new patterns, and above all would strenuously discountenance the despatch of cheap goods, especially for discretionary orders, we should hear less of this parrot cry of "American competition."—I am, &c.,

A BIRMINGHAM MANUFACTURER.

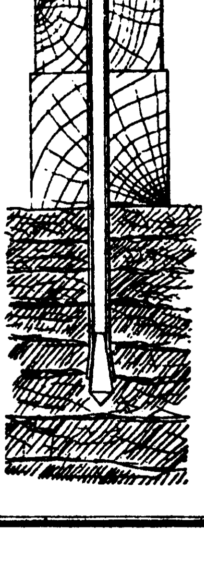
DEATH OF A GERMAN IRON PRINCE.

GERMANY has lost one of her most famous sons; Berlin one of its wealthiest and most eminent citizens. Albert Borsig, the chief of a firm of world-wide renown, the owner of the extensive Borsig works, died on the 10th inst., at the age of only 49 years, from heart disease. The Borsig factories are second only to those of Alfred Krupp; indeed, it may be said that Krupp and Borsig are the representatives of the German iron industry, the former devoting all his energies to the destructive weapons of war, the latter to works of peace. The Borsig locomotive engines are just as well known in Germany and many other Continental countries as are Krupp's cannons. Albert Borsig, the only son of John Borsig, inherited the wealth and factories of his father in July, 1857. John Borsig was a self-made man. When he established his business in 1837 he employed only 50 working men; now no less than 7,000 families are living on the Borsig premises in Berlin and Silesia. Perhaps Albert Borsig could not have started a business and acquired a fortune as did his father, who was a most ingenious inventor and practised engineer. But Albert Borsig could keep the fortune he inherited, and work out the plans of his father. He extended the establishment at Berlin, which has built nearly 4,000 locomotive engines, besides a great many steam-engines for ships, factories, &c, When rents increased in Berlin to an enormous height, Borsig acquired mines in Silesia, and there established a working men's colony. Borsig's Silesian mines supply the coal and pig-iron used in the Borsig establishments in Berlin and Moabit—a Berlin suburb. In spite of his enormous wealth, Albert Borsig had frugal habits. A patent of nobility was repeatedly offered to him; he refused it. A decoration, however, he accepted as an acknowledgment of his and his working men's labours. Although devoted to his extensive business, he still found time to cultivate a taste for fine arts. His gardens and hot-houses are one of the Berlin sights which no visitor will care to miss, and his palace—which, however, he was not destined to inhabit—is a most wonderful building. The influence of Borsig was also felt in the financial world. He was a member of the committee of the Imperial Bank, and invested enormous sums on the Stock Exchange in discounting bills. His wealth can not be estimated in pounds and shillings. Twenty to thirty million marks could scarcely pay his extensive works, his working men's city and stock. Although rather severe towards those he employed, he will be greatly deplored by the working men, for he understood his business thoroughly, and never neglected the duties of a master. He leaves some children who are not yet of age; but the business will be carried on as hitherto.

A WAREHOUSE BUILT OF IRON.—A novel feature in building construction, due in great measure to the present exceptionally low price of iron, has been introduced in the erection of a large warehouse in Manchester, which is at present being built for Messrs. John Rylands and Reuben Spencer, from the designs and under the superintendence of Mr. J. H. Lynde, C.E., of the above-named city. The building, which, when completed, will cover an area of 600 yards, consists of three fronts six stories high, the whole of which are constructed of cast iron. The main structure consists of vertical iron standards, 1 ft. 9 in. wide and 1 ft. 9 in. deep. The cornices and strings are 6 in. wide, and are carried on stretcher beams running between the vertical standards, whilst the floors are carried by means of cast iron columns, between which and the vertical standards are cast iron girders, and the whole framework of the building is thus tied firmly together. The outside decorative features are in the Italian style, and the face, which is of ornamental cast iron, is hung on to the framework and bolted, but in such a manner that, in the case of the bolts decaying, the ornamental castings would still remain in place.

THE DETECTION OF SEWER GAS.

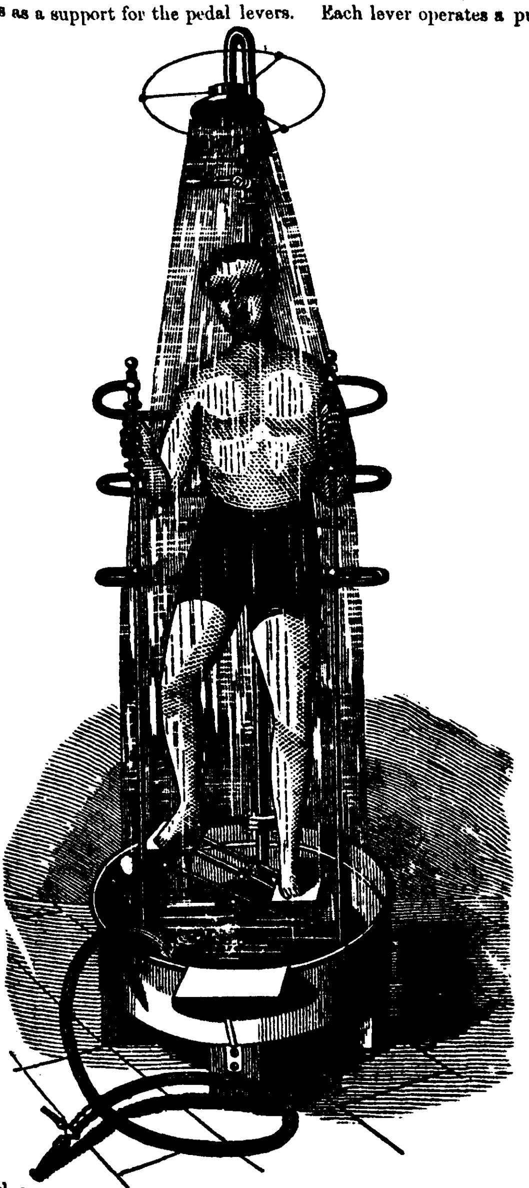
The deadly poison which exhales from the sewers, and makes our city sleeping rooms breeders of fevers and diphtheria, is sometimes a difficult thing to detect. A writer in the *Manufacturer and Builder* says that the odor is not a safe criterion. In the first place, the sense of smell is so different in different individuals, that some will smell absolutely nothing while others do so very plainly; secondly, a bad odor may or may not be accompanied by injurious gases; thirdly, it is not known that the dangerous miasmatic germs floating in the air of sewers or sewer gas have themselves any odor at all, or perhaps only a scarcely perceptible odor; so that they mix with air and can be inhaled without being at all perceived by the individuals exposed in localities subject to sewer communication. One of the most sensitive tests is a solution of permanganate of potash, which is of a brownish pink, and changes its color by the presence of organic bodies in the air to which the solution is exposed; at the same time it purifies the air. It is a substance very rich in oxygen, which it keeps loosely combined, and therefore easily gives off in a condition as active as ozone, and so oxidizes and destroys all germs it comes in contact with. We would recommend a disinfecting of the locality by often using an atomizing spray of this solution. It will even discolor in the air of an ordinary bedroom, but not so rapidly as when sewer gas or other injurious odors are present. Other disinfectants are bromalum, sulphate of iron, and carbolic acid; they are all far superior to chlorine, which is a destructive agent, acting most powerfully on substances on which its action is not wanted, namely, on metallic objects—it ruins them, and produces such an offensive smell as to force people to open doors and windows. Some go so far as to maintain that this is all the good is does. One thing is certain, that it is no protection against sewer gas. We will state in closing, that the time it takes for a solution of permanganate of potash to discolor gives a pretty fair estimate of the amount of impurities floating in the atmosphere when a flat dish containing it is exposed. You must first boil the water in which you dissolve it, because if you dissolve it in ordinary rain or well water this may contain impurities which will change the color, especially when the solution is much diluted. If it is well made and the air kept perfectly pure, it will not discolor soon, and the shortness of time is a warning of danger.



Our esteemed contributor J. E. S. sent us some time ago an excellent suggestion as to anchoring beams, etc., to a rock foundation. We had an engraving made, but our intelligent compositor lost the "copy." In brief, the plan is to bore the timbers and the rock, and let in a piece of iron gas-tubing the exact size of the hole; the lower end being expanded in the rock by driving it over a double taper-plug, which is put in at first. The upper end is expanded by a taper-plug, and hammered down flush with the timber. "The cheapest way to get them out is to saw them off and leave them in."

NEW SHOWER BATH.

The Bozerian New Shower Bath, which is shown in the annexed woodcut, is a novel apparatus readily available and easily operated by the bather himself. In the tub is a cast-iron air chamber, which also serves as a support for the pedal levers. Each lever operates a pump,



which forces the water in the basin into the air chamber, so that the operator has only to move the weight of his body alternately first on one pedal then on the other to work the pumps. The water is thus driven up a pipe connected with this air chamber, and escapes in a shower from the perforated receptacle above. The same water is used over and over again, and the shower is maintained as long as the operator chooses. The bath is a French invention, and we hear that it is in successful use in many of the "water-cure" establishments in Paris.

PORTLAND CEMENT.—Mr. I. J. Mann, assistant engineer, Port and Dock Office, Dublin, has made experiments upon the qualities of Portland cement, which prove that coarsely ground cement when used neat (without sand) is stronger than finely ground cement; but when used with sand, as in concrete and mortar, it was found that cement containing only twenty-five per cent of coarse cement particles had but half the strength of mortar mixed with fine cement, the cement used being in each case four weeks old. On the other hand, extremely fine sand diminished the strength of the mortar to less than one half of that which was mixed with coarse sand.

PORT WINE MARKS.

Several English surgeons have of late endeavored to remove this disfigurement from the human face, obliterating the mark without scar. In these cases the mark was confined to the right half of the face, and the treatment consisted of scarification by means of parallel incisions the entire thickness of the skin, made by a frozen scalpel, the skin being also frozen by means of the ether spray. The cuts were one sixteenth of an inch apart, and as soon as these were healed a second set of parallel incisions were made obliquely to the direction of the first set, and so on with a series of operations until complete. Perfect success was the result, as the port wine mark gradually faded away, and was finally obliterated without leaving a scar.

THE INFLUENCE OF SURROUNDINGS.—The surroundings of the place of labor have more influence upon the operative than many are aware of. Give a workman clumsy tools to work with, a rough, dirty bench to work upon, imperfect light, scarcely elbow room, and but little care exercised respecting proper ventilation and warmth, and he will become careless, his work partaking of the character of his surroundings; he will think more of his wages at a certain time than of the completion of his work. A few years of this experience will spoil almost any workman, no matter how good he may be. But give him, on the contrary, good tools to work with and an airy and agreeable place in which to perform work, and he will insensibly take more pains with it than in a badly arranged room. In a pleasant room he will, of his own accord, keep his tools and work in good order and more cheerfully perform the task assigned to him. A kind of magnetic influence of the surroundings will infuse itself into the operative, and his work will partake of that and go from him stamped with the impress of the influence thus created. This applies with equal force to the workshops in connection with many ironmongers' places of business. General repairing often carried on in rooms wretchedly lighted and ventilated, will do much to induce the workmen to take less pains in turning out satifactory work.

UTILIZING BITS OF SOAP.—Instead of throwing away the pieces of soap which become too small for convenient handling, make a square flannel bag of suitable size; leave one end partly open, and put in the pieces as they collect; when it is full baste up the opening, and it makes a nice bath-tub arrangement. Another way is to add a little water, set them in a tin on the stove, and let them simmer slowly. When cold, you will have tolerably good soft soap, just the thing for putting in your wash boiler or washing tins with. Or by evaporating part of the water you may get the soap hard enough to be molded into small cakes, which can be dried for use.

CEMENT FOR AQUARIA.—An adhesive cement for aquaria may be made by mixing equal parts of flowers of sulphur, pulverized sal ammoniac, and iron filings, with good linseed oil varnish, and then adding enough pure white lead to form a firm, easily worked mass.

THE EASIEST WAY TO DROWN.—If death by drowning be inevitable, as in a shipwreck, the easiest way to die would be to suck water into the lungs by a powerful inspiration, as soon as one went beneath the surface. A person who had the courage to do this would probably become almost immediately unconscious, and never rise to the surface. As soon as the fluid filled his lungs, all feelings of chilliness and pain would cease, the indescribable semi-delirium that accompanies anæsthesia would come on, with ringing in the ears and delightful visions of color and light, while he would seem to himself to be gently sinking to rest on the softest of beds and with the most delightful of dreams.

HERR ACHENBACH, the Prussian Minister of Commerce, has issued an order that, during the progress of the Paris Exhibition, arrangements shall be made at the Berlin School of Mines, to place every facility within the reach of such visitors as desire to avail themselves of the opportunity of studying the mineral wealth of the kingdom. This act of courtesy, it is gratifying to know, has been extended for the special benefit of American scientific visitors, in recongnition of the polite attentions extended to German professional men during our Centennial, by the members of the American Institute of Mining Engineers and others.

AN official guide for the Exhibition at Paris has just appeared under the title of a "Guide de l'Exposition Universelle, et de la Ville de Paris." It contains 54 maps and plans.

PRAIRIE DOG, RATTLESNAKE, AND OWL.

THE PRAIRIE DOG AND THE UNINVITED GUESTS.

The prairie dog (*Cynomys ludovicianus*) of the Missouri region, and westward and southward, belongs to a genus of American rodents intermediate between the marmots and prairie squirrels. This woodchuck in miniature is about 13 inches long, with the tail 4 inches more; the color above is reddish or cinnamon brown, with lighter tips to the hairs, and a few black ones intermixed; beneath, brownish-white or yellow; tail like the back, with a black tip. The cheek pouches are very rudimentary, the eyes large, and the ears very short. The prairie dog was probably so named from the sharp tone of its chattering, somewhat resembling the yelp of a small dog, as it bears no external resemblance whatever to the dog. It is the *petit chien* of the French Canadians, and the *wish-ton-wish* of the Western Indian.

These interesting animals live in burrows, and great numbers are found in the same locality, forming communities which the hunters call "dog towns." These villages often extend over a distance of several miles.

Before the entrance to each burrow there is a little conical mound of earth, heaped up to a height of about 18 inches, and on the top of this, one of the occupants may usually be seen sitting, intent on watching what is going on in the community, or on the lookout for intruders. At the first alarm caused by an intruder, a general scampering takes place throughout the village, with cries of warning. Upon reaching their mounds they sit perfectly quiet, like so many sentinels, curious to know what all the commotion is about. At a further alarm they approach still closer to their entrances, ready to dive in, and appear to make vehement threats, throwing up their tails in a very comical manner with each energetic bark, accompanying this noisy chattering with a liquid gurgling sound. In a twinkling they disappear into their burrows in a ludicrous, tumbling manner, and then, after a short time, they may be seen here and there peeping out to see if the coast is clear. Like young pups, they are very clumsy in their movements, and when (as rarely occurs) they are surprised at a distance from their burrows and find they cannot escape, they assume an air of audacity, and a most singular expression of defiance or of important anger, before allowing themselves to be captured.

They feed chiefly at night, their food consisting almost exclusively of grass and succulent stems. In the fertile lands of Central Kansas, they sometimes prove terrible pests to the farmers in the sad havoc they make among the fields of growing corn.

Squirrel-like, they are prudent enough to lay up a full supply of provender to last them through the long and rigorous winters they often have to endure. It is said that late in summer one may frequently meet with burrows around the entrance of which for some distance, the grass has been neatly mown and left to cure; and that, a few days later, the hay will be found to have been cleanly gathered up and carried into the burrow.

One of the most curious things in regard to the domestic economy of this little animal is that of its strange companionship with such undesirable guests as the burrowing owl and the rattlesnake, both of which are usually found inhabiting its abode. As to the owl, it is there like other parasites, perhaps, on sufferance merely, and very little notice is taken of its presence by the dog. Yet that the presence of the intruder is not always agreeable is proved by the fact that the dog often rids himself of the nuisance by removing his own quarters to a new burrow.

There are few birds that present a more ludicrous appearance than these same burrowing owls. They spend most of their time during the day standing at the entrance of their dwellings, apparently engaged in deep contemplation. When an intruder makes his appearance, they begin a series of most ridiculous and comical bowings and courtesies, staring all the while with their great solemn eyes; and then, with a cry somewhat like the sound of a watchman's rattle, they fly to a neighboring mound and resume the same air of pensive meditation. In the majority of cases, these owls are found in communities by themselves, in the deserted villages of the prairie dogs, their presence in many cases having served to drive the rightful proprietors from their dwellings.

With regard to the rattlesnake, nothing of a satisfactory nature is known as to the part he plays in the domestic arrangements of this interesting community. Mr. Kendall, in his narrative of the Santa Fé Expedition, says that the prairie dogs are "compelled to let them pass in and out without molestation." Certain it is that, although the relations of the snake with both the dog and the owl are not all friendly, they are not so inimical as would naturally be imagined. The rattlesnake seems never to be wanton; it simply defends itself from danger, or procures its food by means of its terrible fangs. This food occasionally consists of the young of the prairie dog, but probably very seldom of the full grown animal or of the owl. Small animals do not usually show much together with them, and the prairie dog will unconcernedly pass them by and enter his burrow as they lie basking in the sun at its very entrance.

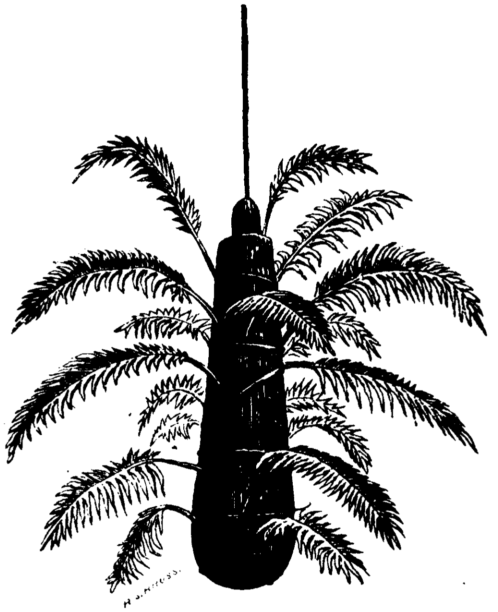
Prairie dogs readily become accustomed to the haunts of man, and their villages are often found on the outskirts of populous towns. They prefer, as locations for their villages, gently sloping lands skirting valleys, yet they are often found in the tops of the highest divides, and far down near the streams, though always avoiding rocky, marshy, or even moist grounds.

A HANGING BASKET FOR A COOL ROOM.

A lady wishes to know how to fill her hanging basket with plants suited to a cool room; the house is moderately warmed throughout, and while the room in which she would place the basket is seldom very warm, it never gets cool enough to freeze. It is quite late in the season to start baskets of this kind. If Mrs. J. can get from a florist a couple of strong vigorous plants of European ivy, the rest will not be difficult. Most florists keep ivy in pots, as there is considerable demand for it during the holidays, and we notice that it is generally on sale at all seasons in the stores of the city florists. But you can, no doubt, get the plants at the florist nearest to you. For the rest, you had better go to the woods. It will not be difficult to find in almost any rocky ravine, or wooded hillside, our largest Evergreen fern, the Evergreen Shield fern, a vigorous species, a foot or more high; take up some clumps of this. You will be very likely to find in the same woods the Partridge-berry, also called One-berry, as its fruit is produced by two flowers. This is a capital plant for a cool place. Some sheets of moss, such as is found at the lower part of trees, will be useful. Of course, you can not get these if the ground is frozen, any more than you can soil from the woods, with which (and some sand) to fill the basket. If lucky enough to secure all the material, set a clump of the fern in the centre, and Ivy opposite each half of the handle, and bits of the Partridge-berry around the edges, so that the vine will hang over the sides of the basket. Probably each Ivy plant will have several stems; train one or more of these around the handle of the basket, and the others to the outside of the basket itself, loosely tying the stems in place with coarsed thread. When all are planted, and the surface of the earth leveled, then place on the sheets of moss to quite cover the soil. The moss can be torn or cut into bits to fill spaces between the larger pieces, and all made to look like an entire sheet of green. Press the moss down firmly, to be sure that it will be in close contact with the earth. The engraving shows a basket we filled with just these materials some while ago,

A JAPANESE FLOWER BASKET.

In the Japanese Building at the Centennial Exposition is to be found a variety of hanging baskets, containing ornamental plants. One of the most graceful designs is shown



in the annexed engraving, the basket being made of the roots of trees, laid parallel and encircled by hoops. Ferns and other plants, judiciously selected, are placed with their roots inside the basket, the flowers and foliage hanging down outside. It would be difficult to imagine a prettier ornament for the parlor or conservatory.

BASKET WITH IVY AND HARDY FERNS.

and we never had one, even when furnished with expensive exotics, that gave us more satisfaction. These are all shade-loving plants, and do perfectly well in a cool room, where there is but little direct sunlight. Of course, the soil must be watered when it needs it, and the Ivy will be all the healthier if its leaves are sponged occasionally, to free them from dust, and if possible a good showering should now and then be given to the whole basket.—*American Agriculturist.*

CRYSTALIZED FLOWERS.

Construct baskets of fancy form with pliable copper wire, and wrap them with gauze. Into these tie to the bottom violets, ferns, geranium leaves—in fact any flowers except full blown roses—and sink them in a solution of alum, one pound to a gallon of water, after the solution is cooled. The colors will then be preserved in their original beauty, and the crystalized alum will hold faster than when from a hot solution. When you have a light covering of crystals that completely crusts the articles, remove the basket carefully, and allow it to drip for twelve hours. These baskets make a beautiful parlor ornament, and for a long time preserve the freshness of the flowers.

A BEAUTIFUL HOUSEHOLD PLANT.

The calla lily, roots of which may be procured of any florist, is one of our finest plants for house-growing, when properly treated. The best method we have tried is to procure an earthern jar—suitably decorated on the outside if desired, by painting or pasting on of frieze or flower pictures, or by a paper open-work covering. In this place rich mould some five or six inches deep, and in it set the calla plant. Now put on the top of this mould a layer of clean coarse sand about two inches deep and on top of this some small pebbles. Then fill the jar with water, and replace as evaporated, so as to always have the water several inches deep above the pebbles. Place in a warm and sunny window and the plants will throw up large, luxuriant leaves, to be followed by the magnificent bloom. What is still better, the flower stalks will be sent up in a succession so as to afford a nearly continuous series of flowers. A few minnows introduced into the water will usually thrive without further care, and afford a pleasing study.—*Scientific Farmer.*

CONTAMINATION OF AIR IN HOUSES.

An adult person consumes 500 grains of oxygen per hour, and gives out 600 grains per hour of carbonic acid. A child of 50 pounds weight gives off as much as an adult of 100 pounds weight. A school-room filled with children will, if not well ventilated at the beginning of the hour, contain 25 parts in 1,000 of carbonic acid, at the end of the first hour 41, and at the end of the second hour 81. The air is also spoiled by the perspiration of the body, and by the volatile oils given out through the skin. An adult gives off through the skin in 24 hours, from 7,500 to 12,000 grains of water mixed with various excrements, poisonous if breathed.

A stearin candle consumes from 200 to 300 grains of oxygen per hour, and gives off four-fifths of a cubic foot of carbonic acid, and half an ounce of water.

Carbonic oxid is a much more dangerous gas than carbonic acid, and this obtains entrance to our rooms in many ways, through cracks in stoves and defective stove-pipes, or when the carbonic acid of the air comes in contact with a very hot stove and is converted into carbonic oxid. The dust of the air may, on a hot stove, be burnt to produce it; or it may flow out from stove-pipes when the gas is not perfectly consumed.

Another form of air injury is the dust of a fungus growth which fills the air in damp and warm places; we call it miasma from a want of a true knowledge of its character. Accidental vapors are the crowning source of air poisoning; these are tobacco smoke, kitchen vapors, wash-room vapors, and the like.

When we heat our houses and close them from outside air, the heat turns the mixture into a vile mess unfit for breathing. The only remedy is ventilation. During cold weather, when the rooms are closed from free currents of outside air, one must look after the matter thoroughly and do his best to prevent injury to himself and family from polluted air.

An eruption of Mount Hecla opened February 27th. Flames were ejected in columns, gradually increasing in size, till the height of the mountain was doubled.

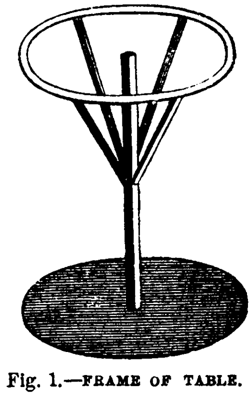


Fig. 1.—FRAME OF TABLE.

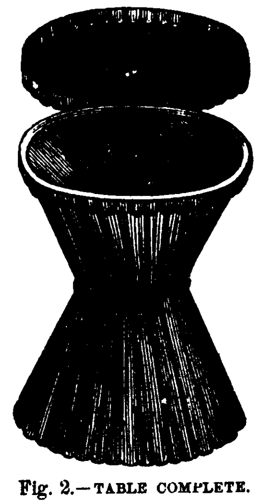


Fig. 2.—TABLE COMPLETE.

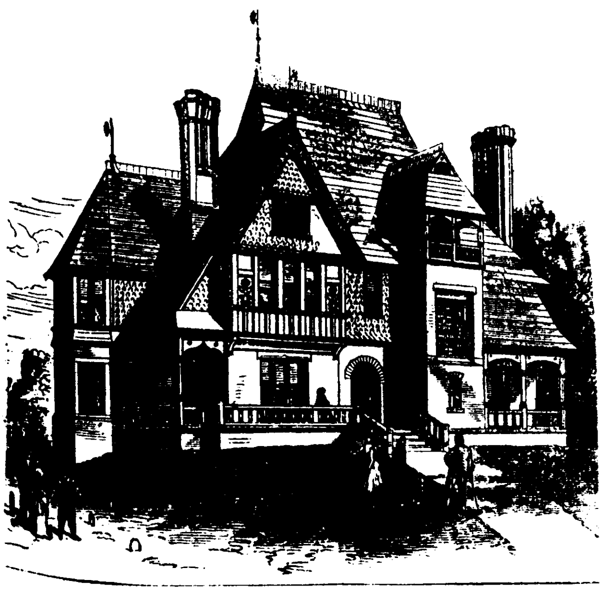
A HOME-MADE WORK-TABLE AND BASKET.

In former volumes we have given quite a number of illustrations of articles of furniture to be made from available materials, and we now add one more to the list—a combined work-table and work-basket, from a design sent some time ago. This home-made furniture, if well put together, will be quite as serviceable as that purchased from the cabinet-maker and upholsterer, and may be made at a cost quite insignificant as compared with the other. In the matter of appearance, there is a cosy-home like look about these home-made articles, that is much more in keeping with the surroundings of those in moderate circumstances, than any showily upholstered work of the shops. Those of our readers who find themselves, as many of them do, at a distance from cities, can, by the exercise of a little mechanical tact, provide themselves with articles of use and comfort, which they could not otherwise obtain. A barrel, and a few pieces of lumber, will furnish the materials for the frame-work of the table. The heads of the barrel answer for the base and the cover; these being in two or three pieces, are fastened together by two strips nailed on in the manner of cleats. To the centre of one of these fasten an upright standard of a convenient height, as in Fig. 1; this may be done by putting several strong nails through the base, and it would add greatly to its strength to place two of four short braces between the base and the standard; these are not shown in the engraving. The strongest and best hoop of the barrel is selected, and four braces, of staves split in halves, or other material, are attached at half way up the standard, one end of each being firmly nailed to the standard, and the other end to the hoop. The frame being finished, as in figure 1, it is also to be covered with such material as may be desired, or may be at hand. Glazed cambric of some bright colour, covered with Swiss muslin, laid on in plaits, makes a very pretty covering; but the matter of covering is one that admits of a wide variety, and most housekeepers will be inclined to utilize some material at hand. The covering should be put on with small tacks, and left full enough to allow of its being gathered in at the middle, by means of a cord or band, as in figure 2. The second barrel-head is to be covered on both sides with the material, and may be fastened by a hinge to one of the braces, or left loose. A ruffle or a plaited strip should be put around the cover, and around the top and bottom, to hide the edges of the covering material, and give a finish to the whole. If the covering is not sewed together, but the edges merely lapped over where they meet, the lower part of the table may be used to hold slippers or other articles, which may be put in through the opening thus left. If desired, the table may have casters attached to the bottom. The upper half may be fitted up to suit the convenience. A single shallow bag of strong material, with an opening to allow the standard to pass through, may be tacked to the hoop, and form one large receptacle, or it may be divided into several compartments. The underside of the cover may be furnished with several pockets to hold articles, and its capacity as a work-stand may be still more enlarged by attaching a row of small pockets around the upper edge of the stand, to hold spools and other materials.—*American Agriculturist.*

COUNTRY HOUSES.

COTTAGE IN THE QUEEN ANNE STYLE.

A PICTURESQUE GABLE.



TIMBER AND TILE COTTAGE.

SMALL COTTAGE, OR LODGE.

EXAMPLES OF COTTAGE ARCHITECTURE.

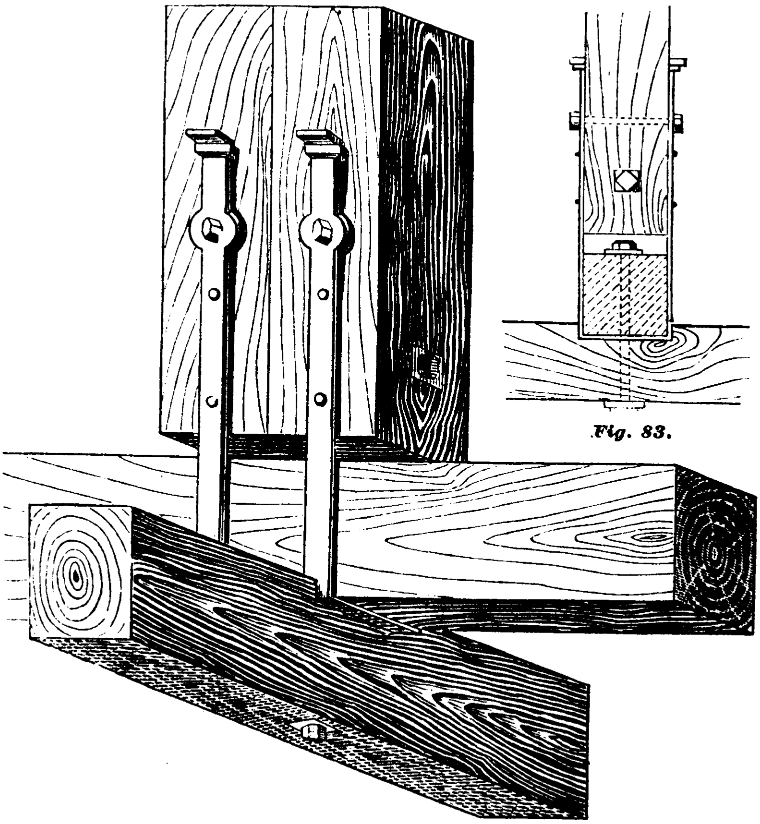


Fig. 82.

Fig. 83.

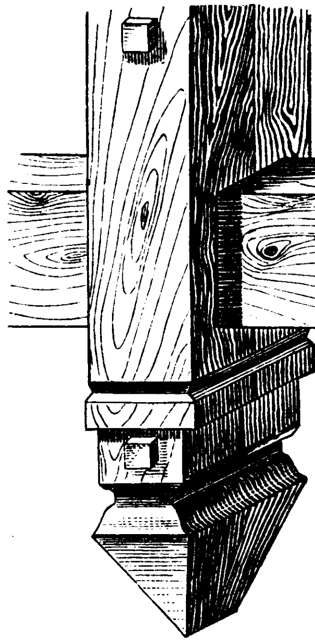


Fig. 84.

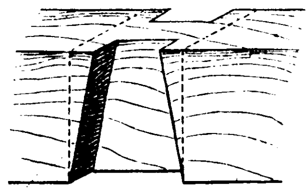


Fig. 85.

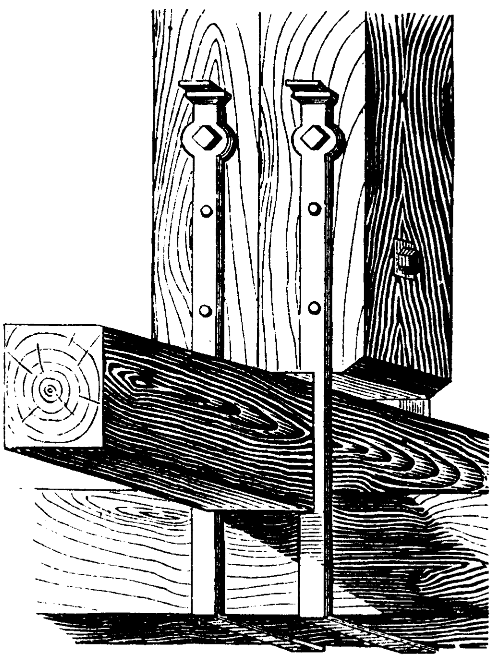


Fig. 81.

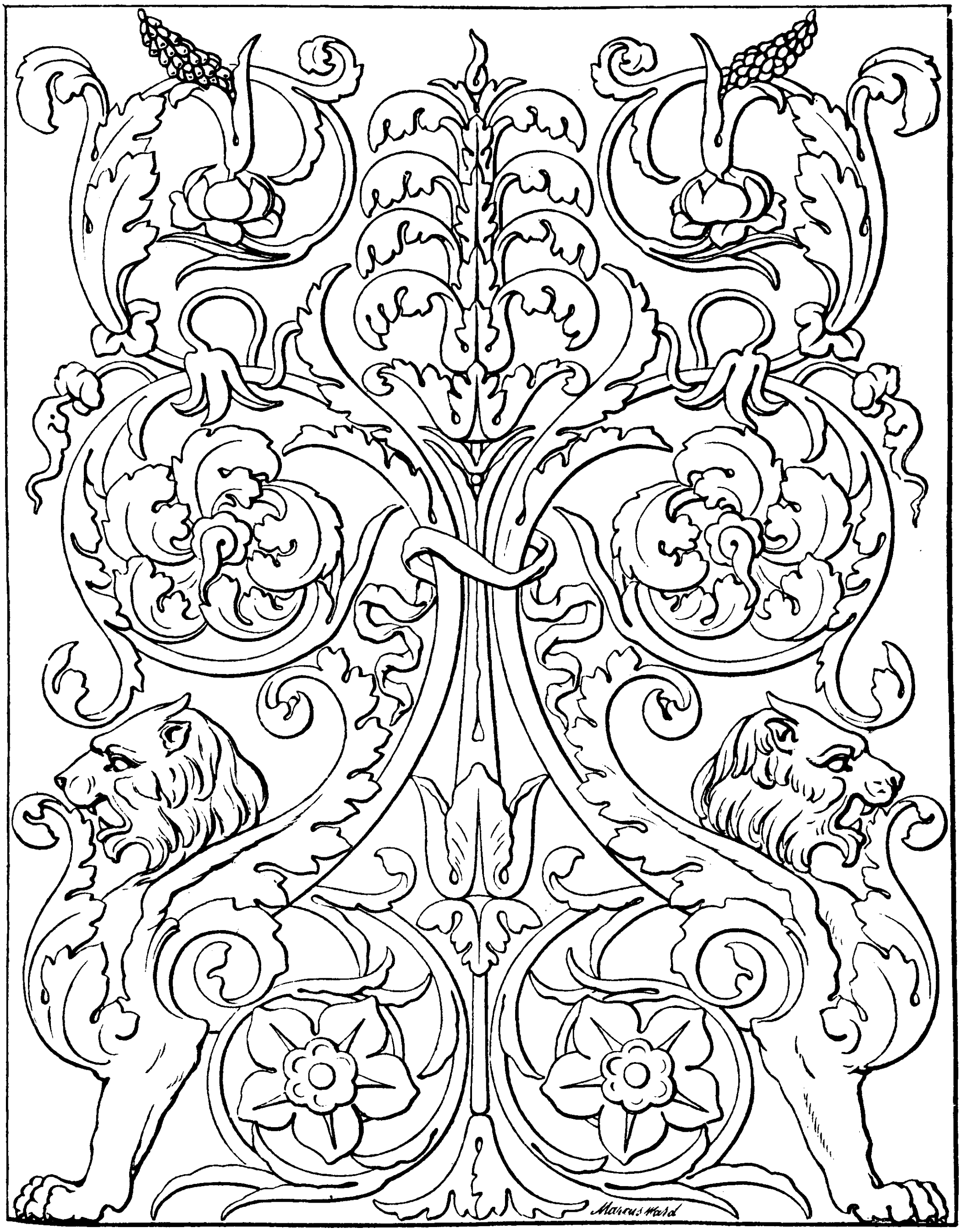
CONSTRUCTIVE CARPENTRY.

Figs. 81 and 82 represent two different arrangements for supporting the middle part of crossing beams from above, the choice of which depends on the circumstances under which they are to be constructed. In Fig. 81 the lower cross beam is supported by two iron stirrups, and the upper one lays on it; in Fig. 82 the upper one is thus supported, and the lower one hangs on the same, as seen in Fig. 83 in section. The latter arrangement is not to be recommended when the lower beam has much of a load to bear; Fig. 81 is preferable. In both arrangements the upper beam may simply lie on the lower one, or may be mortised, which however must only be done to a small extent, so as not to weaken the beams too much. In Fig. 84 a somewhat antique looking ornamental arrangement is represented, which may be used when there is plenty of room below the horizontal beam. The vertical hanging beam consists of two beams, joined by the screw-bolts seen at the sides above and below the cross beam, which is grasped by them being cut out to receive it; or, in order not to weaken the vertical beam too much the cutting out is partially made in the horizontal beam, as shown in Fig. 85.

TAKING COLD.—The human frame was intended for activity, but it must be managed. A locomotive can run very fast, but if stopped instantaneously, when going at a high rate of speed, it is injured; so a skilful engineer tones down his speed gradually. In this lies the whole secret of not taking cold. After walking, or running, or dancing, or any exercise that quickens the circulation, a little current of air from a window, a crevice from an open door, for a few minutes, just to cause a chill, is sure to produce cold. Merely stopping on the street in a current of air will do the job. After exercise always seek rest in a sheltered place, where you will be warm, never being hasty to remove hat, gloves, or cap. Let perspiration subside before disrobing if in-doors, and if out-doors always keep gently moving until the usual condition is attained.

THE average life of a rail is 13 years.

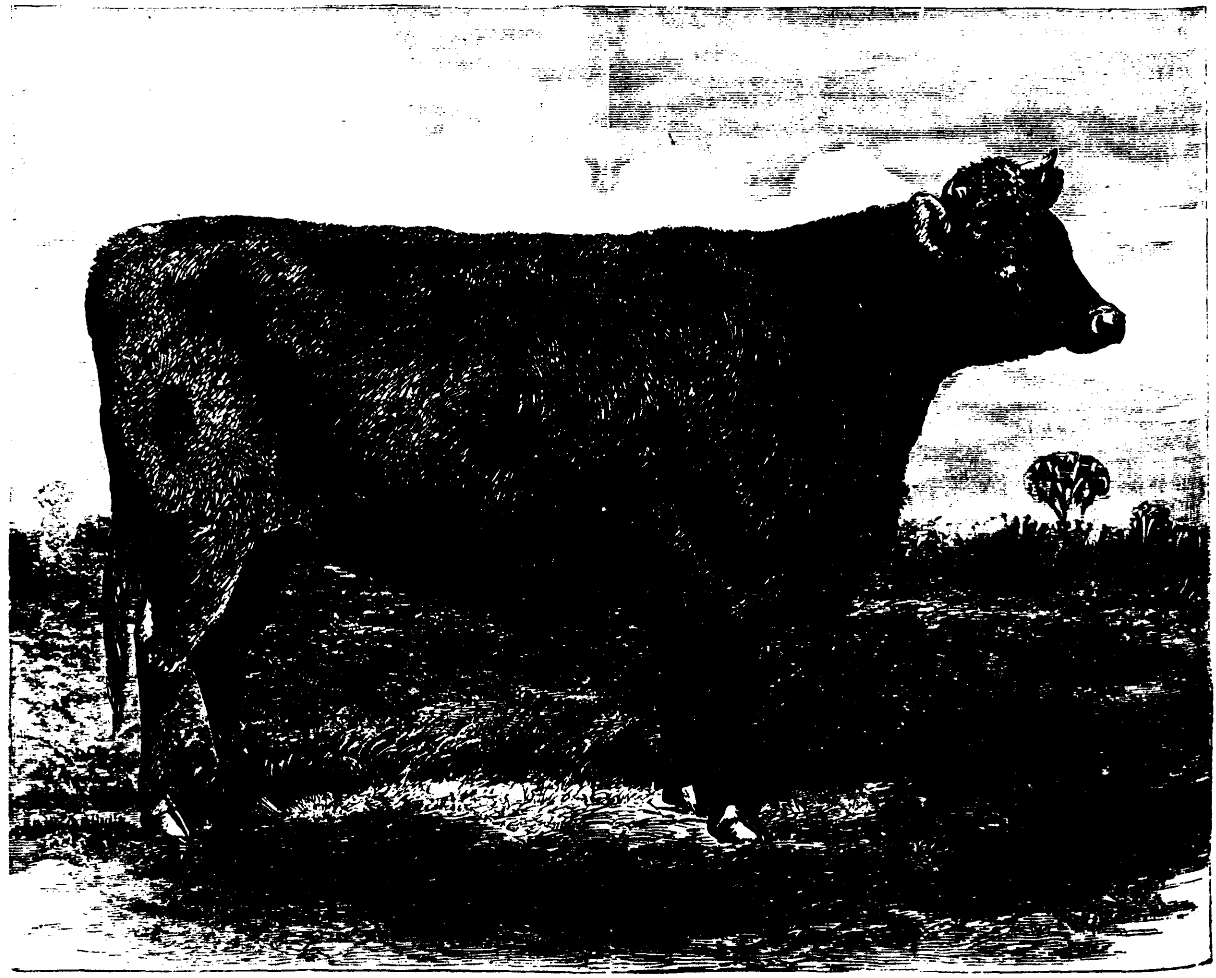
THE renewal of rails in 1877 was 7·7 per cent.



CARVED PANEL. FROM DOOR IN THE LOGGIE OF THE VATICAN, ROME.

The Duchess of Hillhurst 3rd.

Another notable Duchess has made her mark in the world ; and it is one of American lineage and birth. This is Duchess of Hillhurst 3rd, a Shorthorn heifer owned by Mr. Loder, of England, but bred by Mr. Cochrane, of Hillhurst, Canada, and purchased by her present owner at a recent sale of imported stock in England, for 4,100 guineas, or $21.525—a remarkable price for so young an animal, scarcely more than a calf. It is possible that she, as an article of merchandise, is worth all she brought. Breeding animals are not to be justly valued by the price of beef or of milk, and if one of her progeny should turn out to be as valuable a breeder as one of her related race, the Duke of Airdrie, which has the deserved reputation of being the parent of more valuable animals than any other bull, and by far the best Shorthorn bull ever seen in America, the price may well be considered as moderate, even in these depressed times. This animal has been universally accepted as a model Shorthorn, and certainly no one can refuse to admit, at first sight, that she possesses, in perfection, all the beauties of this fine race. Her form and features are perfect, and are admirably represented in the colored print from which the engraving was made. This print is given in an extra sheet by the "London Agricultural Gazette," a journal which has done good service to the Shorthorn interest, in steadily opposing the delusive style of picturing animals, which has, unfortunately, become so popular, both in this country and in England. While our engraving can not give the color of the animal—a rich red—the outline is a tracing of the original, and represents the form of the heifer with exactness. The sire of the heifer is Duke of Hillhurst 2nd, a descendant of the Hillhurst herd, owned by Mr. Cochrane of Canada. The branch of the Duchess family, to which this animal belongs, is much more vigorous and productive than the pure Duchesses, and is, in fact, the only offshoot of the family which continues to increase in number. Unfortunately this Airdrie branch has been almost entirely lopped off from this side of the Atlantic, so that but one pure descendant of this important family, and that as yet unproductive, remains in America.



SHORTHORN HEIFER, DUCHESS OF HILLHURST, 3RD.

The Exportation of Horses.

Several hundred head of horses were sent to Europe last year, and recently a number were shipped through the agency of Mr. Stoddard, of 626 Greenwich St., New York. This, we believe, is the first shipment from New York, and is the beginning of an important business which must grow to large proportions in the course of time. We have a class of horses that are admirably fitted for cavalry purposes, and for road uses. For this we have to thank the breeders of trotting horses, who have, during many years of careful improvement and training, supplied the country with a most useful class of animals. The racing horses of Europe can not compete with our trotters, either for the road or for the purposes of war, and now that the value of our horses has been discovered, we look for a permanent market for them in Europe. The frequent European wars call for a large supply of horses, to be kept on hand even in times of peace, and in war the consumption is very great. Every few years, European journals are alarmed at the scarcity of horses, and just now the English people are anxiously asking where a supply could be procured for their cavalry, in case of war. In this event there would certainly be a demand for our animals, larger than we could supply, and in any case it is probable that all of our surplus stock will find ready and profitable sale in foreign countries.

In view of these circumstances, it would be well for us to consider how we can improve our stock, so that farmers may be able to take a share of this business. It has been too frequently the case that farmers have not only begrudged the cost of the services of a good sire, but they have also reserved for breeding only the poorest of their mares, lest the better ones might be forced to lose a few weeks work in the spring. Spavined, wind-broken, worn-out mares, have been used for breeding, until a vast number of horses are constitutionally prone to disease, and are of little value from their birth. It costs no more to raise a good colt than a poor one, and if farmers would keep a good brood mare or two, and would secure good sires, a mare might be made as profitable in her increase as two good dairy cows, without considering the value of her work, which, at the least, will pay for her feed. It is an established fact, although it may seem at first sight to be an anomalous one, that the more we substitute railroads and steam-engines for horse-power, the greater demand we create for the services of horses. Horse-power is, after all, only a feeder for steam-power, and the more steam-power we use, the more horse-power we shall need to supply it.