CANADIAN MECHANICS MAGAZINE AND PATENT OFFICE RECORD

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THE RESPONSIBILITIES AND DUTIES OF ARCHITECTS.

OUR remarks are intended to apply particularly to those members of the profession practising in the Province of Quebec, whose responsibilities and privileges are controled and governed, to a great extent, by the old French laws of this Province. As a general thing, the duties of architects in Canada are very imperfectly understood by their clients; in fact, many architects themselves find it a difficult matter to keep on the right side of the line in their profession without deviating into that of a clerk or foreman of works, so indistinctly is it defined or understood. We should, in the present day, in a large city like Montreal, be surprised to find a practising physician vending his own medicines and doing the duty of a physician and chemist together; or to see an advocate, also, performing the duties of a bailiff; and therefore if architects desire, as a body, to uphold the dignity and importance of their profession, they should refrain from exercising those duties which appertain to a clerk or foreman of works. Unfortunately so little unanimity exists among themselves as Art members of a high profession, and so conflicting are their opinions as to the proper line of their duties—constrained as they are by an old French law which long since ought to have been expunged from the Code—that we regret to think all are not actuated by that high spirit of excellence and ambition which impels onward their brethren on the other side of the Atlantic. Each member here seems to work according to his own ideas, independent of any of those fixed rules of professional etiquette and government, which are necessary to form a standard for their profession. In fact, it is the only profession in Canada whose members are not recognized in law by a Charter defining their proper rights and privileges.

When an architect deviates from the proper line of his profession and assumes also that of a clerk of works, he, to a great extent, lowers his professional standing; and when he mingles himself up with business transactions between his client and those employed to execute the work, he no longer remains a disinterested adviser, and becomes suspected by both parties; so whilst, on the one hand, the client thinks him too lenient towards the builders and conniving at imperfect workmanship and materials, on the other hand, if he acts as agent to his client, and bound to stand by his interests, whether just or otherwise, he lays himself open to suspicion, and every unprincipled workman thinks him fair game to dupe and over-reach all he can. The want of a general accepted principle among architects is the reason why many clients expect more from them than they have a right to expect, or they to perform, and until the profession becomes more united in action with respect to their proper line of duties, responsibilities and privileges, so long will they be tossed about by the whims and varying fancies of the public, abused for errors, real or supposed, and treated with a general want of confidence.

The duties of an architect may be described as the artistic and constructive adviser of his employer, to prepare the plans and specification, and to see that the work is executed in accordance with his design and in strict conformity with the specification. Nothing can be more prejudicial to the profession than the accepting of any principle that lays an architect open to suspicion, and nothing but a rigid stand on the honor of the profession, by all its members, will ultimately remove the feeling on the part of a client that architects, as a rule, are too lenient towards builders and perform their duties too laxly. It is a mistaken idea of the public that because an architect is paid by his employer to design a house and superintend its construction, that he is, on account of alterations in the plans, &c., to endeavour to exact from the builder more than he is justly bound to perform; it is his duty to be as honorable in his dealings towards the builder as to the client who employs him. It is his duty to see that the work is executed in strict accordance with the spirit of the plans and specifications, and not to deviate one iota from the original, unless by the express order of his client.

When an employer seeks the aid of an architect, his ideas are generally undeveloped; he has an undefined and misty perception of the style of building he wishes to have erected, but is seldom able to place them in that practical shape before the architect that they can at once be seen and put in execution. He therefore asks his advice as to the best means of obtaining the execution of his wishes.

The first duty of an architect then is to ascertain with great care and minuteness the views of his client; who in many of them may be mistaken from a want of technical knowledge, and it is his duty therefore to set him right. He should not take it for granted that because he can flippantly describe all the different arrangements of a building, both without and within, and to which his client in a sort of mystified manner will acquiesce, that he really does understand it; he should therefore take great pains to explain every part of the edifice and all the advantages of such and such alterations, and the disadvantages of his client's views, until he feels perfectly satisfied that he has, by patient investigation and tentative suggestions upon what his client's views are based, designed a building such as his employer desired to have, but which, from want of technical knowledge, he was unable to explain. Every attention should be paid to the object the promoter has in view, and the architect should divest himself of all preconceived ideas. It is his duty to follow out the suggestions and wishes of his client as far aspossible, and give the best effect to his views; in so doing, he generally will succeed, not only in embodying the desires of his client, but been abled to carry out his own taste in the general character of the design.

It is very possible, in fact it frequently happens, that the views of his employer are contrary to all good taste and rules of architecture; but he has no right to insist upon their abandonment. We see many buildings daily, in which some peculiar taste of an architect is stamped upon every feature of the edifices he erects. Thousands of buildings erected thirty years ago, and thought at the time as buildings of superior and tasteful design, are now only a matter of ridicule; therefore, in a case where a client insists, against the judgment of his architect, to have such a facade or construction of his building that would be an outrage to his better taste and an injury to him professionally, it would be better, more discreet, and show a nobler spirit, to suggest that his client should seek the assistance of some one more likely to comply with his wishes, than to force a work upon him that will always be a source of vexation and annoyance.

It is a difficult task, no doubt, for a young architect, desiring to make his mark in the early days of his practice, to make up his mind to refuse a wealthy client, on the score of taste and design; but if all members were embued with the feeling that they represented an honorable profession and bound to maintain a high standard of honour in all their transactions, and would do nothing derogatory to its dignity, clients would learn to respect them more, and yield up more readily their own crude views. But here a word of caution may well be added against our own prejudiced ideas and taste. Many men are naturally gifted with a taste for the beautiful, although not architects by profession, and their suggestions should meet with respectful attention and be assisted by the experience and judgment of the architect in bringing them into harmony and form.

The next duty of an architect, after clearly ascertaining the wishes of his client, is to bring all his experience and knowledge to bear upon the work, in order that he may advise as to the best means of carrying it out. Not only must he now show that he has endeavoured to grasp the wishes of his client, but he must also be able to suggest the best means to be adopted in executing the work; he must be prepared to show the reasons why certain wishes of his client cannot be carried into effect, without detriment to other portions of the building; and lastly, he must have a sufficient knowledge of building materials and labor, to give an approximate estimate of the cost; excluding nothing therefrom that he knows must come in afterwards as extras, in order that his client may decide, before he has gone too far, upon the advisability of proceeding with or modifying his ideas. To lead a client into the supposition that a building will cost only a certain sum, when the architect knows there are extras that will augment its cost nearly a third more, is a cruel wrong.

An error which many young architects are apt to fall into from the want of that experience which only time and practice can give, is that he is always sanguine he can get work done much cheaper than others, and is timorous in running up a sum sufficiently high to cover all cost, lest his client should abandon his intention. This is a grave error, and is apt to do a young man irreparable injury at the very outset of his practice. But whilst in England a recognized Architectural Surveyor can always afford a check to his calculations, if the client so desires it, in this country, the client has entirely to depend upon the architect for a near approximate estimate of the cost, before proceeding further; therefore it is the duty of the architect to furnish it, when required, at the fullest rates and keep nothing in the background.

These preliminary duties having been performed, the next is to prepare such details and instructions as will enable those employed to execute the works. Now, too great care cannot be taken in the preparation of these details and working plans. We do not live in a country where the carpenter, the stone-cutter and other branches of the building business, are obliged to serve for some years as apprentices, and consequently are well grounded in the details of their respective trades; but we have, in the district of Quebec, a very large number of mechanics who undertake to construct buildings with but a mere superficial knowledge of their business, and who, if left to carry out the working plans of a building, would, from their want of knowledge in their own art, commit no end of mistakes to the great annoyance of the client and his architect, and in many cases endeavour to throw the faults arising from their own want of skill and knowledge upon the architect.

There can be no question that the duties of an architect in superintending the execution of works, is one of great responsibility; and here it is that the French law, which holds the builder and architect equally responsible for any failure in the work, is frequently the cause of much trouble and litigation; but still even under these adverse circumstances, if architects, as a rule, asserted an independent spirit, and refused to proceed with any work in which the client or builder (the former too frequently being clandestinely actuated by the latter) attempted to deviate from the plans and specifications after they had been duly signed, insisted upon submitting all disputed points to the arbitration of two or three architects and builders of the highest standing in the place, whose decision should be considered binding, the onus would be taken off his shoulders. There is, however, on the other hand some cases we fear where great laxity and want of carefulness is often shown, and it is to be feared that it arises partially from a want of practical knowledge on the part of the architect, and from an imperfect education on practical subjects.

Young men wishing to become members of the profession should be duly articled and pass an examination under a Board of Examiners authorized by an act of Parliament, the same as for Provincial Land Surveyors. It would be the duty of that Board, from the status of its members, to give to young architects such evidence of their ability by their diplomas and by the strict examination they would have to undergo—both theoretical and practical—as to enable the public to know that they were incurring no risk in employing any one in the capacity of an architect who did possess the necessary qualifications; and it is a matter that should be taken up by the whole profession, for this is one of the reasons why the public employ so many builders to erect for them buildings without calling for the services of an architect. Now, there should be a statute law prohibiting any builder practising in the double capacity of architect and builder; he ought to have no more right to take upon himself the duties of an architect, than an advocate should have to perform the duties of a notary public. The architectural profession stands high on the list, and its members should staunchly combine to maintain its position and their privileges. But the dignity of the profession must of course be upheld by a careful study and preparation for its duties, and a strong determination to withstand any attempt at lowering its standard. The public must have confidence and reliance on the part of him whom he employs, and as a rule submit to his opinions on all subjects connected with his art. The feeling that often exists in the minds of clients, that an architect is in league with the builder, would cease to exist, were there an unanimous desire on the part of its members to raise and maintain their position to the highest possible standard.

In concluding these remarks, it may be well to observe that, although the strictest surveillance over the execution of the work, while in progress, is requisite on the architect's part, the public are not to expect that he can give the whole of his time to the superintendence of a building. This, however, is an error that many clients fall into. Another error also of the public, is that an architect is responsible for the delays and faults of the builder, when perhaps the contractor, on account of his tender being the lowest, has been accepted by the client in opposition to any caution given by the architect as to his unfitness. One or two visits a day is all that is sufficient to be made where an honorable builder is employed, who thoroughly understands his business; in the present unstable condition of the profession, it is not to be wondered at that often the architect, best qualified for his duties, is compelled to submit to treatment ungenerous and disgraceful, brought on by the contempt felt by the public for members of the profession, who have either grossly neglected their duties or have not upheld its dignity.

We have to acknowledge our indebtedness to many excellent articles in the *London Builder* on this subject, from members of the highest standing in the profession. We will continue the subject, in our next, on the advantages of introducing into practice properly recognized Architectural Surveyors, Valuators, Clerks and Foremen of Works.

ALLEN'S FRACTURE BED.

We ilustrate on page 132 a surgical bedstead, the invention of Oliver Allen, of Petaluma, which is constructed in such a manner as to be of great assistance to both the surgeon and the patient in cases of fractured limbs, and which has many new features to recommend it. We examined carefully last week one of these beds in the surgical ward at the City and County hospital, and although a detailed description of it may make it appear a complicated affair, a little study of its construction from the engraving presented will show that its general features are quite simple. Upon it fractures can be cured without shortening of the limb, while the patient is kept comparatively comfortable and all his wants supplied without disturbing his position. A fractured leg or thigh, especially if it be compound, is surely a matter of too much importance to both surgeon and patient to submit it to packing in a hot fracture box, or lashing it to a strip of board with the padding necessary to make it endurable, and which for the purpose of inspection, requires such manipulation that the fractured bone will be jostled about, and any efforts at reparation thus interfered with. The ability to examine any part of the injured limb at any time without its disturbance, and without interfering with the extension, is certainly very important, and perfect control of the positions of the foot is equally desirable, both of which are secured in this appliance.

It is certain, moreover, that the surgeon must have both limbs extended alike, and have a more accurate method of measuring than the old one before he can be certain he is not deceiving himself in measurement. It is stated that the difference in length between a limb in its extended and unextended condition is about half an inch—sometimes more, sometimes less—as any one can easily convince himself. It is at least probable that this error in measurement, and the heretofore imperfect manner of measurement, are the two principal reasons of surgical authorities teaching that "in spite of our best efforts there always will be some shortening," and "if a case results in but half an inch shortening, it is a good cure."

The "fracture bed" and its appliances compose an apparatus which is the result on the part of the inventor of an effort to make something durable, convenient and satisfactory to both patient and surgeon, and in which any forms of fracture in either limb or limbs of any length, a perfect tension may be kept up with little discomfort, a perfect dressing may be quickly effected, and in which after dressings require no removing of appliances, or the least disturbance of the fractured parts. These results are practically attained; in addition to which the surgeon cannot fail to feel perfectly secure and the patient comparatively comfortable. The apparatus is really simple and is adapted to many purposes by purely mechanical arrangement.

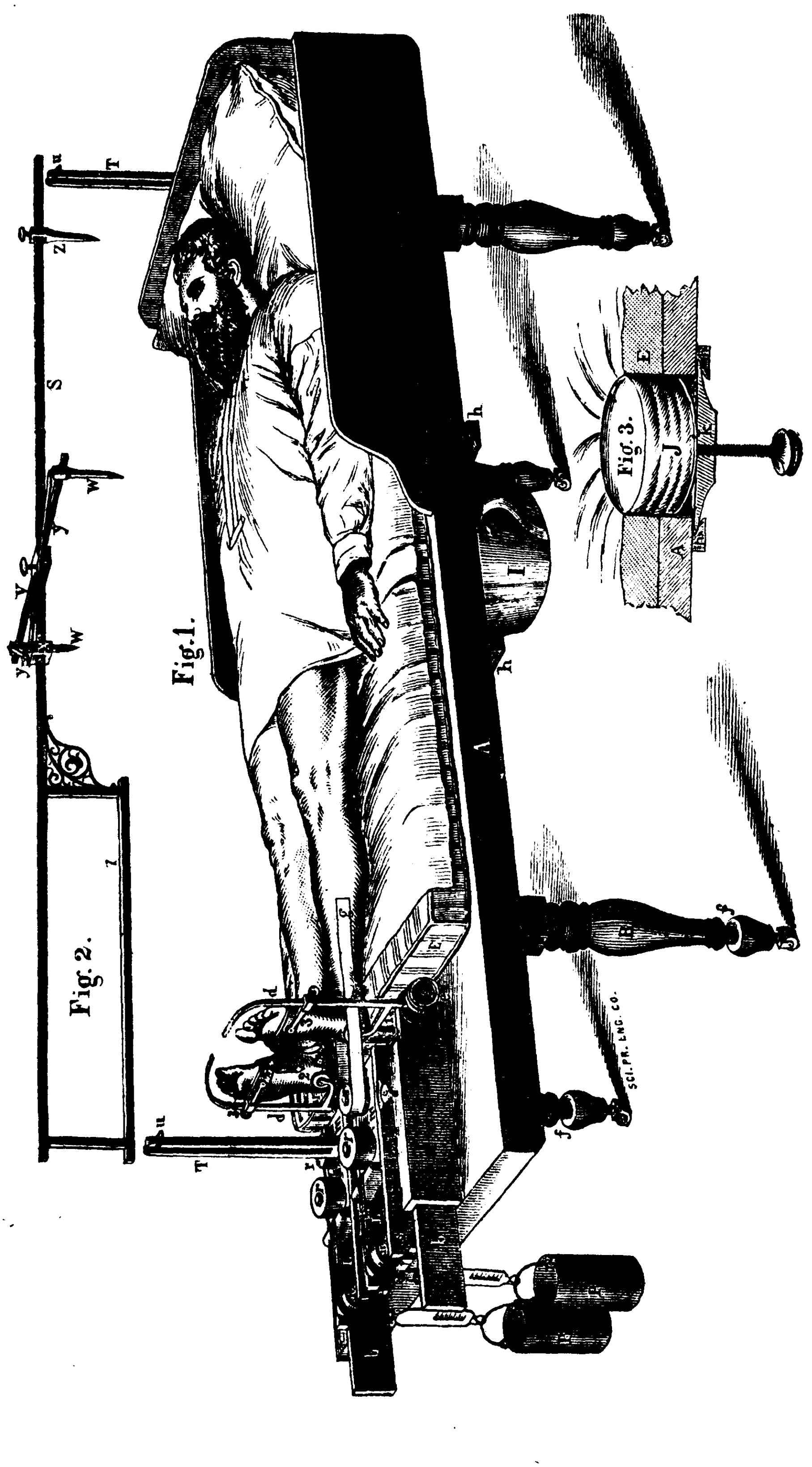
The bedstead itself is provided with all the necessary appliances and conveniences for reducing and curing fractures of those bones in the human anatomy which require extension in order to keep the fractured parts in apposition while union is taking place.

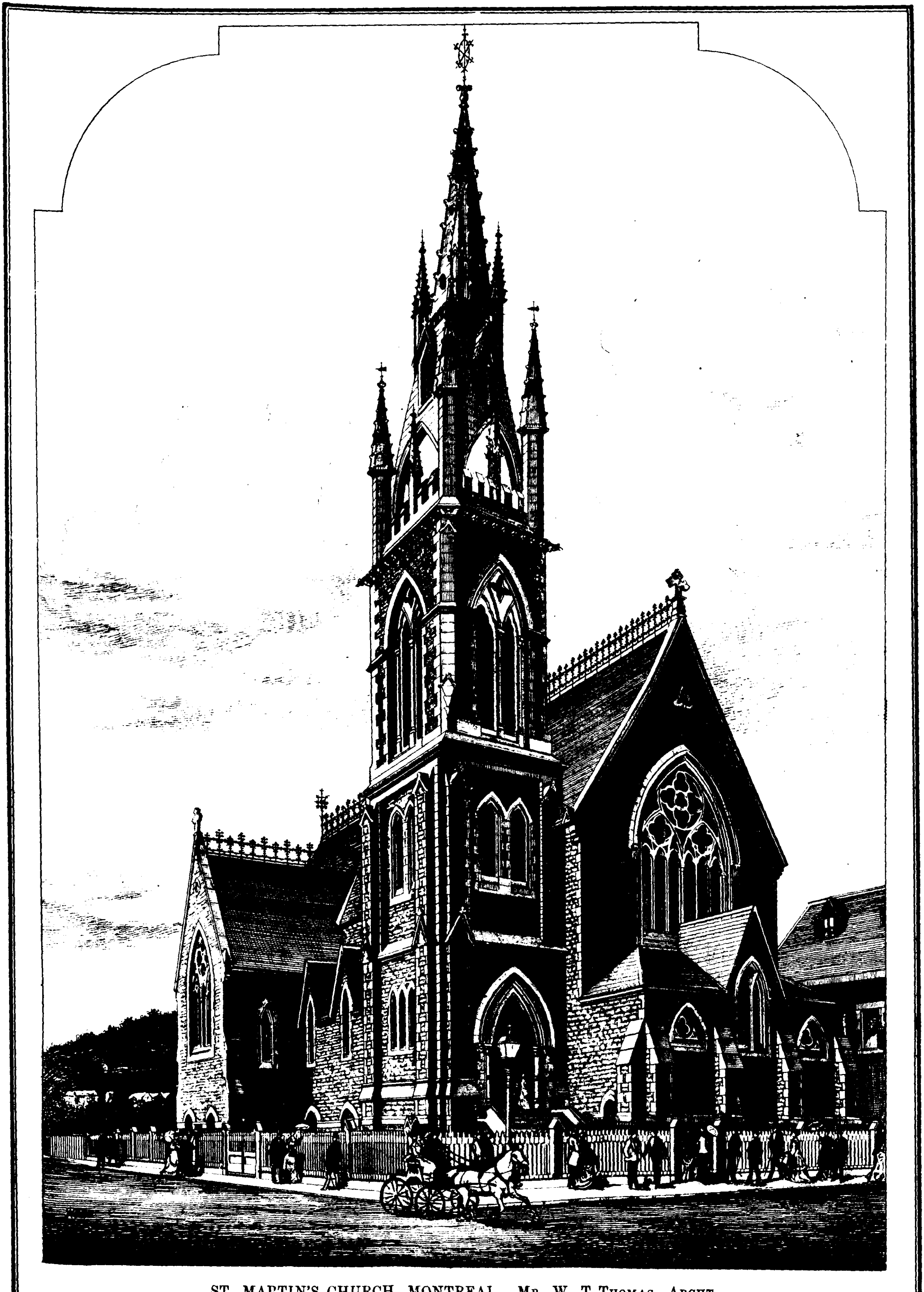
In the engravings, *A* represents the bed bottom, which the inventor makes solid, as a board bottom is best adapted to the various devices which are to be attached to it. The bed frame or bottom is supported on legs which are arranged so as to be removed if desirable. The removable head-board is secured to one end of the bed by screws and is supported by side brackets. In order to provide for the evacuations of the patient, a hole is made through the bed bottom at the proper place and a corresponding hole through the mattrass and sheet, as shown in the sectional cut. The hole is lined with metal, and the lining projects upward above the level of the bed bottom, so as to form an upward projecting flange which entirely surrounds the hole. The hole in the mattrass is also lined with sheet metal, and this lining projects downward on the under side of the mattrass, so as to pass inside of the lining of the hole in the bed bottom, thus forming a perfectly water tight passage through the mattrass and the bed bottom. The metal lining of the hole in the mattrass is screwed to the top of the mattrass around the edge of the hole by a horizontal flange, and this flange is upholstered so that it will form a soft cushion.

A space is also left around the metal lining of the mattrass, so that when the mattrass is pressed down, the upward projecting flange of the hole in the bed bottom will enter the space and allow the mattrass to be compressed.

Underneath the bed are secured two transverse rails, *h, h*, one on each side of the hole. The inner edges of these rails are grooved so as to receive the opposite flanges of a pan or chamber vessel, *I*, and allow the vessel to be moved along underneath the bed until directly under the hole. When the vessel is not in use, an

ALLEN'S FRACTURE BED.





ST. MARTIN'S CHURCH, MONTREAL.—MR. W. T THOMAS, ARCHT.

upholstered plug, *J*, for filling the hole is employed. This plug is long enough to be passed up into the hole from beneath the bed, *A*, and extend to the upper part of the mattrass, *E*, and make an even surface. To the lower end of the plug is secured on a strong screw rod a horizontal bar, *k*, which can be turned after the plug is introduced so as to lock the opposite ends into the grooves in the rails *h*, *h*, and thus secure the plug in place. By turning the screw rod shown, the plug can be properly regulated in case any depression occurs from the weight of the patient's body.

To the foot of the bed is secured by means of screws two parallel boxes, *L L*, so that their rear ends will project beyond the foot of the bed. Each of these boxes has a sliding top, *m*, and a roller, *n*, is placed across the rear end of each, its journals bearing in the opposite sides of the box. A strap, *o*, has one end secured to the rear end of each sliding cover and passes over the roller, while a tin bucket, *P*, is attached to a spring balance on the opposite or hanging end of the strap. Upon each sliding top, *m*, are placed two studs, *r r*, one directly in advance of the other. For convenience a roller is placed on each stud, the roller of the front stud, *r*, being smaller than the one in the rear stud, *r*, for the purpose hereinafter explained.

When the patient is placed upon the bed, the first thing to do is to place him or her in the proper position, and by extending the well limb, determine accurately the amount of extension to be applied to the fractured one. This is necessary, as hereafter explained, otherwise the fractured limb is liable to be too short when the fracture heals.

In order to adjust the patient properly for the purpose of obtaining a correct extension, the inventor uses a measuring bar, *S*, (Fig. 2), which is supported at each end by a standard, *T*, at the middle of each end of the bed, so that the bar, *S*, will pass longitudinally above the middle of the bed and the patient. The standards, *T*, are made of two parallel pieces of wood, between which the ends of the bar, *S*, are placed and adjusted to any desired height. A link, *u*, at the top of the standard, is then used to draw the two parts together to keep the bar in place. Upon the bar, *S*, is placed a transverse sliding bar, *V*, the arms of which project upon each side of the bar, *S*. A set screw to fix this transverse bar in place.

Upon each arm of this bar, *V*, is placed a downward projecting sliding finger, *W*, and these sliding fingers are connected with a sliding block, *X*, by links, *Y*, so that by moving the block, *X*, back or forth along the bar, the fingers, *W*, will be moved toward or from each other along the arms of the bar, *S*; a sliding finger, *Z*, is also placed upon the bar, *S*, at the head of the bed. When the patient is placed in the bed, the finger, *Z*, is moved against the top of his head, and secured in place by a set screw. The transverse sliding bar, *V*, is then moved opposite his shoulders, and his body adjusted until the fingers, *W*, press equally upon both shoulders. The same operation is repeated with the hips, thus bringing the body of the patient in a perfectly straight line.

At the foot of the bed, bars, *b b*, are arranged to slide horizontally in a socket formed between two of the boxes, *L L*, one upon each side of the bar, *T*. To the outer end of these sliding bars is secured, by a bolt, an upright bar, *d*, the upper end of which is curved over toward the middle of the bed, so as to provide a fender, which will prevent the weight of the bed clothes from falling upon the feet of the patient. Near the lower end of this bar is a horizontal arm, 1, which projects toward the middle of the bed, and upon the extremity of this arm is formed a heel pad, 2, as shown. A sliding arm, 3, is arranged to move up and down along the bar, *d*, between the arm, *i*, and the upper curved end of the bar, *d*, and to the outer end of this arm is fixed a swivel block, 4, to which a toe strap is secured. This arm can be fixed at the desired position by a set screw, *e*.

When the body of the patient has been adjusted in the bed, the sliding bar, *b*, is drawn out until the heel of the foot rests against the heel pad. The sliding arm, 3, is then moved to the proper place, to allow the ball of the toe to rest upon the block, 4, and the strap is drawn around the foot and buckled, thus keeping the foot in proper position to prevent eversion without any rigid fastenings. The bar, *b*, will slide easily into its socket, in line with the leg of the patient, so that it can be moved longitudinally, but be prevented from moving laterally.

At the foot end of the measuring bar is constructed a drop bar, 7, which is parallel with the bar *S*, and attached rigidly to it at each end. The drop bar will come midway between the feet of the patient. A try-square is then used for determining whether the feet are in proper position or not, by placing one arm of the square upon the drop bar, 7—first upon one side and then upon the other—so that the opposite arm will stand at right angles to the bar, and thus give the exact measurement.

When the patient has been thus adjusted and his position fixed, if the fracture is of a leg bone, the well leg is attached by means of bandages, with one of the studs, *r*, on the sliding top, *m*, of the box, *L*, which is in line with the foot. Weights of any kind are then placed in the bucket, *P*, of the box, until the leg is extended to its utmost. The square is then employed for the purpose of measuring the extension. The well leg is then released and the fractured limb is connected with the sliding top of its proper box, and the bucket of this box is weighted so as to extend the fractured limb until it is equal in length to the greatest extension of the well limb.

The counter extension is obtained by the foot of the bed being elevated so as to cause the weight of the patient to counterbalance the weight in the bucket. To do this, feet, *f*, are screwed into legs, *B*, of the bed, so that by turning the screws the proper inclination can be given to the bed.

If the bandage on the limb becomes irksome, its position can be shifted by securing a second bandage in another place, and connecting it with the rear stud, *r*, which is made larger than the front one, to permit of the bandage being attached to it without interfering with the front stud. This is a very important point, as when the second bandage is properly adjusted, the first one can be removed, thus changing the location of the bandage to the relief of the patient, but without in the slightest degree disturbing the extension of the limb.

In summing up the special advantages of this apparatus, we can do no better than to quote the words of Dr. G. W. Dutton, of Toniales, who has used it in his practice, and writes a letter to the inventor, from which we make the following extracts: "I have no hesitation in saying that it is the only thing of its kind that has a *perfect* adaptation to the treatment of fracture of the femur, according to the advanced principles which should be applied in the treatment of this lesion. These advanced principles are:

"1st. Extension by weight and pulley; for the reason that the weight is always ready to take advantage of any stretching of the material intervening between the weight and injured limb, and of any relaxation of muscles which may have been in a spasmodic condition at the so-called "setting" of the limb.

"2nd. Counter extension by the weight of the patient's body, applied by means of raising the foot of the bed; for the reason that the continuous use of the "perineal band" (as in the ordinary method of treating these fractures), when tight enough to be of any use, produces pain and excoriation.

"3rd. The extension of the sound limb for a criterion in measurement; for the reason that in making the extension of the broken limb, the ligaments of the knee and hip joints stretch before the muscles, in a spasmodic condition, allowing the broken bone to extend to its proper place; and if the broken limb is drawn out no farther than until it measures exactly what the sound limb does, without extension, there will yet remain a lapping of the fragments of broken bone.

"4th. Measurement with an instrument by which the body of the patient is accurately straightened, and the same point on both sides of the pelvis placed equi-distant from the messial line; for, in measuring with the tape (now the ordinary way), the surgeon guesses at the straightness of the patient's body and the squareness of the pelvis, and he is very likely to be incorrect.

"Your arrangement for supporting the foot, and thereby insome measure preventing eversion, and for sustaining the weight of the clothes, and your arrangement for the evacuation of the bowels without soiling the mattrass, are, it would seem, perfect.

"I also notice with admiration your ingenious method of changing the point of attachment of the extension on the injured limb, by which, during the time of such changing, the steady, even, continuous extension is preserved. This novel device will be of use in every ordinary case, in applying the adhesive strips and bandages.

"The ease with which your bed can be transported, on account of its compactness, and of its fitting inside the carriage box of a spring wagon, is of great advantage."

TO DRILL INTO HARD STEEL.—Make your drill oval in form, instead of the usual pointed shape, and temper as hard as it will bear without breaking; then roughen the surface where you desire to drill with a little diluted muriatic acid, and, instead of oil, use turpentine or kerosene, in which a little gum camphor has been dissolved, with your drill. In operating, keep the pressure on your drill firm and steady; and if the bottom of the hole should chance to become burnished, so that the drill will not act, as sometimes happens, again roughen with diluted acid as before; then clean out the hole carefully, and proceed again.

ST. MARTIN'S CHURCH, MONTREAL.

(See page 133.)

St. Martin's Church was completed in the Fall of 1874. It stands in a part of Montreal's "beautiful situation," and which a few years ago was quite suburban. This neighbourhood is now being rapidly built upon, and opened out into streets and terraces. The growth of the city in this direction has been so decided as to demand the erection of an Episcopalian Church. To meet this want, St. Martin's was built. It is capable of sitting 500. It has an elegant rectory house attached, and underneath the church is a lofty and well-lighted basement, divided into class rooms, and where the Sunday School and other congregational meetings are held. The whole is well equipped to do its good work in this growing neighbourhood. The parish assigned to the new church of St. Martin's extends from Sherbrooke street to the city limits on the north, and from Durocher street to St. Lawrence Main street. The church stands well nigh in the middle of the parish, and is sufficiently removed from any other Anglican church to show its necessity at once to the eye of the beholder looking down on the parish from the neighbouring mountain. The Rev. J. Philip Du Moulin, M. A., one of the Bishop's chaplains, was chosen as its first Rector. The Church-wardens are C. J. Brydges and John Molson, Esqrs. The organist s M. Herbert Oldham. Mr. W. T. Thomas, architect.

SANITARY ARCHITECTURE AND ITS APPLIANCES.

Since commencing this series of articles on the above subject, we have received several communications from correspondents on the importance of the ventilation of sewers, but which our space will not admit of publishing *in extenso*. We will, however, treat of the views furnished and plans suggested 'ere we close the subject, but take advantage of the present time to tender, our best thanks for all contributions, none of which but contain some useful hints. Mr. A. W. Clifford, of Kingston, in particular, has furnished some excellent suggestions for which he will receive full credit hereafter. At present, however, we have only space to bring to the notice of our friends and subscribers a drain trap and foul air extractor patented by Mr. Banner, of England. Although there are some excellent points in connection with this method of ventilating and trapping drains, the system is not such, we conceive, as suitable for this climate, nor is it one which from its cost can be brought into general use; however, we consider it our duty to lay it before the public. Mr. Banner speaks very strongly against the D traps, which he says, "from their conformation, are in point of fact miniature cess pools."

The following on the subject is from the London *Builder:*

BANNER'S PATENT DRAIN TRAP AND FOUL AIR EXTRACTOR.

(See page 137.)

C is the inlet of a horizontal tube leading external air to a vertical shaft or shafts, having the cowl on each, fixed above the roof, by the action of which vitiated air will be drawn from any room in the house, and may be regulated as desired by a throttle valve in each room.

D is the inlet of a horizontal tube leading external air into the "contained," or the soil-pipe immediately above the patent drain-trap (B), (seen at the bottom of the diagram in the centre), and thereby causing a constant current of fresh air throughout the whole system of soil-pipes within the house from the inlet (D) to the cowl fixed on the top of the soil-pipe carried above the roof of the house.

E shows the same plan adopted for the sewer, by means of which the present road or street "ventilators," so called, would become inlets, whereby a constant current of fresh air would be created and—accelerated by the action of a cowl mounted on the top of the pipe—would be constantly maintained throughout the sewer and street drains and up the pipes, carried outside each house above the roof.

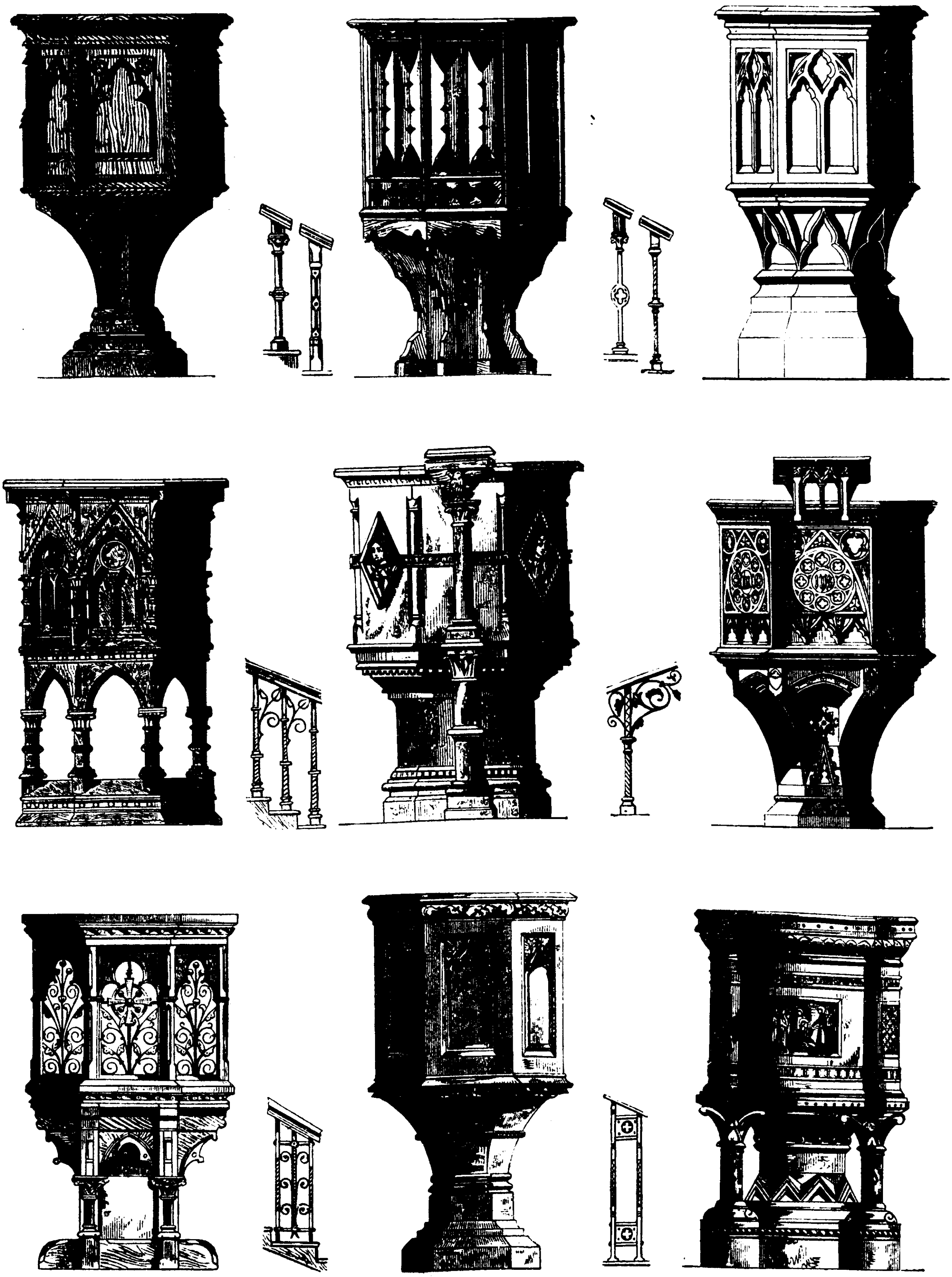
The trap is peculiar. It consists of an air-tight chamber of cast iron (enamelled) or some other material, fitted with an inlet pipe, which projects several inches into its interior; the lower part of this inlet, surrounded by an india-rubber band sprung on, and slightly projecting beyond. The end of the pipe is closed and made air-tight by a copper cup pressed up to it by a suitable weight mounted upon a lever, having its fulcrum on an air-tight centre, and its outer end bent upwards at a right angle. The weight is suspended by a link on the raised end of the lever, and it is so arranged that, when the pan is in the act of tilting, the centre of gravity of the weight is brought nearer to the fulcrum, thus reducing the load, and allowing the pan to remain open till it is thoroughly flushed, yet retaining sufficient power to close the trap again after flushing. A series of holes in the raised end of the lever permit of a proper adjustment of the weight, and the bend in the soil-pipe, just above the trap, breaks the force of the water reaching the latter from above. The lower part of the chamber is formed with sloping sides, terminating in an outlet of communication with the drain. The box, in which the axle is fitted in gun-metal bearings, is air tight. The soil-pipe is 4 in. in diameter inside where it is flanged and fixed to the upper side of the chamber, and tapers to 3 in. diameter inside at its point; 2 in. from its point is another flange to keep the india-rubber band in its place. For practical use, instead of any iron pipe above the chamber, there is a flange only, and then a few inches of leaden pipe, in order that a perfect joint may be formed with the leaden or other soil-pipe to be continued up from it. The cup is made of copper, tinned inside; it is $10\frac{1}{2}$ in. long, 12 in. wide, and from the base or scoop or bottom to the top of the hood or hopper, it is 5 in. deep, except in front, where it is only $4\frac{3}{4}$ in. deep, so that it discharges in front, and any clogging is said to be avoided. When the cup falls and is thoroughly flushed, there is an opening of 3 in. between the lowest point of the india-rubber buffer and the bottom of the cup, and also between the foremost point of the buffer and the inside of the cup in front of it, as well as between the front lip of the cup and the inside of the chamber. The cup, when full, holds five quarts of water with the tube immersed in it; this (or less, according to the "weight" opposed to it on the end of the lever) overbalances the weighted end of the lever. Until the moment when the cup falls the soil is kept in the pipe, while the valve has been sufficiently opened for water to pass into the cup and fill it; but it is not till the cup falls that soil passes into it, and when it does so, the water, nearly a gallon, rushing forward from the heel to the front of the cup (with the addition of a down-flow of water from the closet several feet above), carries all impure matter before it into the sewer; the front of the cup falls $4\frac{1}{2}$ in., and in this way its whole contents are immediately swept away, excepting sufficient clean water retained in the scoop to seal the end of the soil-pipe while flushing. While the cup in the trap is down, there is a water-seal of $\frac{1}{2}$ in., which is increased to 3 in. immediately the cup is brought to its normal position, and further increased by the overflow which the weight on the lever will permanently retain in the pipe, to the extent of 6 in. The efficacy of the trap thus formed cannot be destroyed by either pressure or suction. Besides, the area in the chamber for air being large, the water in the cup in its normal position is 2 in. or 3 in. below the top of the cup, which is open all over; and even if the cup could be unsyphoned, the pressure—the increased pressure—which the weight on the lever will exercise in forcing the bottom of the cup up to the india-rubber, will always keep several inches of water in the soil-pipe, and effectually prevent any gas from the sewer getting up into the house.

In this manner, the patentee maintains, the house will always be effectually trapped against sewer gas; and he is able to dispense with D traps, which, from their conformation, are, in point of fact, miniature cesspools. One of Banner's traps at the basement of the house, which may be placed above the level of the basement, like a gas meter, is considered sufficient for all the closets in a house.

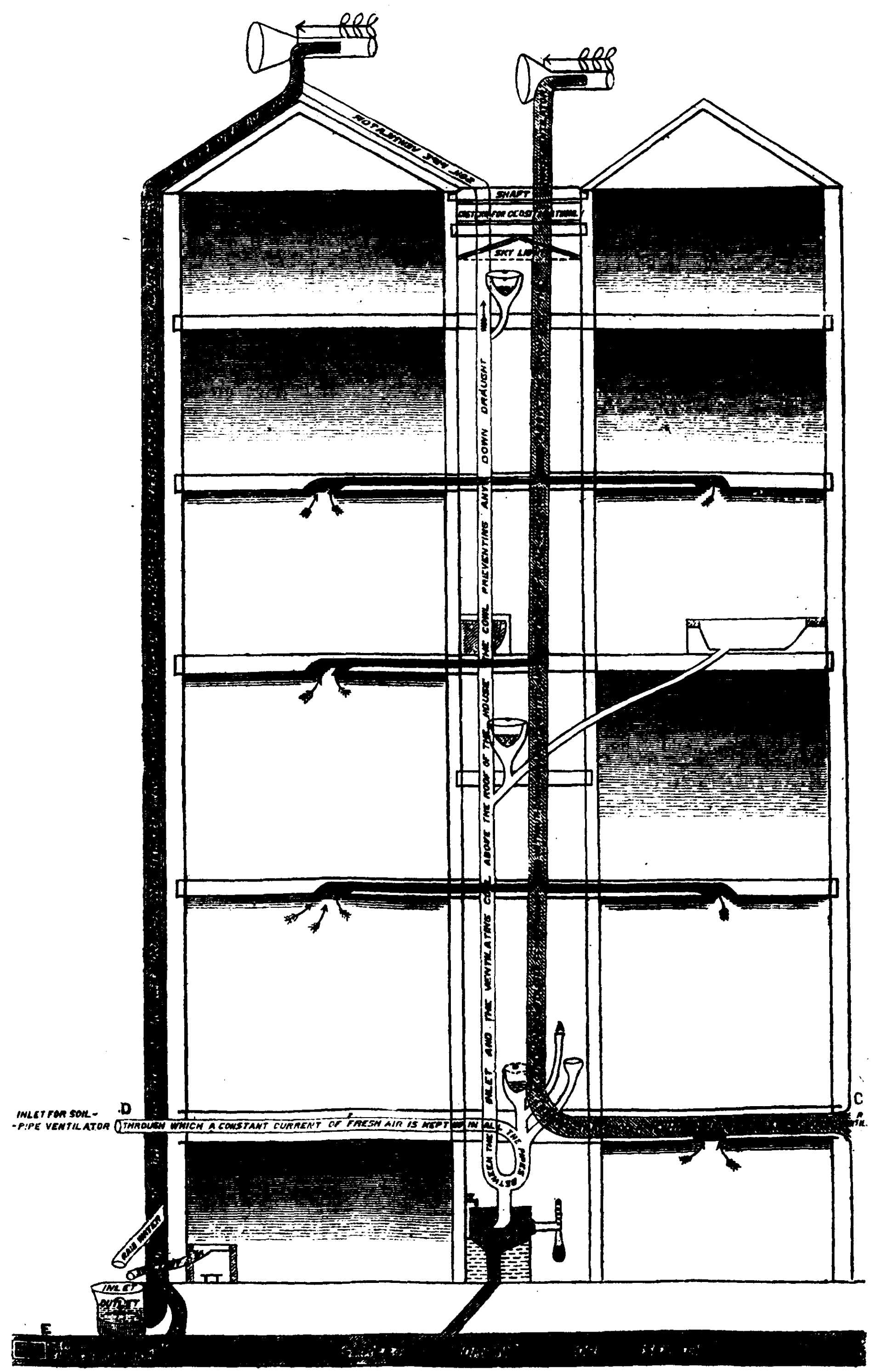
We must not omit to mention another valuable appliance devised by Mr. Banner. Every one knows that ventilating-shafts communicating with the soil-pipes are recommended by leading authorities upon the subject. Although the theory upon which they are constructed is good, they are not always of practical utility. There is a difficulty in getting sewer-gas to ascend a long perpendicular pipe, while in some conditions of the atmosphere there may be a down-draught instead of an upward current; and it is to overcome this that the cowl is introduced. The benefit that would result to the community from their general adoption would probably be great, as each would contribute to the ventilation of the sewers as well as for the pipes of the houses where they were fixed.

A branch pipe, led from outside the house to a little above

CHURCH FURNITURE.—EXAMPLES OF GOTHIC PULPITS.



BANNER'S PATENT TRAP AND FOUL AIR EXTRACTOR.



the trap, is needed, to cause a current of air in, and thus act as a constant ventilator of all the pipes between the trap and the cowl fixed on the soil-pipe carried above the roof of the house. A separate pipe may, if thought desirable, be fixed into the chamber, and taken up above the roof of the house, to ventilate the sewer.

This form of trap would have advantages for low-lying districts, where there is danger, in times of flood or high water, of the drains returning their contents into the basement, as the greater the pressure of the returning sewage matter towards the chamber below the trap, the more tightly is the copper pan closed against the end of the soil-pipe inlet, so that no flood-water, sewage, or sewer gas could be forced past it into the house.

The action of the cowl is as follows ;—The larger end of a funnel-shaped tube (seen in the section), placed horizontally, is always directed towards the wind, and a current of air passing in there is pressed forward through the annular space between the two cylinders, and when it reaches the end of the inner one it expands all round it, and in its passage out at the smaller end of the cowl, a vacuum is created round the point of the inner cylinder, which, by what is vulgarly called suction, draws out its contents into the open air, and thus induces an upward current of air from the shaft or pipe leading from the place to be ventilated. The invention is also adapted for use in churches or schools, where a shaft would not be needed, but merely an opening at the ridge of the roof.

That the cup should be properly fixed in the first instance is of course of the utmost consequence, and good materials for the bearings and the axle are also indispensable. The apparent costliness of the trap in question is met by the statement that one trap will suffice for half-a-dozen water-closets, or indeed for any number, provided the house be not of palatial size, when two or more might be necessary ; and that the cost of D traps and their fixing, and other expensive arrangements as regards the closets themselves, may be safely dispensed with, as an inexpensive common pan-closet answers just as well, so far as security against the sewer is concerned, as the most expensive and elaborate valve-closets. These various arrangements have been in operation for two years in the patentee's house, and, as we are informed, and are prepared to believe, with undeviating good effect.

One lesson which Mr. Banner has learnt, and in his turn teaches the public, namely, that to make a ventilating pipe of constant available air it must be introduced at the bottom, is of itself a boon of value.

PATENT CASK-MAKING MACHINERY.

An invention, the results of which may hereafter have a very serious effect on the skilled labour market in certain departments of trade, was exhibited on Tuesday at the works of Messrs. Ransome and Co., sawmill engineers, King's Road, Chelsea. The invention referred to is a series of improved machines, about a score in number, constructed for making casks for beer and hogsheads for wine. The great merits of Messrs. Ransome's patent are not only an improvement upon former patents which they have pressed into their service, but the combination of their own inventions with those of previous date, and the forming of the whole into one general system. Practical illustration was given that casks for holding liquids of all kinds can be produced entirely without the aid of the skilled cooper at less than half the cost for labour, and when it is stated that one machine alone, worked by a lad, will joint in the most perfect manner six staves in a minute, while another will turn, bevel and oval a head with mathematical accuracy in less than that space of time, the great economy is at once apparent. Apart from the utility of the invention, or combination of inventions, it is a true artistic treat to witness the working of this massive clock-work machinery, and visitors who had the privilege of being present were loud in their admiration of a most interesting and, indeed, educating exhibition. From the delicate handsaw machine, like a bright revolving ribbon of steel, not binding but severing everything which its fine teeth touch, to the circular saw which cuts huge blocks of wood as if they were so much cheese, all was perfect. That this invention will have a great effect upon the skilled labour market is a matter scarcely open to question.—*Iron.*

A NEW FISH.

Mr. J. M. Hutchings, of Yosemite, is reported to have discovered in the head waters of Kern River, 10,500 feet above the sea, a new and beautiful fish, which he names the golden trout. Its color was like that of the gold fish, but richer, and dotted with a black band along its sides.

IRON FRONTS FOR BUILDINGS.

When iron fronts for building were first introduced in America, it was strenuously asserted unsafe. An examination of any of the numerous cast-iron structures which, for a number of years, have been exposed in that country to every change of atmospheric temperature without, and to the heat of steam boilers and furnaces within, will shew everything unchanged. Events have also proven in the cases of burning of storehouses, filled with combustible goods, that cast-iron fronts are absolutely fireproof, and will neither warp nor crack, nor fall down, unless the entire building falls, pulling the front with it. Only let it be remembered that, in addition to a high and intense heat, the use of a blast is required to reduce cast iron to a molten state, and the ability of iron fronts to stand heat will be readily understood. Iron fronts have stood erect in cases where the side brick walls were entirely thrown down and demolished by the elements.

A front of iron is usually laid down and fitted together complete in the manufactory previous to erection of the building. It can be transported from any distance to the place of erection and put together with wonderful rapidity, and at all seasons of the year. It takes up less space than any other material, and so enlarges the interior of the building. When it becomes desirable to tear down the building itself, to make way for other improvements, the iron front may be taken to pieces, without injury to any of its parts, and be re-erected elsewhere with the same perfection as at first. Instead of destruction, there need be a removal only.

Iron has in its favour unequalled advantages of ornament, strength, lightness of structure, facility of erection, durability, economy, incombustibility and ready renovation.

Much has been said against iron from misconception. It is exceedingly difficult in the minds of most writers and talkers who use sweeping denunciations and citations against iron, to separate wrought iron and cast iron in their respective endurances against weather. Wrought iron rapidly oxidises when exposed to the atmosphere, and goes to decay. Cast iron, on the contrary, slowly oxidises in damp situations ; rust does not scale from it, and the oxidation, when formed, is of a much less dangerous kind than on wrought iron. A coating of paint will counteract whatever tendency cast iron has to rust when exposed.

Whatever has been done in iron which deserves censure from critics, can be remedied. Let it not be forgotten that the material is not at fault, but the workmanship. Iron can be made to imitate anything perfectly. Men who have said the most against iron have been they who knew the least about it. Arguments have been made that iron is a sham, but a stone building is a greater sham, because it leads one to believe that it is all stone, when in fact it is usually nothing but a veneer set up against a brick wall.

When the public become thoroughly acquainted with the advantages iron possesses as a building material, it is confidently predicted that for superior buildings of all kinds it will receive a general preference to granite, marble, sandstone or brick.—*Iron.*

EARLY RISING A DELUSION.

For farmers and those living in localities where the people can retire at eight or nine o'clock in the evening, the old notion about early rising is still appropriate. But he who is kept up till ten or eleven or twelve o'clock, and then rises at five or six, because of the teachings of some old ditty about "early to rise," is committing a sin against God and his own soul. There is not one man in ten thousand who can do without seven or eight hours' sleep. All the stuff written about great men who sleep only three or four hours a night is apocryphal and a lie. They have been put on such small allowance occasionally and prospered ; but no man ever yet kept healthy in body and mind for a number of years, with less than seven hours' sleep. Americans need more sleep than they are getting. This lack makes them so nervous and the insane asylums so populous. If you can get to bed early, then rise early. If you cannot get to bed till late, then rise late. It may be as Christian for one man to rise at eight as it is for another to rise at five. We counsel our readers to get up when they are rested. But let the rousing bell be rung at least thirty minutes before your public appearance. Physicians say that a sudden jump out of bed gives irregular motion to the pulses. It is barbarous to expect children instantly to land on the center of the floor at the call of the nurse, the thermometer below zero Give us time after you call us to roll over, gaze at the world full in the face, and look before we leap.—*Exchange.*

BLACKFRIARS' BRIDGE.

The following extract from an article in *Engineering*, relative to removing of the old Blackfriars' Bridge on the Thames, and the centreing for the new bridge, may prove of interest to our readers :

The points to be considered were how the old bridge could be removed in the most expeditious manner, at the cheapest cost, and at the same time to proceed with the construction of the new bridge. After careful consideration, it was determined to erect a double gantry, or scaffolding for traversers to run on, so as to have complete command for hoisting, and lowering over the whole space of area of the works. The reason that a double gantry was adopted was that with a single one the traverser girders would have been too heavy and cumbersome, as the span required for them would have been upwards of one hundred feet, and in case of a breakdown or repairs, the traverser would have blocked the whole width of the works. Between the two gantries, and from one side of the river to the other, a gangway or footway was constructed, which was found very useful, not only because of the facility with which the workmen and others could get to any part of the works, from which a considerable saving of time resulted, but in setting out and measuring spans it was of great service. The widths of the gantries from centre to centre of rails were 50ft. each, with a 5ft. space between them, for the gangway. The level of the rails above high-water mark was 38ft., and about 65ft. above the bed of the river. These gantries were strongly built and braced in a manner shown in the engraving,. It will be seen that the centre uprights rested on the old arches. As the arch stones were removed the uprights were supported on piles, driven exactly plumb underneath to receive them, which was very successfully accomplished. Where the centre gantries crossed the old piers, trusses were constructed to carry them. Dolphins, that is to say, groups of piles, were driven, to which booms—balks of timber—were fastened in such a manner, that they could rise and fall with the tide, all round the works, to protect them from river traffic, and so as to leave three navigable openings in the most convenient positions for navigation. Inside these booms, stages to receive materials, plant, &c., were made as the work progressed for each of the new piers, and besides these, in consequence of the small areas of available space at either end of the bridge, other stages were constructed inside the booms, one for the blacksmiths' shops, and a large one in the centre of the river on which to store materials, and to make the centres for use in taking down the old bridge, all of which last were set out full size by chalk lines for the carpenters to work to. They required careful setting out, as owing to the foundations having given way, the arches were of irregular shapes, so that the centres had to be set out accurately, to allow them to fit in as required when fixed in position. The method of taking the shapes was as follows :—A level staff 25ft. long was used with a plumb-bob attached to it to enable the staffholder to see when it was upright ; at the bottom of the staff a long piece of iron was fixed at right angles to the staff to touch the soffit of the arch at the points to be taken. This was requisite, owing to the projection of the cornice of the bridge. Then points were marked at equal distances on the cornices, and levels taken with an ordinary dumpy level at each of these points gave the shape of the arch very accurately.

As the centres were completed, they were launched from off the middle staging and towed to their respective arches, where they were raised by traversers and skidded along bulks of timber under the arches and fixed in proper position. There were six sets of centres under each arch, placed at a distance of 7ft. 11in. apart.

Where the navigable openings occurred the centres were fixed without stopping the traffic on the river. The engraving represents those used in removing the third arch from the Surrey shore, and they were similar in design at the other navigable openings. It shows them after the old arch was removed, just before they were taken down. Piles were driven and the lower struts fixed in the first place, and fitted into holes cut in the old piers to receive them. Then the sides or wings were placed in position, and held so by chains fastened to lewises let in to the old bridge. Then the top portions were hoisted and skidded along balks of timber to their proper places. After this was done, the whole was fixed and tied together in the manner shown. In removing them, they were hauled bodily over into the river, towed ashore, and taken to pieces there.

In December, 1864, so much of the old bridge had been removed as to admit of the commencement of the excavation for the south abutment dam. A trench was excavated through the ballast, and a single row of piles 13in. by 13in. scantling were driven as closely as possible, after having their sides adzed. The small spaces between them were well and carefully caulked down to below the top of the trench, after the strutting inside had been completed. Then the trench was filled with clay puddle, and the water kept out. This dam answered very well and kept particularly free from leakage, more especially as it was a single pile dam, to withstand a 20ft. rise and fall of tide, sometimes even one greater. It was thoroughly well strutted, which is an important point in the construction of dams, while the pile-driving was very carefully executed. Woodford's patent centrifugal pumps were used in the sump during the excavation and concreting for the foundations. They did their work effectually.

In January, 1865, the centre arch of the old bridge was removed, and it was found that some of the arch stones were considerably crushed—it was remarked more so at the extrados than the intrados. There was great care taken in removing these, for fear that they might fall out of the sling chains into the barges placed to receive the stones, and consequently send them to the bottom of the river. Considering the large quantities of stone removed, and that the work was pushed on by day and night without cessation, excepting in cases of exceedingly bad weather, there was but a small amount of damage done to the craft employed during the work. During frosts, chains require looking to frequently, and to be carefully examined. Passing them through a fire is necessary not only for its action on the chain, but because it also thoroughly cleanses the chain and enables the better examination thereof to be made. Too much care cannot be used in looking after and keeping chains in good order on works. Examinations should, therefore, always be carefully done.

A NEW PHOTOGRAPHIC PRINTING PROCESS.

It is well known that a layer of gelatin containing bichromate of potash, or the so called bichromate of gelatin, possesses the property of becoming insoluble by the influence of light. If a glass plate is covered with such a layer and exposed to the sun or to daylight under a negative, the places exposed to the light become insoluble, and those protected or shaded will remain soluble, and may afterward be water-soaked, while the insoluble portions will remain dry, and thus having the advantage of taking up the oily printing ink, such a plate can be used as a lithographic stone and printed from in a lithographic press ; this is one of the known methods of photo-lithography. Other modes have been invented, intended to prepare plates in such a way that they become similar to wood-cuts, and may be printed on a common press. Some of them are now in use in this country, but the simplest and best is perhaps the method of Despaquis, in France, lately published, and chiefly intended for manufacturing purposes. Instead of a glass plate, he uses a corresponding large belt of linen, on which he places the layer of bichromate of gelatin, develops the image in the usual way, removing that part of the gelatin which has remained insoluble as much as possible, he then sews the ends of the belt together, and stretches it between two pulleys, while by the addition of a little glycerine the whole is kept flexible and prevented from drying hard. On one of these pulleys, revolving by steam power, the belt is inked by an inking roller ; by the other pulley the pressure is produced on an endless strip of paper or other material, which thus receives a continually repeating impression of what there is on the belt. It is proposed to accomplish in this way the reproduction of photographs in a cheaper way than thus far has been possible by any other method, while the use of the principle to print new patterns of calicoes, wall-paper, etc., forms another new industrial novelty.—*Manufacturer and Builder.*

To the Editor of the

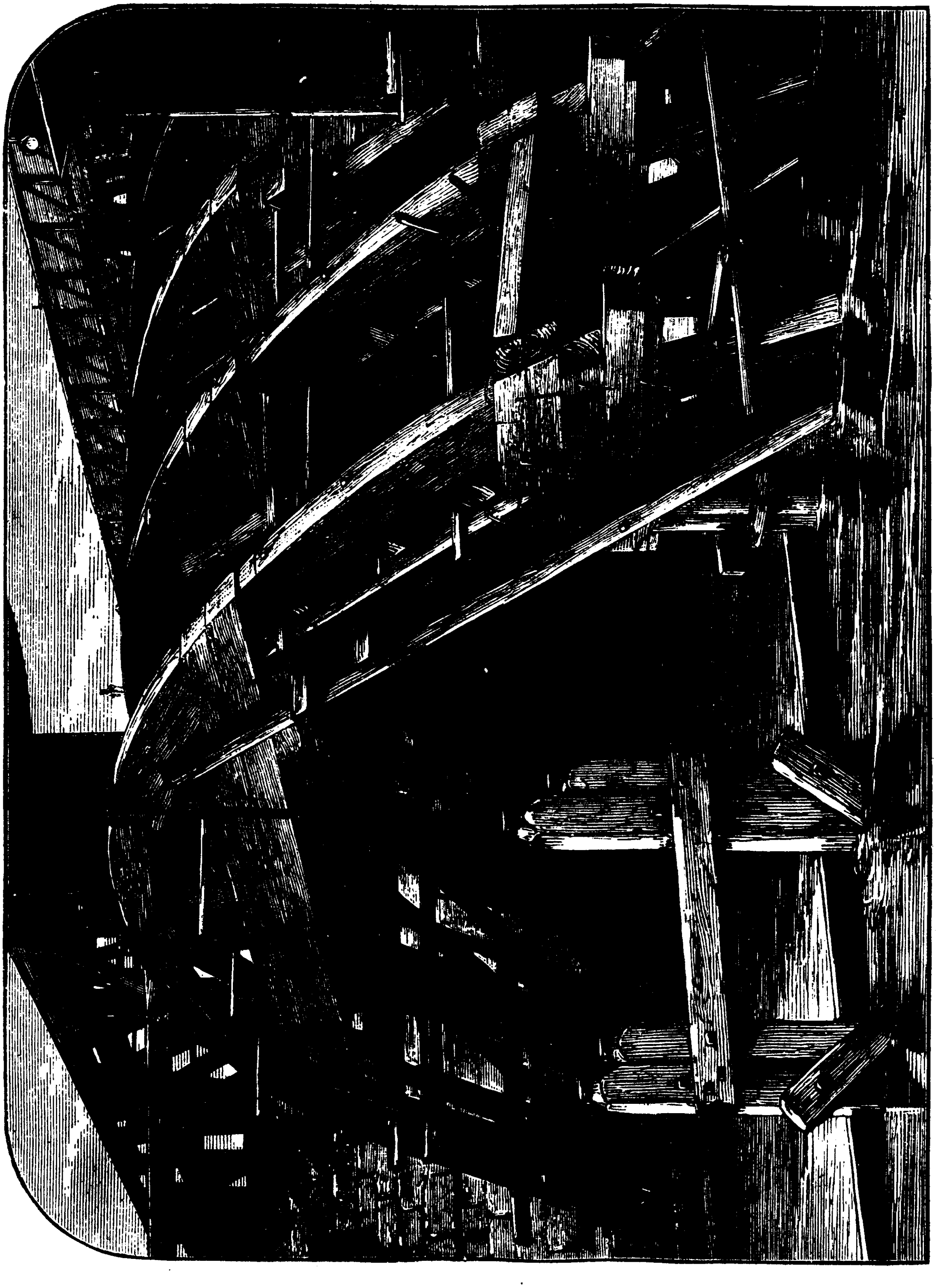
CANADIAN MECHANICS' MAGAZINE and PATENT OFFICE RECORD.

Dear Sir,—On page 57, No. 2, Vol. IV of your valuable paper, you illustrate my "Governor Steam Engine," under the head of "Rigg's Patent Expansion Valve." This principle of governing an engine was patented by me in Canada and the United States in 1871, and provisionally in England in 1872 ; circumstances, however, unexpectedly prevented me completing my patent in England. Hence its introduction under an another name.

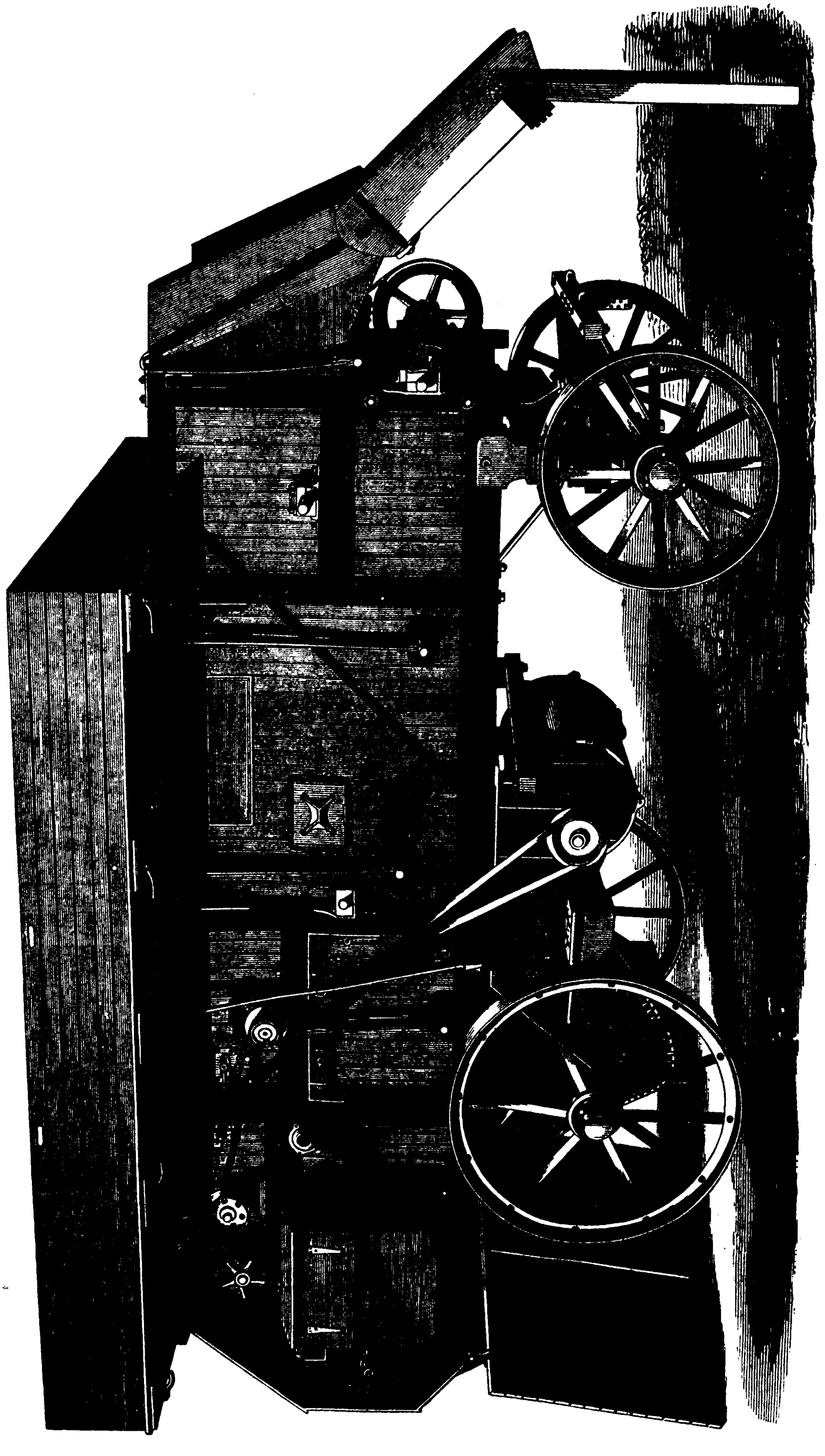
Yours truly,

CHAS. LEVEY.

TORONTO, April 1st, 1876.



BLACKFRIAR'S BRIDGE, CENTREING OF No. 3 ARCH.



NALDER'S THRASHING MACHINE.

NALDER'S THRASHING MACHINE.

On page 141, we illustrate an excellently designed and well-made finishing thrashing machine manufactured by Messrs. Nalder and Nalder, of Wantage, England, who make a specialty of this class of manufacture. The frame of the machine illustrated is of the only pattern used by Messrs. Nalder for all three of the different types they manufacture, namely, single blast, double blast, and finishing machines, and it is so made that the different parts required to be changed in transforming a machine of one class into another, can be secured by the same fastenings. The bolts for attaching the chaff-bagging apparatus are also added, and the spindles are left an extra length, either for attaching the self-feeding apparatus or straw-stacking machine.

As will be seen, the machine is designed to deliver the straw in front of the fore travelling wheel and the cavings behind it, while the chaff is discharged behind the rear wheel and the corn falls into sacks at the back end. This distribution of the various operations possesses marked advantages, as the straw falls upon a rack (hinged so as to double up for travelling), and this gives the grain left by the shakers a second chance by falling through and being saved. If a stacking machine is used, the bottom half of this rack is taken away, the stacker is placed under the remaining part, and requires no loose boards to guide the straw into the hopper. The chaff falling behind the hind wheels allows it to be delivered into bags according to Messrs. Nalder's well-known system without the aid of an extra blower; at the same time the heavy dirt is sifted out, and the light dirt and seeds and other impurities are blown away, thus securing a clean sample of chaff. The arrangement also allows the travelling wheels to be placed nearer together with the object of obtaining an easy draught.

The main framing of the machine is strengthened on each side by iron suspension braces, and transversely by an iron truss immediately over the hind travelling wheels; the drum and concave are of the most improved form, the shakers are of the double crank type with side doors for getting at the bottom crank for adjusting or oiling. The riddle and shog-board crank is placed in the front of the machine and so is very convenient of access. The caving riddle of mahogany is long and the first dressing apparatus has a top sieve for the chaff with a bottom one for taking off stones, chobs, &c., and the blower for this can be easily removed for repairs. The elevators, which are of the outside edge delivery cup pattern, are run at a high speed, and so are not liable to choke up. The barley awner consists of a barrel with knives, and of beaters for beating off the husks from the wheat, either part being used or not as required. This awner is fixed in the middle of the second dressing apparatus, which is fitted with three sleeves, the bottom one being used for taking out the seeds, and also dirt broken up by the awner, securing a much larger surface than when fixed in the first dresser; as all these sieves are interchangeable, and as the second division of the awner can be shut off, rape seed can be put through and dressed a second time. We may here mention that all the small brasses of the machine are interchangeable; in fact, only one pattern is used, and all are fitted with adjusting slips. The Nalder rotary screen, when used, is made of various degrees of fineness with a cut-off tail-board, thus practically turning a fixed screen into an adjustable one, an arrangement less complicated than a movable wire screen.

In conclusion, it may be mentioned that all parts of this machine are very easily accessible, and it may be very readily taken to pieces for repairs.—*Engineering.*

DECOMPOSITION—GUARD AGAINST ITS EFFECTS.— Refuse and waste are the natural enemies to the health of mankind. The products of their decomposition pervade every household. Their offensive odors are charitable warnings to guard against. From the cellar, store-room, pantry, bed-room, sitting-room and parlor from decaying vegetables, fruits, meats, soiled clothing, old garments, old furniture, refuse of kitchen, mouldy walls, everywhere, a microscopic germ is propagating. It contains in itself the seeds of disease—all that is needed is the proper soil or condition of constitution adapted for its reception. Each germ may find its specific habitat, and hence develop into some specific malady. Typhoid, typhus, cerebro-spinal, relapsing or scarlet fever, measles, small-pox, roseola, cholera or some other form of disease may result. Cleanliness, pure air, sunlight and pure water are the antidotes. God indicates and provides these in abundance. He who neglects or rejects these deserves to suffer, as he surely will.

THE TESTING AND STRENGTH OF MATERIALS. *

WROUGHT IRON.—The tensile strength of good wrought iron is nearly four times greater than that of cast, viz., twenty-four tons per sectional inch. Mr. Mallet gives twenty-three to twenty-four tons, and Mr. Kirkaldy twenty-five tons for bars, and twenty-two tons for plates. Mr. G. Berkeley gives as his experience of breaking-strength :—

	Average. Tons.	Minimum. Tons.	Average Stretch. In. In
Plates......	20	19	1 in 12 lineal = 8.33 p. c.
L and T...	22		1¼ in 12 lineal = 10.5 p. c.
Rivet Iron.	18		

The Admiralty would seem to have a good opinion of Low Moor and Bowling iron, for in a late specification for boilers, they mention that all plates, with the exception of these, will be tested, and must be capable of standing the following tests ;—Tensile strains per square inch, lengthways, 21 tons; crossways, 18 tons. Forge test (hot), plates to admit of being bent hot without fracture to the following angles: lengthways of the grain, 125°; across, 100°. Forge test (cold), plates to admit of being bent cold without fracture to the following strains :—

	7/8 in.	3/4 in.	5/8 in.	1/2 in.
With the grain......	20°	25°	35°	55°
	5°	10°	15°	15°

BRIDGE TESTS.—A piece of iron 2 in. wide and ½ in. thick, and of sufficient length to have 7 in. under actual tension, to be cut from any plate intended to be used on the work, and the following tensile strains applied, the plates of similar manufacture to be rejected if the extension of the piece tested is greater than ⅛ in. under 18 tons, ¼ in. under 21 tons, ½ in. under 23 tons, ¾ in. under 24 tons; all bars and L irons being required to bear a tensile strain of 25 tons before fracture. Messrs. Clarke, Reeves, & Co., American bridge-builders, specify in their work that all bars subject to tensile strains shall be tested to 20,000 lb., or nearly 9 tons per square inch, and struck a smart blow with a hammer while under tension, and if any show signs of imperfection, they shall be rejected. I mention this foreign test because in a competition this firm secured a contract against English firms. For bridges of large spans some engineers specify different tests for the larger spans: for a 100 ft. span, average breaking-strain of plates per square inch to = 45,000 lb., or $20\frac{1}{10}$ tons; for the same span, average breaking-strain of channel irons and bars per square inch, to = 50,000 lb., or 22⅓ tons; for a 200 ft. span, all parts to be exposed to a tensile strain of 60,000 lb. per square inch, = to 26.78 tons. In building Black-friars Bridge, experiments were made from time to time, as mentioned by Mr. Carr in a paper read before the Institute of British Architects, and the extension of 1.625th part of the length was given by strains varying from 13 tons to 15 tons (instead of 16 tons, as specified); but even with this, the elastic limit is just about four times the working load, which is ample allowance for safety, taking into account a very large deterioration for time and corrosion. The limit of elasticity of wrought iron under tension is that point at which the elongation ceases to be in uniform proportion to equal additions of load, and commences very nearly with the point at which visible set takes place A bar 1 ft. long, and 1 in. sectional area, should elongate at least 15 per cent. before breaking. The crushing weight is from 12 to 10 tons per inch section, or about half that of tensile resistance. It is sometimes specified that it must be equal to 16 tons per inch, and that it must not show any signs of failure at 8 tons per inch. In specifying or ordering wrought iron, size as well as quality must be borne in mind. L iron, without extra price, runs from 3 ft. to 25 ft.; T iron, without extra price, runs from 3 feet to 21 feet. Some L and T irons are rolled from 30 ft. to 40 ft.: as a rule, it is of the middle size that long lengths are rolled. L iron can be got rolled up to 40 ft. without any extra charge when the specification is a good one, and does not include more than a fair share of such lengths; and they may even be rolled to 50 feet and 60 feet, but the difficulty of carriage enhances the cost. Plate iron must be of a regular shape, and should not exceed 15 feet by 4 feet, otherwise an extra charge will be claimed for rolling. Mr. David Kirkaldy has just completed a valuable set of experiments upon wrought-iron plates manufactured by Mr. Fred. Krupp, of Essen, Rhenish Prussia, and six Yorkshire firms. The experiments were made from plates, 4 feet by 3 feet by ⅜ in., ½ in., ⅝ in. thick,—those most generally used for boiler-making. 324 specimens tests were made from pieces of these plates, and are carefully preserved in Mr. Kirkaldy's museum. The experiments

* By Mr. R. M. Bancroft. Read at the Civil and Mechanical Engineers' Society, and embodying the particulars of a number of experimentel tests not yet published elsewhere.

have been made (1) to ascertain the elastic and ultimate strength, softness, and ductility under pulling stress ; (2) to ascertain the effects produced by drilled holes and by punched holes under pulling stress ; (3) to ascertain the resistance to, and effect under, bending stress. The facts elicited in these experiments, which are very voluminous, will convince the Admiralty that they should at least give Krupp's plates an equal position with the Yorkshire ones.

CAST IRON.—In round numbers, the strength of cast iron in *compression* equals the square of the tensile force, or, in other words, the resistance that cast iron of good quality gives to a crushing or compressive strain is variously stated by authorities on the subject at from 40 to 43 tons per square inch of section, and from 6 to 8 tons per sectional inch for a tensile or stretching strain. Tabulated it stands :—

	Breaking Strain.	Safe Working Strain.
In compression	40 to 48	7 tons
In tension................	6 to 8	1½ "

It is clear from this that cast iron of good quality may in compression be strained to one-sixth of its greater strength, and in tension to about one-fourth. Cast iron of good quality will, when first broken, have a crystalline texture, and a slight indentation will be made if struck smartly with a heavy hammer. Sometimes this metal is specified to bear a tensile strain of 2½ tons before loss of elasticity, and 6½ tons per square inch before fracture. Test-bars should be run each day as the castings are being made, and a good plan is to specify that the test-bars must be cast on to the ends of the castings. One test is, that a bar, 2 in. deep × 1 in. wide, placed on bearings 3 ft. apart, with a load of 25 cwt. placed on the centre, should give ¼ in. deflection and carry 27 cwt. without breaking. A second test is that of a bar, 1 inch square, placed at 4 ft. 6 in. bearing. In this test the bar should not break with a less load than 600 lb. placed on the centre. The above tests are for iron to be used in compression. When required to be used in tension, even higher standards are advisable. Some engineers insist that these shall be *dead weights*, and that no strain shall be applied in any way by levers ; and in important contracts test-bars must be cast in duplicate, one to test, and the other marked with the date when run, and kept for future reference by the engineer. The area of the flanges of cast-iron girders should be in the proportion of 6 or 7 to 1 ; but the upper flange, where the girder is isolated, and not held in position by the structure itself, should be proportionally wider, according to each particular case, as it has to resist flexure, which would possibly deform it before compression of the flange could occur ; but where the web and the upper flange are supported by the structure itself, as in the cases of arches and flooring, the above proportion may be taken. As a general rule, we may, in designing cast-iron girders, make the depth from one-twelfth to one-sixteenth of span ; bottom flange, two-thirds to three-fourths the depth in centre ; top flange, one-third to one-half the width of bottom ; maximum span, 25 ft. With greater spans than this wrought iron becomes as economical, and safer. I believe some of our members are of opinion that strengthening webs or ribs should not be cast in girders, as the metal is drawn away from the flanges in cooling ; others say that at the junction of web and flange, the rib, if broken away, will frequently be found honeycombed.

USEFUL RECIPES FOR THE SHOP, THE HOUSEHOLD AND THE FARM.

If the globes on a gas fixture are much stained on the outside by smoke, soak them in tolerably hot water in which a little washing soda has been dissolved. Then put a teaspoonful of powdered ammonia in a pan of lukewarm water, and with a hard brush scrub the globes until the smoke stains disappears. Rinse in clean cold water. They will become as white as if new.

Tasteful ornaments may be made of natural leaves and sprays artificially frosted. This is done by means of powdered glass, which can easily be obtained by pounding some bits of glass with a heavy hammer, care being taken to protect the eyes against flying splinters. Dip the object in thin gum water and shake the powdered glass over them. When dry, handsome bouquets can be arranged.

In consequence of numerous applications to the Publishers for single numbers of this MAGAZINE, either for samples or to replace lost ones, the Company decline supplying them for the future without the price, 25 cts., is remitted.

IMPROVED SIGNAL LOCKING APPARATUS AT WATERLOO TERMINUS.

(See page 144.)

In the accompanying drawing we illustrate the interlocking apparatus designed by Messrs. Saxby and Farmer, the well-known signal engineers, for controlling the heavy traffic of the South-Western Railway at Waterloo Terminus. The signalling apparatus at this station really governs two railways—the main road and the Windsor road, each having its up and its down line of rails. The two terminal stations include no fewer than twelve platform branches and several sidings, with crossings from one to the other of these branches. Nor are the operations confined only to regulating the movements of arrival and departure trains; many of these trains have to be separated after arriving, and re-made up ready for departure under the control of the point and signal apparatus, by which one, two, or more carriages have to be changed from one position to another in a train, and all this without the possibility of a conflict between the points that lead to or from the various lines and the signals which command those lines.

Messrs. Saxby and Farmer have contrived to render it possible for two signalmen only to perform all these operations. The apparatus is erected in a glass-house upon a bridge which spans the four main lines a short distance in advance of the station. It consists of 109 levers arranged in a row extending the whole length of the signal-house. These levers constitute two systems, each presided over by only one attendant. On the right hand is the system for the main line, consisting of fifteen point levers, thirty-five signal levers, and five setting or locking levers, making a total of fifty-five levers. On the left hand is the system for the Windsor line, consisting of twelve point levers, thirty-one signal levers, two bolting levers, four setting or locking levers, and five spare levers, making a total of fifty-four levers. Thus the one of the two signalmen has fifty-five levers and the other has forty-nine levers to operate with. But the mere working of the levers is only a part of his duty. He has to observe through the glazed sides of his house the positions of trains moving inwards and outwards, or standing to be separated or made up ; he has also to attend to signals transmitted from other signal stations, and he has to transmit electrical signals to them. On the main line side, besides the fifty-five levers that have to be worked, there are nine disc signals and eight electric indicators to be attended to, and seven knobs or handles for transmission of electric communications. On the Windsor side, in like manner, there are seven disc signals, five electric indicators, and three electric knobs. The signalmen therefore, besides noticing what passes on the railway beneath them, have to work or observe, the one seventy-nine and the other sixty-four separate instruments, all of which are so skilfully contrived and arranged that neither the strength nor the attention of the men is overtasked.

As the ultimate strength of a chain is that of its weakest link, so the duty of such apparatus as that at Waterloo is to be measured not by the average work that it has to perform, but by the strain of its busiest hours. Some idea of that strain may be formed from the following figures : — On the Thursday of Ascot week no less than 515 up and down trains, engines, and empties passed the Waterloo signal-box. On the August Bank holiday 553, and on Whit-Monday 556 have passed. Each passage requires on an average, to ensure its safety, sixteen electrical movements of the point and signal levers, so that on the busiest day of twenty working hours more than 3300 lever movements and about 8900 electrical movements have to be made, giving a total of more than 600 per hour, or ten per minute, besides those required from time to time for shunting, making up, or separating trains. But even those numbers, considerable as they are, do not express the maximum work which at certain morning and afternoon hours daily has to be performed. For example, during half an hour about 5 p. m. daily, the lever movements and electrical signals given and received succeed each other so rapidly that in every minute more than twelve distinct actions demand the labour or the attention of the signalmen in the box.

When it is considered that all this work is effected, and without any undue pressure, by two men, we think it must be conceded that Messrs. Saxby and Farmer have played an important part in facilitating the working of our great railway systems. The great peculiarity of the new system of locking is that that locking is effected not by the motion of the signal or point lever, but by that of the detent, so that the moment a lever is grasped, and before it can be moved at all, the locking is effected. The arrangement is so clearly shown in our engraving as to render further description unnecessary.—*Engineer*.

SIGNAL LOCK APPARATUS AT WATERLOO TERMINUS.

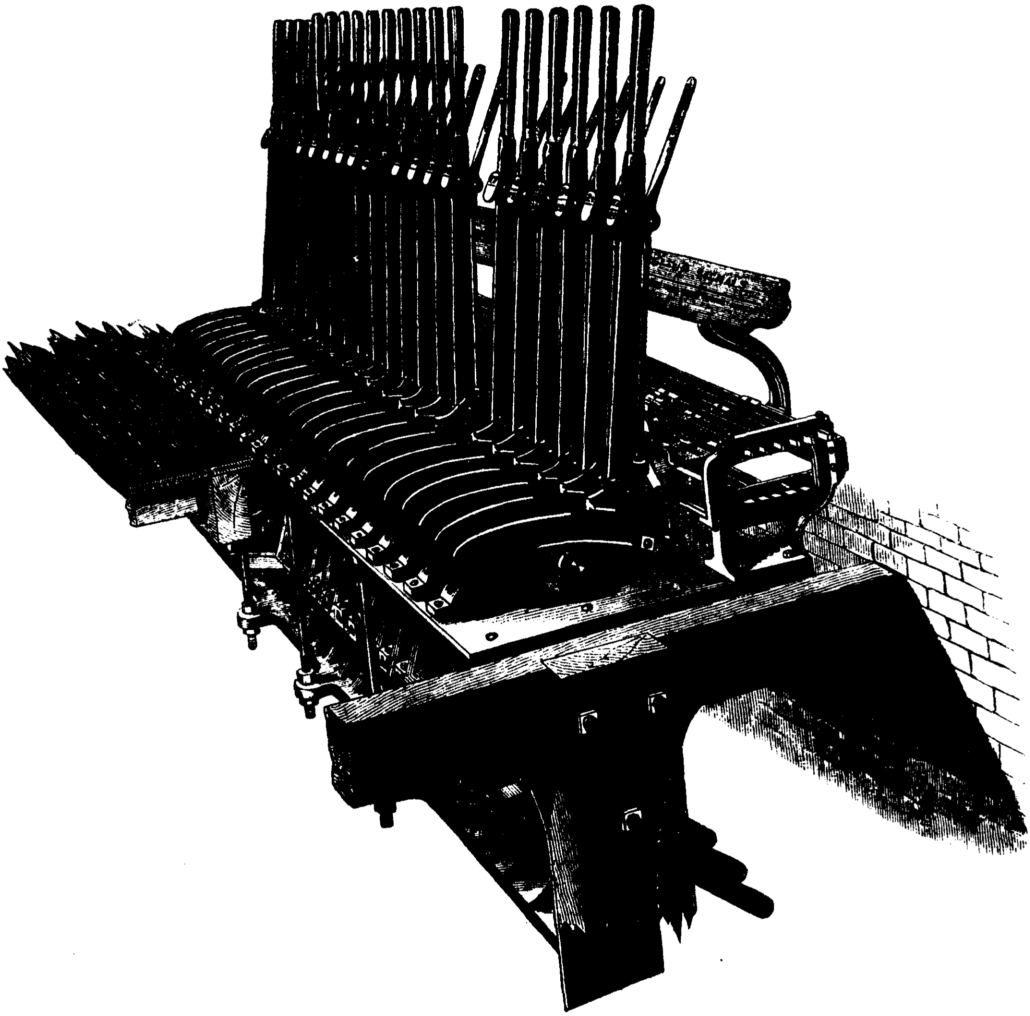
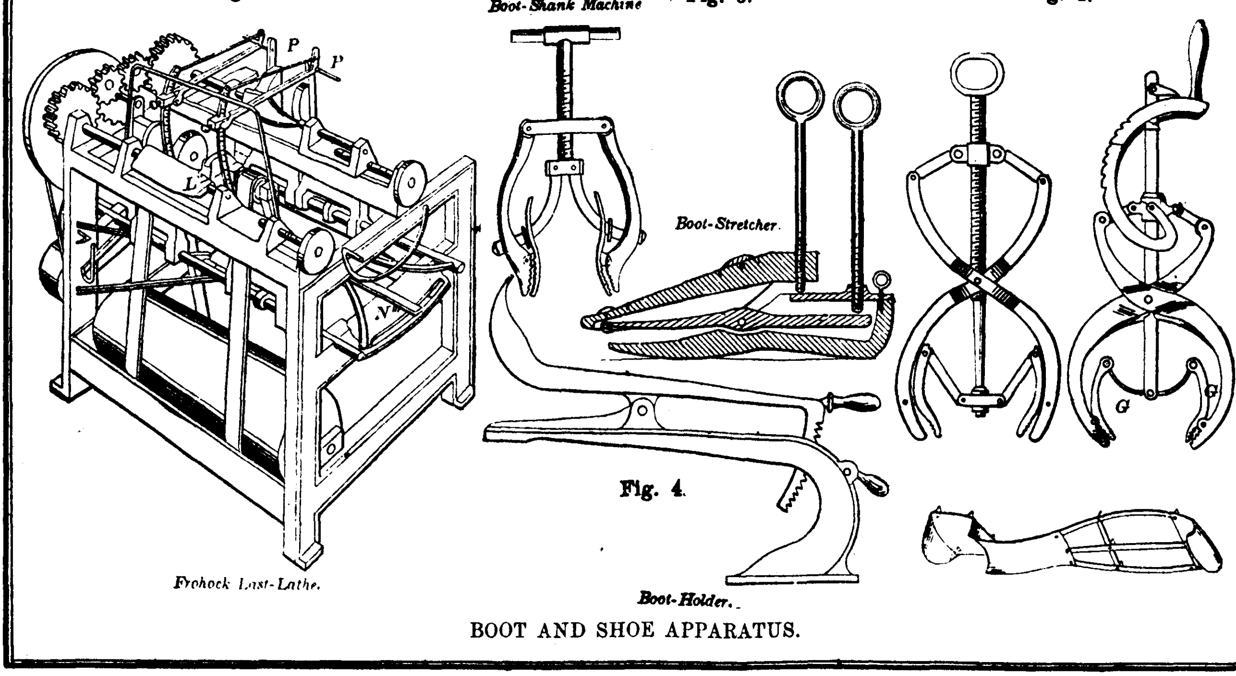
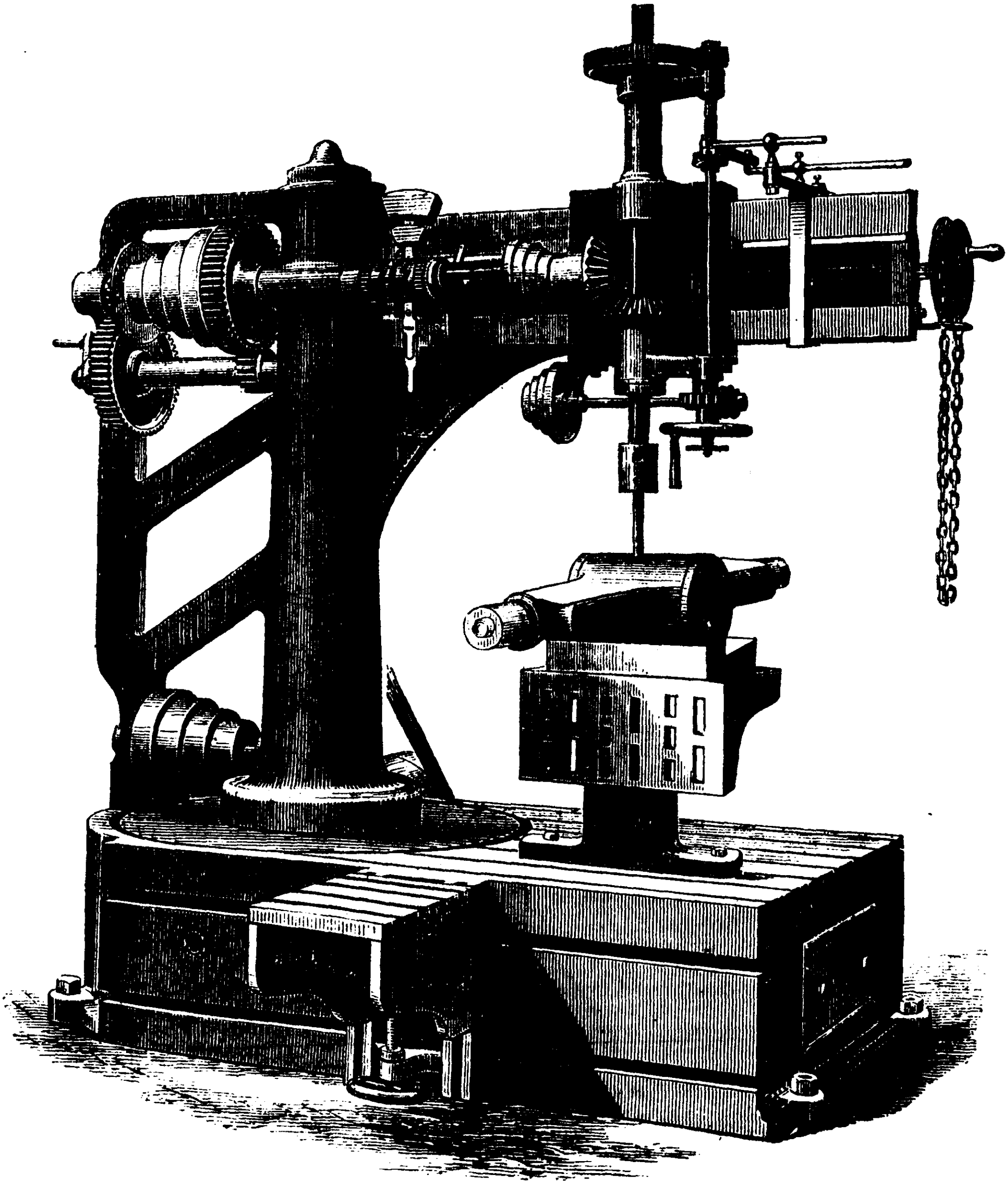


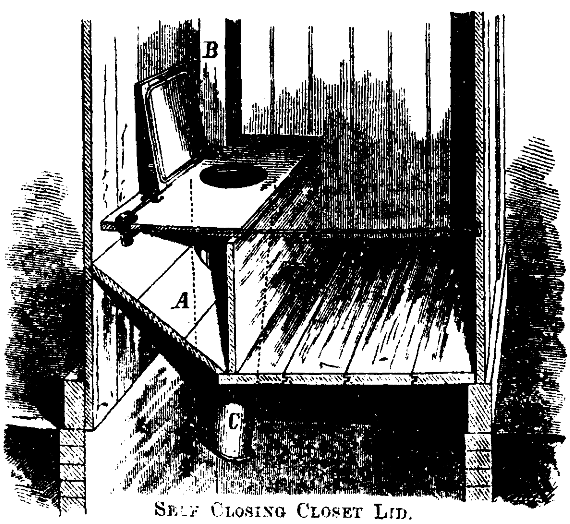
Fig. 2. Fig. 3. Fig. 1.



BOOT AND SHOE APPARATUS.

IMPROVED DRILLING AND SLOTTING MACHINE.





SELF CLOSING CLOSET LID.

SELF-CLOSING CLOSET LID AND ANTI-NUISANCE CLOSET.

The invention represented herewith aims to exclude sewer or vault gases from yard closets, and to offer protection against the very injurious cold draft in these as well as in railroad car accommodations. The lid is provided with a self-closing device and elastic packing, which exclude the gases from all sorts of closets. The closet door is suitably connected with the lid, so that, when the former is opened for the exit of the user, the lid is shut invariably. A board apron, A, below the seat, closes the vault, compelling the gases to pass out by the ventilator flue, B. A tube, C, attached to the lowerside of the seat board and provided below by a balanced valve or flap, passes through the apron, tightly fitted by packing. Anybody cognizant of the present unwholesome yard closets and railroad car accommodation, throughout the country, will readily appreciate the improvement.

BOOT AND SHOE APPARATUS.

(See page 144.)

The illustrations, selected from Knight's "Mechanical Dictionary," * given herewith, represent apparatus used in the manufacture of boots and shoes. The engraving, Fig. 1, represents

LASTING TOOLS,

which are employed to grip the upper leather of a boot or shoe, and draw it over the last. In the tool on the left, the two jaws act simultaneously upon the leather through the motion of the nut, C, upon the screw. The same movement brings the jaws toward each other and stretches the leather around the last. The two pairs of jaws in the second tool engage the sides of the leather, and are then drawn thereupon and also inwardly by the action of the cam lever. Lasts are usually made upon the ordinary type of lathe employed for turning irregular forms. For this purpose, however, special machinery has been devised, to which class belongs the

LAST LATHE,

represented in Fig. 2. In this machine, the block, L^5, from which the last is to be cut, is, by a train of gearing, made to present a face to the cutters precisely corresponding to the face of the model against the guides, P P^4, By moving links on these rods, up or down on their graduated scales, the last may be enlarged or reduced in its relative proportions to the model. A similar variation of the bar, N''', on the sector at the end of the machine, will vary the work in relation to its length as compared with that of the model.

In Fig. 3 is a

BOOT SHANK MACHINE,

used for drawing the leather of the upper or boot leg over the last into the hollow of the shank. The leather being placed over the last is inserted between the jaws, which are pivoted to the plate. The screw connecting the jaws by arms is thus turned, causing the jaws to be brought together, and thus stretching the leather. The same figure also shows a boot stretcher, for stretching the uppers. The last is divided into an upper and an under section which are connected by a lever. The fore end of the upper section is pivoted to the fore end of the lever, and the middle end of the lever has its fulcrum at the mid-length of the lower section. The screws operate to raise the rear end of the upper section directly, and its fore end through the medium of the lever. The upper surface of the last has changeable knobs to stretch the leather in particular places.

Fig. 4 represents a

BOOT HOLDER

or jack, for holding the boot during the process of manufacture. The base piece is attached to the bench and has a stationary prong. The movable prong containing the foot piece is attached to the other, and is held at its adjustment by a rack and pawl. The operation may be clearly understood from the engraving. A similar device is sometimes used to stretch the boot while blacking or varnishing it.

Fig. 5 shows a boot sole with steel calks attached, for the use of pedestrians in winter weather or when scaling the snowy tops of mountains or crossing glaciers. These calks are readily arranged to screw into plates fastened to the sole and heel of the boot, and are then removable at will. In walking over ice, these or similar appliances are indispensable ; and many bruises, and sometimes limbs and even lives,havebeen saved by theiruse.

IMPROVED DRILLING AND SLOTTING MACHINE.

(See page 145.)

In the accompanying engraving we illustrate a drilling machine made by Messrs. Lowry, of Cross-street Works, Salford, which embodies certain improvements introduced recently into this type of drill. These may be briefly described as consisting principally in carrying down the framing at the back of the jib post to the bed plate, so that it can be properly secured, and every trace of vibration is removed. The machine has also been so modified that it constitutes a very satisfactory key-way slotting machine. Our engraving will explain itself without further description.—*Iron.*

A FRUITFUL source of malaria is found in the earth adjoining ponds which are dammed for manufacturing or other purposes. The soil in the vicinity, through the water being raised above its previous level, becomes soaked, and hence damp and very dangerous to health.

* Published in numbers by Messrs. Hurd & Houghton, New York city.

PATENTS IN AMERICA.

IT appears from the annual report of the United States Commissioner of Patents, which has just reached us, that there were 21,638 applications during the year 1875. Of this number 14,837 (including reissues and designs) were granted. These figures show a slight increase over those for the previous year, and are the highest ever known. The number of trade marks and labels registered was 1138 and 313 respectively, The total receipts of the office were 743,453 dols., which is made up as follows : Amount received on applications for patents, reissues, designs, extensions, caveats, disclaimers, appeals, and trade marks, 670,180 dols. ; copies of specifications, drawings, and other papers, 45,380 dols. ; recording assignments, 18,012 ; subscription to the *Official Gazette*, 6646 dols. ; registration of labels, $2334. The expenditure reached $721,657, thus leaving a surplus of $21,795. This added to the surplus accruing in former years gives, $886,909, as "the balance in the Treasury of the Patent Fund." This, however, is, like the patent surplus in this country, nothing but a "phantom fund," as it has been called. The principal items of expenditure are : salaries, $430,218 ; photo-lithographing drawing, $114,309 ; illustrations for the *Official Gazette*, $49,428 ; tracing drawings, $34,972 ; stationery, $16,600 ; cases in model rooms, furniture, &c., $20,000 ; pay of temporary clerks, $29,512 ; and miscellaneous disbursements, $11,765. Following the example of former years the Commissioner gives a table showing the number of patents granted to residents of the different States, territories and foreign countries during the year. It is interesting to notice the wide differences which exist. For instance, in Idaho Territory only one patent was granted, the population being 14,999. Against this we may put the State of New York, where 3771 patents were issued, being in the proportion of one patent per 1163 inhabitants.

The density of the patent-taking population is greatest of all in the District of Columbia, where 1 person out of every 615 appears to be a patentee. This, however, can hardly represent the inventive activity of the district, and the high proportion is probably due to the fact that many inventors acquire a temporary domicile in Washington for the purpose of prosecuting their application. The absolute number of patents taken out is small, reaching only 214, New Mexico Territory contributes the smallest proportion ot patents, there being only one to every 37,101 inhabitants. The agricultural States do not, as might have been expected, make much show. Only 31 patents (1 to every 32,161) came from Alabama. North Carolina contributes 37, or 1 to every 28,906, and South Carolina sends 46, or 1 to each 17,513 persons. To the statistician the table is full of interest. The staff of the office consists of 96 examiners of various grades, and the Commissioner recommends the appointment of 12 more, or he "must view with dismay" the arrears of work which will accumulate. One of the good features of the *Official Gazette* alluded to in the report is the publication of the decisions of the Commissioner of Patents and of the United States courts in patent and trade-mark causes. The publication of the back issues of patents proceeds gradually, but the Commissioner urges upon Congress the absolute necessity of making larger grants for this purpose. The letter-press is printed as far back as November, 1866. The office is rapidly outgrowing the accommodation which the building affords, especially in the model-rooms. About 10,000 rejected models were removed in consequence "to an open space under the roof of the west wing of the Patent Office building. The floor of this attic and the model-shelves are composed of rough boards, and the place itself is very difficult of access. The trouble increases yearly, and if no provision can be made for relief in this regard, it will be necessary to do away entirely with models."

The report concludes with some very interesting particulars of the intended contribution of the Patent Office to the Centennial Exhibition. A space of 10,000 ft. has been assigned for the exhibition of models of American inventions, illustrating the more important and useful industries. The task of selection will be a difficult one, for it appears, for instance, that no less than 2295 patents have been granted for sewing machines and their attachments between 1790 and 1873. There are 2451 patents for ploughs, 2244 for harvesters, 1391 for churns, 1483 for lamps, and even 645 for beehives. The report under notice is carefully drawn up, but we observe one or two glaring inconsistencies, the number of patents issued being put at 14,837 in one place, whilst on the next page it is said to be 16,288. It would appear also that whilst 38 patents were extended, there were only 2 applications for extension. The issues of patents to subjects of Great Britain, France, and other foreign countries, are also variously stated.

MACHINISTS' RECEIPTS.

Perpetual Ink for Tombstones, Etc.—Pitch, eleven pounds; lampblack, one pound; turpentine sufficient; mix with heat.

New Mode of Hardening Sandstone.—In Saxony, sandstone is soaked in a solution of alkaline silicates and of alumina. The liquid penetrates some inches into the stone, and renders the surface so hard that it resembles marble and will bear polishing. On being heated to a high degree, the surface vitrifies, and it may be colored at pleasure.

To remove tarnish from plated good that have turned dark from the action of gas, steep the plated ware in soap lye for two hours, then cover it over with whiting, wet with vinegar, so that it may stick well upon it, and dry it by the fire; by thus drying the whiting is removed from the crevices without the least difficulty. Rub off the whiting and pass over it with dry bran. The silver will look exceedingly bright.

To Detect Leaks in Gas Pipes.—Apply soapsuds to a suspected leaky joint in the gas pipe. The formation of bubbles will show any escape. This is safer than trying the joint with a lighted match. If the leak occur in the branch of a bracket or chandelier, it is repaired by soldering with plumber's fine solder; if it be a very small one, heat the place first with a spirit lamp, and fill the aperture with cement.

Water-Proof Dressing for Leather. — A dressing for rendering leather water-proof made as follows, as proposed by Hager, has been found to answer the purpose: dissolve one part of india rubber in five parts of illuminating petroleum, by digestion for a day, and add twenty parts of paraffine to the pasty mass and digest again for half a day, with repeated stirring, and then mix it with five parts of oil and five of tallow, and finally add ten of petroleum, or enough to give the mass the consistency of butter.

Cleaning Type.—Soak the type in turpentine for an hour or two, then wash with lye or hot soap-suds.

—Obtain sixpenny-worth of potash from an oil and colourman and make a saturated solution of it in boiling water; let the type pickle in it—one lot at a time so as not to fall into "pie"—for half an hour, then wash in cold water and dry on a tray before a fire. Take care the potash does not splash your clothes or it will make holes in them. If your fingers touch the solution, dip them immediately in cold water to prevent burns.

Cleansing Water Mains.—It frequently happens in iron water mains that deposits of rust are formed, sufficiently thick to reduce materially the diameter of the pipe. To clean the interior, Mr. E. Dodds, an English engineer, has lately devised a pipe scraper, which operates as follows: The pipe is cut, the scraper is inserted, temporary joints are made, and the water is turned on at highest pressure, which drives the scraper on at great speed. In the first experiment, a distance of 300 yards of pipe was thoroughly cleaned in two minutes and 20 seconds.

Fastening Leather to Iron.—Upon the question how to apply a leather covering to an iron pulley, some light may be shed by the following description of a process by which it is said that leather may be affixed to a metal so that it will split before it can be torn off. According to the *American Manufacturer*, a quantity of nut-galls, reduced to powder, is dissolved in eight parts of distilled water, and after remaining for six hours is filtered through a cloth; and the decoction thus produced is applied to the leather. Take the same quantity of water as that used for the nut-galls, and place it in one part (by weight) of glue, which is to be held in solution for twenty-four hours and then applied to the metal, which should first be roughened and heated. The leather is then laid upon the metal and dried under pressure.

The following is a new metallic alloy which is now very extensively used in France as a substitute for gold. Pure copper, 100 parts; zinc, or preferably tin, 17 parts; magnesia, 6 parts; sal-ammoniac; 3·6 parts; quicklime, 1·8 parts; tartar of commerce, 9 parts, are mixed as follows:—The copper is first melted, then magnesia, sal-ammoniac, lime, and tartar, are added separately and by degrees, in the form of powder. The whole is next briskly stirred for about half-an-hour so as to mix thoroughly, after which the zinc is added in small grains by throwing it on the surface and stirring it till it is entirely fused; on this being done, the crucible is then covered and the fusion maintained for about 35 minutes, after which the surface is skimmed and the alloy is ready for casting. This alloy has a fine grain, is malleable, and takes a splendid polish. It does not corrode readily, and for many purposes is an excellent substitute for gold.

160-TON HYDRAULIC CRANE.

For some time past Messrs. Sir William Armstrong and Company have had in course of construction at Elswick six guns, each weighing no less than 100 tons, for the Italian Government. The manufacture of such guns at all is a remarkable feat, but it is obvious that something more is required—the guns when finished must be delivered. To this end Messrs. Armstrong have erected at their work a colossal shears, competent to lift 120 tons, while a crane of 160 tons has been nearly completed for the Italian Government, to lift the guns in and out of the ships in which they will be fought. At page 148, we give a drawing of this crane, with a 100-ton gun suspended from it. The platform of this crane revolves upon a live roller frame of 43 ft. diameter. At the rear of the platform is a counter-weight box, carrying about 350 tons, to counterpoise not only the weight of the crane itself, but of the load, so that no lifting strain is brought upon the central pivot. The crane stands upon a masonry and concrete pedestal, 20 ft. high and 50 ft. diameter, the outer wall of which carries the path on which the live roller ring runs, the centre being hollow, and serving as a house for the boiler and pumps supplying the water-pressure for working the crane. The work of lifting is done by an inverted hydraulic press, hung in gimballs, on a system invented by Mr. Rendel. The pumps are arranged to act direct upon the lifting press and turning engine of the crane, without the intervention of an accumulator. The crane is revolved by an hydraulic rotary engine, which also drives a winch connected with a chain passed over a pulley on the head of the jib, and available for lifting light loads. The rake is 65 ft., so that the crane commands a very large surface of the quay, and could, if requisite, set down many monster guns within its sweep—a great advantage the crane possesses over sheers, and one which will be especially important in the case of weights like those it is intended to lift, which cannot be stored, except at great cost beyond the reach of the machinery provided for lifting them. This crane is for the arsenal of Spezia, where the foundations for it are now nearly completed. The whole of the eight 100-ton guns which it is destined to lift may, with their carriages, be placed together under its sweep. —*The Engineer.*

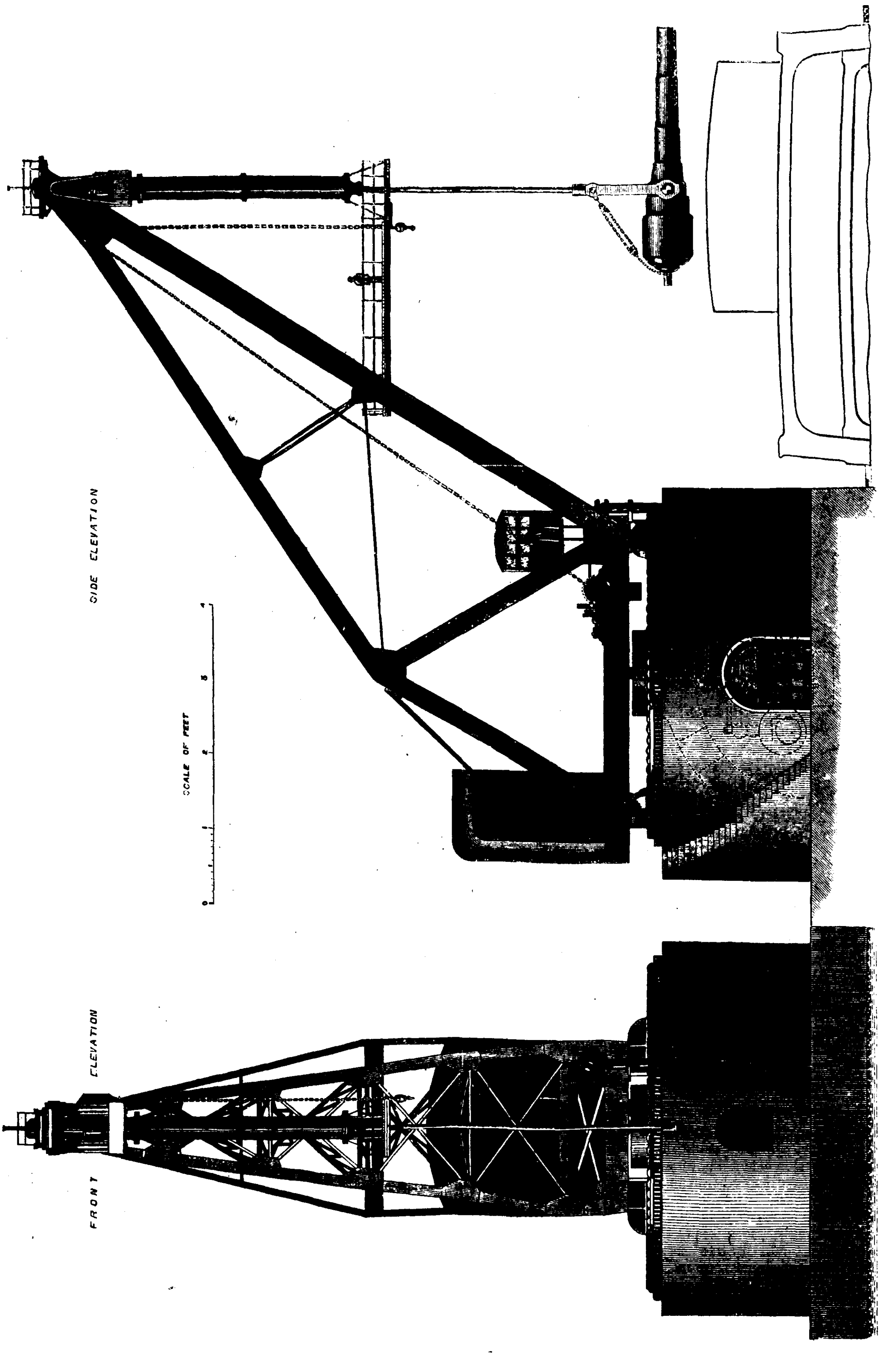
Centennial Clock.—The Thomas Clock Company, at Thomaston, Connecticut, have nearly completed a huge clock for Memorial Hall. It rests on a bed ten feet long and seven feet high. The pendulum rod and ball alone weigh 750 pounds, and the hammer will strike a 13,000-pound bell.

Machine-made Chains.—A new chain and chain-cable manufacturing establishment is expected to go into operation in a short time, at Pittsburgh. The machinery is now being put in, and arrangements made for turning out chains of all sizes very rapidly. The links will be turned and welded by machinery.

Perpetual Motion.—Another motor man has turned up. His name is Gary, and his home Huntingdon. He claims that he has succeeded in discovering some substance which defies the attraction of the magnet, so that by placing the substance over the poles thereof its power is entirely suspended. Engines, it is said, have been invented by Mr. Gary that run continuously by these silent yet powerful motors. We should like to see this motor.

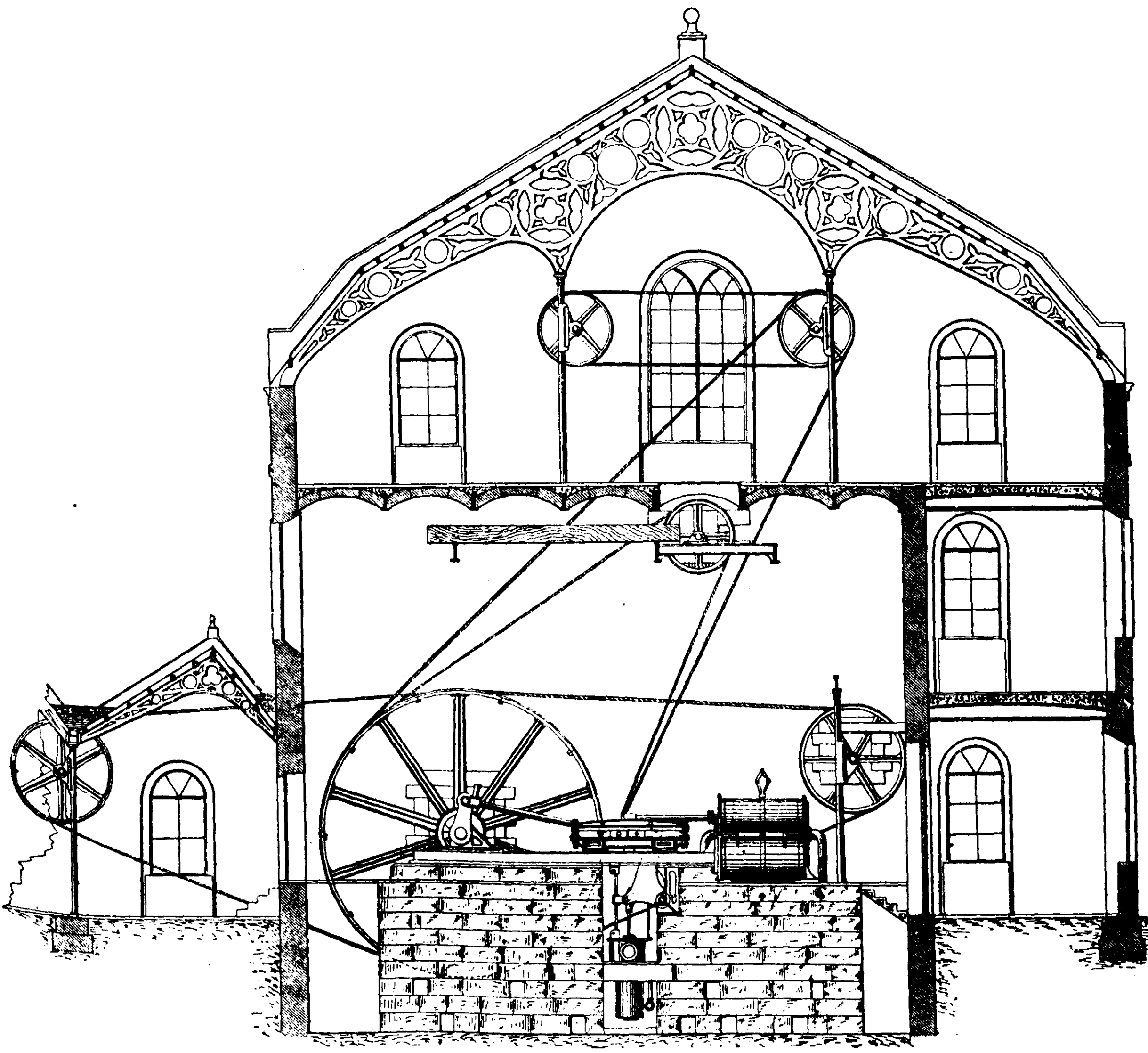
Montreal Bridge.—A gigantic new bridge is about to be built across the St. Lawrence, at Montreal, to accommodate street cars, carriages and foot passengers, as well as railroad traffic. A viaduct 4800 feet long, in twenty spans, will conduct from Sherbrooke Street to the river, five spans of 600 feet each will cross the river to St. Helen's Island, which will be traversed by a viaduct with twenty spans of 120 feet each, while twelve spans will cross the unnavigable channel south of the island. The bridge will be 130 feet over the level of the river.—*Iron.*

American Steel.—An Englishman, now an ironmaster in Pennsylvania, says that steel is now being made about as cheap as iron: that every mill that is adapted to making steel has more orders than it can fill, and that such mills are running night and day on rails. Mr. S. B. Lowe says:—"In the Northern States the steel ores are almost exclusively confined to Lake Superior and Iron Mountain, both of which are many hundred miles from fuel. In Chattanooga we have a number of ore beds that are already being turned into metal and sold in advance to the manufacturers of steel. Still we must say that we as yet know but very little of what we have. We have hundreds of ore banks that never had a pick nor shovel in them, let alone the fact that they have never been tested."



ONE HUNDRED-AND-SIXTY TON HYDRAULIC CRANE.

ROPE TRANSMISSION IN MILLS.



ROPE TRANSMISSION IN MILLS.

Of late years the plan of transmitting power by endless ropes, instead of by flat belts or gearing, has been largely developed, and the results obtained have been such as to warrant the conclusion that the use of such means of transmission will become very greatly extended. In some cases failure, or excessive wear and tear, have resulted from the employment of inferior ropes, or of bad forms of grooves to receive these ropes; but the system, when properly carrried out, appears to give highly satisfactory results. The ropes generally used are 4½ in., 5½ in., and 6½ in. in circumference, and are made of thoroughly prepared hemp. For the transmission of small powers a single rope of course suffices; but for larger power a number of ropes are employed side by side, each rope running in its own groove.

The engraving which we publish on this page shows the arrangement of rope "gear," as applied to a jute mill, and this will give an idea of the system. In this case the ropes are transmitting about 412 indicated horse power, the shaft on the left giving motion to the looms, that in the centre to the spinning machinery, and that on the right to the carding machines, &c. It will be seen from our engraving that the system gives very great facilities for dividing the power of the engine between a number of shafts without the employment of vertical shafts and toothed gear, while the ropes also run very smoothly.

Rope gearing, we believe, can be applied to engines developing in the aggregate about 7000 indicated horse power.

HOUSE FOUNDATIONS.—We have long ago called attention to the evils which must necessarily arise from building houses on foundations formed on dust and other rubbish shot into hollows for filling them up after brick-clay has been removed. Last week a deputation waited on Mr. Cross, urging the Government to introduce a measure for preventing such breaches of sanitary laws in regard to the area under the superintendence of the Hackney District Board of Works. Mr. Ellis, the Clerk of the Board, explained how, after sand, gravel, &c., were taken out, the hole was replaced by the refuse of dustheaps, adding that the Nuisance Removal Act did not give local authorities sufficient power to deal with the evil. Dr. Tripe, the medical officer, pointed out the sanitary evils that resulted from such a nuisance, showing that while good brick earth in many cases was taken away, the rubbish that was thrown in to replace it simply made the houses erected on its surface hot-beds of fever. Many arguments were urged, and in reply the Home Secretary stated that he was fully aware of the danger which might arise, and while of opinion that the law at present existing was sufficient to meet the evil, he should at the same time consider if further measures were needful —of which we have not the slightest doubt.

IMPROVEMENT IN THE MANUFACTURING OF GRAIN CRADLE-FINGERS.

As the time for manufacturing agricultural implements for the harvest season has now arrived, any improvement in the manufacture of machinery which will effect a saving in labor and give a superior result, we deem it a duty to bring to the notice of manufacturers.

We have a model of a machine before us which has been patented in the United States, and now being patented in Canada, which is a great improvement in the manufacturing of grain cradle-fingers, cutting out any number of them in a very rapid manner and of an uniform size from the same piece of timber. We highly commend it to the notice of manufacturers.

Mr. J. L. Multer, of Richmondville, Schoharie Co., State of New-York, is the patentee.

IMPROVED ADJUSTABLE ALMANAC.

(See page 116.)

We illustrate herewith a new almanac, which by a simple re-arrangement of marked pegs inserted in cavities in a block, may by adapted for any year. In the annexed engraving, Fig. 1, a portion of the device is shown. The pegs are placed in columns in the month divisions of the wooden block. Each of said divisions, for the sake of uniformity, contains 42 pegs, and on these pegs are figures to denote the days of the month, so that, of course, as many blank pegs appear as the total number exceeds that of the days in the month.

The pegs are alike in size, and therefore are interchangeable in the block orifices. On the under side of each, at the same end as the figure marked, is inscribed the day of the year. The opposite extremity of the peg is blank, so that, according as it is inserted in the block, it shows either the plan or numbered end. To use the calendar, all the pegs are inserted so as properly to indicate the days of the month, but are pushed into the block to the full length. As each day arrives, its corresponding peg is drawn out until the number denoting the year day, on the under side of said peg, appears. Thus, for every day expired, a drawn peg will be shown, while those days yet to come are indicated by the untouched pegs, so that the last drawn peg points out the current day.

The year in progress is shown at the top by similar movable pegs, which are also interchangeable with those already described. Those pegs not in use for indicating the year are inserted, rear end out, in the blank month spaces, and thus are conveniently stored until needed.

Each peg, as shown in Fig. 2, has a movable metal slide on its upper side. On this slide are figures, and, as the slide is moved out or in on the peg, said figures are shown in succession. This is called a "reminder," and the object is to denote that as many different matters are to be attended to, on the day shown by the peg, as are indicated by the last figure appearing on the slide. Another device may be used to symbolize events. In the engravings, pins are represented inserted in orifices in the pegs, to indicate the occurence of full moons and eclipses — the former being denoted by a crescent-shaped head on the pin, and the latter by a head representing an eclipsed orb. Of course the peg shows the day on which these events are to take place.

Patented August 17th, 1875. Patented in Canada 20th January, 1876. For further information relative to proposals for manufacturing on royalty, &c., address the inventor, Mr. David J. Miller, Santa-Fé, New Mexico.

QUERIES.

[1009]—E. H. Lewis, Winnipeg, inquires—What would be the best means to remove a hard incrustation from the interior of a return tubular boiler ?—Would diluted hydrochloric acid do it ?

[1010]—I am making a pair of oscillating Engines—stroke 9 in x bore 4 in—and intend casting the cylinders out of a mixture of brass and babbit metal ; will it answer for that purpose ?

[1011]—What is the best method of placing a coating of copper on an iron surface ?

[1012]—The fish in my aquarium sometimes get covered with a sort of fungoid growth, a kind of slimy matter.—By what process can I clean them ?—Brewster.

[1013] Will any of your readers favor me with the best method of bending pipes ?—Amateur.

OVERHEAD APPARATUS FOR LATHES.

II.

(See page 85, of April Number.)

There are two or three other arrangements of overhead of which I was inclined to treat in this paper before proceeding to illustrate that of "D. H.G." They are, however, for the most part, on a similar plan to the last, although the tension is arranged differently. In one now before me there are two rigid uprights bolted to the back of the bed (a very bad plan), connected at the top by a strong cross-bar, a slotted arm rises from the end over the mandrel, and a similar one is bolted to the top of the cross-bar at any desired point, according to the proposed length of the overhead axle. The bearings working in these slots allow of adjustment as to height according to the length of cords to be used. When, however, their position is decided, the bearings are for the most part secured permanently, so that this does not really provide for rapid adjustment of the tension. For the latter, therefore, there is added a friction-pulley, carried by an adjustable horizontal arm projecting from the cross-bar. This answers the purpose of keeping up a strain upon the cord, against which the pulley bears ; but to my own mind the method is too much of a makeshift, and only assists in more rapidly wearing out the cord. I have, however, added a sketch (Fig. 7), as the arrangement is novel in its details. But it only provides for one overhead axle, and two are far more convenient, especially for spiral work. Fig. 8, however, taken from the frontispiece in "The Lathe and its Uses," as a good specimen of a modern arrangement, is here given as supplying the latter requisite of two pulley-shafts. The upper one is centred in the frame, which itself swings upon the centre screws carrying the lower shaft ; the tension of the upper cords, or the small pulley and roller, is regulated by the balance weights B. After inspection, however, of "D. H. G.'s" arrangement, it will be seen that the plan he adopts for regulation of the tension might be applied to this form by hooking the india rubber springs to the front bar of the swinging frame, and then conducting cords from these springs over pulleys, as shown in the next drawing. This would not, however, convert the above into a similar one to "D. H. G.'s," as there is a secondary arrangement of speed pulleys—not shown in the present drawing—which greatly increases the facility of varying the speed to suit circumstances. The roller, moreover, would not give that grip to the cord which is absolutely necessary to prevent slip in turning metal. After careful experiment "D.H.G." advises that the grooves in the pulleys should not be V-shaped, but carefully rounded to fit the cords. These are then imbedded almost to their diametrical line, and the whole of their lower section being in contact with the groove at its bottom and sides, receive more grip than when the latter is V-shaped, as only two points are in the latter case in contact with the cord. The general primary arrangement of the overhead use by "D.H. G." is shown in the accompanying figure— there being an additional set of pulleys omitted from this drawing. The details will be given in due course. Two iron brackets, A, A (Fig. 9), are firmly attached to the wall by washers and bolts with good strong nuts. This, which may be modified to suit local circumstances, sustains the rest of the apparatus. The brackets, it will be observed, rest flat against the wall, and are twisted at the lower part, so that where they project from the wall they stand edgewise to receive the sliding-socket pieces B, of which only one appears in the drawing. On the right-hand side this sustains the upright bolt C. The short screw, S, enables the socket to be fixed at any part of the projecting arm of the bracket, allowing the whole frame of the overhead to be adjusted over the lathe-bed. At the bottom the bolt, C, is flattened to slip over the screw, D, which forms one of the points of suspension of the frame. It will be noticed that at this end of the frame there is a second bar which carries the actual centre screws of the two shafts, but it is not essential, and would generally be omitted. In the latter case the centre screw of the hinder axle would be at D, which would thus serve a two-fold purpose, and at the left-hand of the frame this is the actual arrangement, as will be seen from the plan annexed (Fig. 9). This will be referred to again presently. At E, E, are seen two strong springs of india-rubber, such as are sold for door springs. The flat ones are strongest and best for this purpose, the round being much weaker, as they are intended only for use upon light inside doors. I am sorry to say I have found some of the red rubber very bad indeed. A spring I bought the other day for an overhead, on the plan here proposed, showed a dozen faulty places when stretched, and was absolutely useless. Let me, therefore, warn my readers to stretch the spring when purchasing, and to notice the result. The grey seem to be generally more reliable than the red. I have seen thick *rings* of round india-rubber, which I fancy would serve even better than door springs, but this is merely a matter of choice. "D.H.G." applies these springs, as seen in the drawing, in a very simple way, which gives a power of increasing or diminishing tension in a moment — *a point of very great importance*. Cords attached to the springs pass over pulleys screwed to the board which is overhead, and thence to other pulleys upon R, along which they are constructed like the cords of Venetian blinds, and ultimately falling down side by side at H, are there attached to a block of wood, or passed round a pulley hanging loose, and from which depends a chain, L, either link of which can be hitched over a hook, M, firmly screwed to the wall. The pull upon the cords is, therefore, regulated to a great nicety, and in a simple and inexpensive manner. The cord, P, with its hand-ring, is added as a convenience for enabling the turner instantly at any time to slack the cords upon the pulleys by pulling the front of the overhead frame downwards. This is a great convenience, as the action of the lathe can be instantly stopped in case of a hitch, or for the purpose of shifting either cord to a different speed of pulley. The axles of the speed pulleys are of gas pipe, plugged at the ends with steel, carefully drilled and hardened. This is a cheap method, and quite satisfactory. I am told by an engineer, however, that there is a superior tube called hydraulic, which is quite true ; personally I have never seen it, but I suppose it is tolerably easy to obtain, though less so than gas tubing. "DHG.'s" overhead is of mahogany, 2½ in. wide, 1½ in. thick, and the inside width of the frame 17¼ in. The length will depend, of course, upon that of the lathe-bed, and whether the apparatus is to extend over all parts of it, or only over a portion. It is better, and not really more costly, to let it be of full length, so that a screw could be cut, or the extremity turned of a long rod. But the axles should not be extended more than is absolutely necessary, lest they should spring under the strain. The whole ironwork of this overhead may be had for a sovereign, so that it is probably the cheapest that can be fitted up by the amateur or mechanic. Upon inspection of the figure, two screws with wing nuts will be observed, marked N. The use of these will be more plainly seen by referring to the details in our next of the ends of the main frame. The side of the latter has cut in it a long slot, over which a plate of brass similarly slotted is screwed, or a plate of iron if brass is not at hand. The centre screw upon which the front axle turns passes through this slot, and on each side of the frame carries a clamping nut by which it can be fixed in any required position. This enables the pulleys on this front axle, with the axle itself, to be set near to or at a distance from the hinder axle and its pulleys at pleasure. The inside nut has screwed into it at one of its flat sides a rod, upon which a thread is cut, and after passing through a hole in the front bar of the frame, a washer and thumb-screw must be placed upon it, by which the centre screws and axle of the pulleys can be drawn forward, tightening the band which passes over the pulleys O and P. The clamping-nut is then screwed up tight and the centre screw becomes immovably fixed. This plan is adopted, of course, at each end of the frame. The screwed bars N, N, need not be more than light nail rod, and blank wing-nuts can be bought at any respectable ironmonger's, so that they only repuire to be drilled and tapped to suit the rod. The back axle does not need a similar power of adjustment, and is therefore simply mounted on centre screws held securely by clamping nuts.

All these details will appear in our next paper drawn to scale. There are also an additional set of pulleys on a separate frame which fits upon the main frame, which are omitted from the perspective drawing for the sake of clearness, but form a very important part of the apparatus. Our readers must ruminate for a few days upon the general aspect of this long-expected overhead, while we get to work upon the detailed drawings, which we hope to present to them next week.—*English Mechanic.*

HAPPY EVERY DAY.—Sydney Smith cut the following from a newspaper, and preserved it for himself : When you arise in the morning, form a resolution to make the day a happy one to a fellow creature. It is easily done ; a left-off garment to the man who needs ; a kind word to the sorrowful ; an expression to the striving—trifles in themselves as light as air — will do at least for the 24 hours. And if you are old, rest assured it will send you gently and happily down the stream of time to eternity. By the most simple arithmetical sum, look at the result. If you send one person happily separated through the day, that is 365 during the course of a year. And suppose you live 40 years only after you commence that course of medicine, you have made 14,600 persons happy, at all events for a time.

FACTS FROM HISTORY.

IN the time of Richard the Third, war was the chief pursuit of all classes, not excepting the clergy. Even the courts of the universities were frequently stained with blood. Learning was little esteemed.

THE priests of the Anglo-Saxons were commanded to increase knowledge by diligently learning some handicraft. Hence it is that so many curious pieces of inventive mechanism have been handed down as the works of early monks.

THE invention of the musical scale, or gamut, occurred in 1022 : it was the work of an Italian monk, and contributed to diffuse a taste for music. The inventor, Guido Arctine, was sent for thrice from Rome, to explain and teach it to the clergy.

AMONG the Anglo-Saxons, the trade of a shoemaker was somewhat comprehensive. He manufactured and supplied ancle leather, shoes, leather hose, bottles, bridle thongs, trappings, flasks, boiling vessels, leather neck pieces, halters, wallets, and pouches.

IN the reign of John, religion formed part of every exhibition. Theatrical spectacles were of a religious character, the clergy and their attendants being the actors, clothed in sacred vestments. They represented the Scripture miracles, and the sufferings of the martyrs.

IN the twelfth and thirteenth centuries, our ancestors spoke a language as unintelligible to us as a dead or foreign language ; and in the fourteenth century they only began to be intelligible with the help of a glossary, as may be remarked in the writings of Chaucer, and Gower, who flourished at that age.

IN the reign of Edward the Third, laws were enacted to restrain luxury of living. No man under a hundred pounds a year, was allowed to wear gold, silver, or silk in his clothes. Servants were also prohibited eating flesh meat, or fish above once a day. No one was allowed, either for dinner or supper, above three dishes in each course, and not above two courses.

IN the reign of Stephen, long hair was very much worn ; it was a great eye-sore to the clergy, who did not like the contrast of their shaven polls with the flowing ringlets of the knights and barons. Formerly the English wore the hair upon the upper lip, but this not being the Norman fashion, the Conqueror compelled them to have that part, as well as the chin, shaven.

BEFORE Cardinal Langton had divided the Old and New Testament into chapters and verses, two modes of preaching were practized. The first consisted in explaining a large portion of Scripture, sentence after sentence, in the regular order in which the words lay, making short practical reflections on each sentence. The second mode of preaching was called *declaring*, because the preacher, without naming any particular text, merely declared the subject upon which he was to enlarge. When texts were first employed, the new mode was stoutly opposed as subversive of the good old custom.

M. CHEVREUL communicates to the French Academy a paper on petrifaction, in which he proves that the process of change in organic matter comprises two epochs—the first being the absorption of mineral water through capillary action, and the second the disappearance by oxidation of the organic matter, and the substitution of the solidifying mineral matter, taking the actual form of wood. M. Daubrée stated that he had confirmed this view by experiments made upon wood in the hot baths of Bourbonne-les-Bains.

PETROLEUM is not quite such a novelty as some persons suppose. The first shipment of oil in bulk, we learn from an American correspondent, was made from Vedango county in 1815, by General Hays, of Franklin, who gathered three barrels from what was subsequently termed the Buchanan farm, on which most of Rouseville is now situated. The oil was skimmed off the springs along the creek, with no small labour, carefully secured in strong barrels, and sent by wagon to Baltimore. There it was placed in charge of a leading merchant, who frequently complained of its atrocious smell, and after storing it a year or two, emptied the whole quantity into the Chesapeake Bay ! Thus disastrously ended the first attempt to export crude petroleum on a large scale, although as early as 1806 Nathaniel Carey had sold little vials of the stuff throughout the country, under the name of Seneca oil, a title it retained for half a century. Carey procured his supplies at McClintockville, where the precious fluid bubbled in small amounts through the waters of Oil Creek, whence it was taken by means of flannel cloths dipped into the viscid stream and then wrung into vessels all ready for bottling. What a transformation has the business undergone since that primitive period !

BOILER EXPLOSIONS IN 1875.

(Description and further illustrations will be given in June Number.)

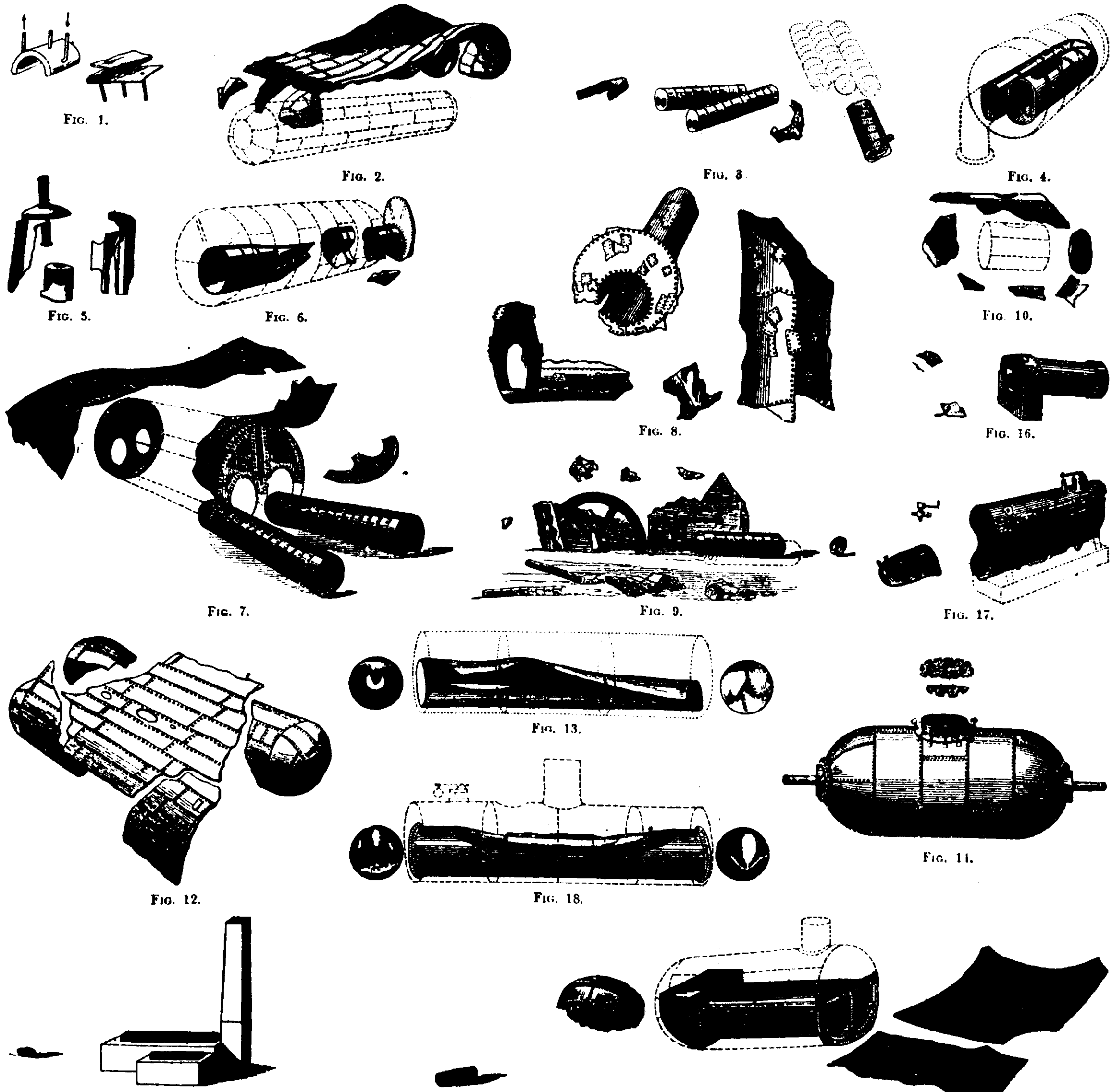


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7. Fig. 8. Fig. 9. Fig. 10. Fig. 11. Fig. 11. Fig. 12. Fig. 13. Fig. 15. Fig. 16. Fig. 17. Fig. 18.

A WELL MADE STEAMER.

The "Great Britain" steamer was one of the first made iron vessels, and among the earliest to ply regularly between New York and Liverpool. She has lately arrived at the latter port from Melbourne, Australia, thus completing her thirty-sixth trip round the world. She was designed by Brunel, and built at Bristol, and in July, 1845, made her maiden voyage from Liverpool to New York in fourteen days. Her dimensions are : Length (extreme) 330 feet, breadth 57 feet, depth 32 feet, with engines by Penn, of 500 nominal horse power.

The weight of iron used in her hull alone is 1,040 tons, which is about equal to an average thickness of 2½ inch. Since 1852, independent of her employment in the Crimea during 1854 and 1855, she has sailed over 1,000,000 nautical miles, her last voyage out from Gravesend to Melbourne only occupying fifty-four days, and when recently surveyed she was pronounced to be one of the strongest vessels in the mercantile marine.

CANAL ROUTE ACROSS THE ISTHMUS OF PANAMA.

The United States Commissioners appointed to inquire into the respective merits of the different routes for a ship canal across the Isthmus of Panama give the preference in their report to the Nicaragua route, and estimate that the proposed canal from the harbour of Brito, on the Pacific, to Greytown on the Atlantic, can be constructed at a cost not exceeding 66,000,000 dols. Their reasons for preferring the Nicaragua route, notwithstanding its great length (181 miles), are, that it is the only route where the climate is not dangerous to health, and the only one where a proper supply of water could be found, Lake Nicaragua being an unfailing source. The commissioners, after referring to the vast importance of a connection between the two oceans, by which probably nearly one-half of the carrying trade of the world will be revolutionized, urge that the United States "take some action at once to carry out the feasible plans of the ship canal, in order to prevent either France or England from coming in and reaping the honour and profit of this great enterprise."

Fig. 1.

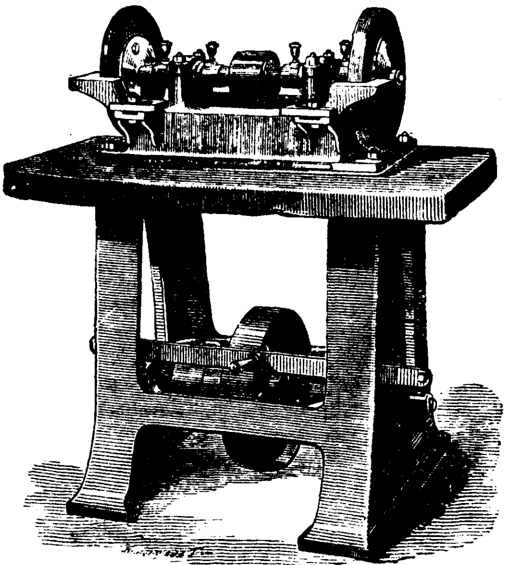
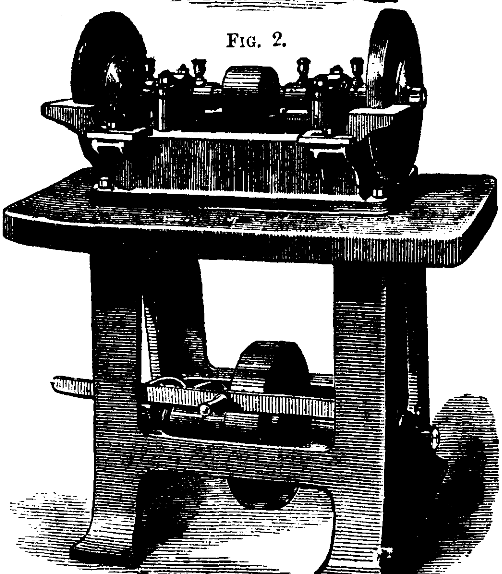


Fig. 2.



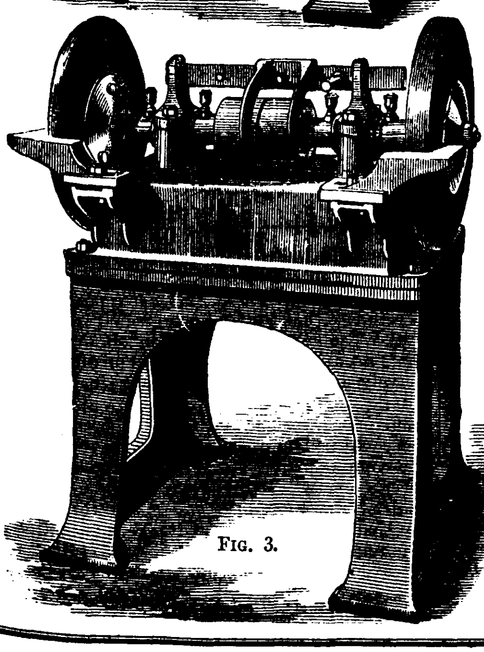


Fig. 3.

MESSRS. THOMPSON & STERNE'S UNIVERSAL GRINDERS.

The accompanying engravings illustrate a neat modification of the well-known emery grinding wheel, now being introduced by Messrs. Thompson & Sterne, Crown Ironworks, Glasgow. The speed of the top driving gear is 370 per minute, and that of the emery wheel spindle 1140 per minute. These machines are substantial and well got up, and, like all well made emery grinders, will do a great deal of work at a very low price.

TONING OF PHOTO-TRANSPARENCIES ON GLASS.

This operation is scarcely necessary if the transparency should have been reinforced with acid silver, and is only required to be viewed by transmitted light. But silver as well as alkali-intensified films have generally a very disagreeable color by effected light, and many amateurs object to this. The use of weak solution of chloride of gold obviates this difficulty, but, unfortunately, the color thus given is too cold to suit many tastes. The best toning agent we have used is chloride of copper, followed by an application of alkaline pyro.; any tone by transmitted light is attainable, while the color of the deposit by reflected light is either black or a deep warm brown. On no account resort to any of the formerly recommended methods of toning by mercury; the colors, though beautiful to the eye, are evanescent, and sooner or later the picture becomes one shapeless blotch.

—*British Journal of Photography.*

BREATHING THROUGH THE NOSE.

There are various reasons for considering the nose the natural outlet of the lungs, and hence various advantages to be derived from breathing through the nose.

1st. If we breathe through the nose we will be enabled often to detect the presence of noxious odors in the air we breathe, and so be warned of danger in time to prevent it.

2d. The internal nose is studded with hairs, which in some degree at least prevent the ingress of noxious matters with the air we breathe. Dust is strained out, and it is confidently asserted by persons who have tested the matter, that miasmas are prevented from entering the blood if one breathes only through the nose. Some persons have lived in malarious districts, slept on the banks of malarious rivers, etc., for years, and yet have escaped all the forms of fever which usually followed a residence in the country, who have ascribed their exemption solely to the settled habit of breathing only through the nose.

3d. By breathing through the nose, little, if any, air passes into the lungs until it has come in contact with the membranes of the nose, which are supposed to possess some power of neutralizing malarious and contagious poisons.

4th. By drawing our breath only through the nose, the air is warmed by contact with the membranes before it reaches the lungs, and so inflammations and congestions of those organs are avoided.

Per contra, the habit, so common, of breathing through the mouth has many disadvantages. In this way a great volume of air is quickly taken in, loaded with dust, malarious or contagious impurities, etc., of which we are utterly unconscious, until the blood has been poisoned, and serious and perhaps fatal disease been inaugurated. The cold air being taken in in great volume and with great rapidity, chills the lungs, whereas, if breathed through the nose, it would be warmed before reaching the lungs.

The habit of breathing through the mouth is caused largely by weakness of respiratory muscles, and one excellent method of strengthening those muscles is to breathe through the nose. It is certainly as wise a plan as sucking air through a silver tube, so often recommended. Then breathe through the nose, as nature indicates, if you would have good health.

Ventilation of Clothes Closets.—Too little attention is paid in the construction of closets to their proper ventilation. It is not always convenient to have a closet door stand open, and if it were, full ventilation cannot be secured in this way. There should be a window or an opening of some sort from the closet to the outer air or to a hall, so that a current of air might remove any unpleasant odors arising from clothing that has been worn, from shoes, or from anything else kept in the closet. A garment that has hung for a length of time in a close closet is as unfit to wear, unless it has been thoroughly aired, as though the unwholesome vapors it had absorbed were visible to the eye. The charm of clothing new and clean lies far more in the absence of these vapors than many people are aware.

LECTURES TO LITTLE FOLKS.

ON GRAVITATION, WEIGHT, AND THE VELOCITY OF FALLING BODIES.

Let any boy hold up a ball and let it fall from his hand. Now why does it fall to the ground as soon as he withdraws his hand? Naturally he will answer because every *heavy* body that is not supported must of course fall. But every *light* one also will fall; such an answer merely asserts the fact, without explaining the reason. Some of you, we daresay, know the reason, viz., that it is owing to the force of gravity; the earth attracts the ball, and the consequence is they both come in contact. But it is equally true that the ball must attract the earth, for you have probably read that bodies mutually attract each other. Now can you tell why the earth should not rise to meet the ball? You will probably answer "because the earth is so much larger and heavier than the ball." It is doubtless much larger; and since the force of attraction is in proportion to the mass, or quantity of matter, you cannot be surprised at not perceiving the earth rise to meet the ball, the attraction of the latter being so infinitely small, in comparison with that of the former, as to render its effect wholly nugatory; but with regard to the earth being heavier than the ball, what will you say when we tell you that in the ordinary acceptation of the term, it cannot be said to have any weight at all. This may at first appear a strange assertion to make, and you will possibly think how can the earth have no weight, when with difficulty I can lift from its surface a moderate sized stone, which is only an atom of the earth? This, which you and all generally call weight, is nothing more than a resistance caused by the attraction of a body for the earth, and if the stone feels heavy which is supported in your hand, it is nothing more than the tendency it has to fall to the earth, and consequently the pressure on your hand is caused by the attraction of gravitation, and what we call weight. But as attraction is always in proportion to the quantity of matter, so, of course, you might suppose that a larger body must be more powerfully attracted, or be *heavier* than a smaller one. This, however, is not the case, magnitude or size has nothing whatever to do with quantity of matter: will not a small piece of lead weigh more than a large piece of sponge? In the one case, the particles of matter may be supposed to be packed in a smaller compass; in the other, there must exist a greater number of forces or interstices.

Now since the earth has nothing to attract it, it cannot have any attraction to resist; according to the ordinary acceptation of the term, it cannot correctly be said to possess weight, although when viewed in relation to the solar system, a question will arise upon this subject, since it is attracted by the sun.

Presuming that you now understand the nature of that force by which bodies fall to the earth, it will be instructive to you to know the degree of velocity with which they fall.

Probably you may suppose that the weight of the body, or its quantity of matter, and its distance from the earth, must determine that circumstance; such, however, is not the case, a cannon ball and a marble would fall through the same number of feet in a given time, and whether the experiment is tried from the top of a house or from the top of a high steeple, the same result would be obtained. This may appear at variance with what you may have learnt, that "*attraction is always in proportion to the quantity of matter*," and that "*attraction diminishes as the distances increase*," and it is difficult to divest your minds of an erroneous but natural feeling, that a body necessarily falls to the ground without the exertion of any force; whereas, the greater the quantity of matter, the greater must be the force to bring it to the earth; for instance, a substance which weighs one hundred pounds, will thus require just ten times more force than one which only weighs ten pounds; and hence it follows that both will come to the ground at the same moment, for although in one case there is ten times more matter, there is at the same time ten times more resistance, for as before stated "the force of attraction is always in proportion to the quantity of matter." Now let us for the sake of argument suppose that attraction had been a force acting without any regard to quantity of matter, is it not evident in such a case, the body containing the largest quantity would be the slowest in falling to the earth? If an empty wagon travelled four miles an hour, and were afterwards so loaded as to have its weight doubled, it could only travel at the rate of two miles an hour, provided that in both cases the horses exerted the same strength, or to express the fact in philosophical, instead of figurative language, gravitation, or the force of the earth's attraction, always increases as the quantity of matter, and consequently, that heavy and light bodies, when dropped together from the same altitude, must come to the ground at the same instant of time. We can imagine you to exclaim, "How can this possibly be the case? If I let a cent "piece and a piece of paper of the same shape and size "fall from my window to the ground, I can see the coin "reach the earth long before the paper." The reason of this we can easily explain; the result of your experiment would not be contrary to the law of gravitation, it arises from the interference of a foreign body, *the air*, to the resistance of which it was to be attributed: the particles of a falling body are under the influence of two opposing forces—gravity and the air's resistance—at first, you might naturally suppose that as the surface of the cent piece was exactly the same as that of the paper disk, the resistance of the air should be the same in both cases, but the reason why the paper does not meet with more resistance than the coin, arises from the latter possessing greater density, and therefore must contain more particles, than the paper, and upon which the air cannot possibly exert any action, whereas every particle of the paper may be said to be exposed to its resistance, the fall of the latter therefore must be more retarded than that of the former body. To prove this, place the paper in close contact with the upper part of the coin, and drop it gently from your window to the ground, and in this position the paper will reach the ground at the instant with the coin.

Now hoping that you thoroughly understand this point, let us proceed to the other question, viz.: that a body will fall with the same velocity, during a given number of feet, from the top of a high steeple, as from the top of a house, this may seem at variance with the theory that as the attraction of the earth for a body diminishes as its distance from it increases (1), a substance at a greater height ought to fall more slowly that one which is dropped from a less altitude, but as attraction acts from

(1) Gravity, or the tendency of a body to approach the earth, is inversely as the square of the distance.

the centre, and not from the surface of the earth, the difference of its force cannot be discovered at the small elevations to which they could have access; supposing two hundred feet to be the height of a steeple, it is a mere nothing compared with four thousand miles, which is the distance of the centre of the globe to its surface. If it were possible to make the experiment one hundred miles above the earth, the diminished effect of gravity would be very evident, for if a lump of lead weighing a thousand pounds were carried up even four miles, it would be found to have lost two pounds of its weight.

We now come to that part of our lecture relating to the velocity of falling bodies, granting that all bodies in vacuum (that is where there is no resistance of air) fall with the same velocity. Since the force of gravity is continually acting, so is the velocity of a falling body continually increasing, or it has what is termed *accelerating velocity;* it has accordingly been ascertained by accurate expeciments, that a body descending from a given height falls sixteen feet in the first second of time; three times sixteen in the next; five times sixteen in the third; and seven times sixteen in the fourth; and so on continually increasing according to the odd numbers, 1, 3, 5, 7, 9, 11, &c.; so that you perceive by observing the number of seconds, which a stone requires to descend from any height, we can discover the altitude, or depth of the place in question.

Supposing that you wished to find the depth of a very deep well, but having no line at the time to measure its depth, the following simple rule will enable you to find it approximately:

"The spaces described by a falling body increase as the squares of the times increase." Many of you are sufficiently advanced in arithmetic to know that the *square* of a number is the sum obtained by multiplying the number into itself, thus the square of 4 is 16; the square of 3 ; 9, and so on.

This then being the case, you have only to square the number of seconds that a pebble takes to strike the water, provided you can see it strike; then multiply that product by 16, being the space described by the falling body in the first second, and you will have the required answer. Supposing a stone took 4 seconds to strike the water in the well; square this number, 4 x 4 = 16; multiply this by 16 and we obtain 256 feet, which would, approximately, be the depth of the top of the water in the well from the earth's surface.

GAS BURNERS.—There has been a discussion in Worcester as to the superiority of gas-burners. Professor Kimball says, "An argand burner, consuming 5 to 7 feet of gas, gives 48 per cent. more light than the common brass fish-tail burner; a lava tip brass burner (no check) 22 per cent. more; the Ellis patent 48 per cent. more; the Evans 58 per cent. more; and the Garland patent 64 per cent. more. The Ellis equals the Argand; the Evans gives 6 per cent. more light, and the Garland 10 per cent. Two burners of each patent were used, and the mean results are given." The Garland patent includes in its specifications the tapering stop, outer case and tip. There would seem to be no doubt, according to Professor Kimball's statement above, that by a perfectly fair test the Garland burner has distanced all competitors by 4 per cent.

FAST RAILWAY TRAINS.—The Great Western railway of England is greatly increasing the speed of its fast trains. The two "Flying Dutchmen"—one of which runs from Paddington at 11.45 and reaches Plymouth at six, and the other of which starts from Plymouth at 8.30 and arrives at Paddington at 2.45—are at present almost, if not quite, unequalled for speed. But Sir Daniel Gooch hopes to reduce the journey by an hour, and is preparing to run the trains at 70 miles an hour.

IMPROVED ANIMAL TRAP.

(See page 156.)

In the annexed engraving we illustrate a novel and ingenious self-setting trap, which may be used for catching any kind of small animal that can be lured by bait. It is entirely automatic in its action, and, it is claimed, will continue its operation until the box is filled with its captures. A, is a metallic plate, having flanged edges through which it is pivoted by a central pin. At the front end of the plate is a rod B, which connects with the vibrating lever C, to which is suspended the gate D. The inner end of the plate is inclosed in the box, a portion of which supports the lever C, as shown. The extremity of the box E, is open and wired, the object being to allow the animal to clearly see the bait and the light beyond, so as not to arouse suspicion. The bait is attached to a curved rod F, fastened to the side of the box. This rod is bent around a catch rod G, which engages with the extremity of the plate A, and supports the same, as shown.

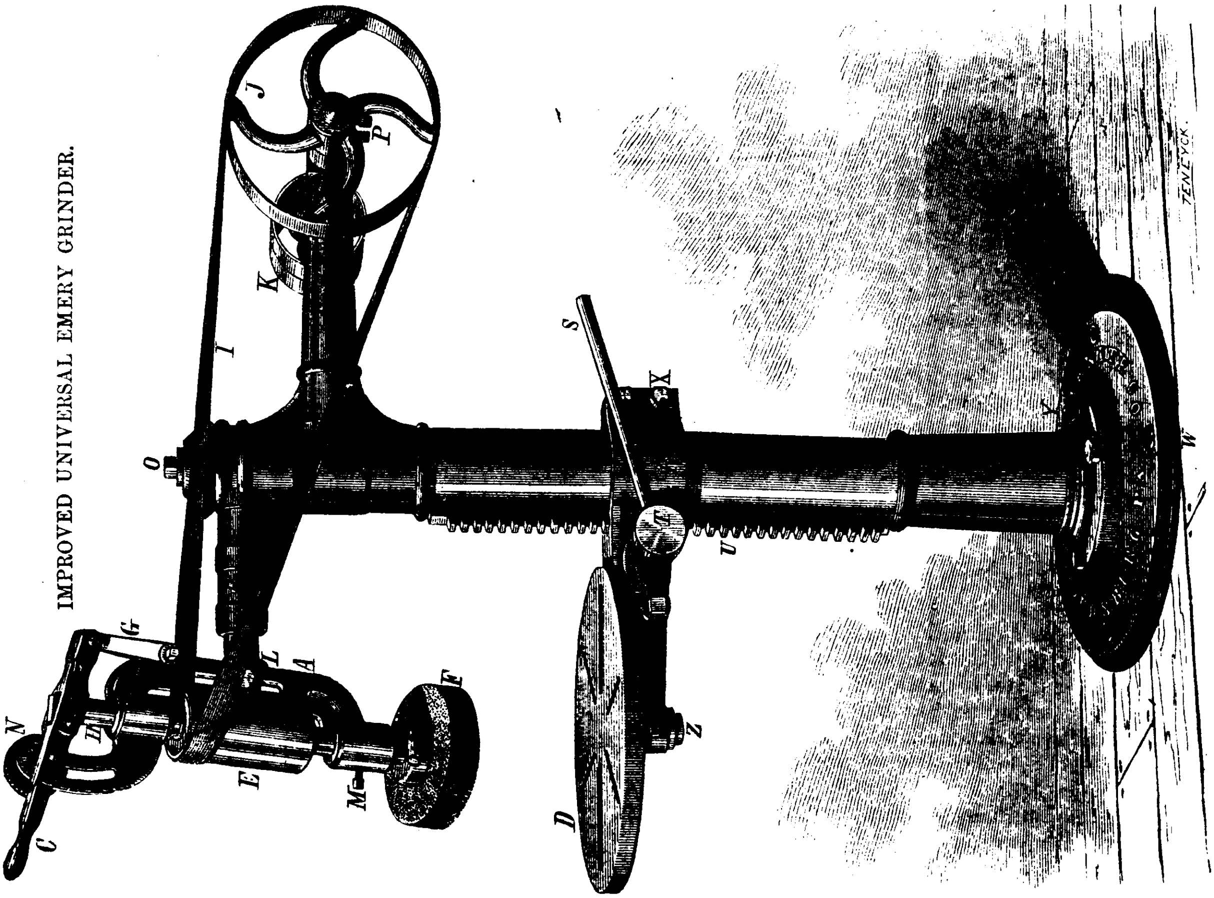
Attracted by the bait, the animal proceeds to the rear end of the plate. The instant the bait is touched, a very slight movement is sufficient to throw the portion of the catch G, which sustains the plate, into a notch in the latter, so that the end of the plate is free to descend by the weight of the animal. As this descent occurs, the opposite end of the plate, of course rising, so moves the lever C, as to cause the gate D, to be lowered, so that any backward escape of the animal is immediately cut off. The animal then slides down the smooth surface of the plate (the inclination of which is limited to the piece H), and is launched into the rear compartment of the trap. Hence he is free to emerge under the swinging door I, but of course cannot return. The plate A, meanwhile regains its normal position, the bait and catch rods slip into place, and the trap is ready for a new victim.

The apparatus is very simple, and can be cheaply and profitably manufactured. The inventor assures us that he has used it with remarkable success, "one trap," as he expresses it, "catching nearly a wash basin full of mice" in a night. It can be made of any desired size and of any material which will resist gnawing.

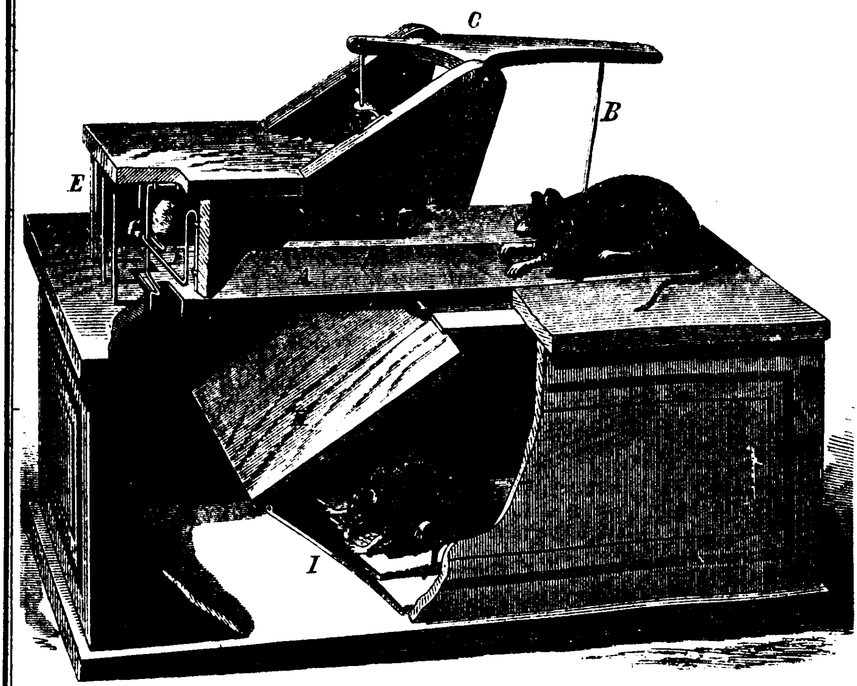
BOILED OIL.—The *Industrial Monthly* says: Do not buy oil which has been treated with litharge, burnt umber, red oxide of lead or vitrol (blue or white,) or sugar of lead, or manganese, or any other siccative. Oil should be boiled in a copper kettle, if possible, set in masonry, and should be thoroughly stirred. While boiling, pieces of toasted bread should be occasionally floated on top of the boiling oil to remove the moisture; pieces of charcoal would answer the same purpose, and would do for fuel afterward. A furnace should be situated in the open air so as to allow the disagreeable vapor to escape, and should be built in such a way that no smoke or blaze could get to the oil, for if your oil gets smoked, it will spoil it in a measure for light colored work, and if the blaze can come near the oil, you run the risk of a fire, as oil at a high temperature evolves an inflammable gas. With oil prepared in this way you can do a better and more lasting job, and will find it to wipe out easier and not show so many brush marks; will not crawl if your under coatings are dry. Your wearing varnish will not strike in any more in one part than another.

ARTIFICIAL FUEL.—Considerable attention is at present being attracted in America to an English invention—that of Mr. Dixon—for agglomerating coal slack, and which, it will be remembered, was successfully tested by Messrs. Bass and Co., of Burton-on-Trent. The essential features of the invention are the employment of dextrine, or similar gummy matters, in combination with fusil oil, sodic aluminate and pitch or bitumen as the binding material, and the production thereby of a fuel which is practically inodorous and smokeless, and which can be burnt at a high temperature without disintegration. It is stated in recommendation of the invention that by the use of dextrine the quantity of water necessary to form the binding composition is much reduced; the fusil oil fixes the carbon in the pitch or bitumen used for waterproofing, and also in the coal itself, and thereby prevents the evolution of dense sooty smoke; the aluminate of soda is said to communicate to the fuel the property of coking, and thus prevents it either from melting or falling to pieces when strongly heated. The prime cost of the finished fuel is stated at 7s. 9d. per ton.

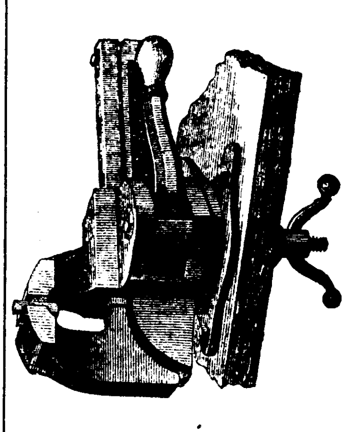
TO PREVENT the skin discoloring after a bruise, take a little dry starch or arrowroot, merely moisten it with cold water, and place it on the injured part. This is best done immediately, so as to prevent the action of the air upon the skin. Invaluable for black eyes.



IMPROVED UNIVERSAL EMERY GRINDER.

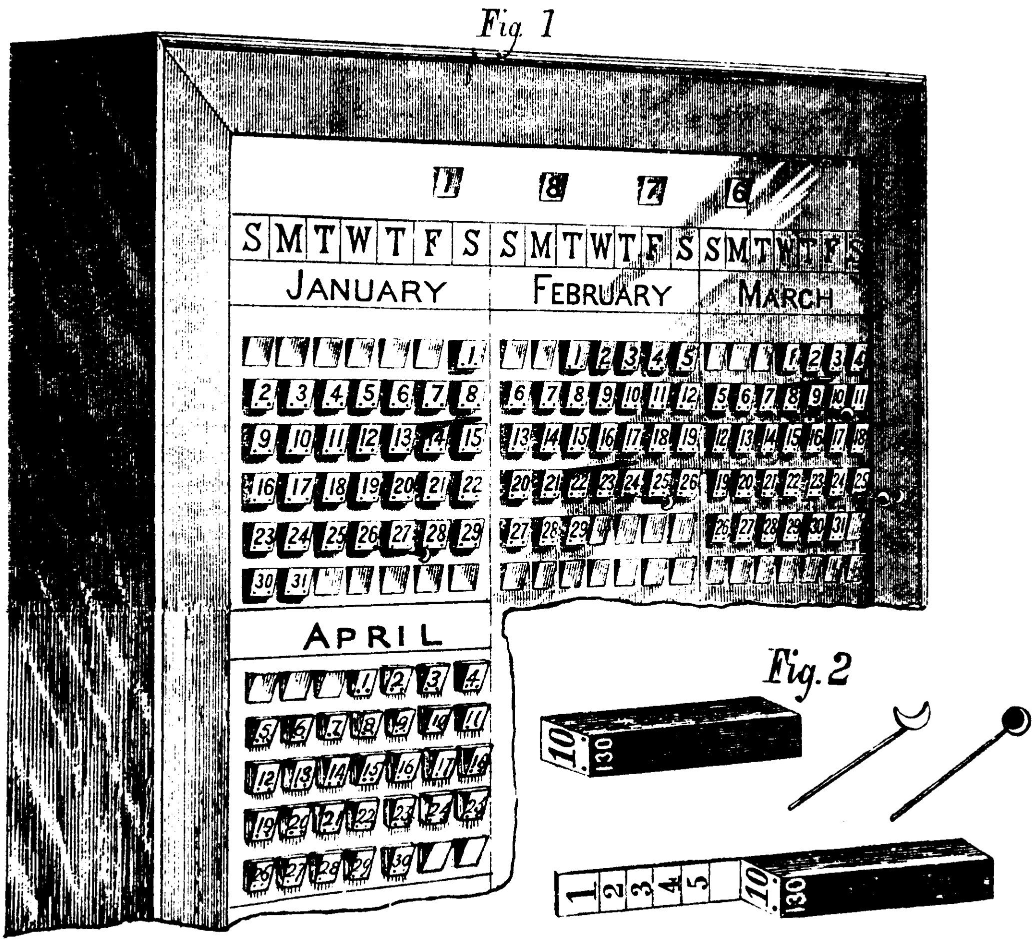


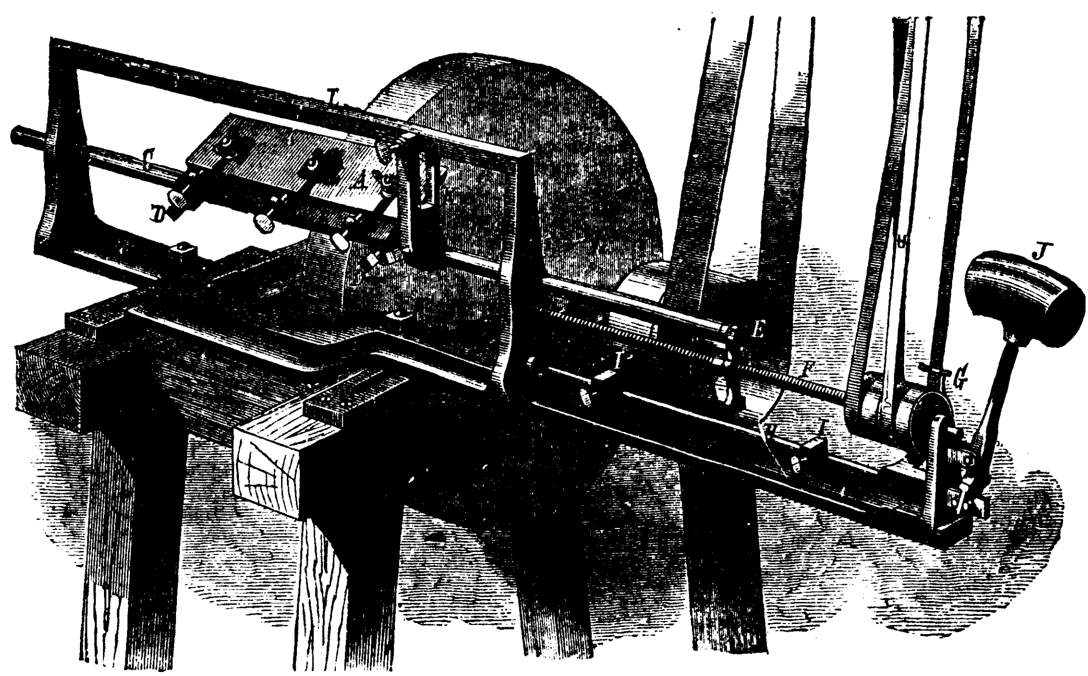
IMPROVED ANIMAL TRAP.



STEPHEN'S PARALLEL VICE.

MILLER'S IMPROVED ADJUSTABLE ALMANAC.





AUTOMATIC TOOL GRINDER.

DOMESTIC READING.

HEALTH MAXIMS.

We breathe in sleep about 15 times every minute.

If the bowels are loose, lie down in a warm bed, remain there and eat nothing until you are well.

Do not allow yourself to read a moment in any reclining position, whether in bed or on a sofa.

Never swallow an atom of food while in a passion, or if under any great mental excitement, whether of a depressing or elevating character; brutes won't do it.

The importance of wholesome water and good sewerage to every single dwelling cannot be over-estimated, and any city neglecting this vital matter must expect to suffer at all times, and particularly when an epidemic of any kind sweeps over the country.

To be liable to lie down at night and fall to sleep within ten minutes, and to know no dream or waking until the morning comes, and then to bound out of bed full of health, freshness and good humor, is a blessing well worthy the warmest outgushings of a thankful heart towards Him who giveth us all things richly to enjoy.

The great regulator of sleep is exercise; it is the best anodyne in the universe, and it is the only one that is always wholesome and natural. If you cannot take much exercise, take a little, and every second hour, increase the distance, and soon you will be able to walk a mile more easily than you walked the first hundred yards.

If an action of the bowels does not occur at the usual hour, eat not an atom until they do act, at least for 36 hours; meanwhile drink largely of cold water or hot tea, and exercise in the open air to the extent of a gentle perspiration, and keep this up until things are righted; this one suggestion, if practiced, would save myriads of lives every year, both in city and country.—*From Dr. Hall's Maxims.*

Dr. Edmunds has given in the *Chemical News* some interesting particulars respecting the formation of colours during the incineration of bread:—He says: "I do not find any note of the fact that, at a certain stage in the incineration (burning) of bread, the beautiful ultramarine blue is formed. This occurs under circumstances which I have not yet sufficiently studied to enable me to reproduce it with certainty; but if the heat be raised to very bright redness, or be prolonged after complete incineration of the bread, the blue passes into a beautiful turquoise colour, then becomes green, then passes on into a rusty colour, and finally comes out as a pale fawn-coloured lining to the botryoidal mass of ash. This is not further affected, even by a prolonged white heat. The tints are so suggestive of the presence of copper that only by very careful examination did I satisfy myself of the absence of that metal; and I find that the colours occur in the purest and finest bread, as well as in the inferior samples. I should be grateful if other analysts would favour me with any observations which they may have made upon this point, and I hope soon to be in a position to submit for myself some further account. It is curious that copper should appear in all the text-books as one of the agents ordinarily used for adulterating bread, and the question arises whether the supposed use of copper may not sometimes have been erroneously inferred from the occurrence in bread ash of those beautiful colours."

French Household Economy.—The French butcher separates the bones from his steaks, and places them where they will do the most good. The house wife orders just enough for each person, and no more, even to the coffee. If a chance visitor drops in, somebody quietly retires, and the extra cup is so provided, but nothing extra by carelessness of intention. When the pot has boiled, the handful of charcoal in the little range is extinguished, and waits for another time. No roaring stoves and red-hot covers all day long for no purpose but waste. The egg laid to day costs a little more than the one laid last week. Values are nicely estimated, and the smallest surplus is carefully saved. A thousand little economies are practised, and it is respectable to practice them. Cooking is an economical as well as a sanitary and gustatory science. A French cook will make a franc go as far as an American house-wife will make three, and how much further than the American Bridget nobody knows—we should probably be greatly astonished, could the computation be made, how much of the financial recuperative power of France is owing to her soups and her cheap food; better living, after all than the heavy bread and greasy failures of our ordinary ignorance. —*Springfield Republican.*

WOOD CARVIN

(Continued from April number.)

(See illustration on page 156.)

In this number we give an illustration of one of the best vices for wood carving now manufactured.

In an amateur's work-room no tool is more handy than a good reliable vice, and we think many of our readers will thank us for introducing to their notice this capital tool that has many advantages over the old fashioned screw vice. It is called Stephens' parallal vice, and instead of a screw, arack-work arrangement and handle effects the necessary grip of the article, and it gives great speed and power with but little effort. (1)

It is admirably adapted to all kinds of work, variable or uniform, light or heavy. A change in position can be made with work that varies greatly in size in less time than it takes to turn a screw half round.

The handle is less in the way on the side than it front, and the operator need not twist himself into a constrained position to work it, but takes the most natural, that is an erect position, and simply moves the handle slightly with the right hand.

There have also been improvements made in apparatus for grinding and keeping tools in order, of which we will give a description.

There has been invented also an automatic tool grinder, which may be had in several sizes; the small sizes are worked by hand, and the largest by steam power.

The engraving on page 157, represents the machine for holding cutters, knives, tools, &c., for grinding. This machine works automatically; the tool being held in the clamp A, is drawn backwards and forwards across the face of the stone or emery wheel as shown in the cut. The clamp K, slipping on the bar L, guides the tool, and at the same time adjusts the exact amount to be ground away.

By substituting a curved or shaped bar for the straight one L, knives of any form or curve may be ground correctly.

The machine is readily adjusted to a grindstone frame, as will be seen in the engraving.

IMPROVED UNIVERSAL EMERY GRINDER.

In the present device the standard is of cast metal instead of wood, and is arranged to receive a collar which supports the adjustable table D, by means of the rack and pawl mechanism shown.

The wheel shaft is mounted in bearings in the frame A, which, by means of a set screw passing through a slot, is secured to a shank which enters a socket on the standard B. The shank, by loosening the set screws which confine it in the socket, can be drawn out to tighten the belt acts on a pulley on the wheel; or it can be turned in the socket so as to set the latter at any angle. By means of the slot and set screw in the frame, the wheel can be adjusted nearer to or further from the table, as desired. The mandrel has several inches traverse in the frame, so that the pulley can be pressed down or lifted up from the work by means of the simple lever arrangement at C. The lever may be set and held at any position by means of the nut shown, or the former may be counter-weighted and operated by a treadle beneath the table.

In order to grind flat surfaces, the wheel is lowered down to them. A conical wheel is used for grinding holes in stove plates, &c., an aperture being made in the table or an auxiliary platform thus provided being secured on top of the latter. For edging plates, the table can be made of sufficient size to sustain the whole weight of the plate, so that the attendant can bring a more even pressure on the wheel with little labor and without danger of injuring it. The wheel can be inclined so as to grind bevel edges with readiness; and by suitably formed grinders, moldings can easily be ground.

The wheel may be adjusted to become an ordinary horizontal grinder; while the substitution of a wooden pulley for the emery wheel turns the machine into a handy contrivance for the use of an emery belt.

An Ancient Woollen Factory.—At Pompei a small woollen factory has just been discovered, near the house where the renowned fresco of Orpheus was recently found. In this factory are still seen pieces of woollen cloth, quite carbonized, and many instruments for carding and weaving similar to those used in some small factories of this kind at the present day.

(1) They can be purchased in Montreal.

NOTICE TO SUBSCRIBERS.

Subscribers to the Magazine are notified that in the future their accounts will be rendered up to the end of the year. Bills for all arrears and the current year's subscription are forwarded with this number, and it is respectfully requested that the amounts be at once remitted to this office to save the expense of collection. In future, all subscriptions must be paid punctually in advance.

DON'T WORRY YOURSELF.

To regain or recover health, persons should be relieved from all anxiety concerning diseases. The mind has power over the body. For a person to think he has a disease will often produce that disease. This we see effected when the mind is intensely concentrated upon the disease of another. It is found in the hospitals that surgeons and physicians who make a speciality of certain diseases are liable to die of them; and the mental power is so great that sometimes people die of diseases which they only have in imagination. We have seen a person seasick in anticipation of a voyage before reaching the vessel. We have known a person to die of cancer in the stomach when he had no cancer or any other mortal disease. A blindfolded man, slightly pricked in the arm, has fainted and died from believing that he was bleeding to death. Therefore, well persons, to remain well, should be cheerful and happy; and sick persons should have their attention drawn as much as possible from themselves. It is by their faith that men are saved, and it is by their faith that men die. If he wills not to die, he can often live in spite of disease; and if he has little or no attachment to life, he will slip away as easily as a child will fall asleep. Men live by their souls, and not by their bodies. Their bodies have no life of themselves; they are only resources of life—tenements of their souls. The will has much to do in continuing the physical occupancy or giving it up.

THE ear of a fish, almost always entirely within the cranium, on the sides of the brain, consists essentially of a vestibule and three semi-circular canals, which receive the vibrations of the integuments and cranial walls; there is rarely anything that can be called an external ear, drum, or tympanic cavity; loud, sudden, and strange sounds frighten fish; in ancient, and even in modern times, they have been taught to come and receive food at the tinkle of a bell, or the pronunciation of pet names.

FLUORINE is an element which appears to be widely disseminated through nature, commonly in association with compounds of calcium. Dr. Tichborne finds that it is frequently present in calc spar, and has detected it in even the purest and clearest crystals. It is noteworthy that so much fluorine exists in some of the calcium phosphates that the pipes connected with the apparatus for the preparation of superphosphates become plugged with silica, which is deposited from the gaseous fluoride of silicon produced in the operation.

A CAR has recently been fitted up at the Central Pacific shops in Sacramento for the purpose of clearing from the track the snow which frequently packs so tightly beside the rails as to throw off a train. The contrivance consists of a flat car provided with an axle, upon which are two little steel ploughs, kept down by a spring when in service and thrown out of place when an immovable obstacle is met, only to resume its place when the obstacle has been passed. This car, run ahead of a locomotive, is expected to do the work of fifty or a hundred men.

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

HOW TO BREAKFAST.

The *Sanitary Record* (English) sanctions our American custom of a substantial meal soon after rising, as follows: Let a healthy man really "break" his "fast" with a substantial meal, and not break his breakfast with irritating little nips or slops beforehand. After the stomach has at its leisure emptied itself during sleep of its contents, and sent them to repair the worn tissues and exhausted nerve force, and the blood has been ventilated and purified by washing and dressing with the window open, then is the time when the most perfect of all nutritive articles, farinaceous food, can be consumed in larger quantities with advantage. Butter also, and fat and sugar, troublesome customers to weak disgestions, are then easily coped with, and contribute their invaluable aid to performing the duties of the day. For example, many persons can drink milk to a fair and useful amount at breakfast, with whom it disagrees at other hours. And the widely advertised "breakfast bacon" by its name warns the consumer against indulgence later on in the day. *Café au lait* and sweet, creamy tea are to many men poisonous in the afternoon, though in the prime of the morning they are a wholesome beverage to the same individuals. Let the vigor, good humor, and refreshment then felt by a healthy man be utilized without delay in eating a hearty meal immediately after he is dressed, and not frittered away in the frivolities of other occupations. Let no reading, writing or business—muscular, political or economical—exhaust the nervous system. The newspapers and letters should not be opened, preferably not delivered, till the appetite is thoroughly appeased.

ECONOMY IN HOUSEKEEPING.

In buying anything, be it groceries or cotton cloth, be not "penny wise or pound foolish." Some people with an honest desire to economize look well to the "spigot, but forget to watch the bung." They spend hours running from one store to another to see where they can buy the cheapest, and if they get an article a few cents less at one place than has been asked them at another, they are in high spirits over their purchasing ability, never dreaming that they have, even at the price given, paid more than the article was worth! Some cannot discriminate fine flavored coffee from that of insipid or rank flavor. That being the case, a cheap article will answer their purpose just as well. Indeed many people educate their taste just to suit their purse—that is well. A man with a slim purse is better pleased and much happier if he have not a refined taste, as it is certainly an expensive thing to own; but if he have, better buy a little of a good article than a good deal of a poor one. Nothing is ever gained by buying cheap articles, nor by changing your place of trade often. Trade at one place year after year if you can find a place to suit you. A store keeper soon learns to prize you if you prove a good cash customer, and will give you many liberal trades. I have known them many a time to even tell a good customer when there was going to be a rise in a certain article, and advise the purchasing of more than the usual stock. Transient customers never reap the benefit of any such hints, and then wonder why they cannot buy things reasonably.

—*Germantown Telegraph.*

MEERSCHAUM shavings or dust is used when compressed for making inferior or imitation pipes. 41,000 cwt. of this waste are annually consumed in Vienna in the production of pipes, cigar-holders, &c., and the imitation has been carried to such perfection that connoisseurs sometimes find it difficult to distinguish these articles from similar ones of the genuine substance. Of the meerschaum itself 12,000 cases, each weighing 50 lb. or 60 lb. and worth £25 a case, are used up in Vienna alone. In working up the shavings and dust into material, about sixty women are employed in Vienna, in sorting, sifting, washing, and cleaning the refuse, and rubbing it through silken sieves.

BEWARE OF FALSE AGENTS.

In consequence of some persons falsely representing themselves to be agents for the publishers of this MAGAZINE, and obtaining subscriptions which they have never remitted to our office, we desire to notify our friends and subscribers that our agents are always furnished with written authority from the Manager, and their receipts are given on the usual printed forms of the Company.

HOUSEHOLD HINTS.

A lady in McGregor, Iowa, sends these: A strengthening liniment, good for lameness, weakness; also for bathing the stomach in cases of dyspepsia—take one beef gall, two ounces of origanum oil, one pint alcohol: mix thoroughly; keep tightly corked; shake well before using.

One of the best cements for crockery is to mix lime with the white of an egg. To use it take a sufficient quantity of the egg to mend one article at a time. Shave off a quantity of lime and mix thoroughly. Apply quickly to the edges and place firmly together, when it soon sets and becomes strong. Calcined plaster of Paris will answer in place of the lime.

If brooms are wet in boiling suds once a week they will become very tough, will not cut a carpet, but last much longer, and always sweep like a new broom. A handfull or so of salts prinkled on the carpet will carry the dust along with it and make the carpet look bright and clean. A very dusty carpet may be cleaned by setting a pail of cold water out by the door, wet the broom in it, knock it to get off all the drops, sweep a yard or so, then wash the broom as before and sweep again, being careful to shake all the drops off the broom, and not sweep far at a time. If done with care it will clean a carpet very nicely, and you will be surprised at the quantity of dirt in the water. The water may need changing once or twice if the carpet is very dirty. Snow sprinkled over a carpet and swept off before it has time to melt and dissolve, is also nice for renovating a soiled carpet. Moistened Indian meal is used with good effect by some housekeepers. The broom wears out carpets as much as feet do.

THE VALUE OF SMALL SAVINGS.

Few young men have a just appreciation of the importance of small savings at the outset of life. Wealth has quite as powerful a tendency to gather in masses as it has to dissolve into fragments and be scattered. Every little helps; dimes soon becomes dollars, and dollars can be made to double themselves in due course of time. Most young men, as well as their elders, have small vices, but seldom stop to think what these vices cost in cash, or what might be accomplished with this cash, were it wisely instead of uselessly invested. Suppose a young man is addicted to smoking. He might affect a worse vice, but we will take a mild one for example.

In a week he will consume a quarter of a pound of smoking tobacco (twenty-five cents) and three cigars per day (which is very moderate) at 10 cents apiece, and by the end of the week will have puffed two dollars and thirty-five cents into the air. Three cigars a day at 10 cents apiece make 30 cents, and 30 cents a day for a week make two dollars and ten cents, which, added to the quarter of a pound of tobacco, makes two dollars and thirty-five cents. In a year this would amount to $122.20. We will suppose the young man to be 21 years of age. Now, instead of smoking this coin away, suppose he should place it in a savings bank at nine per cent. interest, and let it remain there, how much would this little economy alone amount to if he faithfully followed for 10 years? At the end of the first year, as we have said, he would have $122.29. At the end of the second year the interest on this would bring it up to $131,97, plus $122.20 more which he has saved in the same way, making a total at the end of the second year of $254,17. This, at the end of the third year, by reason of the interest, would amount to $277.03, and, plus the $132.20 additional, would make a total of $399.23 saved in three years. Following the same rule of calculation he would be worth $557.34 at the end of the fourth year; $729.67 at the end of the fifth year, $917.48 at the end of the sixth year, $1,122.25 at the end of the seventh year, $1,345.45 at the end of the eighth year, $1,538.75 at the end of the ninth year, and $1,853.96 at the end of the tenth year. Should he deposit his savings on this score every three months instead of annually, the gross sum would amount to more than $1,900. He would be worth that much, at least, at the age of 31, and many a man starts in business on a less sum.

If he not only avoids smoking, but drinking, billiard-playing, and all other amusements and convivialities that are not at all necessary to his happiness, and saves his money prudently, is there any doubt but that he will be able, at his 31st year, to muster ample capital to safely engage in the business he has been learning throughly in the mean time? These calculations are of course based on the supposition that his employment is unbroken. Few young men who secure staple situations need ever lose them if they attend strictly to their business. Billiard playing costs about three times what smoking does, and there is no limit whatever to the cost of drinking.—*Scientific American.*

ADULTERATION AS A SCIENCE. — The *Journal of Chemistry* contains some curious revelations on adulteration. It says:

"Some months ago, in examining a specimen of cream of tartar, we found two or three per cent of gypsum along with a considerable amount of rice flour. We were at a loss to understand how the gypsum came to be there; it was not in sufficient quantity to pay for its addition as an adulterant, and the adulteration was evidently rice flour. On looking the matter up, we found that an adulterated article of rice flour, containing from 15 to 20 per cent of gypsum, was on the market. This at once accounted for the gypsum in the cream of tartar. The manipulator, wishing to buy his rice flour as cheaply as possible, had bought the adulterated article.

"Powdered sugar has long been notorious for its adulterations, but granulated sugar is generally supposed to be all right. We were recently, however, shown an article prepared from rice, which was not to be distinguished from granulated sugar by color or general appearance. It was said that this article was used for adulterating a particular grade of granulated sugar that was sent West to be used by confectioners for manufacturing the powdered sugar.

"Rice flour seems to be an extremely useful article in this branch of business. Hassal gives a list of no less than ten different substances in which it has been detected, and yet his list is not a full one. It has the great advantage over common flour that it does not cake when packed and become clammy; it thus more nearly resembles the various spices and other articles with which it is mixed. This adulteration can only be recognized by the microscope. The starch grains of rice are very small and angular; they polarize very slightly.

"The adulteration of bread with alum has attracted a great deal of attention in England, and it seems also to be practiced to some extent in this country. Numerous methods have been given for the detecticn of the alum, but none of them seem to be as satisfactory as the analysis of the ash; all the other methods are liable to error."

A GOOD cook is not the one who uses the most and richest ingredients, regardless of the expense; but she who studies economy, and is able to concoct a delicious meal from scanty materials.

TO ADVERTISERS.

Points in Advertising.—Advertising gives the impetus to trade, and tact holds the helm. As a matter of experience, it is beyond dispute that judicious advertising pays to an extent beyond any ordinary comparison with its cost. The progress of competition is so rapid that a "good old house" which does not advertise is in danger of losing much sound custom. Some people think it *smacks* of dignity to say they can live without advertising. They may *live* upon this kind of dignity; but life is one thing, and success in life is another. A good reputation in business means that you shall be *widely* as well as favourably known.

The objects to be kept in view by advertisers are:—1. That their announcements shall reach the class of people aimed at. 2. That they shall reach as many of that class as possible. 3. That the advertisement shall come directly before the eye, and not be *lost* in a crowd. 4. That it shall be made as much to the interest of the buyer to look for the advertisement as it is for the seller to advertise.

The Selection of Periodicals.—A wide distinction must be drawn between advertisements intended for the million and advertisements intended for a class; for class advertisements are almost wholly thrown away in newspapers and magazines of a general character. Wholesale and manufacturing houses of all kinds should advertise in those periodicals *which are regularly consulted by buyers.* If a periodical circulates largely among any one class, you should expect to find it valuable and practical in its editorial features; containing such information as your own judgment tells you the class will gladly and frequently consult. The numerical circulation of an advertising medium, though important, is not the only feature to be inquired into. Another question is: What class of readers does it go among—are they likely to become customers of the person advertising? Another is: Is it of a character that makes it pretty certain to be *read through with care* from beginning to end, or nearly so, or is it of an ephemeral character—a paper to be glanced at for the news and then thrown aside? Another is: Is it likely, after being read through, to be destroyed, or to be preserved for reference? And still another: Is it likely to be referred to *frequently* or only once in a while? And what weight do its opinions carry?