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THE CANADIAN MECHANIC'S MAGAZINE AND PATENT OFFICE RECORD

Vol. 5. JANUARY, 1877. No. 1.

THE CENTENNIAL EXHIBITION

OF THE UNITED STATES, AND ITS INFLUENCE UPON CANADA.

To have attempted to have given a description of even a fractional part of this wonderful exhibit of the World's progress, we have felt the task was far beyond the scope of the pages of a monthly periodical. We purpose, however, to give, from time to time, illustrations and descriptions of many of those improvements in machinery that may be of most service to our mechanics.

If any of those who have been enabled to exhibit at the Exposition bore with them, there, any feeling of the self-sufficiency of the productions of their own country, they doubtless had it suppressed and corrected, when their goods were placed, side by side, in comparison with the manufactures of other counties; they have then found where they excelled and where others excelled them, and much benefit must evidently result from this comparison to all parties. The result of the splendid collection of these resources and skill, the contribution of nations, will be to impart to all who visited it a healthy appreciation of the talents of others, and a stimulant to their energies to endeavour to produce, in every branch of art, science, and manufactures, still more perfect results. Much do we wish that Canada, ere half a century has elapsed from the date of her ranking as a Dominion, will be able to hold a World's Exhibition of her own, and exhibit fine arts and manufactures inferior to none on this Continent. Let her remember that from a population of less than four millions, and when science and manufactures were but in their infancy compared to the present day, the United States has become one of the first nations in the world, and is still marching onward, with gigantic strides, to greater progress and power. One hundred years ago, nay fifty years ago, even a quarter of a century since, she possessed few of those advantages arisingf rom scientific discoveries with which Canada now starts in the race fully equiped. In her early existence after a long and bitter struggle for independence, she had to depend almost entirely upon her own resources; but in the last quarter of her centennial life, the use of steam as a propelling power, the revealing of the uses to which electricity can be applied, the discoveries in chemistry, and the numerous and useful inventions of, not only of her own people, but of other nations, have enabled her to develop her enormous resources, to utilise the wealth of her minerals and forests, and to encircle her vast territory with the band of civilization, and, developing the talent of her people through the influence of education, from which such great prosperity to the nation has resulted, proving again the truth of Lord Bacon's words —as has often been proved before—that "Knowledge is Power."

It is only eleven years ago that eight millions of her people were engaged in a "bitter and terrible internecine war," a war which was inevitable in order to stamp out the law of slavery from the statute of a free and enlightened country, and although suffering from financial difficulties arising from an over distension of trade and manufactures, the result of four years of civil war that would have entirely prostrated many other nations possessing less recuperative powers and youthful muscle and sinews, she engaged in this vast national enterprise, and not only carried it out successfully, and to the satisfaction of all nations who participated therein, but exhibited to the world such a representation of the fruits of her industry, perseverance and genius, as has never been displayed before by a nation in but the minority of its existence.

From this Exposition Canada has much to learn, and we trust the spirit of emulation will be diffused throughout the whole country. As it is, she has excelled in many of her productions, and earned well merited reward; but let her not stop short satisfied with her honors, but strive to benefit by the new stock of ideas which her people have now obtained from a close intercourse with other nations, and let the proud cosmopolitan spirit of enterprise enter more fully into her future career. Let there be no distinction of races, of which there is too much at present, and let the impetus of education diffuse itself over the whole Dominion.

We want more education of a mechanical and technical

nature, and for more practical purposes; too much of our public instruction is left to the option or caprice of the teacher. The programme should be of a more definite, explicit and permanent character; and scholars intending to pursue any particular profession or trade, should receive an education in the particular subject relating thereto. Let us take the curriculum of a Massachusetts student, intending to become a civil engineer, presuming that he has finished in a high school the courses required of all :

	Hours per week.
SECOND YEAR.	
Analytic geometry	3
Calculus	3
Descriptive geometry	3
Mechanical drawing	4
Surveying	2
Topographical and plan drawing	4
Physics (lectures)	3
French finished, German begun	3
Rhetoric and English literature, or descriptive astronomy	2
English literature, or physical geography	2
Military science	1
THIRD YEAR.	
Survey and location of roads	6
Construction of roads	6
Water supply, drainage, &c	6
Field practice	3
Stereotomy	4
Bridge and roof construction	4
Calculus	3
Applied mechanics	3
German	3
Physical laboratory	2
Outlines of zoology, or history	2
General geology, or political economy	2
FOURTH YEAR.	
Stability of structures	6
Strength of materials	6
Structures of stones	6
" wood	6
" metal	6
Topography (field practice)	6
Physical hydrography	6
Structure drawing	6
Building materials	3
Water power and water wheels	4
Metallurgy of iron	2
Applied physics	2
German	3
Philosophy of science	3

This is perhaps a too extensive syllabus for many, but if carried out efficiently, could not fail to produce accomplished civil engineers. What we particularly want is more free institutions, with professors of first class ability, and possessing sufficient apparatus for illustrating the fundamental principles of science and mechanics, and possessing libraries of the best works of reference published.

There can be no doubt but that greater results will be obtained by Canada from the Centennial Exposition, than from any of the previous Expositions that have taken place. This one has been brought home as it were to her door, and it is one in which her own people have largely participated. It has come within the reach of many of her mechanics, and therefore has been—in the face of hard times—extensively visited by Canadians, who doubtless will reap, in time to come, a rich harvest from the new ideas and knowledge gained by their inspection of this great exhibit of the industry and genius of the principal nations of the earth.

What another century may bring forth it will be hard to prophecy. Kingdoms have crumbled away in less time than 100 years, but seldom so, where civilization, the product of human effort and time, leads the van; and if we may dare to foreshadow future events, we venture to predict that long 'ere another century has passed away, the *whole* of this great Continent of North America will be the territory of two great powers, whose interests will be blended in one common weal.

We cannot close these remarks without paying a most deserving tribute to the excellent arrangements of the Commission for the comfort and protection of the colossal crowds which at times filled the building, there being at one time no less than 205,000 gathered within the grounds on one day—and yet not a single accident, or a single case of lawlessness occurred. Every one seemed embued with a feeling of good humour and general courtesy; nor can we too much admire the admirable efficiency of the railroad officials when we can state, on authority, that out of eight millions of people transported to Philadelphia, from every portion of a vast country, but one casualty occurred in which a life was lost. We believe in no other country could such another event have taken place and where so much good order, good feeling, good management and national enthusiasm was exhibited as that which crowned the Centennial Exposition with such marked success. In concluding this article we desire to express, also, our grateful thanks to the Secretary of our own commission, J. S. Stevenson, Esq., for his courteous letter of introduction which was a passport that carried us over many little difficulties at the last moment.

TO OUR READERS.

In wishing our readers a Happy New Year, we at the same time desire to acknowledge, with grateful thanks, the support we have received from them during the past year—a year which has been one unusually trying to mechanics—but at the same time we must most urgently solicit, from all interested in the mechanical industries of the country, a more extended subscription to meet the heavy expenses of publishing an illustrated scientific paper.

We desire, at the commencement of a new volume, particularly to call their attention to the remarks which will be found on our first page, on the late Centennial Exposition of the United States; and to impress upon every Canadian the established fact that the high position the United States has obtained among nations, has been owing, principally, to the great encouragement her Government (and her people mutually among themselves) have given to their Commerce and Industry. If we continue to patronize foreign publications and foreign industries in preference to our own, because they possess a little more excellence, which has been gained from long experience obtained from the advantages of possessing a market for the sale of their productions twenty times greater than Canada, how can we ever expect to arrive at the same excellence and perfection, when the encouragement we should receive, both morally and pecuniarily and in a national spirit, from our own people for the support of our own manufactures, and for retaining talent and genius in the country, is given so often to strangers? When our own industrial productions are thrown into the scale with foreigners, it will be no wonder if, in our competitions hereafter for excellence and perfection, *we are found wanting.*

HALL'S STONE BREAKER.

(See page 5.)

We give an engraving of a new form of stone breaker designed and patented by Mr. C. Hall, and now being constructed by the Saville-street Foundry and Engineering Company, Limited, of Sheffield. As will be seen from our illustration Mr. Hall's stone braker is similar in principle and mode of action to the Blake machine, but it includes some important modifications of detail. Thus in the first place the movable jaw, instead of being made in one piece the full width of the fixed jaw, is divided into two, each half that width. The two movable jaws J J, thus formed are driven by separate toggle levers and eccentrics, so that they make alternate strokes. One result of this arrangement, of course, is to greatly reduce the strain on the framing, &c., the width of jaw which is crushing at any one time being reduced one-half, while the eccentrics being placed opposite each other, they together with the connecting rod and toggle levers are balanced.

The alternate movement of the two jaws is also turned to account to draw back the jaws, the india-rubber spring which is used for this purpose in the Blake machine being dispensed with. Thus the drawback rods X are coupled to a cross lever Y mounted on a stout under framing at one end, the forward movement of one jaw thus drawing back the other and *vice-versâ*.

The machine is also fitted with an arrangement of cubing jaws invented by Mr. Hall. Referring to our engraving, it will be seen that the movable jaws have cast on them a transverse projection J1, this projection or rib being undercut on each side and chilled at the top. Against this rib abut the movable faces J4 and J5, these faces being help in place by wedge-headed bolts at the top and bottom respectively, so that they can be readily tightened if necessary. One object in this arrangement is to reduce the expense of replacing the working faces, it being found that the lower parts of the jaws wear much faster than the upper portions, and hence provision has been made for replacing these worn lower parts without interfering with the portions above.

The fixed jaw is also made two sets of faces, the upper set being of wider pitch than the lower, and being so arranged with respect to the movable jaw that the teeth of the latter work opposite a space in the fixed jaw. In the lower parts of the fixed jaw, on the other hand, the pitch is finer and the teeth are directly opposed to the teeth of the fixed jaw, as shown in figure 2. Between the two sets of faces of the fixed jaws is an enlarged throat or space P, this enlargement giving the stone a chance of turning over in its descent so that the blows are not received all on one side. Mr. Hall claims for this mode of constructing the jaws an improved cubing action, a reduction of waste, and the arrangement promises well.

The machine we illustrate is mounted on wheels, the fore axle being arranged so that it can be locked round without the fore wheels striking the flywheels. Altogether Mr. Hall's improvements have evidently been carefully thought out, and we shall probably have more to say of his stone breaker hereafter.

Engineering.

PROPOSED MONSTER BALLOON FOR THE PARIS EXHIBITION.—Amongst the propositions on which it is said the Commissioners have looked favourably, is that of M. Henry Giffard, an engineer of reputation, who has projected a huge captive balloon for 1878. It would be formed of silk and sheets of India-rubber covered with varnish, and painted white to reflect the rays of the sun. The balloon would be about 110 ft. in diameter; the car itself would form a gallery nearly 50 feet in circumference, and the balloon would be held to the earth by eight cables attached to iron rings secured in a wall of masonry, and it would take up forty or fifty persons each time. The cable by which it would be brought down is described as working round an iron axle more than 6 ft. in diameter, and 23 ft. long, worked by a steam-engine of 200-horse power. The length of the cable would be about 1,800 ft., and the balloon would ascend about 1,600 ft. from the earth. The quantity of iron filings and sulphuric acid needed to produce the gas required to fill the balloon is something enormous, and the process would have to be repeated about every forty-eight hours. To us the game is hardly worth the candle, —at any rate, such a very big candle. It is like Mr. Gamgee's very ingenious "Glaciarium," where two steam-engnes are kept going to enable a dozen porsons to do a little skating out of season.

TRADE MARKS IN GREAT BRITAIN.

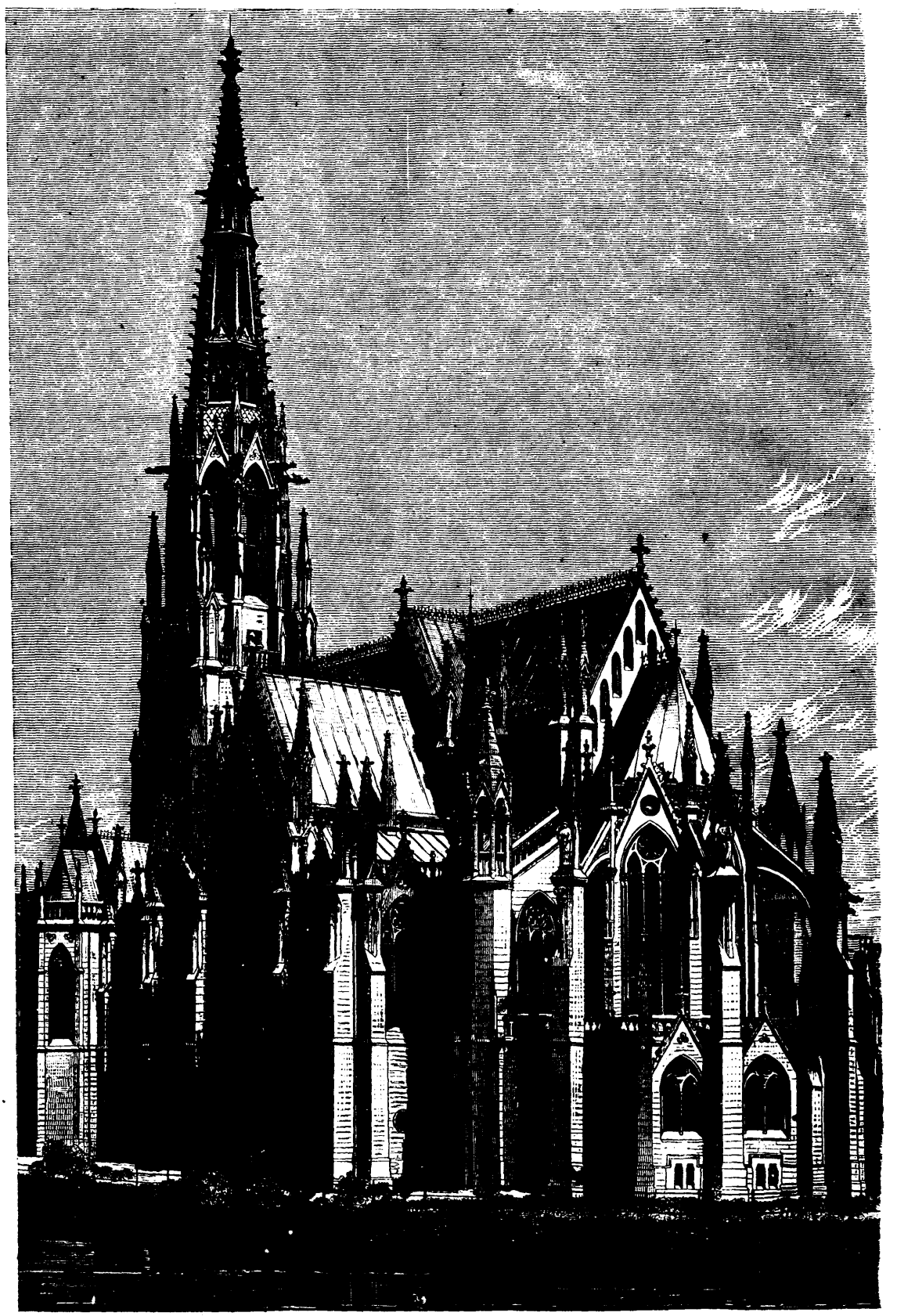
The Commissioner of Patents of Great Britain has informed foreign Governments that by act of Parliament foreigners have been accorded the privilege of registering trade marks in that country on the same terms as British subjects. The United States Patent Office has recently declined to register trade marks for British subjects for the reason that no provision had been made by treaty or act of Parliament extending the reciprocal privilege to their citizens; but in view of the action of England now communicated, their Patent Office will hereafter register trade marks for them on the same terms and under the same regulations as those prescribed by it, in accordance with act of Congress for citizens of that country.

The London Patent Office call especial attention to the fact that prior registration in the country of which a foreign trade mark owner is subjected is not necessary before registration in Great Britain; but in case a trade mark has heen used before the date of enactment of the new law (which date is not, however, stated in this communication) it will be necessary in the application for registry that a description of the goods in respect of which it has been used, and the length of time during which it has been so used, be given.

THE CHANNEL TUNNEL.

This scheme, says the *Standard*, under Sir John Hawkshaw on the English side, and M. La Vallée on the French side, appeared, more than a year ago, to be making substantial progress, and we heard of three railway companies ready to furnish their contingents of £20,000 apiece, and an English company equally ready to collect the remaining portion of the £80,000 Sir John Hawkshaw requires for the trial works which it was at that date comtemplated proceeding with forthwith at St. Margaret's Bay, three or four miles to the east of Dover. What is the progress up to date? On the English side less than nothing—retrogression. Lord Richard Grosvenor and the English company, abiding by the advice of their engineers, Sir John Hawkshaw and Mr. Brunlees, have clung to the £80,000 trial works at Dover, involving a shaft of 19 feet in diameter, colossal pumping engines, and a driftway under the sea of 7 feet square. Sir Edward Watkin, with a vote £20,000 in his pocket on behalf of the South-Eastern Railway, very properly looks that the sum in his custody should be employed for the benefit of the shareholders whose property he represents, and is willing only to part with some few thousands at a time for smaller trial works to make a shaft of 7 or 8 feet diameter, less pumping power, and as moderate a driftway under the sea as can well be driven. Clearly this would realise knowledge with a minimum of expenditure; and there can be little doubt that such a shaft could be driven and a suitable driftway carried a third of a mile under the sea, and water pumped to the quantity of 500,000 gallons a day for £20,000. If, then, Sir Edward Watkin contributed £5000 on the part of the South-Eastern Railway, as it is understood he is willing to do, then the three other contributors doing the like would furnish the means for a trial of real value, and which would determine, as far as a first practical effort could accomplish, the probability of the engineering work of the Channel Tunnel being possible of accomplishment. If the magnitude of the expenditure were increased another £10,000, there could be almost certainly got for the £30,000 outlay an 8-feet staff and suitable pumping gear for a million gallons of water per day from a 6-feet driftway of half-a-mile under the sea. Possibly Sir John Hawkshaw may have been frightened by the volume of the springs he has encountered in the mile and a half of sewage-drains along the shore of Brighton; but the flow of water through the fissures of the white chalk there does not appear to us to be a criterion at all for the prospects in a non-water bearing stratum like the grey chalk—so unlike in every way to both the white chalks above it, and the water from which it holds up on its surface, and so throws off the waters of both by any available outlet rather than let them through its substance. Messrs. Rothschilds and the London, Chatham and Dover Railway would seem either to have withdrawn their influence or to hold aloof, and so the matter on the English side remains at a dead lock.

On the French side there has been quiet and steady onward movement on a small but useful scale. The dredgings of Sir John Hawkshaw on the French side were confirmed and enlarged by M. La Vallée and his staff some time ago, and a report made by him of considerable value in September last year. Since then, the English sea bottom of the Channel has been sounded, and



THE JOHANNESKIRCHE, STUTTGART.

HALL'S STONE BREAKER.

FIG. 1.

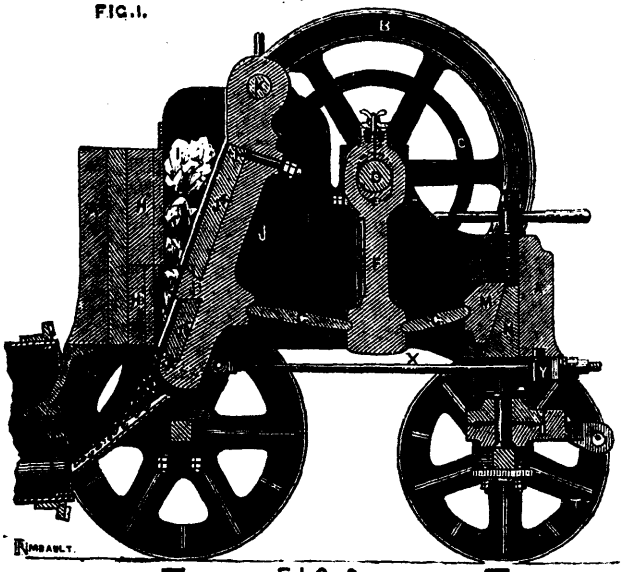


FIG. 3.

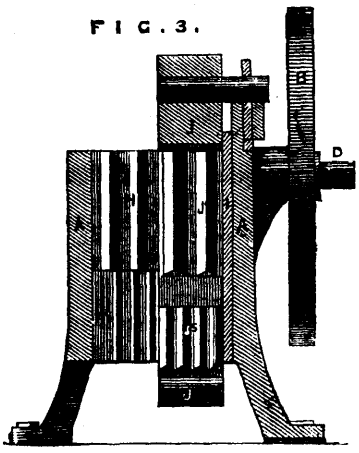
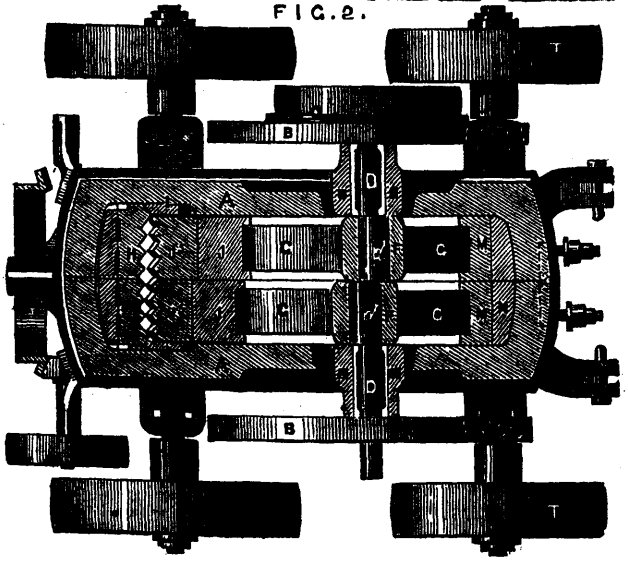


FIG. 2.



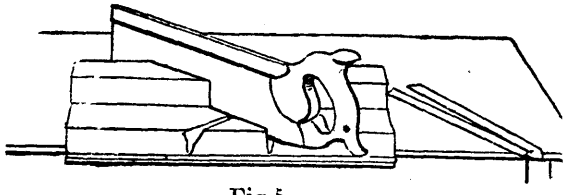


Fig. 5

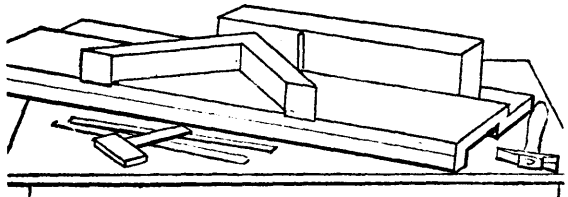
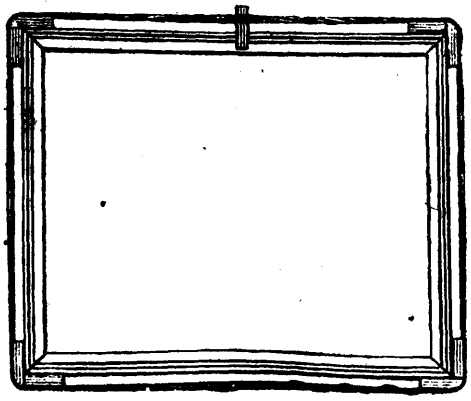


Fig. 6



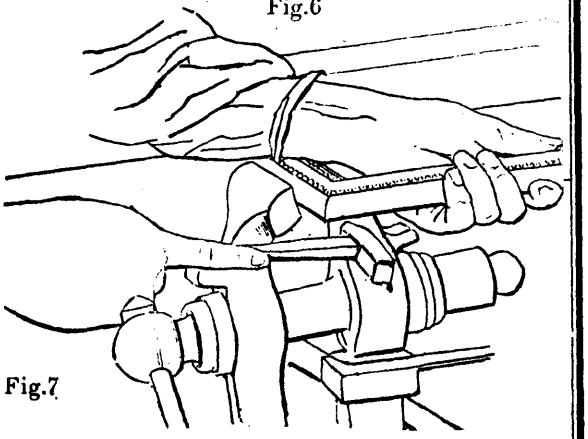


Fig. 7

MITREING PICTURE FRAMES.

similar confirmations and extended knowledge obtained; and a boring has been commenced, and is just finished, at Sangatte, about six or seven miles west of Calais. This boring and its results are the latest attainments, and, as exact details are reserved for the second report of M. La Vallée, now in preparation, we must wait a little while to learn how far the chief French engineer has really advanced. What we know from a visit to the works at Sangatte is that the boring there was commenced on the upper white chalk at somewhat less than half its thickness, has penetrated the lower white chalk, and gone through about 66 metres of grey chalk identical in its beds and fossils and characters with the grey chalk on the English coast between Abbott's Cliffe and Folkestone; and that it has further penetrated into the gault clay after passing a thin band of dark green upper green sand, the total depth of the boring—which was effected by the ordinary iron gouges and chisels—being 133 metres, and the diameter 24 centimetres, or about 9½ inches. We know therefore now, quite independently of the shore sections, the nature and mass of the stratum in which the tunnel is to be pierced, and immediately above and below it; and that although the thicknesses of these all diminish towards the French coast, yet they are of sufficient magnitude for the engineering requirements of the submarine tunnel; and this notwithstanding that the geological series underlying these beds, or those represented on the English coast between Hythe and Hastings, are all rolled up together in strata of only a comparatively few feet in aggregate thickness in the vicinity of Boulogne. Coupling with the exact details of M. La Vallée's last boring at Sangatte itself, Sir John Haweshaw's previous boring midway between that village and of Calais itself, and the boring there made in the market-place many years ago for an artesian well, the dip and inclinations of these most important geological formations—the white and grey chalks and gault—will be accurately ascertained. All this, however, neither proves nor disproves the hostile theories which long existed and still exist as to the occurrence of a vertical fissure along the whole median line of the English Channel, and which discussion will only be really settled when the driftways or the tunnel itself are actually driven from the shores of both countries, and about to meet midway, under the bottom of the sea. That even this stupendous difficulty, if it really exist, will not be surmounted by the engineering skill of the 19th century we should be very loth to say. Nevertheless, every traveller by the fast mail steamers of the Dover and Calais line must certainly realise at every steam-boat voyage the length of distance between even the nearest points of England and France; and, perhaps, may hope, if sensitive to the *mal de mer*, for the days of darkness and steam-clouds under the sea in preference to the stormy winds and boisterous waves he has to endure upon its surface.

THE HUNDRED-TON GUN AT SPEZIA.

(See page 9.)

This enormous engine of warfare, which was manufactured by Sir W. Armstrong as part of the armament of the new Italian iron-clad the *Duilio*, arrived at Spezia on the 5th October, and was safely transferred from the steamer *Europa* to the pontoon prepared for it, by means of a gigantic crane which had been specially constructed for the purpose by Mr. George Rendle, C. E., of the firm of Armstrong and Co. As will be seen in our engraving, the crane rests upon a massive octagonal block of masonry, on the summit of which is laid a circular iron plate, with a ring of teeth or cogs, into which work the cogs of the wheels supporting the movable platform above, so that a circular motion can be imparted to the whole machine. From the long arm of the crane depends a hydraulic cylinder, which is sufficiently powerful to raise a weight of 160 tons, if need be, the balance being preserved by a heavy counterpoise at the opposite extremity of the crane. So perfect and complete is the whole of this gigantic apparatus that it requires only two men to manage it, one stationed on the swinging platform to work the lifting gear, while the other remains below to control the circular movement. The hydraulic machinery for loading and cleaning the gun is also the invention of Mr. Rendle, and is worked by one man, who stands on the deck of the pontoon, and manipulates three handles similar to those by which railway points are worked. When one of these is pulled the self-acting machinery draws forward along a rail a truck containing the powder and projectile to the muzzle of the gun, then another handle is touched which sets the rammer in motion, and the charge is rammed home. The gun is then fired by the application of an electric fuse, and by a subsequent pressure on the third handle the gun is effectually sponged out ready for the next round.—*London Graphic.*

AN AMERICAN BLAST FURNACE.

We are indebted to our American contemporary, the *Polytecknic Review*, for the following cut and description of an American blast furnace of improved design. This furnace was designed for the North Jersey Iron Company, by Messrs. P. L. Weimer, of Lebanon, Pennsylvania, and John Birkinbine, of Philadelphia, and is the result of careful study of these engineers to erect a blast furnace, with the least expenditure of material and money, compatible with integrity and permanence of structure. All of the walls are made as light as possible, and every provision is made for keeping the furnace cool about the bosh walls and crucible. Instead of the ordinary masonry pillars or iron columns, housings are used, which extend up to and support a hollow mantel just below the bosh or greatest diameter. The hollow mantel is so formed as to be of great strength and at the same time keep the bosh cool. The heavy iron housings which support the mantel and superincumbent masonry, are cast so as to support also the bosh walls, crucible walls, water, blast and spray pipes; the spaces between them giving ready access to tuyeres, &c. Slots are cast in the faces next to the walls of the housings, to accommodate T heads on square iron rods, so as to bind the bosh walls with a minimum of iron; the bands having to extend in this case only from one housing to another instead of around the stack, can be much lighter, and expose more of the masonry to the cooling effect of exposure. The spray pipe just below the mantel can also be used to cool the bosh walls. An iron casing encloses the crucible walls, leaving space for sand, through which water is permitted to percolate for cooling effect. The walls above the mantel follow the general slope of the in-walls, and are secured by iron bands varying in size and fastened by double clevices. The top of the stack is surrounded with an iron casing having openings for the down takes to the hot blasts and boilers. The tunnel-head is fitted with the ordinary bell and hopper, covered by Mr. Weimer's patent furnace charger, illustrated above. This consists of an inverted cone placed over the hopper, in which there are openings through which the ore, flux and fuel are charged. These openings—there are three in the apparatus illustrated—are closed by sliding doors secured by hinges to a revolving ring on top of the cone. The hinges are placed as a precaution against accident from explosions of gases while the doors are closed.

Near the tunnel-head is secured a casting, acting as a fulcrum to a wrought-iron beam, and enclosing two cylinders, one vertical and one horizontal. The cylinders are fitted with the necessary valve-chests, valves, pistons, &c., and can be arranged to be operated by steam, hydraulic, or pneumatic power Upon one end of the beam the bell is hung, and the piston rod of the vertical engine engages with other end. A weight box in the beam permits of the proper balancing of it, and the height of the bell can be regulated by a screw and nut on the rods supporting it. The piston rod of the horizontal cylinder engages with a connected rod secured to the revolving ring carrying the sliding doors. Ordinarily, in dropping a charge with the bell and hopper, a large volume of gas escapes, not only from the throat of the furnace, but also from the down takes, hot blast stoves and boilers, necessarily occasioning intermittent temperature. To obviate this trouble and secure the regular operation of the furnace, this charging apparatus is designed. Its operation is as follows: The furnace being in operation and the bell closed against the hopper—both of which are turned off to make a joint—the doors are open, and the charges of ore, flux and fuel are dumped into the hopper, but cannot reach the furnace on account of the bell being closed. When the charge is ready to be dropped, steam is admitted into the horizontal cylinder, and the movement of its piston closes the sliding doors. Steam is then admitted into the vertical cylinder and the bell is lowered, the charge passing into the furnace; after which the bell is raised and doors opened by reverse action in the respective cylinders. The entire apparatus is under the absolute control of the attendant, and the operation of each cylinder is independent of the other, and is regulated by levers.

It is obvious that, in dropping the charge, the only gas which escapes is the little which could be contained in the space between the bell and cone of the charger; the flow to the boiler and hot blast stoves is therefore uniform, and the operation of the furnace is as a consequence under more direct control. In many furnaces the gases from the tunnel-head are not sufficient to properly heat the blast and generate the steam for driving the engine, and additional firing is required. The amount of gas saved by this charger would materially lessen the amount of fuel required for this purpose.

GRINDING TOOLS.

Beginners are sometimes told, when grinding edge tools, to make the stone revolve towards the cutting edge, and occasionally from it. When the first grinding is being done, it matters little whether this is attended to ; but when the finishing touches are given near and at the edge, the task can always be accomplished with much greater accuracy if the periphery or circumference of the grindstone revolves towards the cutting edge, for the steel which is worn away will then be more easily removed ; and when a stone runs in the opposite direction, the grinder cannot always tell when the tool is fully ground up to the edge. This is particularly the case when the steel is of a soft temper. The stone, when running from the edge, cannot sweep away every particle of the metal, but when it revolves towards the edge, it carries off all the feathery edge.

TIN CANS.—An invention which will revolutionise the tinware trade of America has been perfected, after some years of labour, by Henry Martyn, a young Bostonian. It consists of a series of dies by which boxes of all sizes from the salve box to the preserved fruit and oil cans, are pressed from a single piece of tin, the corners being doubly folded in the process, and no solder being required, though the cans are perfectly air-tight. Flared ware, as dripping pans, are also made. They are durable and—as some dozen a minute are manufactured—very cheap, and, in these days of solder-poisoning, will be especially acceptable to canners of preserved meats.

AS LONG ago as 1848, Professor F. Runge invented what he called a chromic ink, from its containing chromate of potash. His directions for its preparation, published at the time in Dingler's *Journal*, were as follows : —A decoction of logwood is first made in the proportion of 10 to 80, that is 10 lb. of logwood is boiled with enough water to produce 80 lb. of the decoction. To 1000 parts of this logwood extract, when cold, is added one part of yellow chromate of potash, stirring rapidly. It is ready for use at once. Gum and other additions are injurious, he says, to this ink. The following year W. Stein proposed an improvement on Runge's ink, saying that the great fault of this ink was that it soon became thick, like sour milk. This he overcame by adding four grains of corrosive sublimate to each bottle. This would restore thick ink to its pristine quality and improve its colour, changing it from deep indigo blue to pure black. In 1867, C. Puscher describe a new ink similar to the above, made as follows :—Boil 10 oz. of logwood in 20 oz. of water, then boil again in 20 oz. more of water, and mix the two decoctions ; add 2 oz. of chrome alum and boil another quarter of an hour ; 1 oz. of gum arabic is added, and we have 25 oz. of deep black ink. Bottger says, that a simple method of preventing gelatinising in chromic ink is to add to the water in which the extract is made some carbonate of soda. His method of operation is as follows :—Dissolve fifteen parts of extract of logwood in 1000 parts of distilled water, to which four parts of carbonate of soda has been added at boiling heat, and add one part of yellow chromate of potash dissolved in a little water.

NEW ROUTE TO INDIA.—The project of a sub-marine tunnel to unite Europe with Africa has been published at Madrid, and called forth much criticism. The tunnel would, of course, pass under the Straits of Gibraltar, but the precise spot chosen is near Algesiras on the European side. From here the coast of Africa would be reached at a favourable landing-place, between Tangiers and Ceuta. It has been calculated that the part of the tunnel entirely submerged would be nine miles long, with a descent towards the centre of about one per cent. The other and slanting portions of the tunnel would measure six to seven miles in length on either side, and altogether the tunnel will be about twenty-two miles long. The maximum depth of the sea in the Straits does not exceed 3,000 ft., and it is proposed to dig 300 ft. below this point. Thus the tunnel will be 3,300 ft. below the surface of the water. As for the somewhat complex question of cost, the promoters of the scheme maintain that this will not amount to more than 4,000,000*l*. By this means, they urge, when the tunnel between Calais and Dover is completed, it will be possible to travel the whole way from London to India by rail, and without changing carriages.

LOWERING THE DEATH RATE.—The King of Belgium has announced to the President of the Health Congress his offer of 5,000f. as a prize to that city, local authority, or private association which shall by improvement in the dwellings of the working classes effect the greatest reductions of the death-rate at the lowest cost. This prize is to be awarded at the next International Hygienic Congress.

A MONSTER HOTEL.—St. Louis (says an American paper) does not intend to be behind Chicago in the matter of hotels. A new one is going up on the corner of Grand and Page avenues, and if the plan is carried out it will have no superiors for size in the country. The building, with an inclosed court 200ft. square, will cover over four acres of ground, and be built of Missouri granite and sandstone. It will be ten stories high, be lighted by 2,100 windows, and contain over 2,000 rooms. It will accommodate 3,500 persons. The front on Page-avenue will be the principal façade, and have a length of 387ft. 6½in. The interior court will be covered with blinded glass at a height of 42ft. above the ground. It will be a conservatory blooming with tropical plants, and a fountain will scatter its cooling spray over the shaded walks. The side of the building facing the court will contain 600 windows. The structure will be in full height 140ft. from the curbstone to the open line of the cornice. The base will be of Missouri granite, and all above will be white sandstone. There will be eight elevators in the building, each with a capacity to carry fifteen persons, and there will be four stairways ascending from the basement to the top story. The upper story on the grand avenue side will have a billiard-room with thirty tables.

A NEW INDUSTRY.—It is curious how invariably the demand for any article calls up a supply. Burglary and its kindred arts appear to be on the increase in the United States, where, indeed, as recent State trials have elicited, the picklock has become to some extent a political engine. At any rate an active trade has of late sprung up in New York in house-breaking and lock-picking implements. In that city, in Philadelphia, and in some localities in the West, there are large manufactories of burglars' tools, to which all the improvements obtainable by modern mechanical science are applied, so that a New York journal is enabled to vaunt that "the burglars of our time and country can boast of having as perfectly-finished tools as any reputable workman." The manufactures are described as often of a class so far reputable or prudent that they would never contemplate any direct deed of crime. Opinions as to what constitutes respectability vary ; but the practice of these law-abiding manufactures is never to turn out a complete implement, for fear of discovery and consequent trouble, so that the tools are made partly in one place and partly in another. The trade is said to be a profitable one—a complete set of tools numbering forty pieces, and costing from £50 to £80 the set.—*Iron*.

THE bath usually employed for imparting the color of fine gold to jewellery and coins consist chieflyof an alkaline nitrate and common salt, to which is added some acid sulphate, like alum, or ferric oxide, so that a dilute aqua is produced. R. Wagner attemped to substitute dilute aqua regia, but without success. He accomplished his object, however, by using a solution of one gramme of bromine and twenty-five grammes, calcic bromide—or thirty grammes potassic bromide—in one litre of water. The articles are left in the bath three to five minutes, then removed and rinsed with clean water. Alloys of silver and gold are to be rinsed with a solution of sodic hyposulphite.

MACHINE FOR CLEANING WATER-PIPES.

We noticed a few weeks ago the method adopted at Elgin for cleaning old water-pipes by heating them in a furnace, and so removing the incrustation. The *Elgin Courant* gives particulars of an experimental attempt to clean the incrustation out of pipes not intended to be lifted; and though all that was contemplated was not accomplished, it was proved that the thing can be done. A little machine, about three feet in length, was obtain some time ago from Mr. Kennedy, Kilmarnock, who has a patent for it. It consists of two pistons and two series of flanges that exactly fit into the water-pipe intended to be cleaned, the pistons being about an eighth of an inch under the inside size of the pipe, while the flanges press hard against it, and take off the incrustatiou. The machine was put into the pipes at the pipes at the railway crossing at Linkwood. The full force of the water was then put on, and away the machine went, grinding through the pipes, and clearing off every obstruction, making a noise like a railway train heard a quarter of a mile off. Unfortunately, it stuck at an air-cock at the back of the New Cemetery, where there had evidently been some fixed obstruction, which it could not overcome. Notwithstanding the accidental hitch, enough was done to prove that the pipes, at a mere trifling expense, can be cleaned without lifting.—*Builder*.

AN AMERICAN BLAST FURNACE.

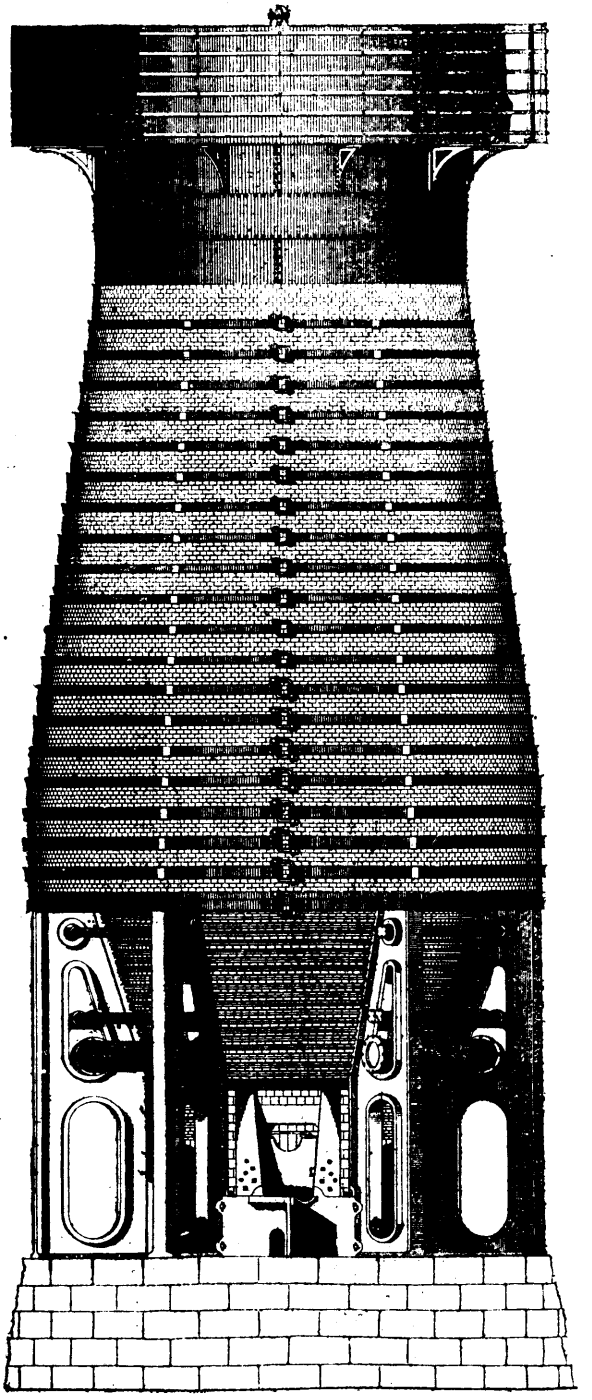
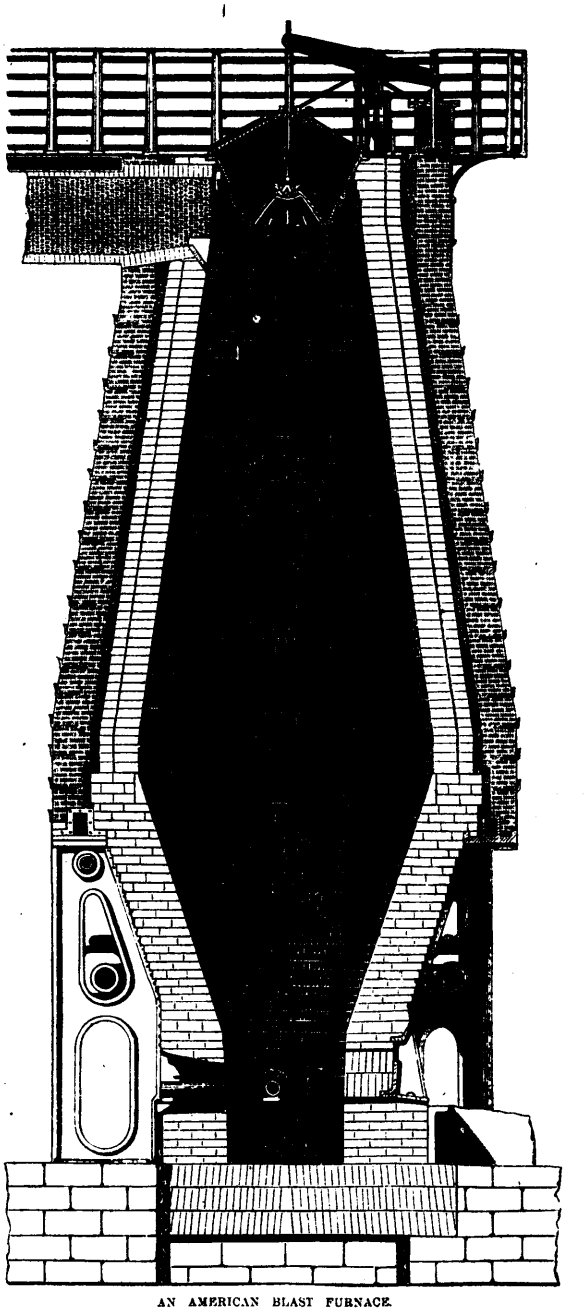
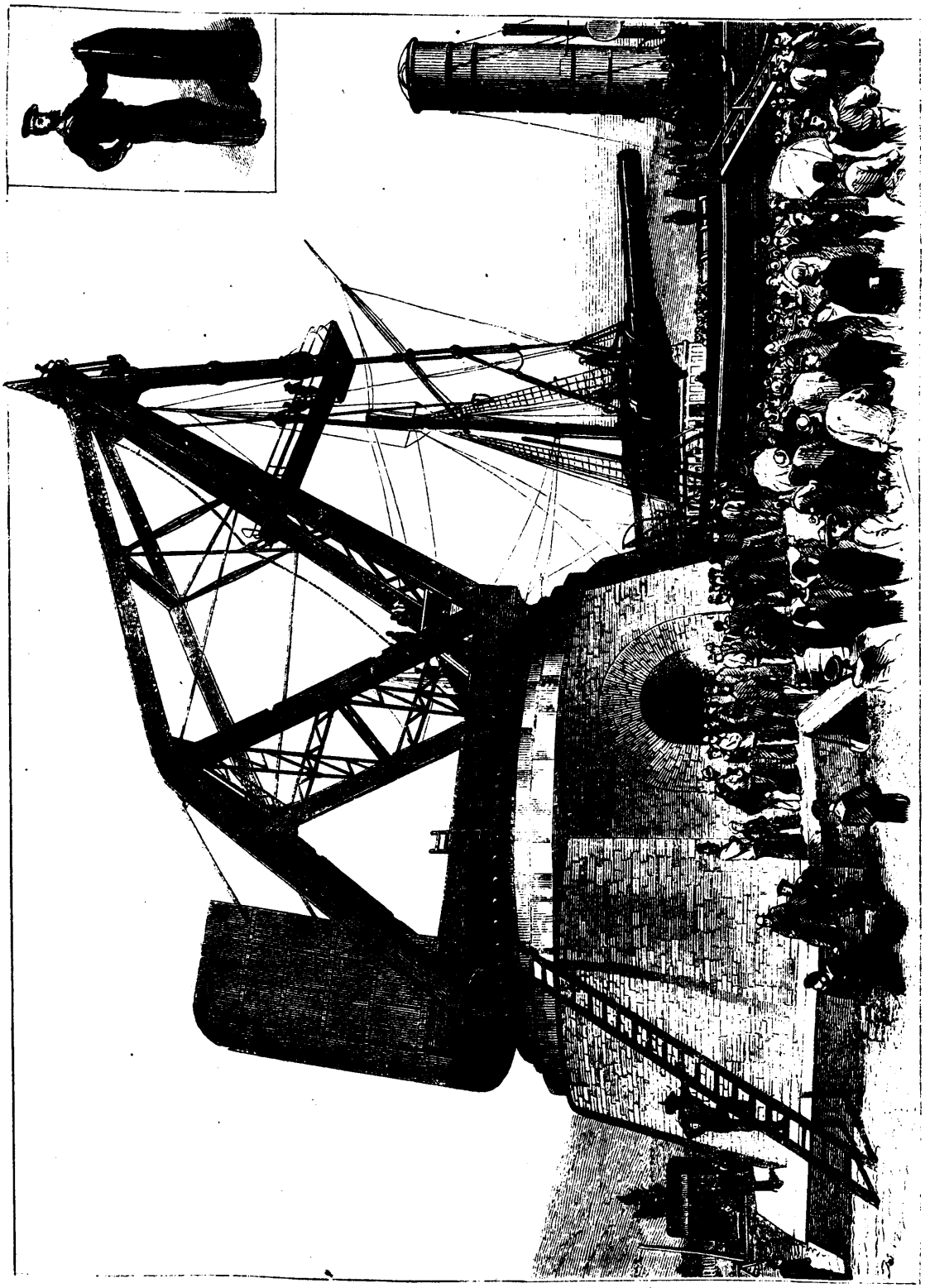


FIG. 1. ELEVATION.



AN AMERICAN BLAST FURNACE.



THE HUNDRED-TON GUN AT SPEZIA—THE GIANT CRANE FOR LIFTING THE GUN.

THE JOHANESKIRCHE STUTTGART.

(See page 4.)

The illustration is a choir view of this church, from which all its principal parts are shown; we quote the following extract from the London *Builder* :—

The tower forms an independent part of the structure at the point where it reaches the eaves of the roof; here is the first gallery, of which there are altogether three. Over the belfry rises the spire of the tower, in which openwork and closed panels alternate. The former impart to the tower, even when seen from a distance, a great charm. But of especial interest is its constructive design; the outlines of the spire are not straight, but they show a swelling of about 7 in. at the highest point. This entasis prevents the pyramid from appearing too slender. The tower has a height of 227 ft., measured from the pavement to the top of the stone structure.

The western front has three entrances. We find first an antechapel, with stairs at the sides leading to the galleries; and from here, after passing the doors of the tambour, the interior of the church. Similiar arrangements are met with in the entrances to the aisles; from these porches also the galleries may be ascended, which are thus reached without disturbing the assembled congregation. The ground-plan shows a design of nave and two aisles. The nave is crossed by a transept, and is separated from the aisles by pointed arches; the transept has flat arches. The whole building differs in its style only very slightly from a Roman Catholic church, with the exception, however, of the choir. The spacious choir required for Catholic rites can, in truth, be dispensed with in the simple forms of Protestant worship. The choir here consists of the five sides of a regular octagon, and is not very deep. The church receives its light from three rows of windows, placed above each other; the first row is the walls of the aisles; over this the second and most pleasing; the upper row being placed in the centre nave. The whole church is so profusely painted as has hitherto been hardly considered compatible with a Protestant place of worship. The ground tone is the yellow-greenish-grey sandstone, of which the whole church is constructed. Only the moulding, the pillars, capitals, paneling, &c., have the natural color. All the vaulting is painted, but especially the keystones of the arches. An increase of color, as in the decorations of the walls, is perceptible in the stained-glass windows. In the windows of the transepts three bright colours are placed together to produce effect; while, with the exception of the half-length figures of the twelve Apostles and four Prophets in the lower row of windows, all the windows of the nave are decorated geometrical patterns; the choir windows show figurative representations. The choir itself has golden stars upon a dark-blue ground, with vine branches and ears of corn. We find here, also, the painted emblems of the four Eveangelists, and in the centre panel the Lamb, resting upon the Book, closed with seven seals. Below the pulpit, surrounded by pillars of red and green marble, stands the statue of the Reformer Luther; his right hand rests confirmatively upon the Bible, supported by the left arm. An eagle with extended wings serves as lectern. The body of the pulpit consists of a balustrade, between the uprights of which variegated tapestry appears. The sounding-board is a piece of elaborate Gothic carving. The organ is a good piece of work. the seats as well as the doors are of heavy oak. The church offers sitting-room for 1,600 people, and there is room altogether for 2,000.

MITREING PICTURE FRAMES.

We regret that our space wil not allow of giving the descriptive matter of the Illustrations on page 5 in this number, it will appear in our next issue.

IRON OF ANTIQUITY.—The oldest pieces of iron (wrought iron) now known are probably the sickle blade found by Belzoni under the base of a sphinx at Karnac, near Thebes; the blade found by Colonel Vyse embedded in the masonry of the great pyramid; the portion of a cross-cut saw exhumed at Nimrod by Mr. Layard, all of which are now in the British Museum. A wrought bar of Damascus steel was presented by King Porus to Alexander the Great, and the rasor steel of China for many centuries has surpassed all European steel in temper and durability of edge. The Hindoos appear to have made wrought iron directly from the ore, without passing it through the furnace, from time immemorial, and elaborately wrought masses of iron are still found in India which date from the early centuries of the Christian era.

MORTISING AND TENONING MACHINE.

(See page 12.)

In the engraving, we illustrate a combined mortising and tenoning machine, which appears to include several excellent features. It performs a multiplicity of operations, mortising, tenoning, housing staircase strings, sticking moulding suitable for doors, small architraves, and other work. The mortising, &c., is performed without the work being previously set out by a skilled man. It can be used for dwelling purposes, chairs, &c., for cabinet makers, and it will cut with ease ornamental open work of any pattern, however irregular, for the eaves of houses. The machine consists of a stout iron pillar, bolted to an iron base. Projecting from the pillar are three iron arms which support the cutting machinery, and at the back is an iron bracket, bolted to the pillar, to carry the wheels for pulleys. In front of the machine is an iron table and framework bolted on to the base. The table travels, and can be raised or depressed according to the thickness of the material operated on, a projecting lever locking the table when the chisels and cutters are in motion. In a minute a door can be mortised ready for a lock, an operation which at a building would take a workman an hour. The chisel for moulding and rebating circular-headed sashes cuts both ways, according to the grain of the wood, springs keeping the moulding in proper position. In tenoning, two small circular saws driven by an endless cord cut the shoulders clean. There is no snipping, and the joints fit to a nicety. The saws can be raised and lowered by means of a lever and screw for the required size of a tenon, and they move sideways for long and short shoulders, and for solid, moulded, or beaded framing.

Figs. 1 and 2 are respectively side and front elevations of the machine ready for mortising; Figs. 3 and 4 show the arrangement for mortising; 5, 6 and 7 show chisels; Figs. 8 and 9 show one side and front elevation of the machine as a moulder, with chisel in position; Fig. 10 is a side view as a tenoning machine; and Fig. 11 is a front elevation of the same. On a foundation plate A is fitted a pillar B, having brackets C formed or fitted on it; these brackets carry the bearers D of the revolving spindle E, to which motion is imparted by means of the belt F passing over the pulleys G, H, and I; the spindle E is regulated and raised or lowered by the spur gear J, which actuates a nut on a screw formed on the spindle, in which is fitted the mortising bit. The bottom part K of the pillar B is turned true, and on it is fitted a bracket L, so arranged that it can be swung round the pillar, so that the one arrangement will serve for mortising door-locks. The bracket L can be raised or lowered by means of the worm gear M, which actuates the pinion N, gearing into the rack O, allowing the different heights for mortising to be obtained. The bracket L can be swung round the pillar B, and it can be fixed in any required position by the screws P; on the bracket L are fitted ordinary longitudinal and transverse slides Q, and on the top slide is fitted a table R made to slide thereon. Underneath and on the side of the table R is fitted a rack S actuated by a pinion T, and worked by the hand wheel U; this wheel is made so that it may be removed when the table is once fixed to the required position and not required for mortising. The table R is fitted with a movable fence V working in slides W. The wood to be fixed for mortising is held against the fence V, and held by the cramping piece X, actuated by the screw Y working through the bearer Z; this bearer is fitted with screws, and can be removed when not required.

On the part K of the pillar B is fitted a ring A^1, made so that it can be raised or lowered, and fitted with a screw B^1 for fixing it to any required position; the ring A^1 is formed with a projecting piece C^1, to which is bolted a guide D^1 made with openings E^1, in which works a guide lever F^1 fitted on the fence V. The lever F^1 travels with the table R, and on and in the opening E^1, which is made equal in travel to the length of the mortise hole to be cut. On the table R, and bolted to the fence V, is a wooden guide frame G^1, on which is placed the wood to be operated on, and on the under side of the frame G^1 are fitted springs H^1 having studs I^1 which pass through openings made in the bottom of the frame G^1, and enter the mortise holes which have first been cut, acting as guides for cutting the other mortise holes, and doing away with the present system of setting out all the holes to be mortised, and in addition making each piece of wood mortised mathematically true.

On the side of the table R is fitted a bracket J^1, in which works the end of a screw K^1, which works through a swivel lug L^1 fittted underneath an independent table M^1; this table is fitted on the top of the table R. Underneath the independent table M^1 is fitted a stud N^1, which works in a curved guide O^1

formed in the table R; on the top of the independent table M^1 is fitted a guide plate or fence P^1 for guiding the wood operated on. The table M^1 is used for the purpose of cutting away the wood of the treads Q^1 and rises R^1 of staircase strings. When the independent table M^1 is parallel with the table R, the treads Q^1 are cut straight on one side by means of the bit Z^1, but by turning the handle S^1, which actuates the screw K^1, the independent table M^1 is made to work sideways, giving the required angle to cut away the wood of the treads Q^1 and rises R^1, cutting the wood at an angle giving the required width at the end, as shown in the drawing, for the purpose of wedging the treads and rises up to the proper joint.

The mortise bits are made of steel, and formed with three, four, or more distinct cutters of a spiral curved shape, cut round and lengthways of the boring bit, and sharpened on the edges. When boring—for first passing through the article to be mortised—all the cutters are acting, but only one or two cutters is or are on the cut when the bit or wood is made to travel sideways or horizontally, that is to say "slotting," the other cutters being formed equally in a circle steady the bit, preventing it working sideways, and producing an evenly cut mortise hole, doing away with the evils in bits heretofore in use, made with two cutters and two small wings, which left the bit loose in the hole until the cutters came in contact with the wood, causing the bit to work sideways, and producing an unevenly cut hole.

The mortising machine is shown fitted with moulding bit and apparatus for keeping the wood in position during the operation of cutting the mouldings. On the table R are fitted plates C^2 having jaws D^2, in which work spring levers E^2 having friction pulleys F^2 fitted in the ends; these friction pulleys are kept pressed against the wood G^2, which is operated on by the screws H^2, giving the required pressure, and preventing the wood working sideways during the operation of cutting the mouldings. In the spindle E is fitted a moulding bit or tool I^2; this tool is made with five cutters J^2 of a curved shape. The bit or moulding tool can be made of any pattern to suit the required mouldings; on the bottom part of the bit is formed a stud K^2, which fits in a hole formed in the top table R, and the top L is made taper to fit the spindle E.

Figs. 10 and 11 represent the mortising machine fitted with apparatus for cutting shoulders and tenons. On the table R is bolted a frame S^2 having sides T^2, in which are fitted the bearers U^2 of the sew spindles V^2; the slides or bearers are raised or lowered to suit the thickness of the wood to be cut, and are actuated by screws W^2, worked by the handle Y^2, which is made to fit the heads of the screws W^2. On the ends of the spindles V^2 are fitted small circular saws X^2, which are actuated by a rope or belting Y^3 working over pulleys Z^2; the circular saws X^2 cut the shoulders of the tenons, and prevent broken shoulders, and consequently bad workmanship. On the end of the spindle E of the mortising machine is cut a screw, on which is screwed a disc A^3 having three cutters or sections of a saw B^3 fitted on it. The spaces C^3 are for the purpose of clearing the cutters from the chips or sawdust. A similar disc D^3 is fitted underneath the disc A^3, having similar cutters; the top disc cuts the top of the tenon, and the bottom one the under side of the tenon. Between the disc is fitted a wooden washer E^3, and this washer varies in thickness according to the thickness of the tenons to be cut. A set screw F^3 is passed through the bottom disc and washer, and screwed in the boss G^3 of the top disc. The wood operated on is made to slide on a top sliding frame H^3 working on bottom frames I^3; stops and a brake are employed to keep the wood firmly fixed on the sliding frame H^3, and to regulate the length of the tenons being cut; the sliding frame H^3 working on brings the wood first through the circular saws W^2, cutting the shoulders, and afterwards through the discs cutting the tenons.

For planing wood a long wooden or iron table is fitted on the table R, and the spindle of a planing tool is screwed on; the table for planing is actuated by gear fitted on the table R and bracket L.

SMALL POWER HORIZONTAL ENGINE.

(See page 13.)

The engine illustrated is one of a type brought out by Deakin, Parker and Co., of Manchester, to supply a want which exists, in the shape of a strong, simple and economical engine. The frame is of a peculiar shape, and is designed to dispense with heavy foundations; all that is required being to bolt to a wooden floor or a 6-inch flag. The slide is of the slipper type, it being found to combine the largest wearing surface with facility for cleaning and oiling. The crank shaft is either made of wrought iron bent, or steel, and being a sweep crank, pulleys can be placed on either side of the engine. The governor is of the high-speed type, loaded with steel spring, being extremely sensitive, and is placed horizontally, so that no bevel wheels are employed; and it is driven direct by a belt passing over a pulley keyed on the spindle of the governor. This governor, while being very simple, is at the same time very powerful; the pressure acting to open and close the equilibrium valve being on this engine, when running at the normal speed (140) 84 lb., so that the danger of sticking is reduced to a minimum. The equilibrium valve is also placed horizontally, so that no joints and pins are required. The piston is formed by a block in halves, so that the ring, which is patent steel spring, can be taken out and cleaned without springing it out. The piston rod, valve spindle, &c., are of steel. Indeed, steel is very largely used by this firm in the construction of their engines.

Messrs. Deakin, Parker and Co. also supply a very simple and efficient water-heater with these engines when required, consisting of a number of brass tubes placed in the body of the casting (which, on reference to our illustration, will be seen to be of a cylindrical form) through which the water is forced on its way from the pump to the boiler. The exhaust steam from the engine passes through the body of the frame and round these tubes, so that the exhaust steam does not touch the water. The water is therefore cold as it passes through the pump, thus avoiding the trouble that is occasioned by the pump refusing to take hot water.

The principal dimensions of the engine illustrated are—diameter of cylinder, 7 inches; length of stroke, 14 inches; diameter of piston rod, $1\frac{3}{8}$ inch; diameter of crank shaft, $2\frac{3}{4}$ inches; length of connecting rod, 2 feet 11 inches; diameter of feed pump, $1\frac{3}{4}$ inches ram.

In conclusion we may say that users of small power could not easily find a more suitable engine than one of this type.

HINTS FOR THE WORK-SHOP.

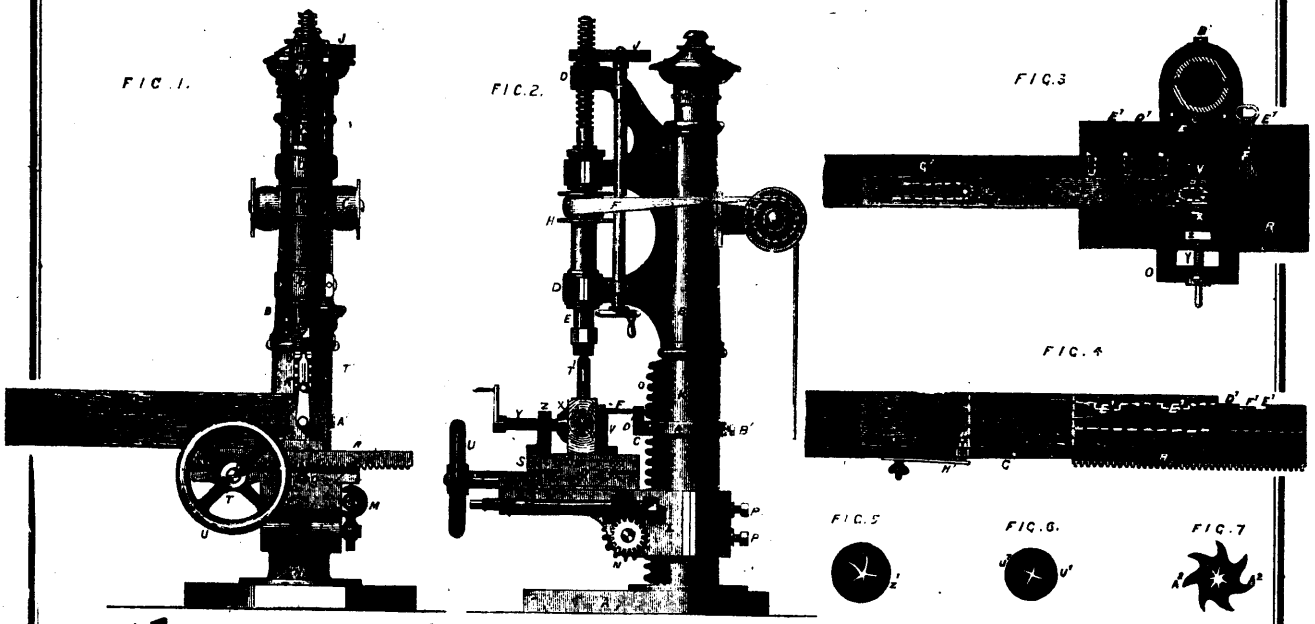
(See page 12.)

How to Use a File Properly is a very important part of the education of a mechanic. Nevertheless, the file is frequently used in such an imperfect manner, as to greatly reduce its value as a mechanical tool. The chief difficulty in using a file is in keeping it in a perfectly horizontal position as it is moved over the work, and in maintaining an equable pressure upon the work meanwhile. Perhaps the most difficult work in filing, and that which is most frequently ill-done, is in sharpening saws. The bearing of the file upon the work is very narrow, and unable to guide its direction, and unless the file is held very carefully, the direction varies continually, so that the saw tooth is filed rounding instead of flat, or sloping instead of horizontal, or at exact right angles with the line of the saw, as it should be in a mill-saw or rip-saw. When the file is held as shown in fig. 1 (a very common manner of holding), it is almost impossible to do good work upon a saw. When the file is pushed on to the tooth, the weight or pressure of the right hand is exerted upon the longer portion of the tool, making it act as if it were the longer arm of a lever, and thus depresses that portion below the horizontal, as at *a*. When pushed forward, the pressure is then exerted upon the longer portion of the file, which is carried from the horizontal in the contrary direction. The work is thus made round. Or if the pressure of the left hand is guarded against, that of the right hand is seldom altogether controlled, and the work is left sloping as at fig. 2; the position at the commencement being shown at *a*, and that at the finish of the stroke at *b*. This is a very common error with sawyers in mills, as well as with many carpenters in filing rip-saws.

To avoid either form of this error, the file should not be held with the ball of the thumb pressing upon the handle of the file, as at figs. 1 and 2; but the end of the file should be taken lightly between the thumb and forefinger, as at fig. 3. There is no uneven pressure in this case, and the direction of the file may easily be kept perfectly level. In filing the base of the tooth, or the under portion of any work which cannot be turned over, the end of the file should be supported upon ends of the fingers, as at fig. 5, or be held by the end of the thumb, in an easy and gentle manner. If held lightly, and not grasped too firmly, the arm or wrist will not be tired so soon as when it is held rigidly; and the motion of the file will be more even and regular.

When the arm is wearied by working in one direction, it may be rested by reversing the position of the file, taking the handle in the left hand, and grasping the end between the fingers and

MORTISING AND TENONING MACHINE.



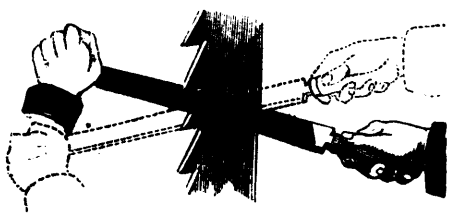


Fig. 1.—IMPROPER USE OF THE FILE.

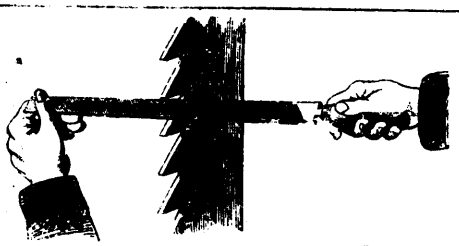


Fig. 3.—PROPER METHOD OF FILING.

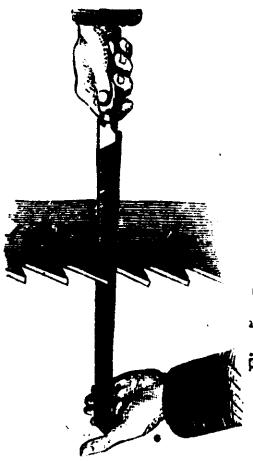


Fig. 5.—FILING UNDERNEATH.

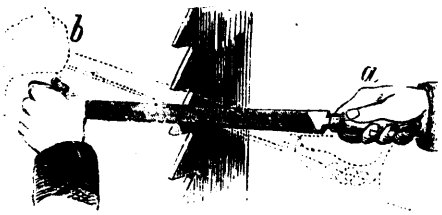


FIG. 2.—ANOTHER WRONG WAY OF FILING.

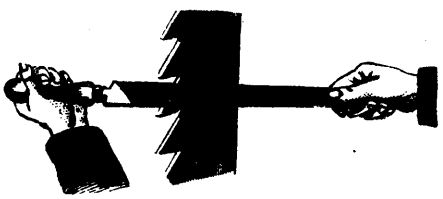
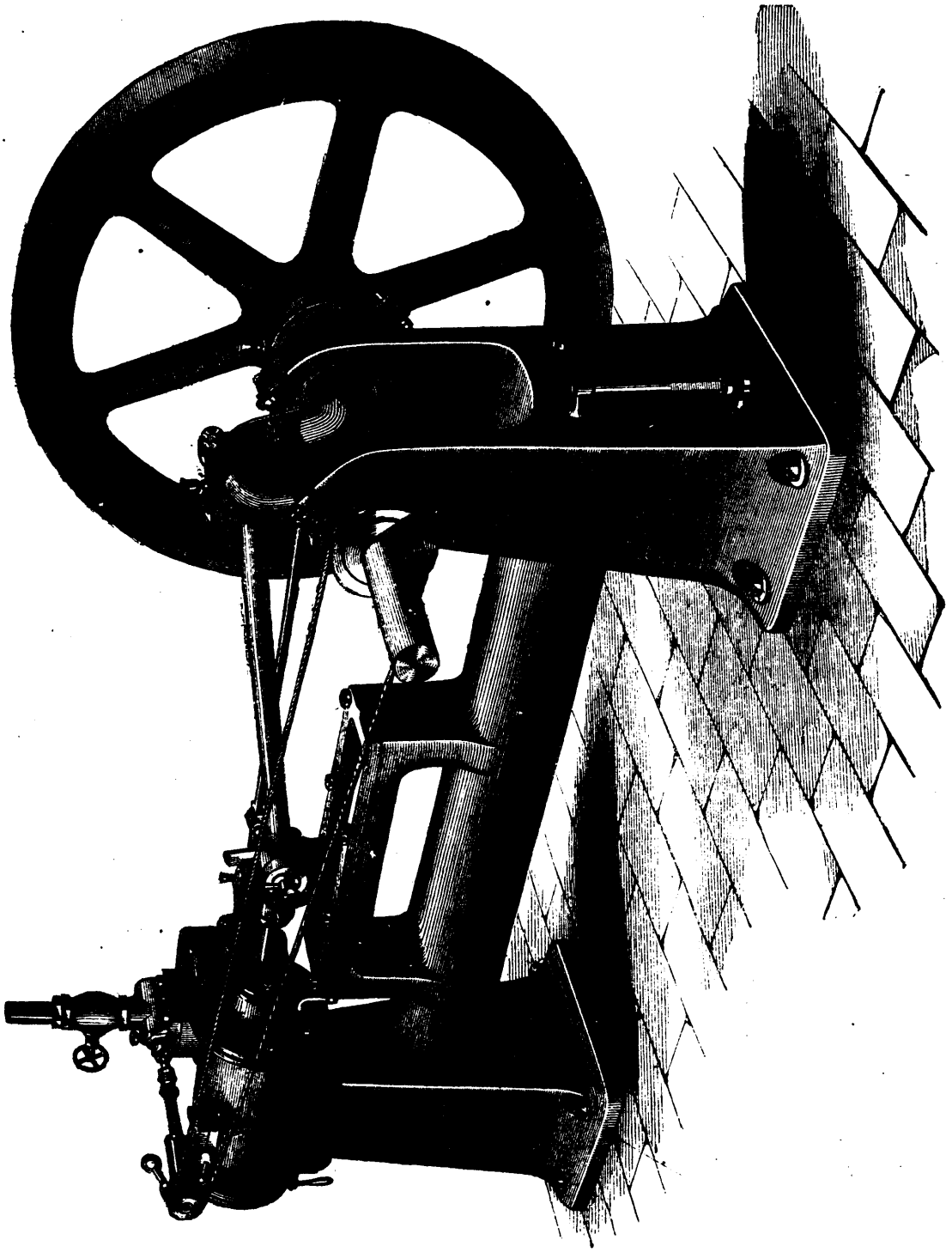


Fig. 4.—TO REST THE HAND IN FILING.

HOW TO FILE A SAW.



SMALL POWER HORIZONTAL ENGINE.

thumb of the right hand, and drawing the file towards the body instead of thrusting it away from it. The file is then held as in figure 4. This is an excellent position in which to hold the file when finishing off a saw tooth, or when touching it off at noon.

BROCKLEBANK'S PATENT RAILWAY COUPLING.

(See page 16.)

This coupling compares very favourably with the other arrangements for the purpose exhibited at Brussels, and described in our issue of last week, both in point of simplicity and fewness of parts, and in absolute certaintly of action under all the conditions of actual working ; indeed, as our readers will remember, a series of trials were carried out on the Great Northern Railway a few months ago with such success that Captain Tyler, in his report on railway accidents for 1875, recommended the invention to the notice of Parliament. The main idea kept in view is the prevention of that great loss of life and limb which now takes place among railway employés ; and a subordinate, but still very important, advantage is the saving of time in coupling and uncoupling, and, therefore, of expense. The arrangement is entirely on the drawbar principle, so that the ordinary drawbar can be converted into the Brockelbank coupling with the sole addition of a new crosshead pierced to receive a bolt, a tumbling-hook between the forks, and a shackle outside the crosshead, swinging on the bolt, having its upper surface flattened, and terminating in a hook.

The model in the British department of the Brussels Exhibition is 25 feet long, and as it is constructed to a scale of 2 inches to the foot, represents a 50-yards length of actual way. It consists of a double line, with cross-over points, an S curve of 3½ chains radius, and a slight incline ; including, therefore, nearly all the difficulties met with in a shunting yard. It is completed with spring-block buffers at each end, and is stocked with a six-wheel coupled goods engine, a brake-van, and two waggons, besides two other vehicles, fitted with a new apparatus, referred to below.

The action of the coupling, which is so simple that it can be readily adapted to any variety of rolling stock is as follows :—On the vehicles being brought together, either softly or with severe concussion, one of the hooks attached to each drawbar mounts the shackle of the other and engages in it, when the coupling is complete, and no amount of play can possibly uncouple the vehicles. For disconnection, a rod running across the buffer-beam is raised by a handle from either side of the waggon, and which bringing the clanked rod to bear on the coupling, lifts the hook out of the shackle, the end of the hook being curved to the circumference of a circle, of which the bolt forming the fulcrum is the centre. When not required, a catch retains the coupling out of gear at the desired height. The tumbling hook in the middle, before mentioned, is for the express purpose of effecting a coupling with the ordinary arrangement now existing for coupling-up waggons, and thus provides the important item of gradual replacement of existing rolling stock.

In close coupling, the only addition made to these combined hooks and shackles, is that of shoulders with chains attached, the other ends of which are made fast to the buffer beams. This will be seen by fig. 1, which shows the coupling between an engine and brake van. The coupling is automatic, as in the former case, but for bringing the vehicles together, the drawbar (divided at any given point) is furnished with right and left handed screws, which take into a single screw bar. This bar, made square outside, is passed into and is free to slide through a loose wheel, capable of being rotated from any desired part of the vehicle. Turning this wheel in one direction shortens the drawbar, draws the coupling into the headstock, and tightens the connection ; and turning in the other direction lengthens the drawbar and propels the coupling from the headstock ; the small chains tighten, the hooks rise, and the disconnection is complete. It will, therefore, be seen that these couplings combine in one action the power to tighten, loosen or uncouple. In one of the vehicles exhibited, this tightening apparatus is worked from the side by a handle or key, and show that it can be adapted to passenger carriages, and yet be out of the reach of the passengers themselves. The intermediate gear between the handle and the screw-bar may consist of bevel wheels, as in fig. 3, or worm and wheel, as in fig. 4.

Two of the trucks are fitted with a modification of the principle applied to a central buffer, intended for India and the Colonies (as shown in fig. 2), and it is claimed that this arrangement is an improvement on all existing central buffer couplings. The difficulties hitherto experienced in many central buffers combined with couplings are that they are liable to disconnection in severe collisions ; that adjustment of the parts is necessary in one or both members before coupling-up can be effected ; and that in the event of accident to a drawbar, there is probable necessity to remove the whole of the buffer apparatus—a circumstance which, in foreign countries or the Colonies, away from repairing shops, is of vital importance. It will be seen from the sketch of the new arrangement (fig. 5) and the detail, partly in erection (fig. 6*), that by making the drawbar independent of the buffer (placed however, inside the latter), and so shaping it so as to enable the whole of the working parts to be seen from the outside, Mr. Brockelbank avoids the above-named difficulties, while at the same time he secures an automatic coupling without the disadvantage of having to alter either coupling hook before contact. The tightening apparatus above described is equally applicable to this arrangement and to the other ; indeed, we believe that with the sole exception of that on the Festiniog Railway, this is the only central buffer coupling capable of being tightened.

The value of an automatic coupling is especially brought home to railway directors in a country like Belgium, where compensation to the wives and families of employés killed in their work is rigidly enforced. Mr. Brockelbank's system has been warmly taken up here ; he is now engaged in fitting up a train to run on a new line forming part of the Belgian State Railways, in order to give a demonstration of the working of his couplings under all the varying conditions of regular traffic.

When we consider that the total number of railway servants killed and injured in shunting operations in England was over 2000 during the years 1874 and 1875, a great proportion of which casualties might have been vastly diminished by such an appliance, we cannot too strongly urge upon railway managers the advisability—nay, the moral duty—of at any rate giving it a fair consideration. To take a lower ground, it has been calculated on fair bases that the saving of time on crowded portions of some of the English railways, with goods traffic alone, would amount to over 1000 days per annum ; this at any rate, is a consideration which railway directors cannot afford to lose sight of.—*Iron.*

COLORED CEMENT FIT FOR GRINDING AND POLISHING.—Colored cements are used to give cast goods of zinc or brass the appearance of buhlwork, and to fill up the holes made by etching in zinc door-plates, street numbers, coats of arms, &c. They are also, with advantage, employed for making casting-models of more artistic objects, as well as for mosaics on metal ground ; but they may be further found useful in engineering works for isolaters, large rings and plates. According to Stach, the following procedure is necessary in their preparation ;—A solution of soluble glass of 33 deg. Reau. is mixed with fine whitening, with the addition of the materials mentioned below, until it assumes the tenacity of a thick plastic mass, and thus different coloured cements, hardening in six or seven hours, of considerable strength, and very useful for the purposes above quoted, are obtained. By adding grey sulphuret of antimony a black cement is obtained ; this may be polished with agate, and has a metallic onyx-like lustre. Another black cement is prepared by mixing equal parts of sulphuret of antimony and iron filings (finest) with the above soluble glass ; but the cement can only be ground. Carbonate of copper, pure chrome green, give green ; cobalt blue, blue cements. (Ordinary ultramarine is not fit for use, because it forms Glauber's salt and scatters the mass.) Red lead gives orange cement, sulphide of cadmium citrine, cinnabar bright red, and cochineal-lac violet cement ; zinc dust and alcoholised iron give a brown cement and powdered manganese acts in the same manner. An especially valuable grey cement, which may be polished with the agate to a metallic luster, and used in the repair of damaged zinc ornaments—whether cast or of sheet zinc—is produced by mixing pure most finely-sifted zinc dust with soluble glass. Hitherto these mixtures have been used solely for imitating marble, but the cements are also of great value in the metalware industry.

STAINING BLACK.—Acetate of iron (vinegar in which nails have been steeped) will produce the stain.

CLEANING TILE PAVEMENT.—Wash them with some soft soap and let them dry, and then rub them over with sweet oil. After a little time you will see a great improvement. Of course, this must be kept up.

GILDER'S WAX.—1. Bee's-wax, 4 oz. ; verdigris and sulphate of copper, of each 1 oz. ; melted together. 2. Bee's wax, verdigris, red ochre, and alum, of each 1 oz. Used to give red gold color to water gilding.

SANITARY REPORTS.

CITIZENS' PUBLIC HEALTH ASSOCIATION, MONTREAL.

A public meeting of the Citizens' Public Health Association was held in the rooms of the Natural History Society, on the 17th November last.

Among those present we noticed Doctors Fisher, Girdwood, Godfrey, Proudfoot, LaRocque, McDonnell, Alex. Johnson, Carpenter, Trenholme, and Donald Baynes; Alds. McCord and McLaren; Messrs. Springle, Murray, Sutherland (Eng)., Radford and others. The President, Mr. Mercer, took the chair at 8 p.m. After the minutes of the previous meeting had been read and confirmed, Mr. R. Carr Harris was introduced to the meeting. He described the principles of the pneumatic system of sewerage in full, quoting freely from his numerous papers in the PUBLIC HEALTH MAGAZINE. For a further description of the system, we refer our readers to the July, September and November numbars of the MAGAZINE. From a Sanitary point of view, it is the most perfect system of sewerage known, for it *absolutely prevents infection*, and Captain Liernur maintains that it will yield a revenue sufficient to more than pay for the working, by the sales of the proudrette. Be this as it may, one thing is perfectly clear, that it will be a vast saving in life alone from its sanitary protection, which is sufficient to warrant its adoption.

The Chairman, Mr. Mercer, in complimenting Mr. Harris upon the able manner in which he had treated his subject, remarked there was no present question of greater public import than an efficient system of sewerage and a plentiful supply of water. It was important for the audience to keep their minds on the main features of the subject they had heard: the principle of suction of the water carriage system. The expense was a secondary consideration compared with its sanitary value. If the system was superior to the ordinary method of water-carriage, it was very important that they should understand its principles. He was convinced that if the system was perfect it would be found to be much more economical than the one now in use.

Dr. Godfrey asked if Captain Liernur's system were adopted, whether the city could still use the present sewers for carrying off the water flow, and also stated that, to him, the system seemed only to recommend itself from a sanitary point of view.

Mr. Harris, in reply, said it would bring a return, and he was understood to say that he thought it would pay its working expenses, and that any city adopting the water carriage system was only wasting its money, and any such scheme would only have to be abandoned in the future. The system of sewage irrigation was a failure on the Queen's farm at Windsor, as he had himself seen, and no expense had been spared to make it a success.

Dr. Trenholm thought the cause of diphtheria and typhoid fever could be easily accounted for by an inspection of the drains. Another important consideration was that our noble stream (the St. Lawrence) was becoming polluted. Take for instance Hochelaga on a hot day, when the refuse was thrown up on the shore. It was vitally necessary to keep our water course pure. If the pneumatic system could be thoroughly carried out, he felt sure that any citizen—property holder or not—would put his hand in his pocket to help to carry out the scheme for its sanitary advantages alone.

Dr. Godfrey stated that at a *conversazione* of the College of Physicians at London, Captain Liernur's system was illustrated and greatly recommended.

Mr. Springle, C. E., knew very little of the system; but it possessed very great and important merits. The line of Beaver Hall, he thought, would be a very desirable place to have its practicability tested.

Dr. Carpenter drew attention to the fact that the current number of *Good Words* contained an allusion to the subject. He was of opinion that these theoretical ideas did not work well. This was an exceptional city with an exceptional climate. In summer the heat was great, and in winter the cold was excessive. Was it still possible, he asked, to try some experiments? They had an admirable city in which to try experiments. Hochelaga and St. Henri were now in the very act of securing an engineer to lay out a system of drainage at what he might call our north and south ends. It would be a very serious thing to go any great expense on any one thing; but if it was intended to lay out a large sum of money on parks and for other purposes, it might with advantage be applied to this system. He then referred to the baneful influence of kitchen water, and the carelessness used in disposing of it.

Mr. Harris said the system applied to kitchen waste when it was first used, and that the question of changes of temperature had been solved long ago in Holland, and that no leakage could take place even if fissures did appear in the pipes, as the pressure was taken from the outside inwards, and not from the inside outwards, as in gas and water pipes.

Dr. Girdwood thought the separation of the fecal matter from the rest of the drainage to be an extremely good and practical one, and advised by the best authorities.

Dr. Fisher enquired into how many districts this system had been introduced in Amsterdam.

Mr. Harris said into seven, and in reply to a subsequent question from Ald. McCord, stated that in one of the blocks of a European city in which it was used, there were 14,000 inhabitants.

Ald. McCord did not think that the dry earth closets would ever come into vogue or become satisfactory. The great benefit of the present water carriage system was the rapidity with which the matter was got rid of. For the moment he thought he saw many valuable points in the Liernur system. It was possible this experiment would be tried. With regard to the cost of the drainage of Montreal he did not think it was so great as generally supposed. The city had only paid for the main drains, the connecting ones being laid at the expense of private individuals. The silence which was shown by those present he thought to be an evidence that they were not prepared to take up the principle which seemed to him just then to be a good one. But it could not be adopted by private persons; it must be taken hold of by the city. He would try to get the cost of trying the experiment upon a limited area, if possible. The greater cost would not come to them. The system might, perhaps, be introduced by sections. The Health Committee had just concluded a contract with a firm for pumping refuse matter and converting it into *poudrette*. He could appreciate its mercantile value, but would be able to form a better opinion when the above experiment had been tried. The general feasibility of the pneumatic sewerage system from a central point was its great attraction to him.

After passing a unanimous vote of thanks to Mr. Harris for his interesting and exhaustive remarks, the meeting adjourned.

Public Health Magazine.

We fully concur in Ald. McCord's suggestion that the *Liernur* system should be tried as an experiment upon a limited area; and that the cost should be borne by the city; but in the event of its efficiency being tested, we trust the Alderman will bear this in mind, that no system of sewerage, however perfect, will prove satisfactory, unless, in the first instance, it is most positively ascertained that every house contained within the area to be subjected to the experiment has *perfect* interior sanitary equipments, and that there is no "skeleton in the closet." We repeat our former remark, that a million of dollars might be expended in perfecting drains in the streets—but so long as the interior of houses is allowed to remain as it is at present, with imperfect drains—with the earth beneath the kitchen and cellar floors undisinfected from the poisonous oozings which have saturated it for years from foul defective pipes—privies overflowing, because either tenants are too apathetic to the evil, or landlords too penurious to have them emptied—and wooden floored yards permitted to be saturated daily with liquid filth, which, under the heat of a hot summer's sun, steams up in poisonous vapour into open doors and windows—it will be only money spent to no purpose, until these primary causes of the unhealthy state of this city are effectually removed and remedied. There are many ways of carrying off the foul air from drains, but it is in these hidden sources of disease that the greatest danger exists.

The question of whether this city is to be hereafter healthy, or otherwise, lies with the City Council, and upon that body rests a fearful responsibility if it does not carry into execution, to the very lettter of the law, the powers invested in it by its charter.

EDITOR C. M. MAGAZINE.

BROCKLEBANK'S PATENT RAILWAY COUPLING.

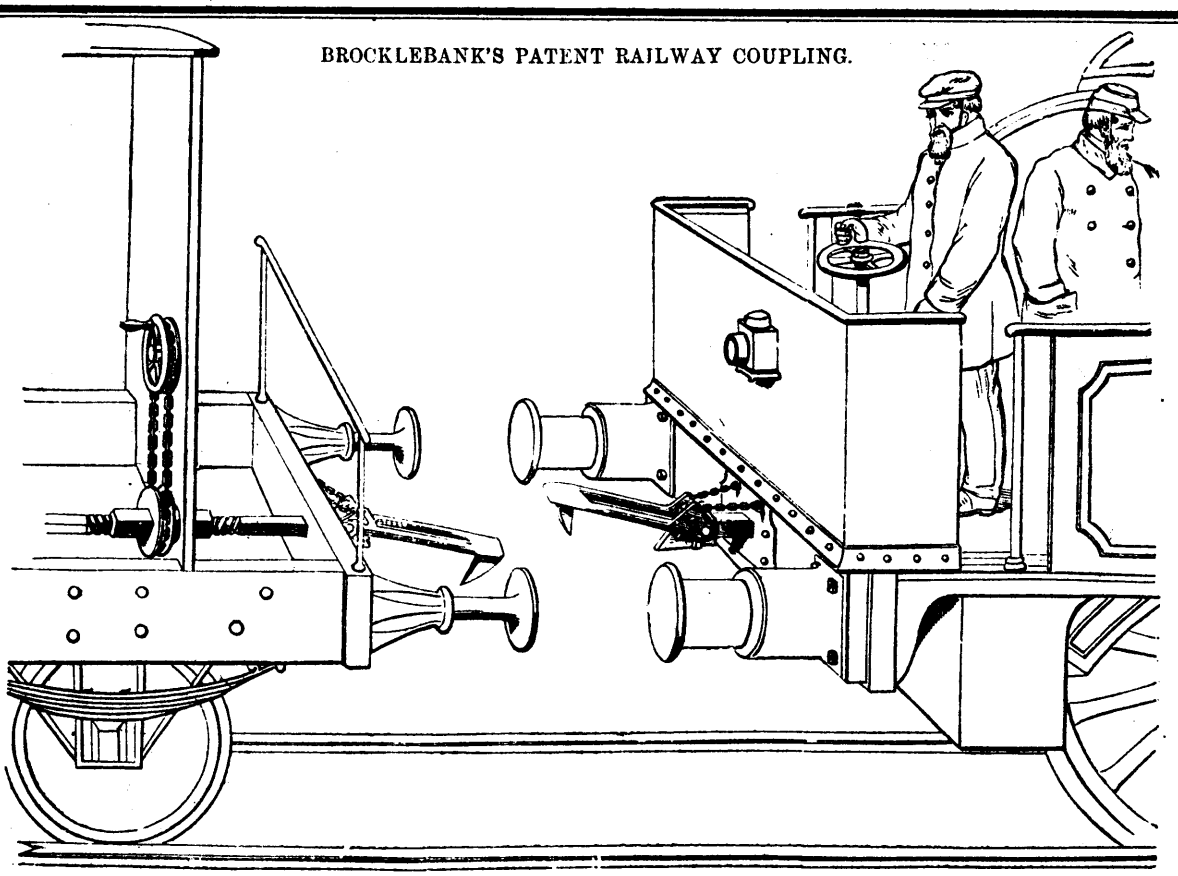


FIG. 1.

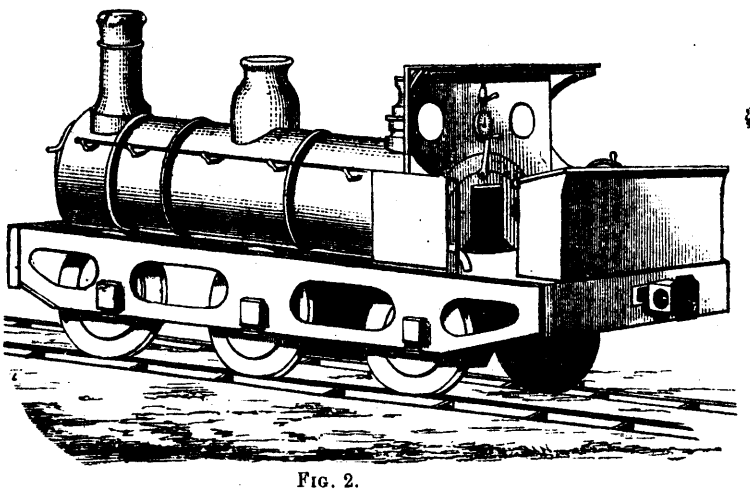


FIG. 2.

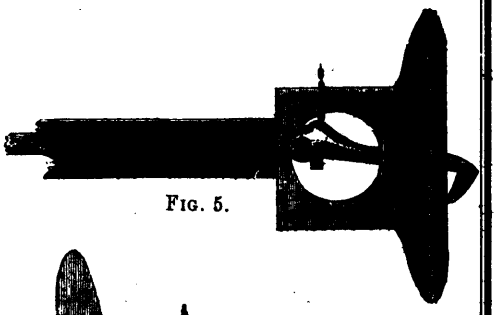


FIG. 5.

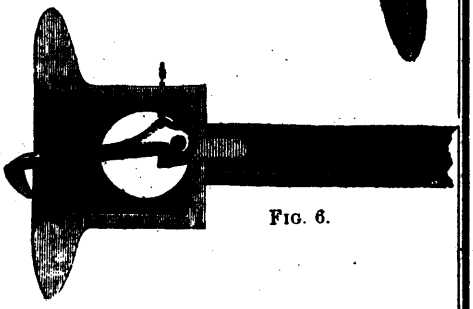


FIG. 6.

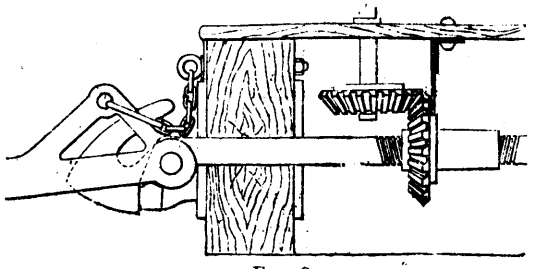


FIG. 3.

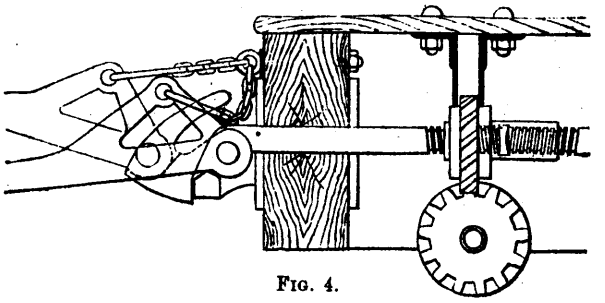


FIG. 4.

THE FAMILY FRIEND.

This part of the MAGAZINE, for the future, will be devoted to instructive domestic reading for the *Home Circle*, such as SHORT PLEASING STORIES, DRAWING, MUSIC, BOTANY, NATURAL HISTORY, POPULAR GAMES, and amusements for boys and girls, NEEDLE WORK, AMATEUR MECHANICAL PURSUITS, and all the elements of a *practical domestic education*; also GARDENING and AGRICULTURAL NOTES.

THE LAST EXPEDITION TO THE NORTH POLE.

ARCTIC EXPLORERS AND THE CENTENNIAL.

(See page 17.)

England may be proud of the place she holds in the annals of discovery. She was the pioneer of Arctic exploration and has never let the spirit of Frobisher entirely die out. It has been her ambition to clear up the mystery that envelops the higher latitudes of our globe, to break through the fields of secular ice, to navigate the waters of a hypothetical "open sea," and fly her colours to the breezes of the Pole. The more important of these objects is doubtless the investigation of the hydrography and general physics of the ultra-northern regions; but this often escaped the popular eye, fascinated as it easily is by the prestige of reaching the wonderful point where the stars neither rise nor set. It was idle to talk of the thousand difficulties attending such enterprises. There was a charm in the idea of exploring the unknown and aiming at the unknowable that dwarfed every danger and hushed all scepticism. But the wings of this popular ambition have at last been clipped, and the fond dream of many has reluctantly faded away as the latest herald from the frozen latitudes laconically declared the "Pole impracticable." The goal on which were fastened the cheering hopes of Parry and Franklin must probably remain inaccessible, and the silence that reigns around it continue unbroken by the intrusion of man.

The report of the Arctic Expedition recently returned dispels much of the romance attaching to this luring problem, and tends to confirm conclusions already arrived at by many of the less enthusiastic. But it does not detract from the merit and glory of the brave men who have in the past exposed themselves to all the rigours and hardships of Arctic winters, in order to extend our knowledge of the physical conditions of those inhospitable wastes. The additions they have made to polar geography, as well as their gallant bearing in trying circumstances, will not easily be blotted out from the pages of history or the records of science.

It was no donbt, a high appreciation of such men, the services they have rendered to science, and the honour they have reflected on their country, that indnced the authorities of the United States Navy to form at the Philadelphia Exhibition a little collection that would be commemorative of their achievements.

The collection was exhibited in one of the Government Building. It was arranged with much taste and with a decided view to bringing every object within easy and distinct vision. It consisted of a large number of miscellaneous articles, some of which were found in the Arctic regions, whilst the great bulk belonged to one or other of the six recent American expeditions, viz., that of Lieutenant E. J. De Haven, 1850-52; that of E. K. Kane, M.D., 1853-55; that of I. I. Hayes, M.D., 1860-61; and the three of Captain C. F. Hall in 1860-61, 1864-69, and 1871.

The first American expedition that sailed for the North left New York in May, 1850. It consisted of the *Advance* and the *Reserve* under the command of Lieutenant De Haven. It had been fitted out chiefly by the munificence of Mr. Henry Grinnell, of New York, for the purpose of making another vigorous effort to ascertain the fate of Sir John Franklin. Reckless alike of personal discomforts and drifting floes, the "mad Yankee," as the commander was called by the more wary English explorers, proceeded with despatch through Banks Land and Melville Peninsula, and reached Beechy Island on August 25th. Here he picked up some scraps of information, from which he thought himself warranted to conclude what the English navigator must have passed that way in his search for the North-West passage. This conjecture was subsequently confirmed by McClintock in 1857, and by Hall in 1864. The highest land attained by De Haven was appropriately called Grinnell Land. The extent of this vast tract was not ascertained by its discoverer, but Hall's party believed its further limit stretched out as far north as 83 deg. 20 mid. It is not a little curious to notice that this altitude almost coincides with the limit reached by the expedition that has just returned to our shores, and which limit thus appears to be the *ne plus ultra* of Arctic exploration. Satisfied with the results obtained, De Haven returned in October 3rd, 1851.

This expedition was represented in the Centennial collection by a soup-canister from Franklin's first winter quarters.

The second expedition was placed under the command of Dr. Kane, a graduate in medicine of the University of Pennsylvania. Dr. Kane has decided proclivities for a nomadic life. He had already served in the Chinese seas, visited India, Ceylon and Egypt, traversed Greece on foot from Patras to Trieste, crossed Germany, Switzerland and Italy, and returned home viâ France and England. In 1850, he was again in the front demanding service under De Haven. His offer was accepted, and he obtained the post of surgeon and naturalist. The experience acquired in these extensive travels, as well as the habits of endurance and observation which they fostered, eminently fitted Dr. Kane for the arduous undertaking now entrusted to his care. On May 30th, 1853, he sailed from New York in the brig *Advance*, buoyant with the hope of discovering certain tidings of the missing navigator. He was a firm believer in an open circumpolar sea teeming with life, and unvisited by extreme temperatures. It was the tranquil waters of this vast sea that the keels of the *Erebus* and *Terror* were not supposed to be ploughing, and thither Dr. Kane determined to extend his search. The ideal was more smiling when unfolded to the Geographical Society of New York than when fronted by the thick-ribbed ice and 90 deg. cold of Van Rennselaer Harbour. Here in latitude 78 deg. 37 min. and longitude 70 deg. 40 min., Kane took up his winter quarters; and, as the dark days crept by, he may have derived some satisfaction from the thought that no previous expedition had ventured to spend the dreary months in so high a latitude. In June he sent out an exploring party under William Morton with the hope of securing some data confirmatory of his cherished theory. Morton happily chanced to meet with an extensive sheet of water which he called Kennedy Channel. Pushing onward from this point, he ultimately reached Washington Land in latitude 82 deg. 27 min. Nothing further was achieved; the prospect of a third winter was too uninviting for the crippled expeditionists. Unable to free the *Advance* from her icy prison, they abandoned her in May, 1855, and set out with three small boats and sledges for the Danish settlements on the north of Greenland. These they finally reached after enduring untold hardships, and encountering unceasing perils for eighty-four days.

No traces of Frankling had been found; but in compensation for this disappointment, it was believed that strong evidence had been obtained of the existence of an open polar basin. She service of Kane were highly and universally appreciated. Congress awarded him a gold medal; the legislature of New York and the Geographical Societies of Loncon and Paris did the same, while the "Queen's Medal," granted only to Arctic explorers, was also presented to him.

The memorials of this expedition collected at the Centennial were the Queen's medal and photographs of the other honours awarded to Dr. Kane; the chief instruments used by him, his journals, twelve Arctic scenes in oil colours, forty-eight in water colours, ten daguerreotypes, a copy of Tennyson which he read to his men, stones gathered by Morton at the most northern headland reached, photographs of Kane and Morton, and a photograph of the vase presented by the British Government "as a token of their sincere gratitude and esteem to Henry Grinnell, of New York, through whose exertions and munificence the American Arctic expedition in search of Sir John Franklin, and the officers and crews of Her Britannic Majesty's ships *Erebus* and *Terror* was undertaken and carried into execution, between the years 1850-55." The last relic that we shall mention, and an interesting one it is, is the boat *Faith*, which was carried 80 miles beyond the limits of the ice-field, and in which the party thence made 1000 miles of perilous navigation to reach Disco, on the Greenland coast.

The third expedition was got up by private subscription in 1860. The command was given to Dr. Hayes, who had been familiarised with Arctic scenery in the company of Dr. Kane. He sailed from Boston early in July in the schooner *United States*, manned by only 14 men. Dr. Hayes was another warm advocate of the "open polar sea" theory, and did not fear to enter the lists of authorship to vindicate it against scoffers and sceptics. While his ship was ice-bound in Port Foulke, he despatched frequent sledging parties to northward, but their progress was anything but commensurate with his wishes. This is easily conceived, for sledging was only in its infancy and had not yet been reduced to an art. Even in 1876, an advance of a mile and a quarter a day over the rugged hummocks was not dispiriting, and we may presume that Dr. Hayes must have felt satisfied when he reached 81 deg. 37 min. and his men declared further progress impossible on account of the rotten condition of the ice. Eargerly climbing a neighbouring headland, he contemplated with delight the scene that lay outstretched before him; and prepossessed by one dominant idea, easily fancied himself standing on the shores of the polar ocean. He thought the soft ice with which it wes encumbered would melt under the rays of the returning sun, while the floe-bergs would drift

southward, and thus leave the Arctic sea open to navigation. Different, however, is the information brought home in 1876, and opposite the conclusions one would draw from the presence of an ice pack varying from 100 ft. to 200 ft. in thickness. It is scarcely conceivable that such masses could be formed in one winter, and melted in the following summer. Like the glaciers of the Alps, they are probably the growth of centuries; and hence the propriety of christening this vast extent the Sea of Ancient Ice, the Palæocrystic Sea.

Dr. Hayes was prevented from advancing any farther by the crazy state of his schooner, and he determined to put back. The return voyage was prosperous, and Bostou was reached at the end of October, 1861. In 1869, he proceeded to Upernavik, with the intention of starting again for the North. He made a short voyage in the *Panther*, but accomplished nothing of importance. His labours were rewarded by a gold medal from the Royal Geographical Society of London in 1867, and another from the Geographical Society of Paris in 1868.

The expedition of 1875, visited Port Foulke, and there found a journal, a few books and documents, that belonged to Dr. Hayes and his cempanions. Captian Nares has found fault with Dr. Hayes for changing names previously given by Admiral Inglefield, and also for publishing inaccurate and therefore misleading delineations of Grinnell Land.

Dr. Hayes was a voluminous and somewhat versatile writer. In his "Arctic Boat Journey" he records his impressions of his voyage with Dr. Kane; "The Open Polar Sea" is a warm argument in favour of a cherished myth, whilst "The Land of Desolation" and "Cast away in the Cold" are not bad specimens of the descriptive and romantic.

This expedition was illustrated by a copy of "The Open Polar Sea," a fragment of syenite from the most northern point attained, and an electrotype of the medal awarded by the Geographical Society of Paris.

We now come to the irrepressible Captain Hall. He was a blacksmith by trade, and possessed all the patience and energy requisite for bold enterprise. Endowed with a mind that soared far above the limits of his forge, he soon found means of exchanging his sledge-hammer for a pen. Journalism turned the tide of his thoughts towards the Pole; and in 1860 he left New London, Connecticut, in a whale ship, determined to go in quest of "the bones of Franklin." In this expectation he was disappointed, but found instead relics of Frobisher's expedition of 300 years before.

The reminiscences of this visit to the North are numerous, and include fool's gold and fossils from Frobisher Bay, musk-ox horns, graphite from latitude 67 deg. 30 min. and longitude 68 deg. 41 min., minerals from Rescue Bay (Frobisher's Bay Expedition), whale chart prepared by Lieutenant M. F. Maury at the National Observatory, Washington, a boat log, a sledge log, a photograph of Hall with authograph, an electrotype of the medal from the Geographical Society of Paris, and lastly the flag that was successively borne to the Southern Ocean by Captain Wilkes, and to the Arctic seas by De Haven, Kane and Hayes.

In 1864, he set out again, and landed on the shores of Hudson Bay with only two Esquimaux for companions. He rightly deemed that a knowledge of the language and customs of these hardy people would materially help him in gathering information and carryiug out his projects. For this purpose he remained with them five consecutive years, during which time he was made acquainted with facts which led him to conclude that Franklin succeeded in discovering the North-West passage, while his vessels were wintering at O'Reilly Island, and that his men died of starvation in King William's Land. He found no records, but brought home many relics, which formed an interesting portion of the Centennial collection. Among these are a barometer, a piece of an azimuth compass, a cylindrical lead, a fragment of a chair, a bottle containing some hair, and articles of clothing, a tin vessel to enclose a record, canisters for preserved meat, a wedge, a chisel, arrows, &c.

The expedition of 1864-60, was represented by the captain's flag, a note-box, a long sabre used in King William's Land, a seal-spear, Hall's notes, brass writing plates, which were heated to prevent the ink from freezing, a walrus tooth, reindeer horns, a specimen of quartz from Mable Island, and minerals from Hecla and Fury Strait.

In June, 1871, Captain Hall sailed from New York on his third and last expedition, It it often called by the name of his vessel the *Polaris*, and had for its object the settlement of the polar sea question, and, if possible, a visit to the Pole itself. He set out with determination, little dreaming that the end of his checkered career was at hand. Sailing up Kennedy Channel he passed through Robeson Strait and reached latitude 82 deg. 16 min. He wintered at Polaris Bay in latitude 81 deg. 38 min. and displayed great activity in sending out sledging parties. In one of these he attained latitude 82 deg. It was his last feat in Arctic discovery, for on his return to the ship, he was struck with apoplexy and died on November 8th. In June, 1876, Captain Stephenson visited this spot; and while his men unfurled the American flag and fired a salute, he erected over Hall's grave a brass plate with the following inscription, "Sacred to the memory of Captain C. F. Hall, of the United States ship *Polaris* who sacrified his life in the advancement of science on November, 1875, who following in his footsteps, have profited by his experience." The tribute was as graceful as it had been well deserved.

The *Discovery*, one of the twin steamphips of this latter expedition, wintered in sight of Polaris Bay, whence parties were sent out in various directions to verify the reports of Hall's companions. They discovered that Robeson Channel has an outlet into the Arctic Ocean, and failed in finding the far-extending land about which the crew of the *Polaris* were so enthusiastic. They are firm in maintaining that the polar sea is never navigable, and that there is "no land to northward."

The highest latitude attained by Hall, was 82 deg. 16 min.; the Austrian expedition of 1872-73 reached 82 deg. and sighted 83 deg.; Captain Nares wintered in 83 deg., and sent out sledging parties to 83 deg. 20 min. 28 sec. This station, which is within 400 miles from the Pole was reached after a struggle of 82 days, and there, on the remotest point of Arctic exploration, Commander Markham and his associates planted the English flag on May 12th, 1876.

The relics of Captain's Hall last expedition include the log of the *Polaris*, pieces of the flag, Centigrade and Fahrenheit thermometers, fossils from Thank God Harbour, a stone overgrown with lichens, a shot-gun, a note-book used by Hall in his last sledge journey of October 10th, 1871, his inkstand, seal-skin mittens, eider-down wristlets, a bog of tobacco, ivory articles made by the Etah Esquimaux, and photographs of Joe Ebierbing and Hannah. These were two Esquimaux whom Hall chanced to meet in England, and who subsequently became his fastest friends and constant companions. Ebierbing rendered good service in the *Polaris*; and to a skill as a seal-hunter, Captain Tyson and his eighteen companions owed their preservation when they drifted away for 195 days on an ice-floe. Hans Christian, an Esquimaux dog-driver, was also very useful to Hall, and he acquired additional celebrity by the valuable services he since rendered to the expedition of 1875-76.

Captain Hall also brought home a considerable number of relics belonging to former expeditions. The larger part of these refer to Sir John Franklin, and have already been enumerated. The remainder consist chiefly of small articles of outfit and rigging of the expeditions of Parry, Ross and Rae, and complete the halo of interest that surrounded the Centennial memorial of Arctic explorers.—*The Engineering.*

PLAIN DIRECTIONS FOR ACCIDENTS AND EMERGENCIES.

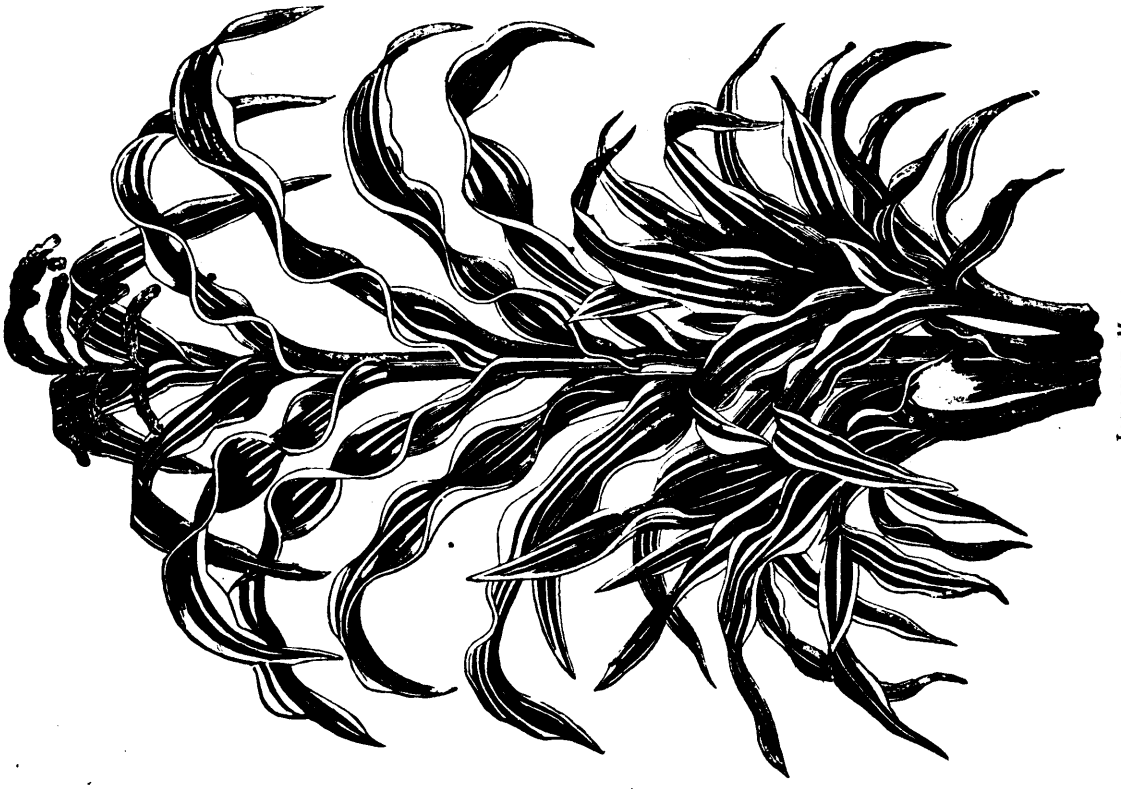
Carbonic Acid Gas.

Asphyxia, by inhalation of gas, takes place as soon as the person comes within the influence of this compound, and takes it in with the breath. A sudden sense of suffocation is felt, with dizziness of the brain, and inability to stand. If a person is standing at the time the air is taken into the lungs, and falls over, he is in a position, while down, to inhale more of the carbonic acid gas, for, being heavier than air, much more of it is to be experienced at the bottom of a well, or cavern than five feet higher up.

This gas, sometimes known under the name of 'Choke Damp,' is produced in the ordinary process of fermentation, in burning and slaking lime; and it is also found in mines, particularly coal mines, and in wells, cellars of caves which have been long closed up. It is considerably heavier than the atmosphere, and is consequently found lying on the floor of the cavity where confined.

No well, vat, old cellar, or cavern of any kind, should ever be entered without first lowering down into the deepest point a lighted candle. If the flame is extinguished, or burns dimly, indicating the presence of this gas, no one, under any circumstances, should be permitted to enter without removing this foul air. It lies at the bottom because too heavy to ascend. It is not so heavy, however, that a strong *current* of common air will not

FLORAL CULTURE.



JAPANESE MAIZE.

GROUP OF SEEDLING VERBENAS.

BUBBLES.—From the Art Journal.

dislodge it. Buckets of water dashed down into the well, or masses of lighted shavings or blazing paper, give enough *movement* to the carbonic acid gas to dislodge it from its resting-place. After *testing* the success of the effort by again introducing the lighted candle, it can soon be known whether a person may enter with impunity. Freshly slaked lime also rapidly absorbs it.

Often there may be no such gas shown in the *cavity*, but the efforts of the workmen will *dislodge* it from an adjacent space into the one in which he is breathing. This *possibility* should never be lost sight of.

When a person appears overcome by this Carbonic acid gas, he is, of course, wholly unable to help himself, and he must at once be removed by another. Sometimes a grapnel hook can be used with advantage, but often the better way is to rapidly lower some bold, clear-headed person, with a rope securely fastened around his middle, who can seize and bring to the surface the unfortunate individual. No time should be *lost* in descending or arising, as the person lowered depends upon doing everything during the interval he can hold his breath; for of course, should *he* inhale the gas, his position, in this respect, would be but little better than the man he attempts to succor. A large sack is sometimes thrown over the head and shoulders of the person who descends. It contains enough air to serve for several inhalations, while the texture of the material prevents, to a hurtful degree, all *admission* of the deleterious gas.

The person suffering from Asphyxia from the gas, immediately after being brought out, should be placed on his back, the neck and throat bared, and any other obstacles to the breathing quickly removed. His body should then be quickly stripped, and if he have not fallen into water on being overpowered by the gas, his head, neck and shoulders should be freely dashed with cold water.

Remember, this is not "sprinkling," as commonly practised; but, as said before, a person should stand off some distance, with a bowl of cold water, and, *throw* its contents, with as much *force* as possible, against the parts. Others should follow with about an interval of half a minute, while one count thirty slowly, then the dripping water wiped away by a towel. This procedure should be repeated from time to time, as apparently required. Sometimes, if a brook of water is near, the stripped person might be dipped again and again; being careful, of course, not to dip in his face. Artificial respiration should be used with as little intermission as possible.

Should the person have fallen in the water and become *chilled*, the use of the cold water, in this manner, had better be avoided as the evaporation of the moisture absorbs more heat than can be manufactured by the exhausted and overpowered system. In such a case, the body of the person should be put into a warm bed, with hot applications, and artificial respiration at once established, as in the Asphyxia from drowning and hanging.

While artificial respiration is being used, friction applied to the limbs should be kept up.

Burning Charcoal.

Certain gases (Carbonic Oxide Gas) are given off during the burning of charcoal, of a very poisonous character, and when inhaled for a sufficient length of time, rapidly prove fatal. The person quickly drops insensible, and dies of Asphyxia, in many respects like the person who has succumbed to the Carbonic Acid Gas, just described. The treatment there advised should at once be carried out.

Anthracite and Bituminous Coal.

These also, when burned in a close room, as a kitchen shut up for the night with an open stove of these burning coals, give off, to a degree, the peculiar poisonous gas alluded to as coming from burning charcoal; Carbonic Acid Gas; as well as *other* noxious gases. Persons sleeping in such a room, under the circumstances, unless awaked as the air becomes fouled, will be found senseless or dead, soon after. The treatment should be as described in the preceding case of Asphyxia from inhaling Carbonic Acid gas.

Common Burning Gas.

Persons retiring at night often leave the gas "turned down," and the flame becomes extinguished. Enough gas often escapes to give trouble to the sleeper unless the room is well ventilated. Persons have been known to "blow it out," as they would a candle, and suffocation more or less complete has followed.

Foreign Bodies in the Throat.

A piece of food or some other body, often gets back into the the mouth, and cannot be swallowed. In such a case, the finger will often be able to thrust it downward, should that be thought best. A *hair-pin*, straightened and bent at the extremity, will often drag it out. If the body is firm in character, a pair of scissors, separated at the rivet, and one blade held by the point, will furnish a *loop*, which often can be made to extract it.

Foul Air in Drains and Privies.

This is usually Sulphuretted Hydrogen, and arises from the decomposition of the residual matters usually found there. Great caution, on this account, should always be observed on opening and entering such places, or places in possible *communication* with them, especially if they have been long closed. A small quantity of *pure* Sulphuretted Hydrogen, if inhaled, is usually fatal; but in the cases referred to, the gas usually exists *diluted* with common air. The breathing becomes difficult, the person loses his strength, falls, becomes insensible and cold, lips and face blue, and the mouth covered with a blood secretion.

The person should be removed as quickly as possible beyond the influence of the foul air, and the treatment under the head of "Carbonic Acid Gas" pursued.

The *possibility* of such a disaster should always be borne in mind in opening long-closed drains or privy vaults, and the danger lessened by taking a few pounds of chloride of lime (bleaching salt), dissolving it in a pail of water, and dashing it into the cavity. In absence of this, lime and water, in the form of the common "whitewash," may be employed. This gas readily combines with lime, to that extent freeing the air of the poisonous compound.

PROPOSED PALACE ON THE TROCADERO, PARIS.

(See page 29.)

The general style of the building is a modification of the Arabesque; its form is semi-circular, accompanied by two spacious wings; proceeding from there are half-circular galleries, forming, as it were, the sides of an immense horseshoe as large as the Trocadero itself, and enclosing the whole of the park. The termination of these galleries is not seen in our view. From the centre of this half-circle springs the rotunda, which will be used as a theatre (with its domed roof surmounted by a winged Genius), flanked by two lofty minarets, and encircled by two tiers of galleries giving access to every part of the theatre, and forming a covered promenade looking out upon the wonderful panorama of Paris and its environs, Meudon, Sèvres, Clermont, &c. The architects have succeeded in combining lightness with strength. All the iron framework of the buildings will be furnished with materials of different colours placed one over another, and further enlivened with bright-coloured panels of enamelled clay.

Although several journals here have asserted that the buildings on the Trocadero will be devoted to an International Retrospective Exhibition, and to agricultural and horticultural shows, we have received official information that up to the present moment nothing whatever has been decided upon, and cannot be, until the plan and interior arrangements of the buildings are finally settled. The Government at Versailles have receive official notice from Germany that she will take part in the Exhibition.—*Builder*.

Imitation Marble.— Carl Boschau, says, that if a statue, made of plaster of Paris, or *papier maché*, be coated with thick white varnish, and then dusted with pulverized glass, it will have, when dry, the appearance of alabaster. If it be afterwards varnished a second time, and dusted with coarsely pulverized white glass or mica (*marienglac*) and again dried, it will be a very successful imitation of Carrara marble especially if the marble veins be first traced with some delicate blue pigment. This method of preparation follows that of nature, for alabaster consists of very small crystals of sulphate of lime, and Carrara marble of somewhat larger crystals of carbonate of lime, which in reflected light glistens like white sugar. This effect is obtained with perfect deception by the brilliant white glass in coarse powder.

CANARY BREEDING.

The principal dangers attending the early days of a nest of young canaries are the probabilities, I was going to say possibilities, but the odds are, I think, in favour of a probability, that the hen will not feed, or else she will "sweat" her nest; either contingency meaning a lot of anxiety and trouble with only a very small ultimate chance of rearing the young ones—a dismal look-out certainly, but an event of only too frequent occurrence. To any one who may put up only a pair or two, or who may have had pretty fair success, much of this may be strangely at variance with his experience, but a breeder who has, say, fifty pairs up, knows well how often his first work in the morning is to throw out dead birds, and assist others towards the last stage of their existence, and then sweep up the dead bodies in the morning's cleaning up. Some sanguine reader may, perhaps, say this indicates defective treatment. Men of my acquaintance, thinking men who dislike groping in the dark, and search deeply for the why and because, have said so, but my reply is, go on long enough, and your turn will come. A nest of young birds requires careful watching from the first, and a person whose business calls him from home the greater part of the day has not so much chance of success as one who can visit his birds at shorter intervals. One would think that the wisest thing to do would be to leave the hen to herself, on the old theory of what birds do and don't do in a state of nature. But practically, it won't always do to leave the hen to itself. If when the young ones are a few hours old, nicely dried and fluffed up like balls of thistle-down, you observe the hen rise gently in her nest, and, without leaving it, go round the little circle and give each a meal with the most tender care and after performing other little offices tuck them in and make them comfortable for a nap, this looks well. So long as the birds continue to grow and do well, even if they seldom show any food in their crops, be content to leave well alone. Some hens feed little and often, and others cram. But if a hen should show disposition to begin to feed, and time after time when you take a peep the young ones gape for food, it's no use saying that the hen knows best about it. She knows nothing of the kind, or, knowing, from some cause not understood, persistently refuses to feed. This fit *may* not last long, and the young ones must be kept alive by some means till this most strange apparent suppression of natural instinct gives place to a healthier state of things. To feed such and others which may require relief from the parish, I always kept a hard-boiled egg ready: cut it down to the yolk and moisten with saliva; just scrape up a little on the end of a pointed stick, and pop it into the little mouths. Many a nest I have saved in this way. As one means of trying to effect a change in this miserable state of things, run in the cock; but notice the result, as is may possibly only make matters worse, for it is just on the cards that the hen may be all the more obstinate, calling incessantly to the cock for food and swallowing all of it herself. If she does this, turn him out again and run in the wire slide. He will then come to the wires and if she wants any of his sweet morsels she must come off to get them, and there is just the chance that, on returning to her nest, the gaping mouths may excite some compassion. A little now and then will keep them going, and in addition, to such help as can be given by hand-feeding, let the cock have an opportunity of feeding at intervals, by shutting off the hen. On no account, however, allow her to remain off long enough for the young birds to get chilled. All these little contrivances, bear in mind, are only recommended as a means of saving a nest, though only too frequently, it is a kindness to destroy the whole and set the hen going again. Of such methods as removing the young to other nests, it is not necessary to speak; the thing is so obviously simple as to suggest itself to the veriest novice. My difficulty is to condense what I have to say, or I might show the value of keeping a lot of common hens as feeders, which is a common plan when many pairs of valuable varieties are put up. Returning to our single hen, however, we must suppose no difficulties arise, and that the young ones are never sick or sorry for an hour, but continue to grow till eight or ten days old. Then comes another critical stage. One year my friend Mr. Young scarcely got one nest beyond this point. Finer nests I never saw, but at this stage nest after nest died with their crops full, apparently surfeited. When this sort of thing happens too frequently to be pleasant, reduce the supply of soft food, for if a hen means feeding she can and will bring up her young upon little else than seed, which she will manage to prepare for them. Very little experience will enable a beginner to tell at a glance if things are going on in a healthy way. Steady progress is what is desired, and what is meant by that will be seen at once by noticing the difference between a well-fed lot, as plump and fat as it is possible to conceive, and a nest which is making a struggle for existence. You can almost see the one grow; I wish I could say as much of the other; if they grow at all it seems to be *backwards*, becoming dwarfed and stunted, and never developing into good birds. The most painful sight is when a hen "sweats" her young, the first indication of which is their losing their fluffy covering, which becomes tangled and matted with moisture. I know of no preventive which I can recommend with any confidence, though a warm bath is sometimes tried, and as frequently a cold one. But the cause lies deeper than either will penetrate, and an unhealthy state of body requires treatment based upon accurate knowledge of cause and effect.—*Live Stock Journal.*

FLORAL CULTURE.

(See page 20.)

VEERBNA. — Nat. Ord. Verbenaceæ. *Linn.* — *Didynamia Angiospermia.*—To speak of the beauty and effectiveness of the Verbena would be to "paint the lily, or add new perfume to the violet." Verbenas in quantity are more easily obtained from seed than from cuttings; sown in Spring they flower quite early in the season. The self-colors are generally to be depended upon, and there is, moreover, the chance from seedlings of raising new varieties.

VERBENA HYBRIDA, choice mixed, from a celebrated German collection.

VERBENA HYBRIDA, extra fine, saved from the newest and best named varieties.

VERBENA NEW ITALIAN STRIPED, brilliant colors, striped *carnation-like* with *rose lilac* and *purple* on various colored grounds.

VERBENA AURICULAFFORA, choice mixed varieties, *white* center.

VERBENA COCCINEA, saved from the most brilliant *scarlet* flowers.

VERBENA CŒRULEA, beautiful *blue*, constant.

VERBENA MONTANA. This is a gem, truly; it has the habit of the common Verbena, but is perfectly hardy and blooms more profusely. The plant literally covers itself with its bright *rose* colored flowers from early in May until Winter sets in; a native of the gold regions of Colorado Territory.

There are many other varieties.

ZEA JAPONICA FOL. VARIEGATA, (*Variegated Japanese Maize.*) Nat. Ord. Gramineæ. *Linn.*—*Triandria Monœcia.* A valuable addition to our ornamental foliage plants, presenting a beautiful appearance; large tufty foliage, broadly ribboned in all its length with alternate stripes of *white* and *green;* half-hardy annuals; from Japan; 6 ft.

A CLOTHES DRYER FOR A MANTLE SHELF.

(See page 28.)

In most houses the stove has taken the place of the open fire, and though the fire place may be permanently or temporarily closed up, the mantle shelf originally built with it, is found quite too convenient to be abolished with the fire-place. Indeed, so desirable is a shelf if this kind, that recent houses built with reference to the use of stoves only, are almost always furnished with mantle shelves to the chimneys, though there are no fire-places below. This shelf, besides being useful to hold lamps and other things, may be converted into a convenient clothes-dryer. The great number of portable clothes dryers that have been patented, shows that there is a demand for such things. However objectionable it may be to dry clothes in the house, there will be occasions when it is necessary to do it, and the simple arrangement here given will answer quite as well as a more expensive patented one. The dryer in use is shown in figure 1; *B, B,* are two strips of wood, two or three feet long, as may be desired, and 1½ x 1 inch at one end, and tapering to 1 x ¾-inch at the other. At 4 inches from the shelf, and every 4 inches towards the smaller ends, small holes are bored, through which to pass the lines, *P, P.* The manner of attaching the arms to the shelf, is shown in figure 2, which represents one of the brackets into which two small iron hooks, *H, H,* are driven in such a manner that when the arm *B,* in inserted, it will fit snugly against the hooks, and also against the under side of the shelf. In case the shelf has no brackets, the arms may be supported by means of iron staples, made of the proper shape and size to fit the arm, and driven into the lower side of the mantle. When not in use, the arms can be removed, and the affair rolled up to occupy a very little space.

LADIES' FANCY WORK, HOME DECORATIONS AND FURNITURE.

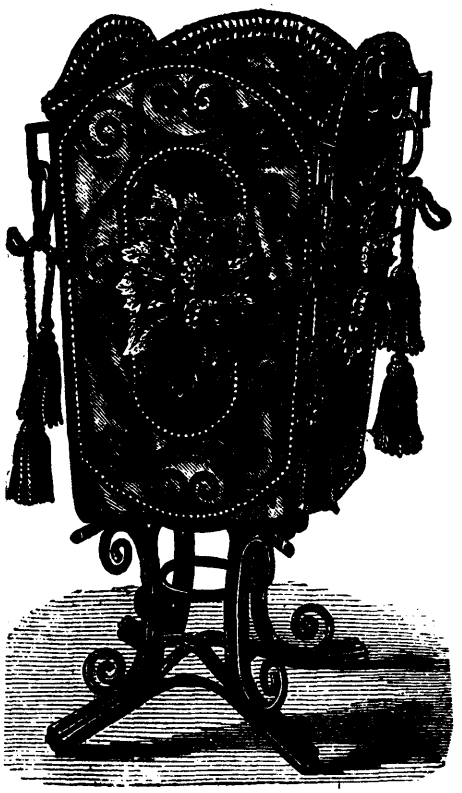


FIG. 1. WASTE-PAPER BASKET.

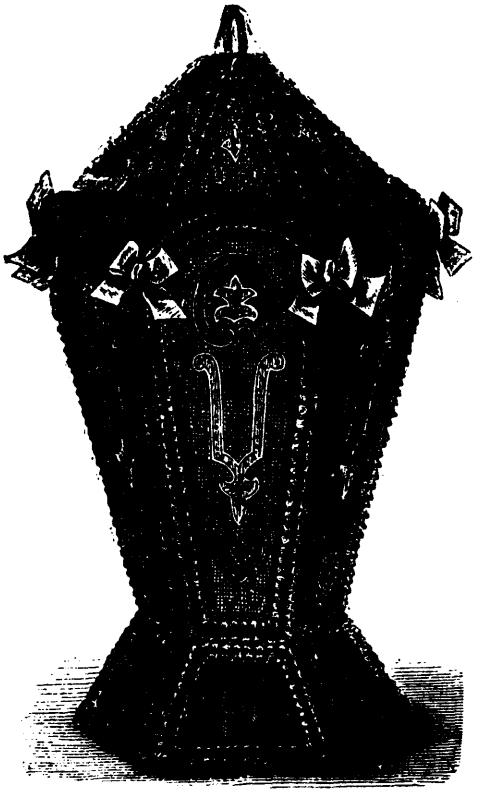


FIG. 2. WASTE-PAPER BASKET.

FIG. 3. WASTE-PAPER BASKET.

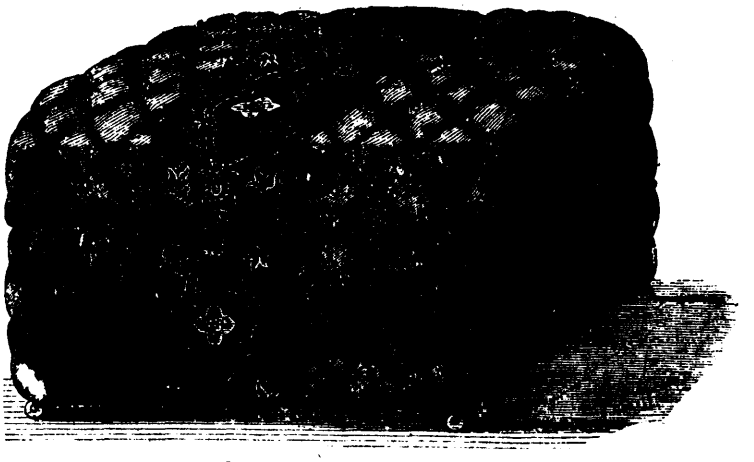


FIG. 4. BOX-OTTOMAN.

FIG. 5. SILK-WINDER.

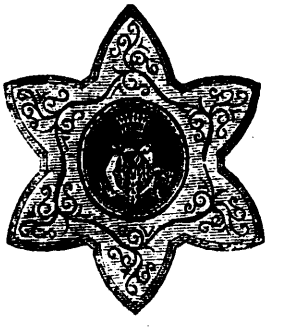


FIG. 6. SILK-WINDER.

LADIES' FANCY WORK, HOME DECORATIONS AND FURNITURE.

FIG. 7. EMBROIDERY FOR FLOWER-POT-COVER.

FIG. 8. WORK-BASKET.

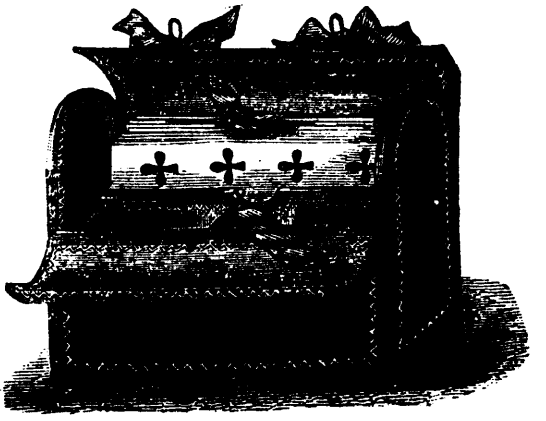


FIG. 9. BOX FOR PLAYING-CARDS.

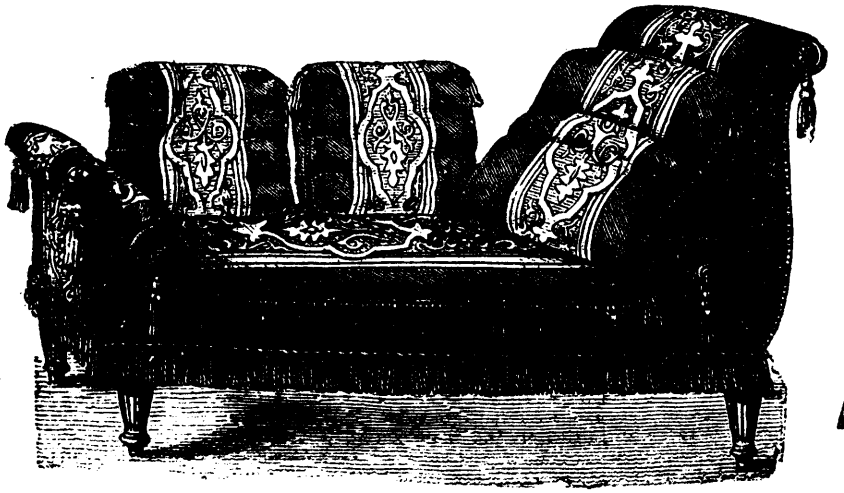


FIG. 10. SOFA WITH APPLIQUE STRIPE.

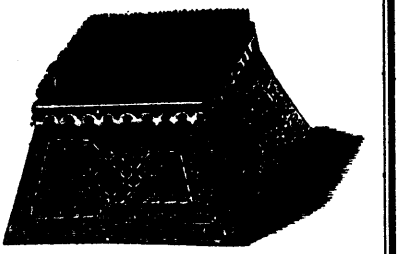


FIG. 11. PEN-WIPER.

THE LOVE OF BEAUTY.—Everything which surrounds us is an influence. We are surrounded with beautiful things in the world, and it is our duty to make our homes look as beautiful as possible. Everything we have in our houses, every glass and jug, every painted door and table, is an influence, an association, out of which the mind receives its instruction, even more than that which the pedagogue conveys in school. Therefore, art is nothing more nor less than the recognition of the example set us by God. I should be sorry to limit art to a mere canvas and statuary exposition of it. The basis of all good art—of painting, statuary, and architecture, and the ornamentation of domestic vessels—is a constant acknowledgment of the beauty of the external world, out of which can only come good art. The craving for this art is perfectly universal. The savage who carves his spear and war instruments, and paints his body, evinces a leaning towards things that are beautiful. The commonest hind, who cultivates his small plot of land with flowers, is declaring an inward and conscious sense of the beauty alluded to. Therefore, the manufacturer, the designer of every class, and the workman, instead of working from the thought that he is merely catering to a luxurious feeling, should labour rather with the consciousness that he is labouring to cultivate and raise that which in the human mind is a natural instinct. To the designer — and house-painters and architects are among this class—a true sense of art is indispensable; that he should think for himself, and not be continually reproducing what has been done before. Take the ordinary house painter; a man thoroughly educated for his business would for $2 make his cottage an arena of excellence. Shop-fronts and signs, and all these things, are influences. It is impossible to live opposite an ill-painted shop-front without being morally the worse for it. We are continually talking of our inferiority to France and Germany in designs. In these countries every man has received an education in art, from the designer to the lowest kind of workman, to enable him thoroughly to understand and to love the work to be done. These are the men to make work beautiful, and to do justice to the designer.

FROSTING FOR ORNAMENTS.—Not long since there appeared in the shop-windows of Munich certain artistic figures and ornamental objects, which were remarkable for their beautiful silvery appearance. They attracted a good deal of attention, both on account of their beauty and novelty; and the curious German—for curiosity is not limited to the inquisitive Yankee—could not rest until he learned the secret of their manufacture. It seems that the objects were only plaster casts, but were covered with a silvery film of colourless and finely divided mica. Mica has long since replaced the bronze colours in certain manufactures, so we are not surprised at its being used for this. After experimenting for some time, Schelhass found that his silvery appearance could be given to the object in the following simple and inexpensive manner:—Plates of mica are first rendered perfectly clean and white, either by boiling in muriatic acid, or by igniting them; they are then washed, dried, and ground to a fine powder, which is carefully sifted, or elutriated, and mixed with very thin collodion. It is now ready to be applied like a paint or varnish with a soft pencil, two or more coats being given until of the desired thickness. The objects thus coated have a silvery appearance, and possess one advantage over those in which tinsel or metallic bronze is employed, not being at all affected by sulphurous vapours. They are not injured by dust and dirt, and may be cleaned by washing in water. Collodion adheres firmly to glass, porcelain, wood, metal and pasteboard, and as mica is capable of taking any desired colour, this furnishes a cheap and excellent mode of covering toys and objects of *vertu*, and increasing their beauty.

"CUT FINGER—BRUISES.— Put a wet bandage on the one; and on the other bread and water, pounded and well squeezed. In skin accidents the latter is best. The following case is too important to omit. A boy who had lacerated his fingers in a machine was brought to us in the greatest agony. He had neither slept himself for a week, nor allowed one in the house to sleep. To heal such a case required the most painful effort. We steamed the poor hand to soften the covering and clean the wounds, and afterwards applied lint, wet in tepid water, which was then covered with oiled silk. When going through this last process the poor child grew rigid with agony and became insensible; but in a few minutes the torture abated. Before he left he was able to eat a piece of bread and jam. He slept that night, and every night after, and it was beautiful to see the nails growing in about three weeks' time. In such cases the covering need not be removed perhaps for a couple of days at first. Keep the lime moist by pouring a spoonful or two of water on it as often as required, and trust to the steam bath for keeping the wound healthy throughout the process of recovery. There never was a case which gave so much pain as well as so much pleasure. Its great peculiarity was the surprising relief from suffering produced by change of treatment, which must always make us most earnest in recommending neither ointments nor poultices, but water dressing, for wounds."

LADIES' FANCY-WORK.

(See page 24.)

WASTE PAPER-BASKETS.—Fig. 1.

The frame work is of cane, and may be purchased at a fancy basket shop. It is lined throughout with reps, and trimmed at the top with a quilled ruche of satin ribbon. The medallions are filled in with leather work, and thus the basket is finished with cord and tassels.

Fig. 2.

The framework of this basket is of wood; it may be made by any carpenter. It would be necessary for him to see the design of the basket. The dimensions of the side, top, and bottom should be given him. The canvas or cloth should be allowed large enough to nail to the edge of the framework, which is afterwards covered with quilled ribbon. The bottom of the basket is covered with fluted silk, edged with a quilling of ribbon. The top is made to fit on to the sides, and the quilling is on the top. The basket may be lined with silk or reps quite plainly.

Fig. 3.

This basket is of cane-work. The drapes surrounding it may be a ground of thin cloth or silk. Suitable designs may be cut out of cretonne and appliqué to the ground-work. They should be sewn down with bright-coloured sewing-silk. Fringe and ribbon bows are required.

BOX-OTTOMAN.—Fig. 4.

These elegant ottomans are very useful for the drawing-room, as they are excellent receptables for unbound music, or for fancy-work that may be in progress. The quilted parts should correspond with the colour of the drawing-room furniture. The foundation of the stripe may be of cloth or velvet.

EMBROIDERY FOR FLOWER-POT COVER.—Fig. 5.

A foundation of stout cardboard is first required to fit loosely over the flower-pot for which the cover is intended. Some small pieces of cloth, silk, or velvet, are needed for the bird and bar crossing the bottom of the design. The foundation is of cloth, and the work, which is principally in chain-stitch, is done with crewel. Cord and tassels are needed to finish the edge of scallops and bottom of cover.

PEN-WIPER.—Fig. 6.

MATERIALS: Cardboard, kid, purse-silk of two colours, and black cloth; thick gum or glue.

The foundation is of stiff cardboard. The four sides measure 3 inches at the bottom, but are slopped off to 2½ inches at the top. The bottom is a square of 3 inches each way. The sides are covered with kid, and are worked with purse-silk of two colours, according to design. The sides, top, and bottom must be firmly sewn together. After all have been covered, the black cloth is cut into fine shreds, and tightly bound together to fit the case; it must be glued or gummed to the bottom and sides.

SILK-WINDERS.—Fig. 7.

These little winders are of satin-wood, painted according to designs, and afterwards varnished.

WORK-BASKET.—Fig. 8.

MATERIALS: Cardboard, gray cloth, blue silk, or satin ribbon, embroidery silk of several colours to match.

Cut out the shape of basket in cardboard, cover with the gray cloth. The mode of making up the basket is with puffed sides and full top. The handles may be of card, covered with ribbon twisted round them. The edges are finished with a leaf trimming made of quilled satin ribbon.

GRIEF.—"There is no cure for grief," says an old writer, "but time. Attempts at consolation only act like wind upon the fire—keep the flame alive."

THE HONEY BUZZARD.

(See page 24.)

(*Falco Apivorus Linn.*, or *Falco pernis*, as Cuvier has it.)

Derives its name, as the reader may suppose, from its fondness for the apiary. This bird is known generally throughout Europe. Its common length is about 20 inches, but I have known them to be as large as 23 inches, while with expanded wings it measures rather more than 50.

Plumage.—The head is always grey, and the eyes, as well as the feet, are yellow. The talons, bill, and cere are black. The plumage on the upper portion of the body is brown ; beneath, brown and white mingled indiscriminately, while the tail, which is long, is marked with transverse ash-coloured bars ; the toes of the Honey Buzzard are only half feathered. In the female the plumage is similar in colour, only very decisively spotted. The Honey Buzzard breeds in trees ; the eggs are two in number, colour—grey with obscure spots. I know an egg-collector who came across a nest of one of these birds while in pursuit of his hobby at Selborne. In the nest he found but one egg, which was much smaller than that of the *falco apivorus*, not so round, and dotted at each end with small red spots, being surrounded in the centre with a broad blood-marked zone.

Prey.—The food of this bird it must not be supposed is restricted to honey, which I might say forms its "dessert," but the species under notice devotes his attention to small birds, insects, and reptiles, as well as "rats and mice, and such small deer." They have been known to purloin to eggs of other birds. —*The Young Fancier's Guide.*

WHO IS A GENTLEMAN ?

A gentleman is a person not merely acquainted with certain forms and etiquette of life, easy and self-possessed in society, able to speak and act and move in the world without awkwardness, and free from habits which are vulgar and in bad taste.

A gentleman is something beyond this—that which lies at the root of every Christian virtue. It is the thoughtful desire of doing in every instance what others should do unto him. He is constantly thinking, not, indeed, how he may give pleasures to others for the mere sense of pleasing, but how he may avoid hurting their feelings.

When he is in society, he scrupulously ascertains the position and relations of everyone with whom he comes in contact, that he may give to each his due honour, his proper position. He studies how he may avoid touching in conversation on any subject which may heedlessly hurt their feelings—how he may abstain from allusions which may call up a disagreeable or offensive association.

A gentleman never alludes to, never even appears conscious of, any defect, bodily deformity, inferiority of talent, of rank, of reputation in the person in whose society he is placed—never makes a display of his own power, or rank, or advantages—such as is implied in habits, or tricks, or inclinations, which may be offensive to others.

A BLOODLESS COMBAT.

Eudocia von Amburg was young, was a beauty, was an orphan, was posessor of great wealth, and was a ward of the Emperor Joseph II. of Germany. Of course there were many suitors for her hand ; but among them all were only two upon whom the fair Eudocia looked upon with any degree of favour. These two were barons, comparatively young, and had served with her father against the Turks. They were the Baron von Obendorf and the Baron von Frobach. The Emperor entertaining equal respect for both these suitors, knew not how to decide between them, and the maiden could not give him the benefit of her decision. In this dilemma, Joseph told the two barons that they stood upon equal terms upon his confidence and esteem, he could give give neither the preference over the other, and they must decide the matter by their own prowess ; and as he did not wish this matter to be the cause of bloodshed, and perhaps of death, as might be the case if offensive weapons were used, he had ordered a large sack to be provided, and he who should be successful enough to put his rival into it should have his fair ward for a wife.

The suitors agreed to the proposition, and this strange and ludicrous combat between the two noblemen took place in the presence of the whole Imperial court. It lasted almost an hour. At length Frobach, utterly exhausted, was forced to yield, and the triumphant Oberndorf, having forced him into the sack, took him upon his back and laid him at the feet of the Emperor ; and within a week the fair Eudocia became Baroness von Oberndorf.

NOTES AND MEMORANDA.

THE use of mahogany for cabinet purposes has recently received increase attention among manufacturers of furniture, and is destined, at a very early day, to supplant all other woods for first-class furniture. Black-walnut and other woods have commanded the market, of late years, but the present indication is that mahogany will rule for many years to come.

FILES.—A new file should always be used with a light pressure on the work till the needle like points of the teeth are worn away. After this, a heavier pressure may be used with much less danger of breaking off the teeth at their base. Many new files are violently diminished of half their efficiency by a few careless strokes when first applied to the work.

HOW "HARD" WATER MAY BE MADE "SOFT."—A late number of the *Popular Science Monthly* contains an interesting article under the caption of "A Piece of Limestone," from which the following paragraph is taken, which contains a hint that may be useful to engineers, as well as to others who may desire to learn a simple process of rendering "Hard" water "Soft :" But, though insoluble in pure water, carbonate of lime is lightly soluble in water which is already charged with carbonic acid ; and as all rain water brings down carbonic acid from the air, it is capable of taking up carbonate of lime from the soils and rocks which it filters ; and it thus happens that all springs from rivers that rise in localities in which there is any kind of calcareous rock become more or less charged with carbonate of lime kept in solution by an excess of carbonic acid. This is what gives the peculiar character to water which is known as 'Hardness ;' and a water hard enough to curdle soap may be converted into a very 'soft' water (as the late Prof. Clark, of Aberdeen, showed) by the simple addition of lime water, which, by combining with the excess of carbonic acid, causes the precipitation of all the lime in solution in the form of insoluble carbonate, which gradually settles to the bottom, leaving the water clear.

TEMPERED GLASS.—A singular instance of the behaviour of tempered glass, says The Times, comes to us from Mrs. Nassau Senior, who writes to say that on the 11th of last month she furnished twelve gas-burners with tempered glass globes purchased in London, and having the veritable label of M. de la Bastie affixed to each. Two of these globes were fitted on burners in her bedroom, and on the night of the 6th inst., after the gas had been extinguished for exactly an hour, one of the globes burst with a report and fell in pieces on the floor, leaving the bottom ring still on the burner. Those pieces which were, of course, found to be perfectly cold, were some two or three inches long and an inch or so wide. Curiously enough, they continued for an hour or more splitting up and subdividing themselves into smaller and still smaller fragments, each split being accompanied by a slight report, until at length there was not a fragment larger than a hazel nut, and the greater part of the glass was in pieces of about the size of a pea, and of crystalline form. In the morning it was found that the rim had fallen from the burner to the floor in atoms. It is interesting to note these facts as they indicate that the tempering process affects glass in a most peculiar manner. It would appear desirable that an exhaustive physical investigation should be made in respect of this singular material.

PAINTING ON GILT PAPER.—We wish to paint, with water-colours, a monogram on gilt paper, but could not get the paint to lie, not even when mixed with gum, it either scalled off, or was patchy. After trying various expedients, we scratched all over the surface of the monogram with a hard lead-pencil, and we then found that the water-colours could be easily painted on the surface. Their effect on the gold ground was very great, and perhaps some of our "illuminating" readers may thank us for illuminating them with this "wrinkle."—*Printers' Register.*

UTILIZATION OF SAWDUST.—Sawdust can be converted into a pasty state, and afterwards into a solid, flexible, and almost indestructible mass, which when incorporated with animal matter, rolled, and dried, can be used for the most delicate impressions, as well as for the formation of solid durable articles, in the following manner : Immerse the dust of any kind of wood in diluted sulphuric acid, sufficiently strong to affect the fibers, for some days ; the finer parts are then passed through a seive, well stirred, and allowed to settle. Drain the liquid from the sediment, and mix the latter with a proportionate quantity of animal offal, similar to that used for glue. Roll the mass, pack it in molds, and allow it to dry.

Envy is a littleness of soul which cannot see beyond a certain point ; and if it does not occupy the whole space, feels itself excluded.

NATURAL HISTORY.

HONEY BUZZARDS.

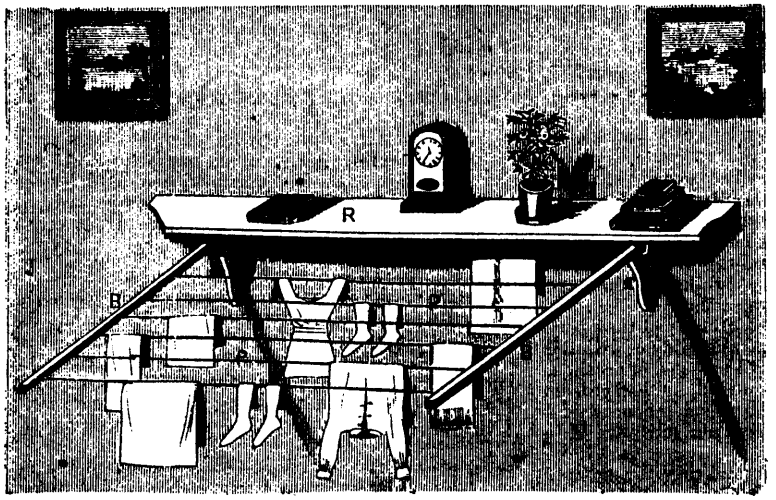


FIG. 1.—CLOTHES DRYER ON MANTLE SHELF.

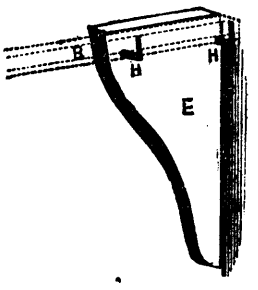


FIG. 2.—BRACKET.

PROPOSED PALACE ON THE TROCADERO, PARIS: INTERNATIONAL EXHIBITION, 1878.

WAXING WOOD CARVINGS.—The following methods, which are those followed in France, where, perhaps, carving in walnut has attained the greatest perfection, will give satisfaction. As walnut is very liable to become worm-eaten, it is advisable to give a preliminary wash to the wood, composed of the following ingredients:—Shavings of walnut ½ ld.; water, 1 quart; alum in powder, 30 grains; boil for au hour in a tinned sausepan. Or take the shucks of two or three fresh walnut, boil in a quart of water, and add 30 grains of alum as before. When quite cold, paint over the carving with a soft brush. When the wood is perfectly dry it may be painted over with either of the following waxing mixtures or "encaustics," as our French neighbours called them:—Dissolved in good clear spirits of turpentine some clean bees'-wax; to this end take as much spirits of turpentine as you may require, add to it one-tenth its bulk of the wax, reduced to fine shreds by scraping with a piece of glass. Place the two in a long narrow-necked bottle, stop tightly with a piece of paper, and facilitate solution by warming the bottle by placing it in warm water, to which hot water may be added until all the wax is dissolved. Shake well from time to time. Or else take a quart of water, boil it in a couple of handsful of wood ashes, let it stand, and then decant the clear portion. In this liquor boil 1½oz. of salts of tarter and 4½oz. of the best white wax free from white lead. Keep the mixture boilling with constant stirring, until it has boiled away to 1½ pints, when it must be constantly stirred until cold. When this encaustic gets old it stiffens, when it only requires re-melting, with the addition of a little water, and salts of tartar, to be as good as ever. Both these encaustic are applied with a fine brush, taking care to use as little as possible, in order to avoid clogging up the finer portions of the carving with wax, as this would entirely spoil the sharpness and beauty of the carving, and render it very liable to catch the dust, especially if the escaustic prepared according to the first receipt be employed. As soon as the encaustic has been applied it must be lightly rubbed over with a soft brush to spread it equally, and when dry, the carving must be polished with a rather harder brush—just like a pair of boots. I can speak from personal experience of the beauty of the result afforded by either of these methods; personally, I prefer the second recipe.

PAINLESS KILLING.

Benjamin W. Richardson reports in *Nature* as follows: The latest experimental researches which I have conducted on lower living animals have had for their object the discovery of a ready, cheap and innocuous method for killing without pain those animals which are destined, as yet, for the food of man. If the labor of the physiologist be allowed to progress, the day will soon arrive when the slaughter of of animals for food will become unnecessary, since he will be able to so transmute the vegetable world as to produce the most perfect and delicious foods for all purposes of life without calling upon the lower animal world to perform the intermediate chemical changes. But until this time arrives animals will have to be slaughtered, and my research has been directed to make a process, which at present is barbarious and painful, painless in the most perfect degree. For this purpose the various modes of rapid destruction of life—by powerful electrical discharges, by rapid division of the medulla oblongata, and by the inhalation of various narcotic vapors, have been carried out. The experiments, which have been exceedingly numerous, have led me to the conclusion that the most perfect of the painless methods of killing is by the inhalation of carbonic oxide gas. So complete is the action of this gas, that I might say physiological science has done her part, as far as need be done, for making the painless killing of every animal a certain and ready accomplishment, an accomplishment also so simple that the animal going to its fate has merely to be passed through the lethal chamber in order to be brought in senseless sleep into the hands of the slaughterer. The application of teaching and the putting into practice this humane process lies now with the world outside science; but to insure its acceptance all the force of selfishness, of prejudice, and of practical apathy for the sufferings of the animal creation have to be overcome. There is a great deal of talk and a great deal of sentiment abroad on the question of the sufferings of the lower animal kingdom, but when an attempt is really made to relieve those sufferings by the invention of methods for the operating, surgically, without the infliction of pain, or for painless killing, the true vital sympathy which one would expect in support of such practical and humane efforts until they are made universal, can scarcely be said to be found at all. With the exception of a few, not a dozen altogether, of really humane ladies and gentlemen, I have found no one, out of the ranks of science, in the least interested in the saving of sufferings to which I am now directing attention. The man of science stands and wonders at the strangeness of the psychological prohlem before him, and in spite of himself, is forced to the conclusion that, pratically, the noise that is made at him in the name of humanity is, after all, sounding brass and clinking cymbal.

CHINESE OVERCROWDING IN SAN FRANCISCO.—Mr. Thomas J. Vivian, in *Scribner* for October, says: — "Fifteen Chinaman will live, sleep, and cook in a hovel or cellar 12 ft. square, having only a door as a means of admitting light and air. Clouds of rancid smoke issue continually from the common chimney, window, and door, through which John and his fellows may dimly be seen crawling, cooking, smokeing, and sleeping; for when Coo Lee has nothing to do, he generally crawls into his hole to sleep or smoke. The large companies' boarding-houses are no better. Every story is refloored, and made into two, and often three, the standard height of a room being a trifle over or under 5 ft. Clean at first, the building soon becomes grimy, and then black, and then dirt-encrusted from garret to roof. Once occupied by Chinese, a building must always remain a pest-hole, or be torn down."

A HINT FOR MARK TWAIN.—It is stated that a short time ago Dean Howson was lecturing in the choir of Chester Cathedral to a number of well-dressed persons. On leaving the choir for the nave the Dean gave strict orders for the choir to be cleared. In apology for what seemed a harsh command, he informed his hearers that a few days previously he had discovered a "gentleman" in the act of cutting off the wing of an angel from some carved work. There is no real occasion to do this sort of thing. Mark Twain, in his new Pilgrim's Progress, gives an interesting description of a fellow-traveller, whom he refers to as Old Blucher, who would pick up the stone in any out-of-the-way place, and, after breaking it into twenty or more fragments, would label the pieces with the name of as many distinct and widely-apart localities, remarking, "The old woman will not know the difference."

VARNISHING WALL PAPER.—Most papers will stand varnishing, if care is used in the first sizing. I have seen some of the common pulp papers varnished, and in some cases where the colors have been soft; but in those cases very great care must be used in going over that portion of the pattern that has a heavy blotch of colour. Machine papers are sometimes prepared for varnishing by having a felt roller, fed with a solution of size placed over them. You might give them a strong coat of size on the back of the paper before hanging. This would tend to harden the colors.

INSTRUCTIONS TO NURSES RESPECTING DIET FOR THE SICK.

FOOD MUST HAVE IN IT WHAT THE SYSTEM WANTS.

As all foods which properly sustain man must contain these principles, it will be readily seen that those vegetable substances which are composed of but one of them, or even two, cannot *alone* support life. Experience confirms this view. Oils or fat are useful as oils or fat, but cannot supply the place of starch or sugar; nor can starch or sugar supply the place of albumen or flesh.

VARIETY IN FOOD.

To obtain all these needful constitutents, we must seek a *variety* in our food, and not depend exclusively upon any single one for continued use. There are some apparent exception to this rule, as in the case of milk, which we know is capable, under certain circumstances, of sustaining life for a length of time; but the exception is only apparent when we examine into the matter.

BULK OF FOOD.

An almost universal error among nurses is in the bulk of the food, and especially the quantity of the drinks, they offer to their patients. Suppose a patient is ordered four ounces of liquid during the day, how is he to take this if you make it into four pints by diluting it? The same with tea, and beef-tea, with arrow-root, milk, etc. You have not increased the *nourishment*, you have not increased the renovating power of these articles, by increasing their *bulk;* you have very likely *diminished* both by giving the patient's digestion *more* to do, and most likely of all the patient will leave half of what he is ordered to take, because he cannot swallow the bulk with which you have been pleased to invest it. It requires very nice observation and care

(and meets with hardly any) to determine what will not be too thick or too strong for the patient to take, while giving him no more than the bulk which he is able to swallow.

Milk.

Milk has these necessary articles in suitable proportion, more than any other food, perhaps in general use. Hence, it might be taken as a sort of representative diet, and better adapted to sustain the body in health, or to strengthen it in sickness, than any single article of food.

Flour.

Flour made from wheat, meal from oats or Indian corn, grits, etc., come next in order, perhaps, and stand at the head of the list of all articles of food grown for general use. Food of the above description is made up chiefly of starch, some albumen (under the form of gluten), and a certain amount of oil. Hence, bread made of flour may well be called the "staff of life," because, from containing these elements, it is capable of supporting life by itself, for a longer time than any other single article of food excepting milk, as mentioned above. But though containing these essential elements of life, yet flour, without the addition of albuminous or oily matter, to a certain degree, cannot long *properly* sustain the human body.

Flour Better than Corn-Starch.

If flour cannot nourish the body in a proper manner, it will at once be seen that corn-starch, arrow-root, tapioca, and the like, which are nothing but pure forms of starch, made by washing away the oily and glutinous (albuminous) parts, cannot *possibly* be expected, when used alone, to afford more than a limited amount of nourishment; not, of course, as much as food prepared from flour, which has *in* it the deficient articles. Not only is flour more nutritive than arrow-root, or any preparation of starch, but is less liable to ferment, and as a rule, it should be preferred whenever it can be used.

Useful Articles of Food.

Do not misunderstand what is meant. None of these articles, compared with flour, are spoken of as *useless* to the body; but some preparations for the sick must be more useful than others, because they contain more of the elements of usefulness, in the shape of albumen, starch, oil, etc.

Cream Better than Milk.

From what has been previously said, it will be seen that milk, when it agrees with the digestion, may be one of the most valuable articles we have to restore the sick, and in many chronic diseases, cream will be found superior even to milk, because of its richness in those parts the system most requires. Even although not as digestable to some people, it is less apt than milk to turn acid in the stomach. It is often beneficial to dyspeptics and convalescents, taken alone or diluted with water. Unless there is something to contra-indicate it, as an irritable condition of the digestive tract, mush made of Indian meal, if suggested to the patient, is often an acceptable change, and there are few things, in every sense of the word, more nutritious than mush and cream, or mush and milk.

Cream seems to act in the same manner as beef-tea is generally understood to act, and to most persons it is much easier of digestion than milk. It fact, it seldom disagrees.

Cheese.

Cheese is not usually digestable by the sick, but it is good nourishment for repairing waste; and physicians constantly see the sick desiring it, which craving shows how much it is needed by them.

Sour Milk.

But if fresh milk is so valuable a food for the sick, the least sourness in it makes, of all articles, perhaps the most injurious; diarrhœa is a common result of fresh milk allowed to become at all sour. The nurse therefore ought to exercise the utmost care in this. Yet if you consider that the only drop of real nourishment in your patient's tea is the drop of milk, and how much almost all patients depend upon their tea, you will see the great importance of not depriving your patient of this drop of milk.

Buttermilk.

Buttermilk, a totally different thing, is often very useful especially in fevers, if it can be procured fresh.

DOMESTIC RECEIPTS.

Veal cake; Supper Dish.—Bone a breast of veal, and cut it in slices; cut also slices of ham or lean bacon, and boil six eggs hard; buttter a deep pan, and place the whole in layers one over the other, cutting the eggs in slices, and seasoning with chopped herbs and cayenne pepper, and wetting the herbs with anchovy or other highly-flavoured sauce. Cover up the whole; let it bake for four hours, and, when taken from the oven, lay a weight upon it to press it well together. When cold, turn it out.

Pound Cake.—1 lb butter, 1 lb loaf sugar, 1 lb eggs, 1¼ flour. Put the butter into a clean pan, about milk warm, and stir it round with your hand until it becomes cream; then add the sugar, which must be pounded very fine, and stir them together for a few minutes. Break the eggs in, and beat them altogether for five minutes; then gradually add the flour, and six drops of essence of lemon; stir them lightly together, put in a buttered mould, and bake in a cool oven. This cake is good but plain. If a richer one is desired, put in 1 lb currants, half a nutmeg, grated, and ¼ lb candied lemon cut into thin slices.

Small Rice Cakes.—Beat and mix well together four eggs properly whisked, and ½ lb fine sifted sugar; pour to them by degrees, ¼ lb clarified butter, as little warmed as possible; stir lightly in with these 4 oz dry sifted flour; beat the mixture for about ten minutes; put it into small buttered patty-pans, and bake the cakes a quarter of an hour in a moderate oven. They should be flavoured with the grated rind of a small lemon, with pounded mace or cinnamon.

Sponge Cake Pudding.—Butter a mould well, and ornament it with dried cherries or sultanas, then three-parts fill with sponge cake, and fill up with custard. Four sponge cakes, half a pint of milk, and two or three eggs, sweetened with loaf sugar, make a nice small pudding. Boil or steam it for half an hour, and serve with sweet or wine sauce.

Children's Plum Pudding.—6 oz finely grated bread, 6 oz sugar, six eggs, six apples, some lemon peel and nutmeg; let it boil three hours. Eat with sweet sauce.

Stewed Apples.—Peel and core six apples, put the cores and parings into a quart of water, and simmer gently. Strain off, and pour the liquid over the apples, adding the juice of half a lemon, and 3 oz white sugar. Boil gently till the apples are quite tender, then turn out into a basin, and beat up with a fork, gradually adding about a tea-cupful of cream. When the whole is about the consistency of cream, pile up in a glass dish, and put away in a cool place. Whipped cream or the whites of eggs, well-whisked, may be put over the top before serving.

GRAINS OF GOLD.

We may mend our faults as easy as cover them.

The half-learned is sometimes more dangerous than the simpleton.

Lying.—Lying supplies those who are addicted to it with a plausible apology for every crime, and with a supposed shelter from every punishment. It corrupts the early simplicity of youth; it blasts the fairest blossoms of genius; and will, most assuredly, counteract every effort by which we may hope to improve the talents and mature the virtues of those whom it infects.

As before swift ships there is a hill of water and a corresponding one glides along behind, so always before us is a mountain which we hope to climb, and behind us is still a deep valley out of which we have ascended.

Praise.—Praise is not valuable unless it comes from one who has also the courage to condemn.

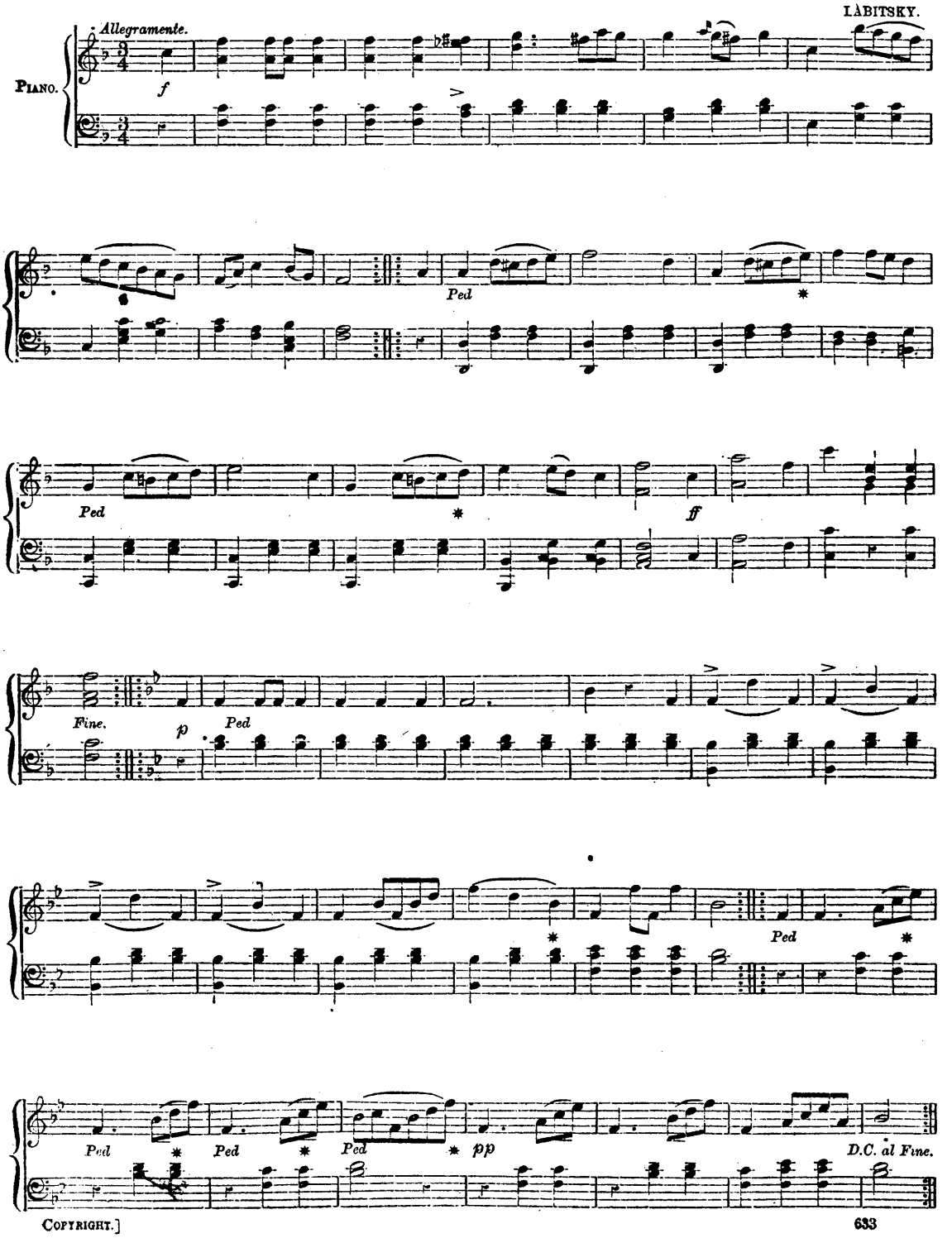
One cheerful face in a household will keep everything bright and warm within. Envy, hatred, malice, selfishness, despondency, and a host of evil passions may lurk around the door, they may even look within, but they can never enter and abide there; the cheerful face will put them to shame and flight.

Laughter.—Laughter very often shows the bright side of man. It brings out his happier nature, and shows of what sort of stuff he is really made. Somehow we feel as we never thoroughly know a man until we have heard him laugh. We do not feel "at home" with him till then. We do not mean a mere snigger, but a good, hearty, round laugh. The solemn, sober visage, like a Sunday's dress, tells nothing of the real man. He may be very silly or very profound; very cross or very jolly. Let us hear him laugh, and we can decipher him at once, and tell how his heart beats.

MUSIC.

The Postilion Waltz.

LABITSKY.



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Those marked with an Asterisk are accompanied with Illustrations.