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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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WORK WORLD.

A TOOL urgently wanted has been invented by a young North of England engineer. It is a lock-nut so constructed that, on its being screwed up, one half of the thread, for one quarter of the distance up, is converted into a buttress thread, which is the proper geometrical form to resist vibration. To slack it back, twice as much leverage is required as that which screwed it up.

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In making cork sole boots and shoes, old pieces will come in very handy, as they can be ironed over the whole of the inner sole with a glazing iron, and when warmed again the cork can be pressed in. This makes the work more waterproof, holds it firm, and prevents creaking, and holds it well in position, while its top is cut and filed into a smooth surface.

* *

Tesla is to be outdone in the world of electricity. Another genius—in America—is announced. He, like Tesla, professes to have thrown away all existing theories of construction, and begun afresh. His wonders comprise wires without insulation, and a dynamo which is perfectly harmless, and can be handled by a child without danger. We await proof of such statements, remembering that it is impossible to assign a limit to the surprises of a science so young as electricity.

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A much-needed reform has been inaugurated in the Ohio railways in the abolition of the old-fashioned heating stoves, and the compulsory adoption of hot water, steam, or hot air as the heating medium. Funeral pyres, so often consequent upon American railway accidents, may now become things of the past. The legislation is clearly of a vigorous nature, as the penalty for non-compliance has been fixed at 1,000 dollars, in addition to 100 dollars a day.

* *

Electricity is to be used for transmitting the motive power in a large flour mill to be built at St. Paul, Minnesota. The engine house, which is to produce 2,000 horse-power, is placed in the centre of a large plot of ground, and the conductors radiate from this centre, carrying the power to Edison motors placed in the surrounding buildings. It is difficult to see exactly where the economy of this arrangement comes in, but it probably depends upon some favourable local conditions.

* *

Flexura, *i.e.*, the steel spring, waists are introduced only by the boot maker who has thought fit to make them a speciality, but if the majority were to follow suit, it would not only be an advantage to them (by the extra money that can be charged for such goods), but also to the general public, for by this means a boot is made firm from the back of the heel to the centre of the waist, and this is just about the length of the calcaneum, and gives it a support; and this bone, in its turn, supports the astragalus bone, and prevents unnatural strain upon various ligaments, and tend to bring about flat feet.

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Apropos of the gigantic water scheme for Birmingham, a proposal to utilise the waste water which percolates into the South Staffordshire mines is finding some favour. It is contended that, by using a double service of pipes, this water would prove good enough for manufacturing and street watering purposes, hydraulic lifts, etc., which would leave the present water supply solely for domestic purposes. On the other hand, experts say that for steam generating purposes the mine water is useless, owing to its liability to quickly corrode the boiler plates, thus involving constant renewal of steam boilers

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A Sunderland engineer has been giving an eight hours day scheme a trial with his workmen. In the latter part of last year he called them together, and told them that, in his opinion, eight hours per day was quite sufficient to work, and that he wanted to have a practical test; but while this trial was proceeding the men would have to submit to a 5 per cent. reduction in wages, so as to recoup the employer for any loss that might arise in business speculation. The men consented, and the experiment has proved successful—so much so that the master intends soon to refund the men the sums reduced from their wages. What we should like to learn, however, is whether the men, with their increased "play" time, are really the better off. If so, how?

The British Horological Institute have announced the resumption of the lectures on Gems, which they arranged to be given by Mr. W. J. Lewis Abbott, F.G.S., last winter. They were then interrupted by the lecturer's illness, and it is an encouraging sign to see that in one direction at least in London some attempt is made at providing advanced technical instruction to those engaged in trades, such as the jeweller's and lapidary's. Mr. Abbott is well known as an expert; he can, and does, give most useful and interesting lectures, for he knows his subject well. Thanks are due to the committee of the Institute, not only for the course of lectures, but for the convenient time at which they commence—8 p.m.; also for the place of their delivery, which is in the centre of the Clerkenwell jewellers' quarter. Rather a contrast this to the Goldsmiths' Institute at New Cross!

* *

During the coal crisis, an interesting experiment in the use of oil as a substitute for coal in raising steam has been in operation at Black Banks Chemical Works, Darlington. A boiler 30 ft. by 7 ft., working at an average pressure of 60 lbs. per square inch, is supplying power for working the steam engines, hydraulics, and air pumps used in the various manufactures carried on at these works. The boiler is heated by oil supplied through two $\frac{3}{4}$ in. pipes. A small pipe of superheated steam blows into the oil pipe inside the furnace with a noise which may be heard all over the works. The heat obtained is enormous, and there is no difficulty in maintaining the pressure of steam, which can be regulated by merely turning a tap; the heat is sometimes so great as to melt the brickwork. The oil used is creosote, which is made at the works, and the consumption is about 20 gallons per hour. The process has been adopted in consequence of the failure of the supply of coal caused by the Durham miners' strike; the cost, owing to the oil being manufactured on the premises, is less than that of coal. At night the oil is used for lighting purposes, and the light from the orifice of a pipe 20 ft. from the ground, and through which compressed air is blown, is of sufficient brilliancy to light up the whole works. This is a step in the right direction, and goes to show that the resources of civilisation are equal to so portentous a trouble even as a coal strike.

Three noble tusks of ivory are now to be seen on the principal staircase of Messrs. Rodgers' works in Sheffield. They form a goodly trophy, and are probably the finest teeth ever grouped together. The first is 9 ft. long, 21 in. in girth, weighs 161 lbs., and is worth £150. The second is from the Congo, is 8 ft. 8 in. long, 21 in. in girth, weighs 160 lbs., and is valued at £150. The hollow end of this tusk is 2 ft. 6 in. in depth, leaving a length of 6 ft. 2 in. of absolutely solid ivory. Another, which is also from West Africa, is distinguished by its ebony-lined surface, and is the longest of all, standing 9 ft. 3 in., its girth being 20 in., weight 130 lbs, and value £120.

* *

The Public Health Committee of the Aberdeen Town Council has just taken an important action regarding the sanitation of the city, which it would well befit more pretentious cities to copy. Every house in the town that could in any way be suspected of being insanitary was visited by the sanitary inspector and the medical officer. The outcome of the investigation was the condemnation of a large number of houses in various parts of the city. The reasons which have led to this action have been either the insanitary nature of the structures themselves, or the fact that they interfere with the air space and the ventilation of adjacent buildings. A step of this kind rigorously applied to London—say, in the St. Pancras and Clerkenwell districts—would make certain landlords "sit up."

* *

An exhibition and sale of hosiery and other woollen goods from Shetland took place at Ventnor lately. These exhibitions are occasionally held in different parts of England, with the aim of helping on the sale of the hand-spun and hand-knitted garments produced by the Shetland islanders, for which a dépôt was opened in 1884 under the auspices of Lady Aberdeen. Apart from this agency, from which the workers receive prompt and direct payment, their only means of disposing of their work is to local drapers, who pay them in wares from their own shops, and are not in all instances above sharp dealing. Between the profits made by these men and by the London traders to whom the goods are again sold, before 1884 very little ever went into the pockets of the poor women, whose only source of livelihood is in many cases their wheel and needles. Since the establishment of the dépôt all the profits, excepting necessary working expenses, go to the producers, while their work is sold to the public at lower prices than are charged for it at the London shops. Some of the shawls exhibited were marvels of delicacy and beauty, the mesh, though 2 ply, being as fine as the thread of the heavier kind of Maltese lace, and worked in lovely designs, which the islanders themselves produce and hand on to one another. The best of these shawls was valued at £6, but the price does not appear exorbitant, considering that its production was the work of seven months. Underclothes of delicious softness, wraps and gloves, socks and comforters, and everything that can be knitted for men, women, and children, including shaded wrap shawls in sixteen shades of delicately blended brown and grey, were shown in all shapes and sizes. The prices, considering that everything was the result of handwork, were extremely reasonable.

PHOTOGRAPHY BY ARTIFICIAL LIGHT—A NOVEL FLASH LAMP.

BY ST. MUNGO.

So much has been said and written on this subject that I might well approach it with diffidence, but it has afforded me so much recreation that I am quite sure my experience will be of use to some brother of the tripod.

My first experiments were with an explosive compound of magnesium powder and chlorate of potash, lit with a vesuvian; but this apparatus was so little under control, and made so much smoke, that I speedily gave it up, and hunted around for a better, eventually adopting the modified lamp which is illustrated. There is nothing new or original about it, I suppose, but I have never seen one just like it, and have no hesitation in recommending it before any I have seen, for reasons which will be apparent from the description.

The basis of my lamp is an ordinary Bunsen burner, which is in no way altered. I got a piece of mahogany 4½ in. long, 2 in. broad, and ¾ in. thick. About 1¼ in. from one end I bored a hole which fitted the Bunsen tube: tight enough to stay in any position, but not so tight as to stick.

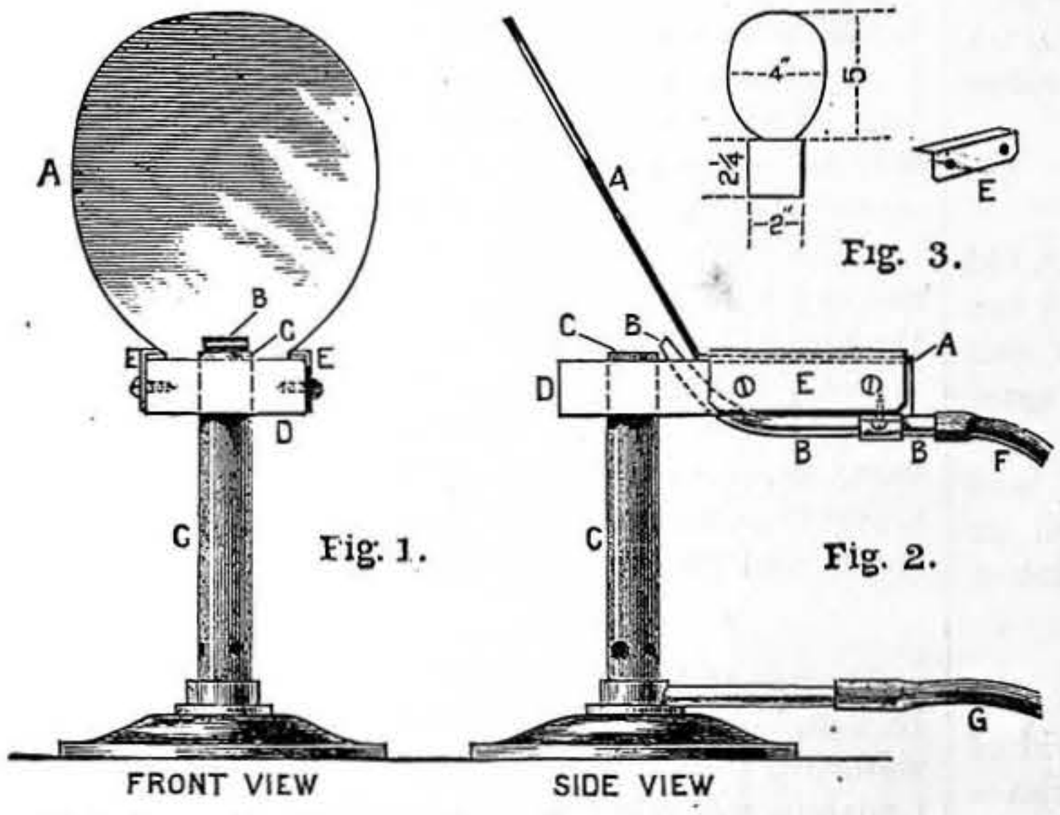
Then I got a piece of brass tube 5 in. long and ⅜ in. external diameter. This I bent as shown in Fig. 2, where B is the brass tube. Next I cut a piece of tin and bent it, as shown at A. Fig. 3 shows the shape and dimensions of A before bending. Then two pieces of tin were cut and bent in the vice to the shape shown in perspective at E. These, when screwed in the sides of the mahogany, formed grooves for the bent portion of A to slide in. A might have been fixed, but the lamp is easier packed or carried if it is made movable, as I made it. Then a slanting hole was bored in the mahogany to receive the tube, B, which was fastened underneath with a little tin clasp and two screws; and the lamp, with the addition of two indiarubber tubes, was complete.

I had some difficulty at first in focussing, but since I have used my magic lantern to illuminate the sitter I can see the image better; occasionally I get the sitter to hold a taper or candle in various planes, and focus for that; sometimes a piece of bold printed matter held in the hand of the sitter is an aid in focussing.

Having got the focus sharp, and the lens stopped down to f 8 (it works at f 6), I prepare the lamp by introducing about 10 grains of magnesium powder into tube B. For this purpose I simply remove the blowing tube, F, insert the charge, using the small blade of a penknife, three blades full being the usual amount; give the tube a tap or two, so as to shake the powder down into the head, replace the tube, and turn on the gas. The blowing tube is about 2 ft. long, the gas tube as long as may be necessary, according to the position of the supply.

When the gas is lighted the utility of the tin deflector, A, will be seen: it spreads the flame out, and when the magnesium issues from the flattened nozzle at B it is thoroughly consumed. After using some lamps which I have tried, the air was filled with particles of unconsumed magnesium; that never happens with this form of lamp: the powder is thoroughly consumed.

A professional photographer in this town is using my lamp, or, rather, half a dozen of them, daily during bad weather, and is much pleased with the results.



Flash Lamp for Photography. Figs. 1, 2—A, Tin for spreading Bunsen Flame to ensure combustion of Magnesium Powder; B, Flattened Nozzle of Brass Tube through which Powder is blown; C, Bunsen Burner; D, Piece of Hardwood; E, Tin Slides for Deflector, A; F, Tube for blowing Powder into Flame; G, Gas Tube. Fig. 3.—Deflector before bending.

A NEW IDEA IN DOOR-PANEL DECORATION.

BY CHARLES KELSEY.

INTRODUCTION—DESCRIPTION OF THE DESIGNS—COLOUR TREATMENT—MATERIALS REQUIRED—MIXING THE PIGMENTS—GROUND COLOUR OF THE PANELS—PREPARING THE PANELS—SIZE OF THE ILLUSTRATIONS AND METHOD OF ENLARGEMENT—MASSING IN THE DESIGNS—APPLYING THE PIGMENTS—SCHEME OF COLOURING—FINISHING OUTLINE—CONCLUSION.

Introduction.—Many readers of WORK possess some ability in the kindred arts of drawing and painting, and most of these persons are animated by the laudable desire to employ that ability in making their homes more attractive and beautiful. To such, the accompanying designs for the decoration of door panels will prove acceptable.

The mode of their execution, now about to be described, is a novel one, the result being satisfactory, and attained by a small amount of labour: even professional decorators may gather from the description some "wrinkles" which may prove valuable to them.

These door-panel spaces exist in every house, ready for embellishment; and from their conspicuous position form a favourable field for the display of the decorator's art.

The original examples from which the illustrations are taken were executed on the panels on the inside of an ordinary door. In the illustrations, to economise space, the vertical stiles and the horizontal rails of the door are omitted, the panel spaces being alone shown. The designs will be found, so far as arrangement is concerned, applicable to most of the doors to be met with in ordinary houses in towns; and will also lend themselves readily to the variations which may become necessary by reason of the panels, in the door desired to be decorated, being of different proportions to those in the door originally dealt with.

Description of the Designs.—As will be seen, the designs are treated in the Japanese manner. Those for the lower panels represent fish swimming in water, with a few water-plants also indicated. The water is represented by the few ripple lines at the top of the panel, and by a few short horizontal lines lower down, crossing the water-weeds, etc. Those for the upper panels exhibit a treatment of a view over the surface of the water. A few flowers and weeds grow out of the water, some dragon-flies fly above, and some hills are represented in the background. In the upper portion, the bough of apples ignores, in true Japanese manner, the parting stile, and crosses both panels—a treatment which has its advantages, as it brings the two panels into one complete whole.

Colour Treatment.—This being a conventional way of treating a landscape, the colours employed are conventionalised also. Instead of trying to imitate the wondrous variety of colours in nature, a few tints are selected to represent the different parts of the design. These tints are formed by bronzes—*i.e.*, the powdered imitations of gold, silver, etc., and a few mixed tints of bronzes and powder colours.

This treatment emphasises the fact that the designs form a decorative scheme, and that it is not an attempt to paint a picture; and the result will be judged accordingly. Japanese decorators perhaps understand this difference of treatment better than any others, and for this reason their works are almost invariably pleasing.

Materials Required.—These will include charcoal, chalk, or some similar material, for drawing the outline of the designs upon the panels; and a small quantity of each of the following:—

Mediums.—Japanners' gold-size and turpentine.

Pigments.—Gold, silver, and copper bronzes, and a little of each of the following colours in powder: French blue, orange chrome, vermilion, raw umber, and Brunswick green.

Tools.—Two camel-hair brushes, or, as they are sometimes called, pencils. One, a short full brush, for putting in the first masses; and a longer and finer one for the finishing outline. These, with a piece of unwetted chamois leather, complete the outfit. These materials may be procured at any oil and colour store, and should cost but a trifling amount, as the smallest procurable quantities of each only are required.

Mixing the Pigments.—Our intention is to treat the subject with a few coloured bronzes; and, to do this, some judicious mixtures of the colours with the bronzes are required. Proceed as follows: take a little of the green pigment on the blade of a knife, and mix it with a portion of the gold bronze, so as to form a bronze of a greenish hue. If too much colour is added, the metallic lustre of the bronze will be overpowered, and care must be taken to avoid this. Then mix a little of the blue in the same manner with the silver bronze, thus producing a silvery-grey tint. Also mix some of the red with the copper bronze, and make a similar mixture with the brown colour, thus making a rich red and a dark bronze pigment respectively. The orange may be mixed with the gold bronze, forming an orange-gold pigment. Thus, with a little judgment and taste, a few lustrous tints will be secured; and these, with the three bronzes in their simple state, will be the pigments for carrying out the work. All the above-mentioned mixtures must be made with the powdered colours and bronzes in a dry state.

Ground Colour of the Panels.—The idea is to utilise the colour already existing on the door as the ground colour for the designs. If the door has been painted in any of the ordinary flat tints of buff, cream, grey, or green, providing such tints are fairly light, they may be so utilised with advantage without alteration. If the door is painted with some utterly unsuitable colour, a flat tint of either of the before-mentioned colours may be first applied to form a ground; but care must be taken that it is perfectly dry and hard—not sticky in the least—before anything further is attempted. The great advantage of using the existing colour as the ground is the fact that it will be much more hard and dry than any newly applied colour can be. I strongly advise my readers to work upon the existing colour if possible. The design may, with a little judgment, be made to look well upon almost any coloured ground.

Preparing the Panels.—If the paint of the panels presents a glossy surface on which it is difficult to draw, a rub over with a little finely powdered pumice-stone, placed upon a damp rag, will give a better surface for working upon. Indeed, it will be wise to do this under all circumstances, care being taken not to rub through the colour.

Size of the Illustrations and Method of Enlargement.—The designs are one-eighth full size, and may be enlarged to the full size by any of the usual methods. The one usually adopted is to divide the illustrations and the panels into an equal number of squares, making those of the panels eight times larger in length and breadth than those on the illustrations. Say the squares on the illustrations are formed by lines ¼ in. apart, the panels should be likewise divided, only the lines should be placed 2 in. apart. The squares on both panels and illustrations should be numbered alike, and the portion of the design appearing in each square of the particular illustration copied into the corresponding enlarged square of the panel. By this means a properly enlarged copy will be obtained. All these lines upon the panel and also the outline of the design should be drawn with charcoal or chalk, so as to admit of easy obliteration when they have served their purpose.

Massing in the Designs.—Having got the outline on the panels, the next step is to take the largest of the two camel-hair brushes, and charge it with the gold-size. With it mass in all the portions of the design. If the size is too thick to work comfortably, a little turpentine may be worked up with it, but the less of this used the better, as it tends to destroy the sticky nature of the size, which is the property depended upon for the work. If, from the colour of the ground, the size, when placed upon the panel, cannot be seen, a little of one of the colours mixed up with a little turpentine and added to the size will overcome this difficulty. Do not work with the brush barely charged with the size; keep it moderately full.

Applying the Pigments.—After the whole or a portion of the designs have been massed in with the size, the work done should be carefully watched to see that the size does not become dry and hard. For this reason too much should not be taken in hand at one time. When the size is dry enough not to smear if the tip of the finger is drawn across it, and yet feels a little "tacky," the pigments must be applied. This is best done by having the pigments each placed upon a separate piece of note-paper, and taking up a small portion, by pressing a smooth part of the chamois leather down upon the pigment and giving a gentle rub. This will cause some of the pigment to adhere to the leather, and the pigment may thus be applied to the particular part of the design where it is required. If the leather is then gently rubbed upon the "tacky" size, the pigment will leave the leather and adhere to the panel. Thus each previously sized portion of the design may be tinted with the desired colour. A separate piece of leather will be required for each tint used.

Scheme of Colouring.—Taste will be necessary in this operation. A pleasing result will be obtained if the colours are distributed as follows:—The high lights of the apples, the centres of the daisy-like flowers, the gills, fins and portions of the bodies of the fish, the bodies of the dragon-flies, and portions of the blades of grass and leaves should be rubbed in with the gold bronze. The silver will be effective used upon the petals of the daisies, the sides and bellies of the fish, the wings of the dragon-flies, the ripple lines on the surface of the water, and similar parts. The copper bronze will be in place on the rosy portions of the apples, the tips of the fins of the fish, the tips of the wings and eyes of the dragon-flies, the tips of the daisy petals, and on portions of the stems and leaves. The silvery grey will be effective on portions of the water, for the distant hills, and the half tones on the fish, on portions of the grass, stems and leaves. The brown tints will be effective used for the apple branches, for the stems, and for portions of the leaves and shaded parts of the fish. The green tint will be useful for the grass and leaves, and for the backs and front portion of the heads of the fish. The red may be used for the apples and portions of the fish and leaves; the orange for the high lights on the grass.

The leaves should be treated much after the style of nature's autumn tints. The whole should be treated so as to produce a pleasing colour effect, taking nature as a guide in the distribution of the tints, but there is no necessity to copy her slavishly in this particular instance. The use of the colours in powder will facilitate the blending of the tints, and many pleasing accidental tints will also be obtained.

Finishing Outline.—The superfluous colour must be wiped away with a soft duster, and the designs will then appear in their broad forms upon the panels. The last operation is by the addition of a brown outline to give force and definition to the designs.

Mix a little of the raw umber and the

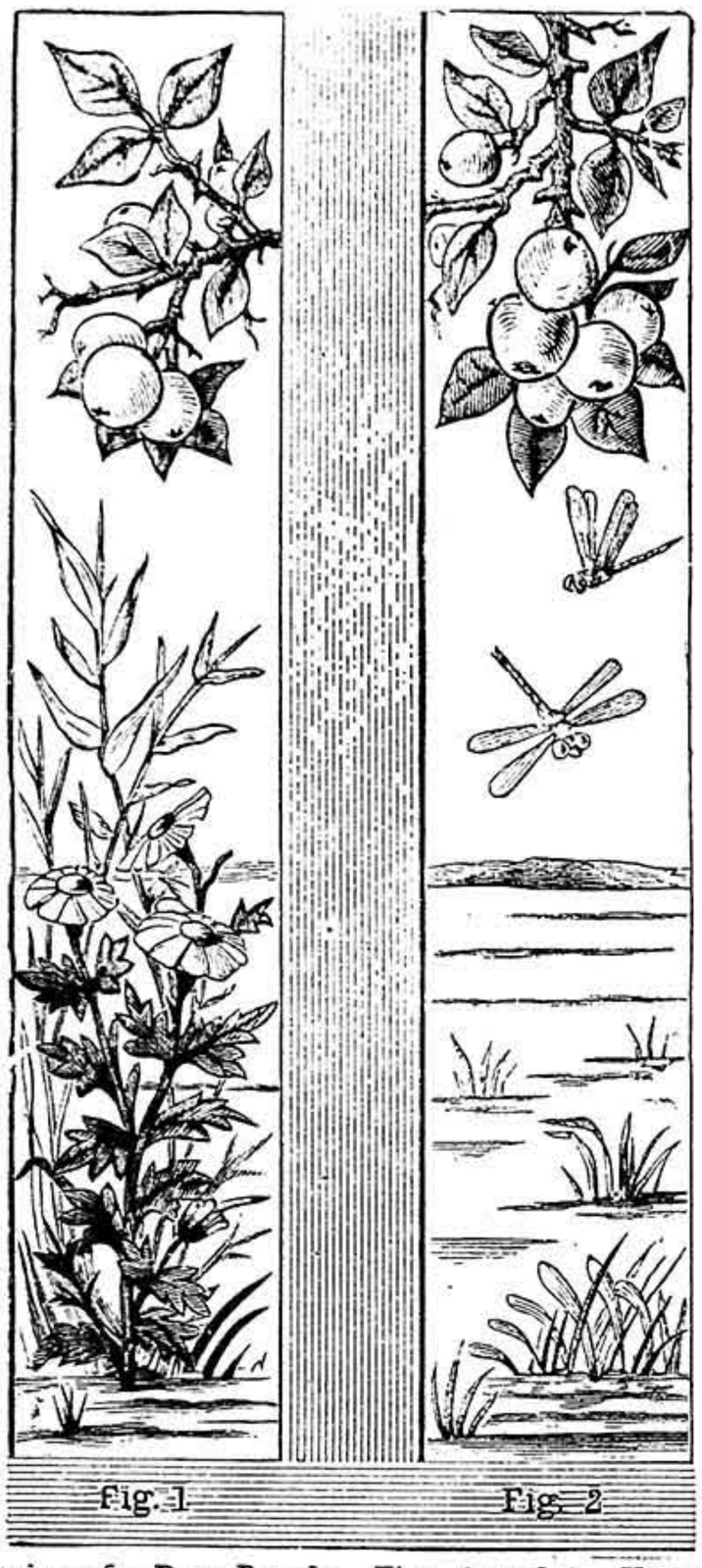


Fig. 1

Fig. 2

Designs for Door Panels. Figs. 1 and 2.—Upper Panels, left and right. Figs. 3 and 4. Lower Panels, left and right.

vermilion together, grinding them up a little with the blade of a knife upon a piece of glass or a china slab, moistening the colours with a small quantity of turpentine. Then add about an equal quantity of the japanners' gold-size, and this will form a paint with which the outline may be made. If this is found to dry "dead," add a little more of the size until a glossy, drying paint is obtained.

The longer and finer of the two camel-hair brushes must now be charged with the brown paint, and the design gone over with it. No formal outline round all parts must be made, but a few artistic touches are required so as to bring out the salient points and give definition to the designs. These touches should be placed on the shaded sides of the stems, on the edges of the flower petals, on the lower edges of the leaves, with a few markings to indicate the veins. A few touches will represent the gnarled bark on the apple branches and the eyes of the apples, which require also a few touches to express their rotundity and an outline round their shaded sides. The eyes of the fish, with the markings round the gills and mouth and on the fins and tail, may be put in in a similar manner.

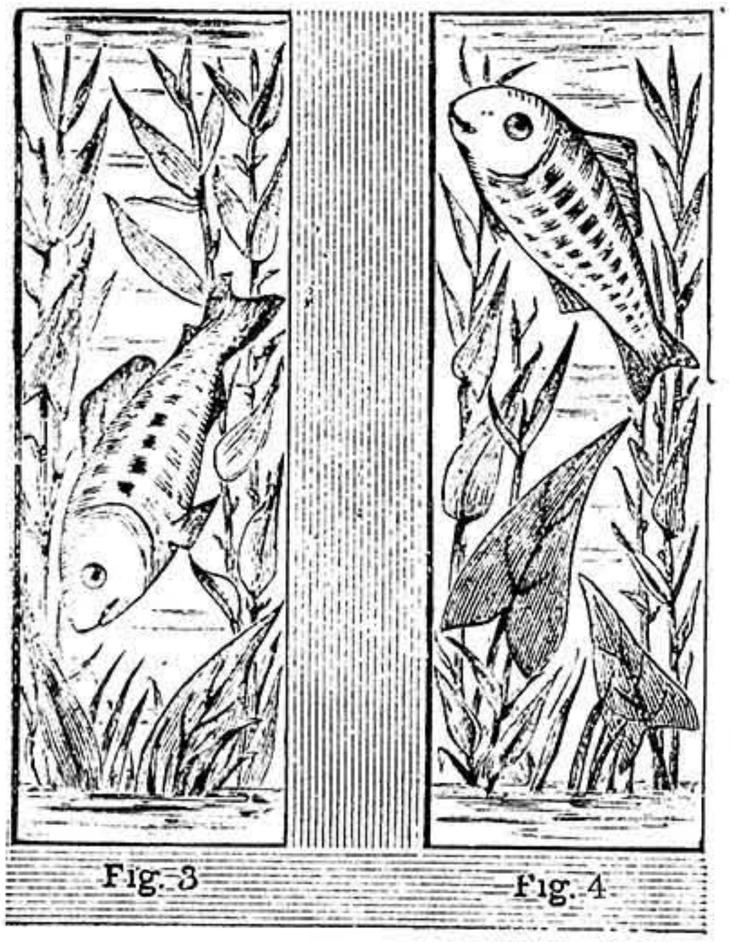


Fig. 3

Fig. 4

A few touches along the surface of the water will indicate ripples, and a line along the base of the hills will give the distant shore. In the lower panels the water will be represented by a few ripple lines at the top, with a few short horizontal touches lower down, crossing the water-weeds, etc.

Conclusion.—This completes the process, and though the description of all the details of the process—oftentimes required urgently by amateur workers—may make it appear a formidable undertaking, in truth it is not so. The worker, with a small amount of ability, will find that the result is easily obtained, and very satisfactory when finished.

When the work is thoroughly hard, a coat of varnish may be given, but this is not essential, nor altogether desirable, for the varnish has a great tendency to destroy the metallic lustre of the colours, which is one of its greatest charms. If the stiles surrounding the panels are of a darker colour (as they usually are in existing flat tinting), the panels will be, as it were, framed in, and their beauty enhanced.

Speaking from experience, I may say that any reader who is induced by the article to take the matter in hand will be more than satisfied with the result. The process described may be used with equally satisfactory results with other designs, which may be suggested by the present one, and by this means the home may be rendered more attractive and its beauty enhanced.

HOW TO MAKE A PHILOMELA.

WITH MORE ABOUT VARIOUS ZITHERS.

BY AN OLD ZITHER TEACHER.

On page 390 of WORK, No. 129, Vol. III., R. F. was good enough to give us ample directions as to how to build a zither. On page 747, No. 151, appeared a supplementary article from my pen, dealing with the stringing and tuning of the instrument. The large number of inquiries and letters which have been forwarded to me by the Editor is a proof that a very considerable section of my fellow-readers are interested in this charming and eminently simple instrument. Hence the present article, which, however, is devoted to the construction of a cognate musical vehicle.

First, though, let me suggest to any who may undertake the making of a zither, that considerable augmentation of tone can be secured by adopting the shape shown in Fig. 1, which is that of the "Arion" zither. This form was designed by a well-known specialist some years ago, and embodies several distinct improvements over the usual type. Foremost among these may be instanced the greater area of the "tables," or sound-boards, which of course admits of a far greater volume of sound, not, however, at the expense of any of the pure, distinctive tones peculiar to the zither alone. Then, again, the strings are affixed by means of pins, as in the guitar—a matter which conduces more to the elegant appearance of the instrument than to any marked superiority of timbre—although the attachment of the tail-piece to the belly is by some supposed to improve the tone also.

As to the rich form of the "Arion" there can be no two opinions; and it need not be mentioned that there is no difference in the manner of playing. Now, anyone capable of building a zither of the usual shape would have no great difficulties to contend with in the construction of the "Arion," whilst the finished result, being a decided "thing of beauty," should be a "joy for ever." Allied to this is the "harp" zither (a sketch of which I append in Fig. 2). This form of the zither was originally designed to accommodate a large number of supplementary bass and contra-bass strings, which, however, do not appear in the drawing. Such additional strings are of very limited use; but the extremely elegant design might be followed to advantage, especially as it presents no insuperable obstacles to the constructor.

With these few remarks or hints to those who contemplate the building of a zither, we come to the real object of the present article, which is to describe the Philomela and its prototype, the "Streich" zither, for the benefit of the very large number of WORK readers who, having overlived their opportunities, can never hope to excel upon the violin. Only about one per cent. of all who commence to learn the latter instrument ever achieve more than mediocrity; and those who really excel have attained their proficiency only at the expense of long-continued and severe application.

In introducing to the notice of would-be violinists such instruments as the "streich" or "bow" zither, I am confident of receiving the thanks of a very numerous class, as upon either of these very elaborate violin music may be performed with only a few weeks' practice. Of the two, the earliest form is the streich zither (shown in Fig. 3). This consists of an upper and lower "table" or sound-board, of the bellows-like form shown, the upper one perforated with "rosettes" or sound-holes of arbitrary shape. Along the centre for the greater portion of the length runs a slightly rounded fret-board, full instructions for the division of which into semitones have already appeared in the pages of WORK. Four metal strings are used, attached at the "bridge" end as on the zither proper, and strained by pegs in the ordinary way. The lowest is of wire, wire covered, and is tuned to G; the second, also covered wire, is tuned to D; and the third is a brass wire tuned to A; while the fourth is a fine steel wire tuned to E. Thus the pitch, tuning, and compass of the instrument are identical with those of the violin. Great facility of execution may readily be acquired, as all the notes are formed by the frets; while the bowing is done across the narrow end, which projects over the edge of the table for the purpose. A single leg, with a minute spike, is provided at about 2 inches from the tail-piece, while two others, somewhat higher, are placed one on each side of the wider part (as shown in Fig. 3).

The tone of the bow zither is almost exactly the same as that of the violin, but is, unfortunately, rather thin and weak. For the latter reason the Philomela, or Philomel zither, or zither-viola (each name is used), has been invented. This instrument approaches very nearly to the violin in tone and volume, and may be regarded as the

perfect form of the streich zither. Although it differs very much in shape, and is played in a different manner, there is no easier instrument of the viol type; and all who have given up the violin in despair are hereby invited to make a trial of the "Philomèle." (This is shown in Fig. 4.) The neck differs from that of any other instrument, inasmuch as it is square and of equal thickness through its whole length. It may be slightly rounded on the fret-board, and the divisions of the latter are the same as on any other form of zither. At the back of the "nut" or thereabouts is a short spiked leg, which rests upon the edge of the table in playing, while the broad tail-piece end is supported upon the lap of the player. A somewhat shorter bow than usual is employed; and of course the fingering is done with the thumb and three first fingers of the left hand. The latter is not curled round the neck, as in the violin, but is held in a drooping position over the fret-board. Now, as to its construction, the philomela offers no difficulties, as the back and belly may be left flat; though if shaped, as in the case of the violin, a more elegant result is obtained.

The admirable articles which have appeared in these pages on the construction of the violin and mandoline—as well as the one quoted, which deals with zither building — comprise all necessary instructions as to the making of the ribs, which is the only delicate matter in making a philomela. As to the size, the viola or tenor violin may be taken as about correct; but of course the neck is wider. Sound-posts are employed, as in the violin. Machine heads are usually affixed, but are not *de rigueur*. For the information of possible inquirers, I may add that the philomela may be bought at about two guineas, but that they are not much known in this country; also that instruction books for the streich zither, which of course would be applicable also to the philomela, are to be procured, but only in the German language. Finally, that considerable proficiency may be attained in a fortnight, while the most difficult violin music may be performed after a few months' application.

I have endeavoured to say my say in as few words as possible, and to convey my meaning as clearly as I could; but if any point remains obscure, I shall be happy, with the Editor's permission, to give any further information through the "Shop" columns.

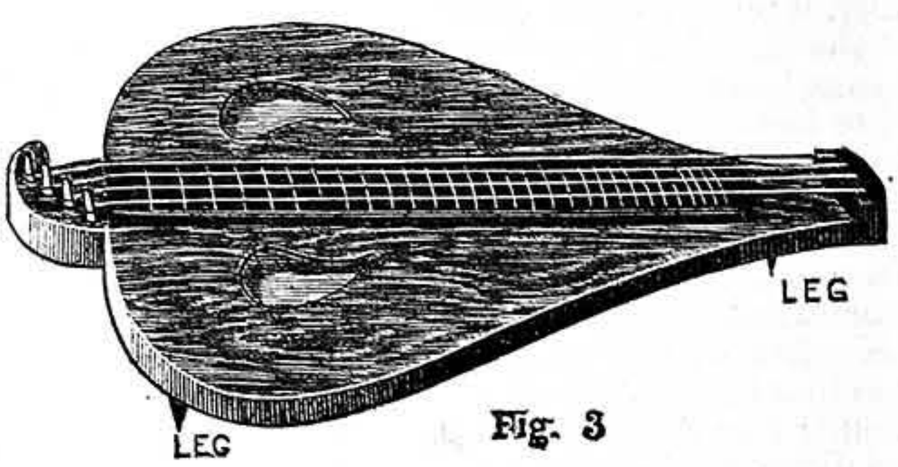


Fig. 3

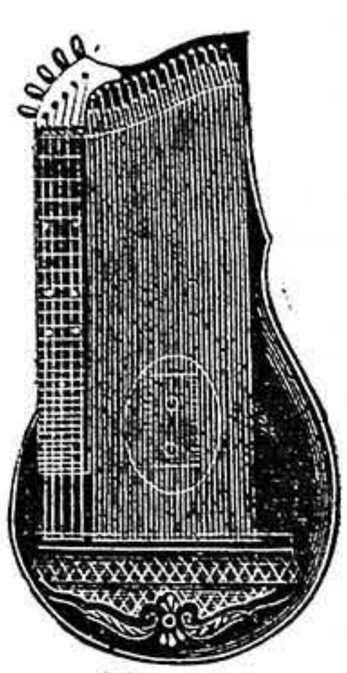


Fig 1

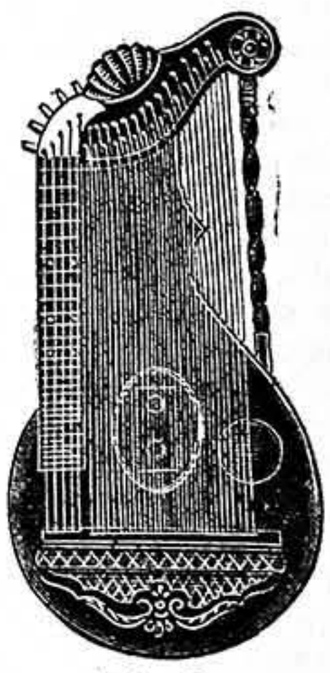


Fig. 2

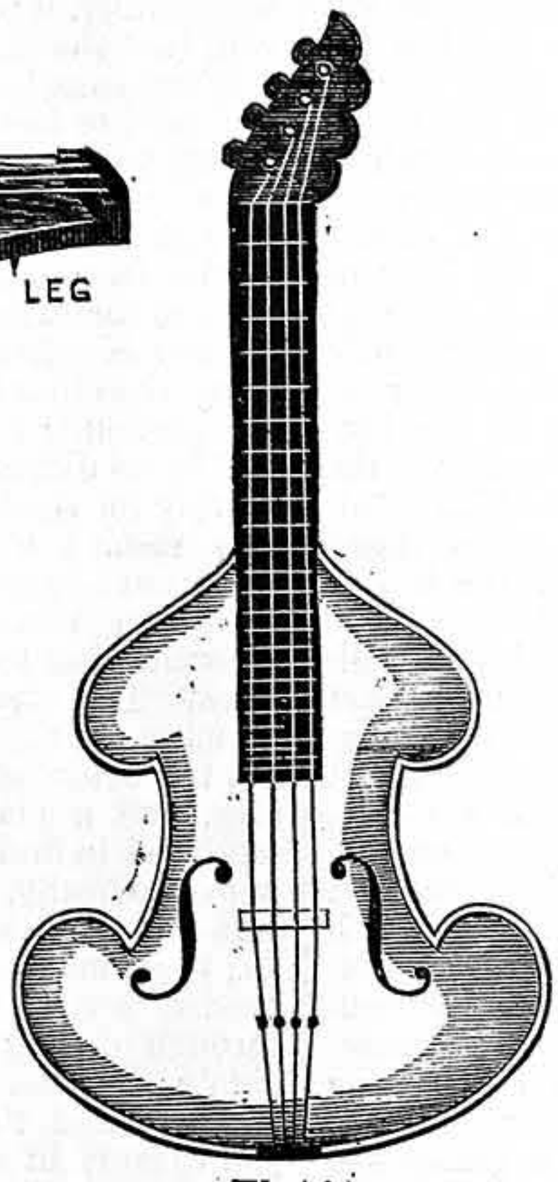


Fig. 4

Philomela. Fig. 1.—Arion Zither. Fig. 2.—Harp Zither. Fig. 3.—Streich Zither, ordinarily called the Bow Zither. Fig. 4.—Philomèle, or Zither-Viola.

HOW TO PAPER A ROOM.

BY ONE WHO HAS DONE IT.

ALL the old paper should be first stripped off the walls. A painter's stopping-knife is very handy for this; but if you find it will pull the wall about too much, you may leave those parts that are thoroughly stuck to the plaster; but it is better to take it all off, being careful not to dig into the plaster with the knife. Pull out all nails, etc. All loose or bad places should be cut out, and be made good with plaster-of-Paris or a piece of brown paper pasted over them. When dry, give all the walls a coat of thin size (as when clear-coleing a ceiling). The sizing sometimes shows up loose pieces of paper that have not been torn off. If this is so, tear them off, and touch the places up with size again.

Now cut the edges of the wall-paper. The best way for a novice to do this is to unroll a piece of paper right along the length of the table or paste-board, letting the unrolled part fall on the floor at the other end. Then, sitting down, start cutting the edge off right up to the pattern, rolling the paper up with the left hand as you do so. When one edge is done, turn the piece round and unroll it, again letting the unrolled part fall on the floor at the other end as before, and trim the other edge, cutting right up to the pattern. A pair of sharp paperhanger's scissors is best for this, which must be done very carefully and true, as we are going to butt our edges together, and not lap them, so you see they must be perfectly straight. The pattern is straight enough, if you only cut exactly to it in a series of decisive cuts as long as the scissors will allow. The paper is now rolled up again in the same way as it was before you started. Bear in mind that the outside end of the piece is always the top of the paper. Now proceed with the rest of the pieces in the same manner.

To make the paste, put half a quartern of flour in a clean pail, and thoroughly mix it with clean cold water until it is of the consistency of thick cream, and then pour boiling water on it quickly out of a saucepan, mixing it all the time until it thickens. Then stand it by until it gets cold. Sometimes alum is put in it; about half an egg-cupful of powdered alum would be an advantage, but nothing else.

You must have a good table to work on, at least 5 ft. 6 in. long. If your table is not long enough, it will pay you to buy two ½ in. by 11 in. pine boards 6 ft. long, and lay them side by side on the table, secured together by two battens screwed on underneath. Cover the top of these with brown paper pasted on. You will now have something to work on, and will not damage the table. Now cut the paper to the lengths required. This is the most ticklish part, but, if you pay strict attention to what follows, you will be all right. First cut off a length 2 in. longer than the height from skirting to ceiling, and tack it up in its place temporarily, so that it is one inch too long at the top and one inch too long at the bottom. Now offer the next length up not cut off, and you will see that to make the pattern match you must waste a piece. How much, of course, I cannot tell, so much depends on the pattern chosen, the length of which is indicated by dots on the edge of the paper; cut this next length off the same length as the first, and tack it up beside it, making the pattern match.

Now by studying these pieces you will see what I mean. The first piece can now be taken down and laid on your paste-board face upwards. Now the next piece, and make the edges coincide as they lay there; then look carefully at them, and lay the second piece directly over the first; now unroll the third piece, making the pattern match with the second on the opposite edge to that which matches the first. Cut it off, allowing enough; but be careful you do not allow too much, or you will cut into the block for the other end of the next piece. Go on in this manner until you have cut as many lengths as you require. Now grasp the whole in your hands and turn them face downwards, get the edges all nice and even, and push the whole of the pieces about 3 inches away from the front edge of the board, letting both ends overhang the board equally.

You should have an apron or you will make your clothes in a dirty state; one with a bib, and a pocket in front, is the most convenient for all these jobs about the house. You next want a brush—a stiff hat-brush will do, that can be washed afterwards—a clean piece of rag about the size of an ordinary duster, and an old wheel castor off a chair fastened to a bradawl handle for rolling down the joints. These things, with your scissors, should be in the pocket of your apron.

Now for hanging. Work your distemper brush well into the paste, and clean it by scraping it on the edge of the pail. Keep the pail in one direction, so that you scrape the brush against the same side, then when you lay the brush on the top of the pail you do not get the handle covered with paste. Pull the first piece of the paper towards you, so that the edge nearest comes over the front edge of the board about half an inch, and draw it to the left, so that it overhangs the board on the right-hand side about half an inch; the right-hand side should be the bottom of the paper. Now commence pasting this first piece, beginning at the bottom,

and paste the whole length of the board. You will see that you cannot paste the board, and the paste that goes on the paper at the back does not matter. Now take hold of the bottom edge of the paper, and fold it back on itself, letting it lay lightly on the other pasted part without wrinkles and the edges coinciding. Now carefully draw it from right to left along the board and paste the rest, being very careful that you do not let any paste get on the face side.

See that your steps are convenient for your getting up on. Starting from one side of the window, carefully take the pasted piece of paper by the two top corners, and bring these next to the ceiling; see that the length hangs straight and upright with the window. Having previously plumbed the outside of the window frame, gently press the top part of the paper to the wall just sufficient to hold its weight; draw the bottom away from the wall and undo the folded portion, letting the whole length hang free of the wall except the top six inches. See that it hangs perfectly plumb, and with a downward sweep of the brush in the centre fix it there, and then brush it outwards both ways from the centre. It should now hang without a wrinkle. Mark on the face of the paper with the back of the scissors along the line where the wall touches the ceiling; draw the paper gently away and cut it along this line, brushing the paper back afterwards; treat the bottom in the same manner. Now go over the whole with your clean cloth, dabbing it all over carefully, and roll the edges down with your wheel or castor. If the top or any other part wants a little adjusting gently draw it away from the wall, and brush it back to its place. Proceed with the next piece, taking care that the pattern matches and the joint butts exactly. Go round part of the room in this manner until you come to the door, and then commence on the other side of the window and go round in the opposite direction, taking care to finish behind the door or in a dark corner. Frequently try the lengths with a small plumb-bob, with the end of the line fastened round a bradawl, so that by lightly driving the bradawl into the plaster directly in the joint of the paper you can at a glance see how you are getting on.

When you come to internal angles measure the width of paper you want from the last piece hung up to the angle, and cut that width on the paste-board, and then hang it, following with the remainder cut off this piece, and then start with a whole roll again.

In all cases I should advise you to use such papers as will stand a lot of handling in the hanging, and from which any paste, etc., can be sponged off afterwards.

English wall-paper is made in pieces 12 yds. long by 20 in. wide, so that in measuring a room for papering, go round the room marking off how many 20 in. there are round the walls, then reckon how many lengths you can get out of the 12 yds., allowing for waste; divide the number of 20 in. there are round the room by the number of lengths you can get out of the 12 yds., and this will give you the number of pieces required.

One pair of paperhanger's scissors, 3s.; flour, 3d., must be provided; distemper brush, we will assume, was bought when we did the ceiling.

In view of the approaching warm weather many rooms will want re-papering—if comfort and health are to be considered; and they should be.

MICRO-PHOTOGRAPHY WORK.

BY ARTHUR RENAUD (B.A. OXON.).

DIFFERENCE BETWEEN ACTINIC AND VISUAL FOCI—PRECAUTIONS TO BE TAKEN WHEN FOCUSSING—METHOD OF USING VERTICAL MICROSCOPE—METHOD OF TAKING PHOTOGRAPHS WITHOUT A CAMERA IN A DARKENED ROOM.

HAVING now focussed the object, and got it clearly and sharply defined on the ground glass of the camera, we could proceed to take the negative without further delay, were it not that at this stage of the proceedings there is another matter which has to be taken into account, as, though it is quite immaterial to an unscientific gazer at microscopic objects, it influences very much our photographic work, which has to be conducted with great precision if the results are to be satisfactory. Supposing the camera and microscope have been fixed as directed, and the image focussed with the greatest care, and a plate exposed and developed quite successfully, it may happen (and probably will) that the negative, in spite of the accurate focussing bestowed upon it, is nevertheless more or less out of focus! This, though it may be rather disheartening to one who knows nothing of the cause, may easily be set right by investigation. It is simply due to the fact that every lens, as far as our work is concerned, is possessed of two different *foci*—that is, one called the *actinic* focus, the other the *visual* focus. Now, if in any particular lens these foci coincide, there will be no difficulty, and when the object is sharply focussed on the screen the plate will also receive a sharp image. But in nine lenses out of ten the actinic is not coincident with the visual focus, and consequently allowance has to be made for this in actual work. The correction may easily be made by means of the fine adjustment. One cannot tell beforehand what allowance is necessary, and a plate or two will have to be sacrificed to find out. Only, do not proceed unmethodically, and so waste the plates, but make notes of the amount of displacement—*i.e.*, the number of divisions of the milled-headed screw which have been turned through during re-focussing—necessary to obtain the best results for each objective you use, and these notes will then enable you to go right at once in future.

A simple method of arriving at somewhere near the correct amount of alteration required, and which may very likely hit it exactly, is the following:—Take a photograph in the ordinary way at the usual visual focus, develop, fix, and dry in the usual way. Now, supposing that the foci do not coincide, the picture will be more or less blurred. Remove the lens from the object by means of the fine adjustment, until the image on the ground glass screen of the camera is just as much blurred as that of the negative. Take another negative with the lens in this position, and you will probably have a sharp image. One or two trials will settle the question, and the amount of alteration required for that lens should then be carefully noted for future use. It is worth while to remark that the amount of difference between the foci has no influence on the good or bad qualities of the lens. Some objectives require no alteration whatever, while others which necessitate a considerable movement from the object can be made to give just as good results.

Mr. Wenham has introduced the idea of having a bi-convex lens of low power carefully centred in a setting that can be inserted in the place of the posterior diaphragm or stop; the chemical focus is thereby brought back to the visual focus. If a lens is found that will give the necessary correction exactly, of course this method gives excellent results, but it would probably necessitate the choice of a lens from a large number for each objective, and the majority of my readers will probably prefer to work on the first plan.

Mr. Highley's is a method of combining the object-glass and camera together, which may be interesting and considered worthy of a trial by some readers. The sectional diagram (Fig. 3) will help to explain it.

A tube, A, is inserted in the flange of a camera, which should be able to extend at least 24 in., and the front of it is closed by a plate into which screws the object-glass, B, the eye-piece and tube of the microscope not being used. Over the tube, A, slides another tube, C, which is closed by a plate, D. This latter plate extends beyond the upper and lower circumference of C, and carries a small tube, E, on which is fixed the mirror, F. To the upper part of D the fine adjustment, M, is attached; this consists of a spring-wire coil acting on an inner tube, G, to which the stage plate is affixed. The spring is regulated by means of a graduated head, K, which acts on a fine screw, also attached to the stage plate. Opposite the graduated head is fixed an index, L. The stage and clamps, H, slide vertically up and down on the plate, D, and when these are moved vertically, and the object-slide horizontally, the object is easily moved sufficiently to bring it into the field. This is rather an obscure description, but those who use Beck's microscopes, or others with sliding stages, will easily understand how it works. The amount of the object required being brought into the field by adjusting the stage, the image is roughly focussed by sliding the tube, C, over the tube, A, and the fine adjustment is then used to get the details accurately focussed, allowance, of course, being made for any difference between the visual and actinic foci of the objective. It is said that, by greasing the focussing-glass, which should be a finely-ground one, with oil, this arrangement forms an agreeable method of viewing microscopic objects with both eyes, and is less fatiguing than the ordinary method.

We now come to a method by the use of which a camera which has no arrangement whereby it can be placed horizontally may be used with the tube in a vertical position. To do this a right-angled prism is used, one side of which is fixed to a tube which slides over the tube of the microscope. The image is thereby thrown at right angles into the camera, which stands above the microscope. Fig. 4 will explain the arrangement.

A is an ordinary bellows-bodied camera, placed on a stand, G, which raises it above the microscope, E. This latter has a right-angled prism, D, fixed to the top of the tube by a short brass tube, another one similar to which is fixed to another side of the prism, and slides into a brass tube, C, which in its turn slides into a square chamber, B, fixed to the front of the camera. The right-angled prism reflects the rays from the object on the stage of the microscope into the tube, C, and thus on to the focussing-glass of the camera, A. Having focussed clearly by moving the tubes and the back of the camera (or front, as the case may be), the final focussing is accomplished by means of the fine adjustment, H, of the microscope. By this arrangement it is evident that the same method of illumination may be made use of as in the case of the microscope placed horizontally, as the rays of light can be reflected by

the mirror up through the object placed on the stage.

Another method of taking photographs, with the microscope fixed vertically and using sunlight, is that which has been employed by Mr. Wenham, in which the camera is entirely dispensed with. This may seem astonishing; but the fact is, that the room in which the operator is at work is turned, for the time being, into an enormous camera. Supposing we wish to take photos in this manner, we proceed in the following way:—The first thing to do is to darken the room, which is easily done by having a wooden board to exactly fit the lower half of the window, and a frame of wood to fit the upper half. When these two are up, one on the top of the other, they should fit tightly inside the frame of the window, and exclude the light. If there are any chinks, a few thicknesses of cloth should be glued round the edges, which will be pressed tightly against the sash of the windows when in position, and keep out any rays that might get round the sides of the frames. The top frame is now covered with thick brown paper in which there are no pin-holes. On the wood, at the bottom half, a little carpentering has to be performed. Two circular holes have to be cut, one about 3 in. in diameter, and another, at a few inches' distance from the first, large enough for the passage of the operator's arm. This latter hole has a flexible sleeve attached to its margin which fits round the operator's sleeve, and thus prevents light from entering at the wrong place when his arm is thrust through the hole, and also covers the hole up when his arm is removed. Outside the first hole is arranged a solar reflector, or an ordinary mirror mounted in such a way that it can be turned in any direction round its centre, and thus made to reflect the sunlight through the hole when turned by the hand, which is passed through the second hole for that purpose. If the reader possesses a heliostat, by all means let him use it, by placing it on a shelf fixed outside the shutter in such a position as to reflect the sunlight through the hole as it turns.

The microscope has now to be placed on a table or bench in front of the window, at such a height that its axis corresponds with the centre of the aperture of the first hole, through which the sunlight is entering. The eye-piece of the microscope is generally removed. The object is placed on the stage of the microscope in the usual position, and the light is reflected on to the mirror, and thus up through the object, either directly or condensed by a bull's-eye condenser. A vertical stand, with a board fixed horizontally, is placed on the bench, the board being vertically above the tube of the microscope. This board has, on its under-side, two supports for the plate, which is thus held horizontally above the microscope. All being thus prepared, a card of the thickness of the plate, or a negative glass with white paper pasted over it, is placed in the supports under the board, and the image of the object which now appears on it must be accurately focussed. The top of the microscope has now to be covered with a cap, corresponding to the cap of the lens of an ordinary camera, the light between the orifice of the shutter and the object-glass being shut off by means of a black cloth, or otherwise, and all light except that falling on the mirror beneath the stage is shut off. This can be done by making a sleeve of black cloth to fit round the 3 in. hole, the other end being fastened tightly round the bottom of the microscope, so that no light enters except that falling on the mirror. The plate having been substituted for the card under the board, the cap of the lens is removed, and the exposure takes place, at the end of which the cap is replaced and the plate developed as usual.

If the microscope can be placed horizontally it is best to do so, as the work thus becomes easier, the light being more readily shut off between the orifice in the shutter and the lens, and the board to hold the plate being more readily placed in a vertical position than horizontal; focussing also is rendered easier, as the board can obviously be moved along the table till the correct point is nearly found, and the rest done by the fine adjustment of the microscope. The first plan can, however, be made to give equally good results in competent hands. It is possible by this method to obtain good photographs of different parts of an object not lying in the same plane, by focussing the parts separately, applying pieces of card suitably shaped to cut off the different parts of the images, as required. With very minute objects and high powers, it may be necessary to use an achromatic condenser as well as the bull's-eye.

I have submitted here a diagram of the arrangement, in order to show how the different parts are to be put together. The sunlight is reflected by the mirror, M, through the hole in the shutter, to the mirror, C, of the microscope: a bull's-eye condenser may be placed at B, if required. The light reflected by the mirror, C, passes through the object up the tube, E, of the microscope—the eye-piece having been removed—and is focussed on the sensitive plate placed at F, and supported horizontally above the camera by the struts, S, S, the board being fixed to a stand with a heavy leaden base, H.

The length of the base-board and bellows of the camera is no trouble: the ceiling of the room is the boundary-line. It is far easier to get the picture into any definite space required. Then there is the possibility of focussing in different planes, and, by the same method, of exposing different parts at a time. The thick, yellow portions of the object may be given a longer exposure than the lighter parts. We can arrange a frame to hold the plate, and, by substituting a piece of fine ground glass when focussing, it can be accomplished by a magnifying focusser.

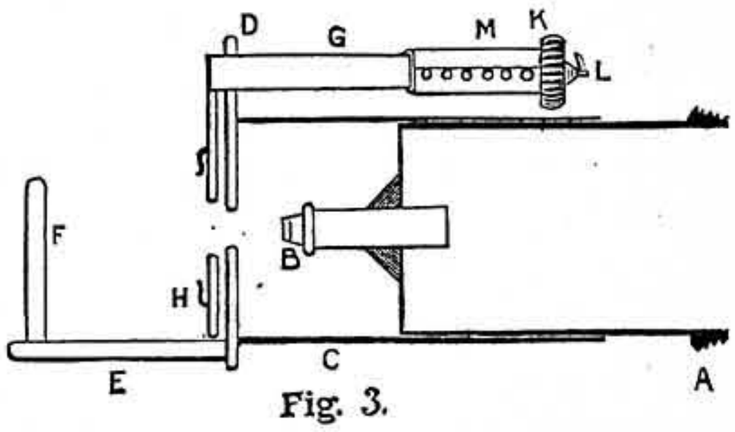


Fig. 3.

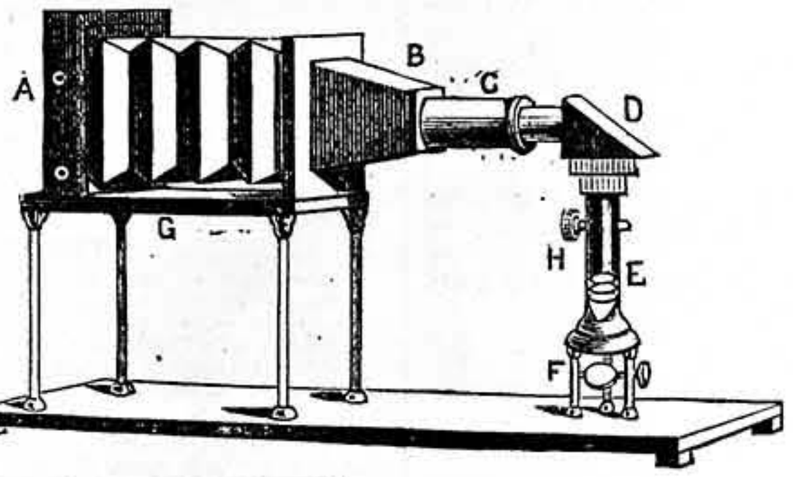


Fig. 4

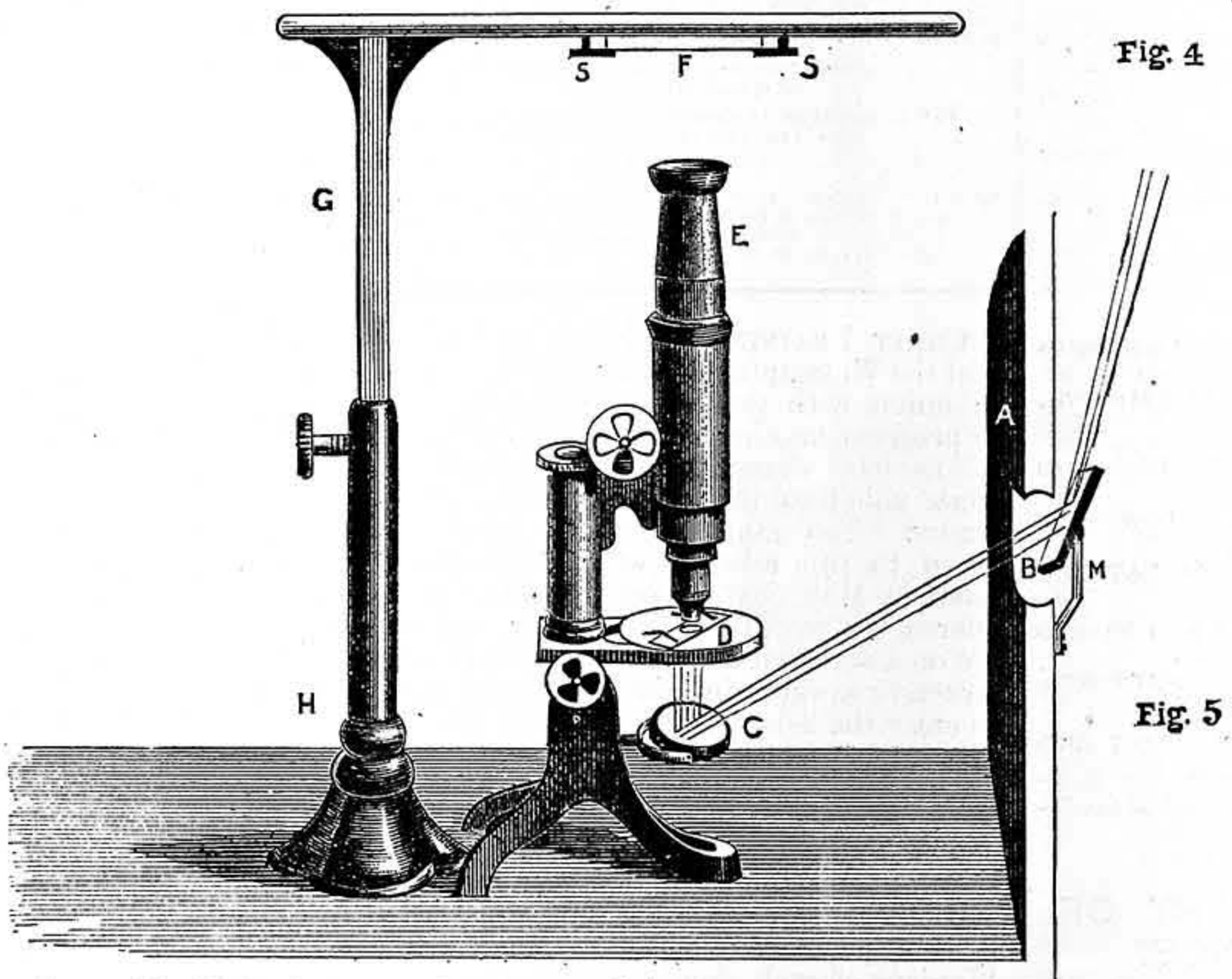


Fig. 5

Fig. 3.—Mr. Highley's Method of adapting Object-Glass to Camera—A, Brass Tube screwing into Flange of Camera; B, Object-Glass fitting into front of Tube, A; C, Tube fitting over A, carrying the Front, D, and the Fine Adjustment, M; G, Interior Tube of Fine Adjustment fixed to Stage-Plate, which carries the Stage and Clamps, H; K, Milled-headed Screw of Fine Adjustment; L, Index of Fine Adjustment; F, Mirror. Fig. 4.—Method with Camera placed vertically—A, Bellows-bodied Camera of any ordinary make, to front of which is attached the Chamber, B, into which slides a Brass Tube, C; D, a Right-angled Prism, to one face of which is attached a Tube sliding into C, to another side a Tube sliding over the Microscope Tube; E, Microscope; F, Mirror beneath the Stage of Microscope; G, Stand to support Camera above Microscope. Fig. 5.—Method of taking Microscopic Photographs without a Camera—A, Shutter with Hole, B, through which the ray of light falls on the Mirror, C, and is reflected upwards to the Object, D, and through the Microscope, E, to the Plate, F; G, Adjustable Stand with heavy Base, H, holding Plate above Camera, supported by Side Struts, S, S; M, Mirror adjusted outside the Shutter.

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CRAFT TRAINING.—With fit and proper zeal the Worshipful Company of Carpenters, in union with the Joiners' Company, have in progress another competitive exhibition of models, drawings, and specimens of work allied to the carpentry and joinery trades. Too much publicity cannot be given to this scheme, which will declare itself in May next, especially as the prizes offered are worthy of competing for, and are on a scale which should induce all constructive workers in these particular crafts to enter the lists. It is the larger question of technical education, however, with which we are most concerned. It is in the power of these ancient and honourable City Companies to do more for the cause of craft training and the education of apprentices and others than any other public body, and it is a privilege which the Masters and Wardens of each should be jealous to turn to account. No action which the Companies could take would be more commendable than that of inaugurating classes and competitive examinations such as would be calculated to promote the branches of the trade they represent. By this means many trades in this country might be revived, and much of the old repute of English workmanship restored. Certainly no more effective blow could be given to the disheartening inroads of foreign trades and manufactures. These wealthy civic Companies number some seventy or eighty—some of them, it is true, representing defunct industries—industries, however, which in many cases might by energetic action be revived in this country. Speaking at one of the banquets lately, the Master of the "Worshipful Company and Antient Mistery of Horners" stated that he hoped soon to be able to treat the public to an exhibition of articles still made in this country by horners, which might surprise many who regarded the industry as a trade of the past. We shall look forward to this exhibition with much concern, and shall be glad to give it all assistance in our power—movements of this kind being specially identified with such a journal as WORK. May we suggest to this and other City Companies a careful consideration of the subject of systematic and well-devised class instruction—on that liberal scale which they can afford—in the several trades with which the Companies are allied? If moved to do so, the London City Companies could set an example to the whole world in the matter of technical education. We will see if the Guilds will not stir themselves to enhance their great and honourable reputations.

WORKMEN'S TRAINS.—A matter of already great, and still growing, importance to workmen in large industrial centres is their cheap and easy conveyance between their workshops and their homes. To meet this want something has been done by the railway companies; but still not much, when we consider what they might do. The latest cheap train in the morning conveying toilers to work is usually run too early for the convenience of those working in warehouses and shops that do not open until 8 or 9; and it is no uncommon thing for members of these classes to come up to town by a 6 o'clock train so as to avoid the extra payment by ordinary trains. The time between their arrival and the opening of their shops is spent in loitering about the streets, or dozing on seats in public gardens, if the weather be fine; and if it be bad, refuge is taken in a coffee shop, and the weary waiting performed over a mug of cocoa, or tea, or coffee. This is far from a stimulating preparation for a day's work, and it is evident that the interests of the employers themselves lie in the extension of the workmen's train service. The company that stands foremost in this movement is the Great Eastern Railway, whose liberal policy has brought them a rich reward, for towns and working men's homes have grown up all along that line in consequence of its cheap train service, and this has become its most remunerative traffic. As an instance of how far a railway company may go in reducing fares, take the trip between Enfield and Liverpool Street, a distance of eleven miles. The fare by workmen's trains is 2d. return—twenty-two miles for 2d! Eleven miles instead of one for 1d.—the ordinary fare; yet these trains pay the company better than their ordinary trains. The reason, of course, is that the trains are full, and not, as too often happens, *full* of *empty* seats. It is thus not a question of philanthropy, this reduction of fares, but business.

WEIGHTS AND MEASURES.—Thanks to the courtesy of the Speaker and the Serjeant-at-Arms, we were privileged to join in the recent ceremony of examining the standard yard measure and pound weight deposited at the House of Commons. The bronze yard measure, marked "Parliamentary copy No. 4," and a platinum pound weight marked "P. C. IV.," were, by means of a balance of precision, and a microscopic comparator which had been specially prepared for the purposes of the examination, carefully tested; and we can assure our readers that they need have no misgivings on the score of accuracy of these important standards. After the immured standards had been compared, they were replaced in the box, which was sealed with the seal of the Standards Department. The soldering-up of the lead case, and the re-insertion of the stone in front of the cavity in the wall, was subsequently carried out; and except some unforeseen occurrence happens, the next examination need not be made for another twenty years.

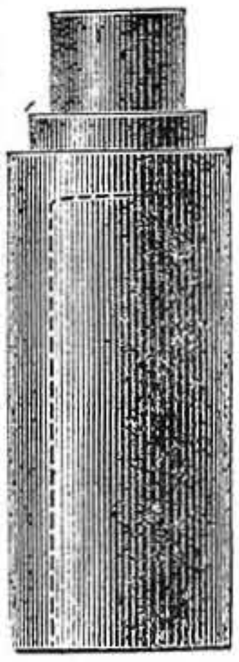


Fig. 2.

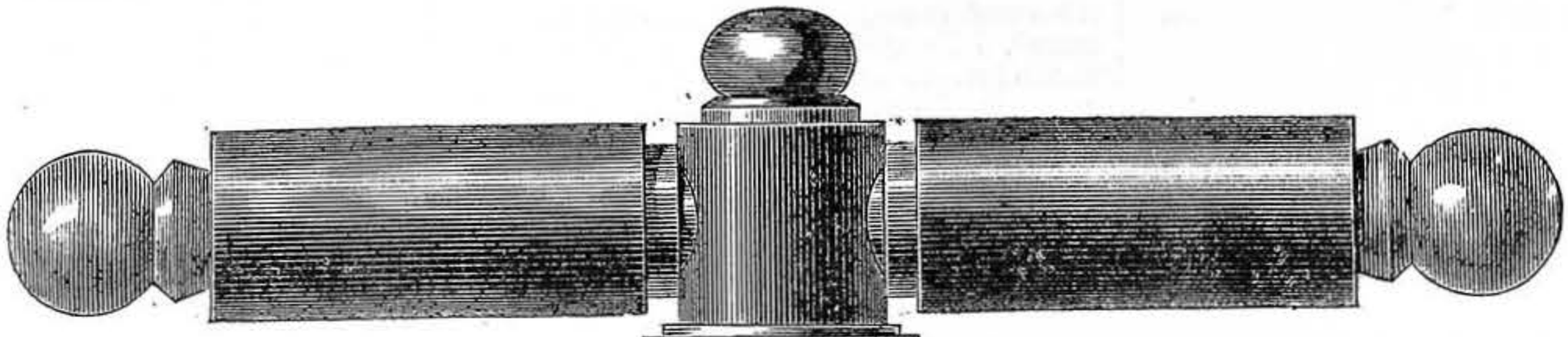


Fig. 7

Fig. 3

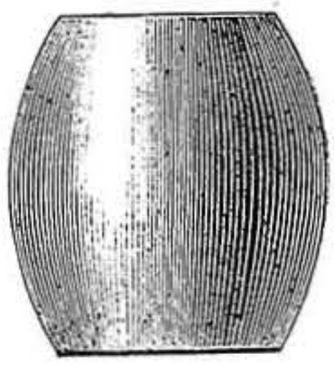


Fig. 15

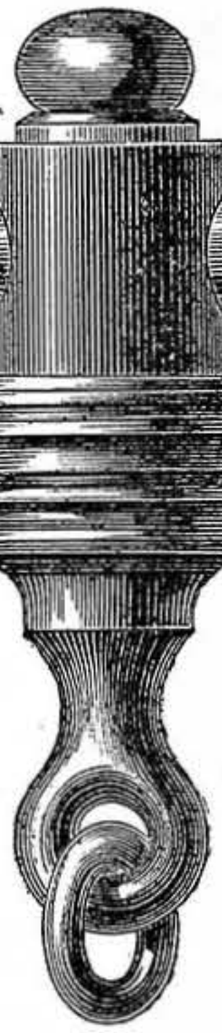
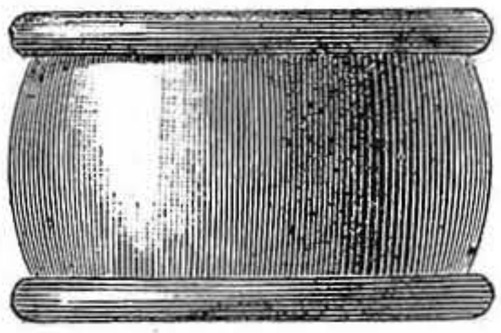


Fig. 1



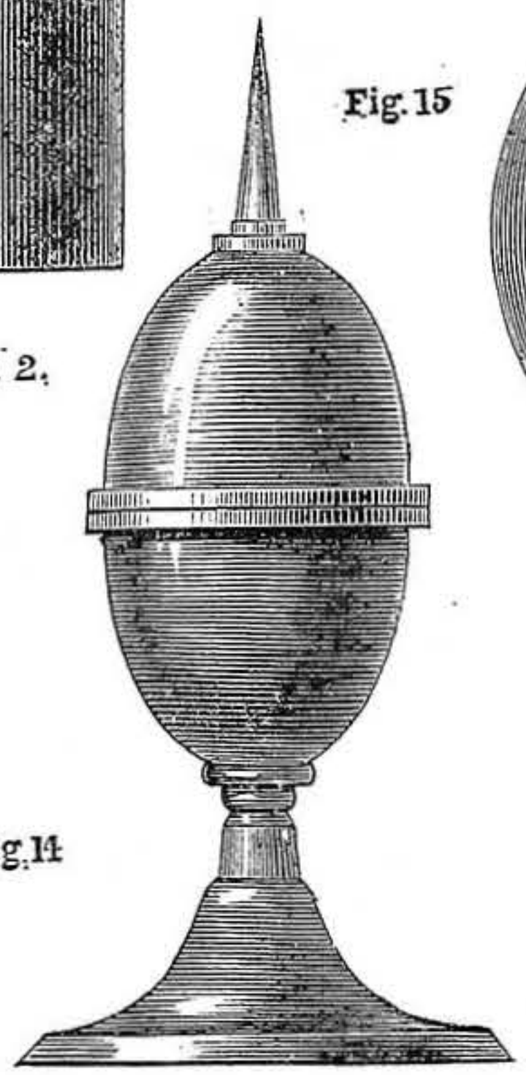


Fig. 14

Fig. 6

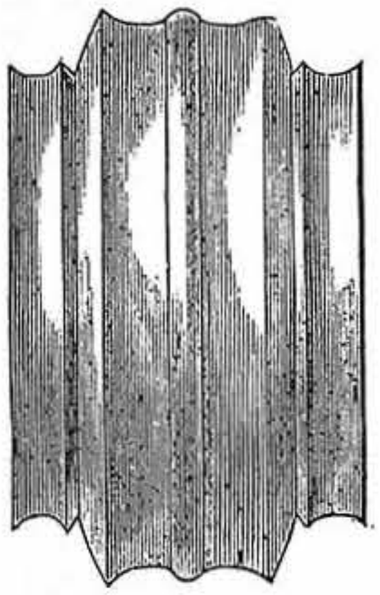


Fig. 8

Fig. 16

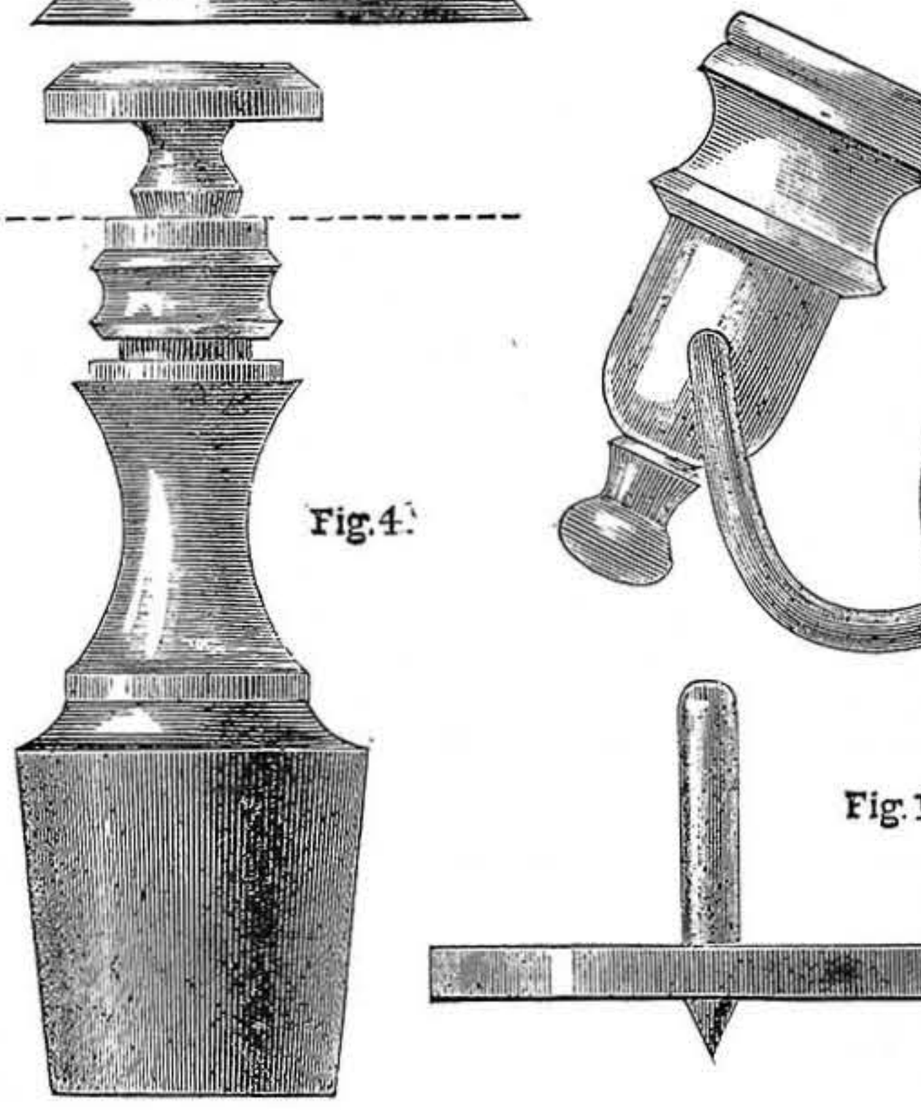


Fig. 4.

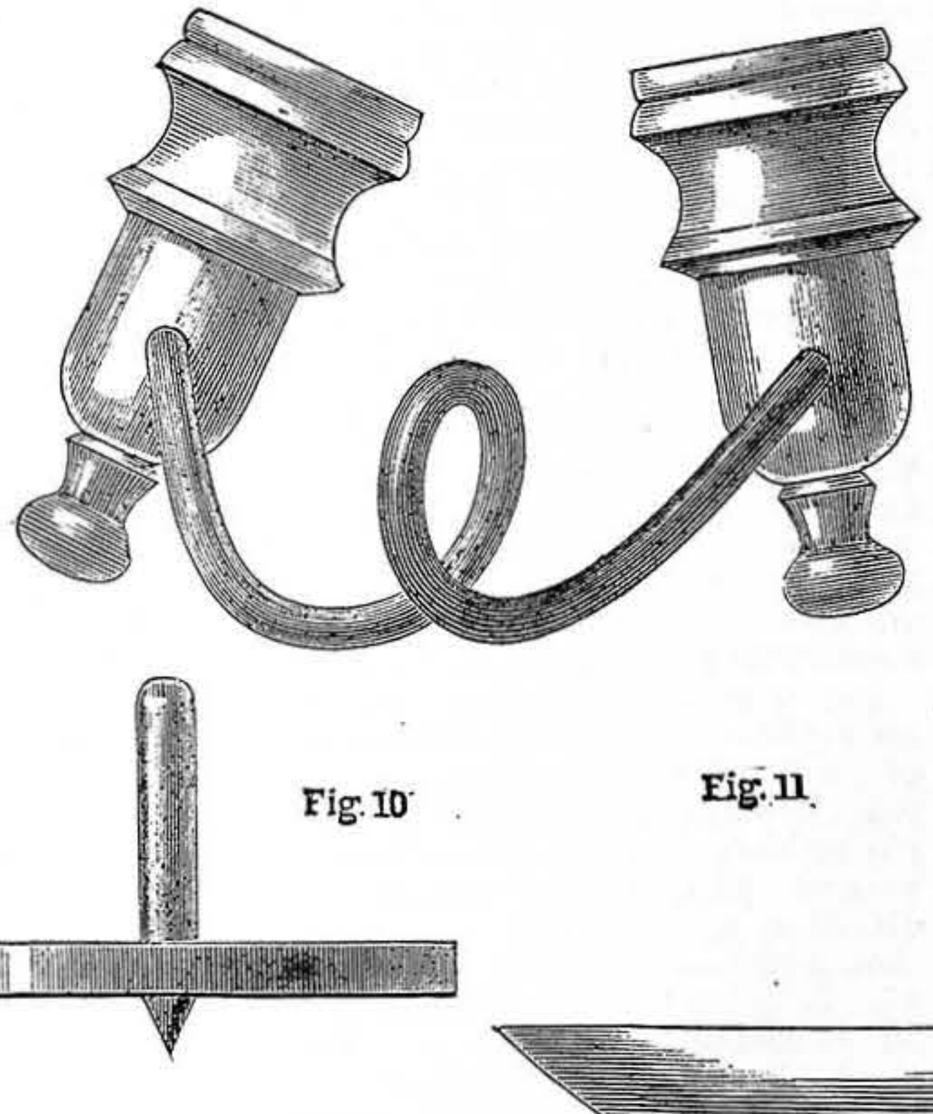


Fig. 10

Fig. 11

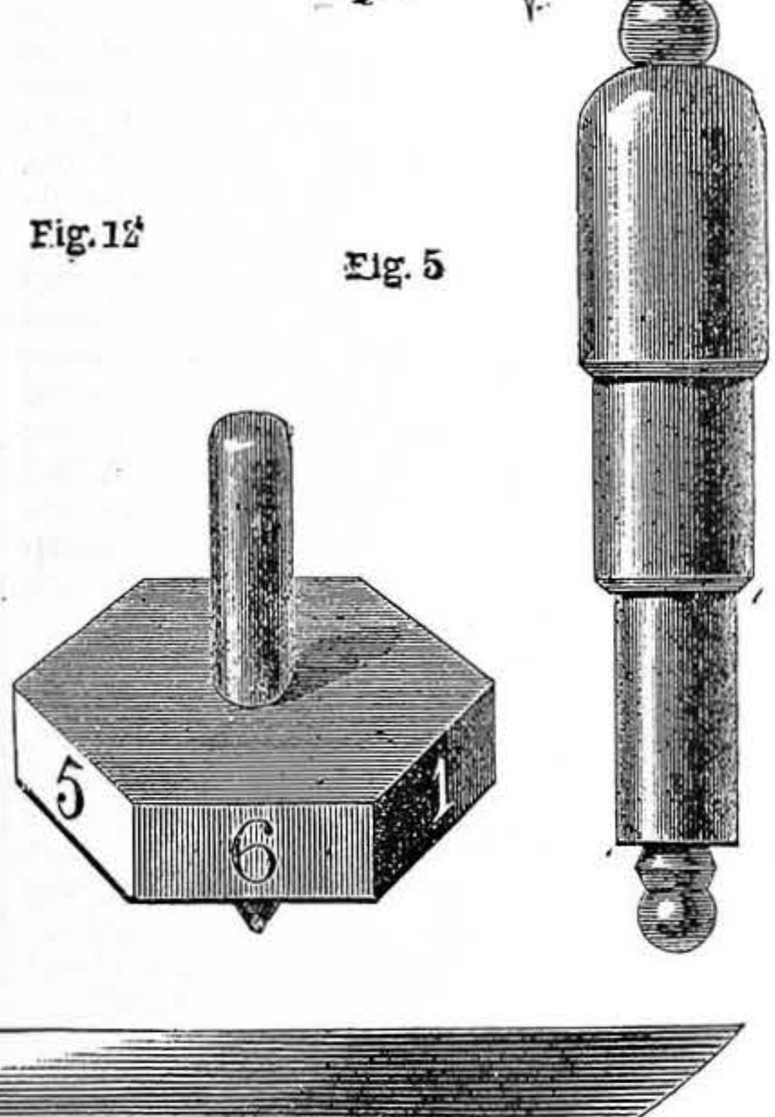


Fig. 12

Fig. 5

Fig. 9

Fig. 13

Novelties for Wood-turners. Fig. 1.—Double Needle Case. Fig. 2.—Part of Fig. 1, which contains the Needles. Fig. 3.—Stopper of Needle Case. Fig. 4.—Needle Case in shape of a Decanter. Fig. 5.—Needle Case in the shape of a Cannon. Figs. 6, 7, 8.—Napkin or Serviette Rings. Fig. 9. —Pin-cushion. Fig. 10.—Boxwood Top. Fig. 11.—A Teetotum. Fig. 12.—Knitting-Needle Case. Fig. 13.—Pin Tray. Figs. 14, 15, 16.—Thimble Cases.

NOVELTIES FOR WOOD-TURNERS.

BY A TURNER.

NEEDLE CASES—NAPKIN RINGS—TEETOTUM AND TOP.

THE articles which come under this heading are useful for a variety of purposes, and, when exactly finished, have an extremely picturesque effect. They may all be produced in a very short space of time, and with the aid of the most simple lathe and tools; and since most of them are of rather small dimensions, the labour expended in their production is not very great.

Let us now consider the construction and use of each of these articles in detail. Fig. 1 is a case intended to contain needles or pins. It consists of a turned handle having a ring fixed on to one of its ends, and two oblong cases, which contain the needles, fixed at the other end. Each of the oblong cases has its open end secured by a stopper of the same shape as those which are used in glass bottles. We will commence the construction by making the handle. This should be about 3½ in. long, and should have the part of the end where the oblong cases are to be fitted turned quite smooth for about 1 in. in length, as indicated in Fig. 1. This having been done, and before turning down the other end of the handle, prevent the mandrel of the lathe from rotating by inserting the point of the index spring into the division plate, if your lathe has one. If you do not possess a division plate and index, unscrew the chuck containing the handle from the lathe, and fix it in a vice; then bore a hole with a ½ in. centre-bit through the centre of the part of the handle which was turned quite smooth. Be very careful, in boring the hole, that it goes exactly through the centre of the handle. Now finish off the rest of the handle with ornamentation, as shown in Fig. 1, or in any other manner you please, and remove it from the lathe. The ring must next be turned and cut in half, in order that it may be inserted into the hole bored for its reception in the end of the handle; the two halves are then glued together, and when quite dry, the place where they are joined is carefully pared with a sharp chisel, in order to remove any glue which may have escaped.

We have now come to the two oblong cases, which are to contain the needles. These are made in the shape shown in Fig. 2. A hole ¼ in. in diameter is bored down the middle, and the end is turned down ½ in. in diameter for about ½ in. in length, so that it will fit into the hole which was bored for its reception through the handle. The hole down the centre is best bored with a chisel ¼ in. wide, and having its edge not quite at right angles to its length, but ground so as to form a slight angle with that direction. When both of the cases are completed, glue them into the hole made at the end of the handle, using a very little glue, otherwise it will ooze out over the flat part of the handle, and disfigure its appearance. The stoppers are turned in the shape shown in Fig. 3, the part which enters the case being made rather rough, so that it will not easily slip out. As regards the material out of which this article can be made, hard woods are of course necessary, and boxwood, ebony, or ivory would make a very handsome case. The appearance would also be greatly enhanced by turning it so that the alternate segments are formed of ebony or some other dark wood, and ivory.

We have now come to Fig. 4. This is another needle case, turned in the shape of a decanter. It is constructed in the same manner as the former case, a hole being bored down its centre for the reception of the needles. The stopper meets the top of the bottle at the point indicated in the design by a dotted line, and has its top turned flat and about ¾ in. in diameter. Other kinds of needle cases of the bottle form will readily suggest themselves to the reader; for instance, he may make some in the shape of hock and other wine bottles, and some in the shape of claret jugs. When the body of the bottle is very wide as compared with the neck, it is best not to hollow out the neck, but to make the neck to take off where it widens out into the body of the bottle.

Fig. 5 is another needle case, turned in the shape of a cannon. Its length may vary from 2 in. to 3 in., and it would look best if constructed in ivory. The stopper may be made as shown in Fig. 3, or can be made to screw into the cannon's mouth. You can easily devise other cannons of a different pattern, some being made short and thick to resemble "Woolwich Infants," others being made long and thin to resemble field guns. You can also, if you feel inclined to bestow the necessary time and trouble, supply trunnions, touch-holes, and the various other parts of the machinery of real guns. Figs. 6, 7, and 8 are napkin or serviette rings. The best way of turning them is to first of all turn a ring of wood, having a width equal to the intended width of the ring when finished, and of the same thickness as that of the ring at its thickest part. Then re-chuck the ring on the lathe, finish off the edge where it was cut off, and turn down the outside into the shape shown in one of the figures. When wood which has a pretty grain is used, Fig. 6 is the best form, since by presenting a flat surface it exposes the beauty of the grain to view. Holly wood is very suitable for making rings of this shape, since, when finished off with fine sand-paper, but without polish, it has a beautiful ivory-white colour, which is diversified by amber markings.

Fig. 8 is rather more complicated, and would look nice if executed with segments made of different materials — ivory and ebony, for instance. Of course, the labour and time consumed in making these rings are greatly lessened by turning a dozen or more of the same design at the same time.

Fig. 9 is a pin-cushion consisting of a single piece of turned wood, having a portion of its inside hollowed out so that a bag of plush or satin, stuffed with bran to form the pin-cushion, can be glued into it. The wooden part, if, for instance, 3 in. in diameter at the top and 1½ in. thick, should be hollowed out so as to form a hole 2 in. in diameter and 1 in. deep. It must be re-chucked, with its top turned towards the mandrel of the lathe, so that its base may be turned quite flat and polished. The plush bag must be made so that it fits tightly into the hole destined for its reception, is compact in itself, and projects about as much above the wood as shown in the design. Some pin-cushions can be made quite small—about 1 in. or less in diameter—and fitted with bags stuffed with emery powder, when they will form emery cushions. Others, on the other hand, can be made 5 in. or 6 in. in diameter, and may have their woodwork fluted, inlaid, and otherwise ornamented. These pin-cushions and emery cushions form very suitable objects for sales at bazaars, where they sell well, and will fetch a high price compared with the trouble expended in making them.

Fig. 10 is a boxwood top, which is spun by twisting the upper part between the forefinger and thumb, and allowing it to drop on a smooth surface. It is about 1½ in. in diameter, and the part by which it is spun is about 1 in. long. It is turned with the point on which it spins facing the back centre, and is separated from the lathe by gently rounding the end of the upper part with a chisel held sideways on the rest. The point must not be quite sharp, but should be slightly rounded, by which means it will be found to spin much better.

Fig. 11 is a tectotum, also made in boxwood or in some other equally hard wood. It is made exactly in the same manner as the former top, except that it is cut into an hexagonal instead of a circular form. The numbers are written on the middle of the faces in ink, or they may be done in black paint with a fine brush.

Fig. 12 is a knitting-needle case, which is meant to hold a set of knitting-needles on which some article is being knitted. The arrangement consists of two circular pieces of wood, which are made exactly alike, and have holes ¼ in. in diameter and 1 in. deep bored down the centre of their thick ends. They may be made in ivory or some kind of hard wood, and can be variously ornamented. A hole is bored near the end of each, and they are fastened together by a piece of elastic 4 in. long, the ends of which are fastened into these holes by knots on the inside. In order to use the knitting-needle case, the ends of the knitting-needles are brought close together, and are inserted into the holes which were bored down the centre of each piece of wood, the piece of elastic preventing them from slipping off.

Fig. 13 is a pin tray suitable for holding pins, studs, and various other stray articles of haberdashery. It is about 2½ in. high and 4 in. in diameter, and when the stem has been turned and the bowl has been hollowed out, it must be re-chucked in order that the bottom may be turned perfectly flat and polished. The bowl may be made of ebony, the middle part of ivory, and the base of ebony. Care should be taken to render the interior of the bowl quite smooth and evenly curved, since it is shallow, and greatly exposed to view.

Figs. 14, 15, and 16 are thimble cases of various forms. They are made in two pieces, which either screw together or are fitted together in the ordinary way, the place of junction being indicated in the designs by a dark line which, with the exception of Fig. 1, is in the centre of the case. A small hole can be drilled down the centre of the stem of the lower part of Fig. 14, and when fitted with a small stopper will be suitable for the reception of needles. The outsides of the cases may be inlaid with spots of various woods, as taste may direct, and the pointed ends of Figs. 14 and 16 would be improved if made of ivory.

In conclusion, I will state that the reader can easily devise various other forms in which to construct needle cases, napkin rings, and the various other articles which have been described, and that he can ornament them according to the tools which he possesses. The chief thing to be aimed at in the construction of these nicknacks is a good finish, and it should be constantly borne in mind that a well-finished surface will enhance the aspect of an indifferently ornamented article; whereas a badly-finished surface and irregular inlaying, fluting, etc., will quite spoil the appearance of an article which would otherwise have been extremely pretty.

A DRAUGHT EXCLUDER, AND HOW TO MAKE IT.

BY CHOPSTICK.

We are continually being reminded that plenty of ventilation is a good thing, and I do not intend to deny that it is so, but I think that everyone will agree with me that it is *not* a good thing for the fresh air to be admitted at the bottom of the door; and yet, how many houses are there to be found in which there is not too much space allowed at the bottom? In fact, if the door is well fitted at first it will not continue so for any length of time, as whether the sill be stone or wood (and the latter is the best, in my opinion), it soon gets worn away, and in comes the cold wind as well as the rain and snow. Several patents have been taken out for draught excluders at various times, and they answer very well for a while, but all that I have seen have soon got out of order, and then they are useless; and as they are expensive as well, I put on my thinking-cap to see if I could not devise something better and cheaper, and the result was the article I am about to describe, which can be made for about one quarter of what the patented articles cost, and serves the purpose equally as well if not better than the best of them, and has nothing about it to get out of order. It is so ridiculously simple that I think any joiner would be able to make it from the drawings only; but as we are not all joiners, I will give a few explanations, so as to give all a chance of keeping out any future chilling winds.

For materials, we shall want a piece of yellow deal, 3 ft. long 4 in. by 1 in., two brass plates, as Fig. 4, which is drawn full size—that is, 3 in. by 1 in., and about $\frac{1}{16}$ in. thick—and a good stout lock spring (Fig. 5). To make it, first cut the 4 in. by 1 in. board into two pieces, which will then be two inches wide; then plane them up properly and rabbet each of them 1 in. by $\frac{1}{2}$ in., so as to fit one in the other, as in Fig. 2. They can then be finished off to any shape to please the fancy. I have shown the shape which I finished mine. Now take the brass plates (Fig. 4) and fix them on the back diagonally, as shown in Fig. 1; they can be screwed on at first and then marked, and afterwards taken off and the wood cut away, so that they lay level with the surface. It will now be plain to all that if pressure be applied to the bottom piece at A (Fig. 1) that it will cause the two pieces of wood to open, as shown at Fig. 3. Now, this pressure is applied by the door-jamb when the excluder is screwed on to the door, so that the bottom piece is about half an inch more to the right hand than the top piece (or to the left hand if the door opens that way). On the door being closed, it pushes A (Fig. 1) against the jambs at the hanging side, and thus forces the bottom piece in contact with the sill. Now we are all right as long as the door is shut; but on opening it, our excluder would drag on the floor, and this is where the spring (Fig. 5) comes in. This must be fixed (sunk in level, of course) to the top piece with a screw through the loop and the short arm abutting against the sinking in the top piece, and the long arm abutting against the sinking in the bottom piece, so that on the pressure at A being released, the spring will throw it back, and thus raise it at the same time. And now for fixing. In the first place, force the two pieces open, and put a piece of $\frac{1}{2}$ in. stuff between them in the rabbets at the front side, so as to hold them in the same position as they will be in when the door is closed. Then cut them to the right length, so that they will go easily between the door-jambs. Then scribe the bottom to fit the sill, and tack a length of indiarubber draught tubing along the bottom, with the tube part outside, as shown in the end elevation. Now close the door, and, holding the draught excluder firmly down, fix it to the door with about four screws; then open the door, and remove the piece of wood which you placed between the two parts, when the spring will act and raise the bottom piece so that it will clear the floor easily. All that now remains to be done is to put a screw in the end, as in Figs. 2 and 3, and another in the door-jamb, so that the two coincide when the door closes. These screws will take the pressure from the wood and also give us a chance of regulating the article; as, by unscrewing one screw it will push the bottom piece down on the sill with more force, while by screwing one of them in it will ease the pressure in case we have made it too tight. A coat or two of varnish would do a good deal towards preserving the wood, and should be put on before fixing, so that the back will get its share as well as the front. Care must be taken to make these draught excluders the right way, according as the door opens to the left or right. Beyond this everything is very simple, and I hope that none, after this, will complain of their doors not fitting close, as the remedy lies in their own hands.

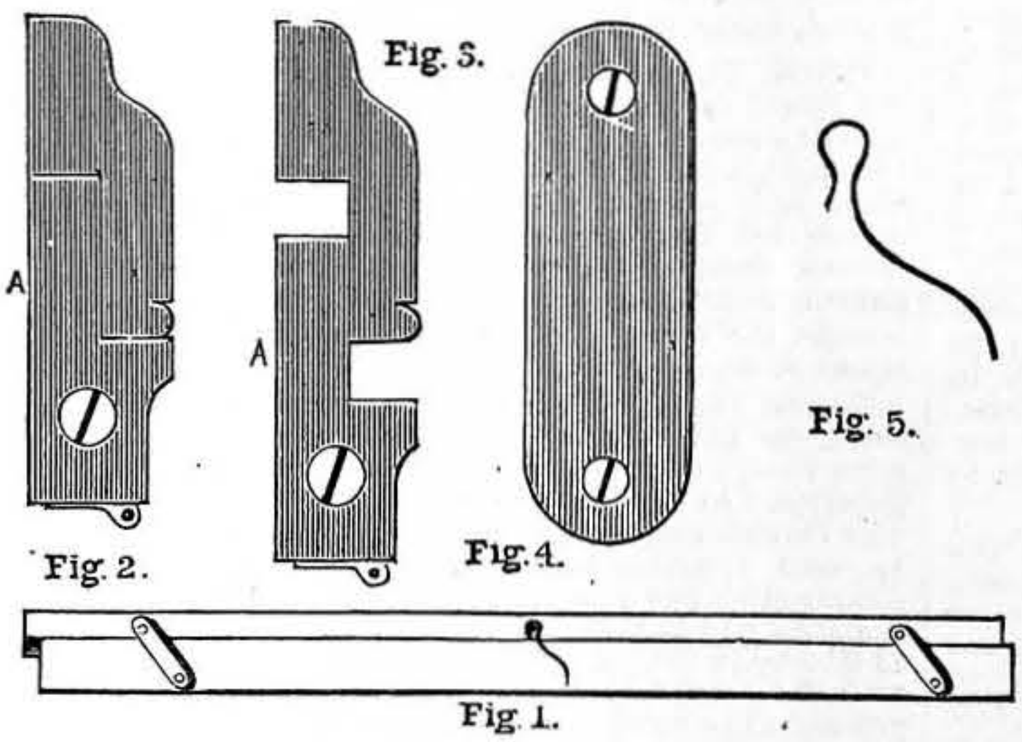


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5.

Draught Excluder. Fig. 1.—Back Elevation of Draught Excluder—A, End to go to Hanging Side of Door. Fig. 2.—End Elevation of ditto when Door is open—A, Side next Door. Fig. 3.—End Elevation when Door is closed. Fig. 4.—Brass Plate (full size). Fig. 5.—Spring (full size).

Remember,—That one cubic foot of sea water = 64·11 lbs.

That one gallon of pure water = 10 lbs.

That 6·24, or 6¼ gallons of pure water = 1 cubic foot.

That 1 square foot of cast iron 1 in. thick weighs 40 lbs.

That 1 square foot of cast iron ½ in. thick weighs 20 lbs.

This is very useful when getting out the quantities in estimating, as 40 is so readily divisible by the regular divisions of an inch.

That when driving shafting or machinery by strap or rope, the *slack* side should always be on the top.

SCIENCE TO DATE.

Liquid for Gilding Objects.—Gold bronze mixed with a solution of gutta-percha in benzine or chloroform is recommended for this purpose by a German contemporary.

Porcelain from Asbestos.—M. Garros has invented a new kind of porcelain. Asbestos is ground to an impalpable powder, and made into a paste with water. This paste is moulded into the form desired, and the object is dried in a stove. It is then baked in what is technically termed a "seggar" (a case of fireclay) for sixteen or seventeen hours, and then the temperature is raised to 1,200°. A porcelain more translucent than ordinary porcelain is thus obtained. It can be used for the filtration of liquids, as acids for example; and it is also claimed that it prevents the passage of micro-organisms. Thus, a liquid containing 1,200 microbes per cubic centimetre was absolutely sterilised by filtering it through this porcelain.

"Ginger-Beer" Plant.—Prof. H. Marshall Ward has lately brought before the Royal Society some interesting results of a study of the organism known to villagers as the "ginger-beer" plant. He finds that it consists of a species of yeast living together with a bacterium. The latter organism destroys a substance, produced by the existence of the yeast, which is a poison to the yeast, and would stop its development if not removed. The action of the bacterium in decomposing this poison as fast as it is produced enables the yeast to live much longer than it could by itself. A case such as this, where two organisms live together for the advantage of one and with no injury to the other, is called in biology "symbiosis."

Artificial Rain.—Recent experiments and discussions on this subject seem to lead to the conclusion that, *when atmospheric circumstances are favourable*—that is, if there is probability of rain—then a concussion of the air such as is produced by an explosion may determine its formation

NOTES FOR WORKERS.

Galena is the principal ore of lead, and forms extensive veins, traversing clay slate in Cornwall, and limestone in Derbyshire and Cumberland. It is also found in Scotland, Flintshire, and the Isle of Man.

A good soft varnish can be made by boiling together for some time 4 oz. linseed oil, ½ oz. white wax, and ½ oz. gum benzoin.

An electric letter stamper is being tried at the Post Office, Washington, U.S.A., in which the time-stamp is altered every minute.

It is proposed to erect a fac-simile of the Tower of London at the World's Fair, Chicago.

An underground city, with streets of houses two or three stories high, has been discovered in Bokhara by the Russians. It dates back to two centuries before Christ.

Nearly all native sulphur comes from Sicily, but it also occurs in Iceland, parts of Italy, Mexico, South America, and more or less in all volcanic districts.

In many German villages some tradesman has a small telephone exchange installed in his house or shop. This is connected with the nearest telegraph office, and thus answers the purpose of an official telegraph office in the village.

A patent has been brought out in America for a new insulating compound composed of carbolic acid or creasote, shellac, vegetable drying oils, asphalt, gums, or resins.

Jupiter is 84,846 miles in diameter, and its mean distance from the sun is 475,692,000 miles.

Six seams of coal, amounting to 14 ft. 6 in., have now been discovered in boring operations at Dover.

The specific gravity of any body is the ratio of its weight to that of an equal bulk or volume of some other body, as water, taken as the standard or unit.

The Belgian Government will resume, from January 1st, 1893, the working of all telephone lines in Belgium, which are now worked by private companies.

TRADE: PRESENT AND FUTURE.

*** *Correspondence from Trade and Industrial Centres, and News from Factories, must reach the Editor not later than Tuesday morning.*

HARDWARE TRADE.—The large works in Sheffield have settled down again after the coal stoppage, and the manufacture of railway material is, for the most part, satisfactory. Orders for marine goods are of a fairly average character, with the exception of for the Clyde, where trade is very slack. The makers of hydraulic-pressed shafting and of castings for marine purposes have not lately received many large orders, and the slackness is likely to last until a further naval programme is initiated by the present Government or its successors. Some owners of large iron and steel works, taught by recent experience, are considering the acquisition of colliery property. In Rochdale and district, the ironworkers are not doing well. Most of the foundries are working short time, and, from the scarcity of orders, seem likely to do so for some time to come.

COTTON TRADE.—The Stalybridge strike has had a far-reaching influence upon the cotton trade of Lancashire, and is calculated to be fraught with serious consequences. At a recent meeting of the Employers' Federation, it was shown that 91 per cent. of the employers in the districts of Oldham, Bury, Hyde, Stockport, Heywood, and Rochdale were in favour of a general stoppage of work. This decision involves the stoppage of 17,500,000 spindles, and the non-payment of about £50,000 in wages.

SHEET METAL TRADES.—In materials, the London market is as dull as it can well be. For black sheets there is scarcely any demand; galvanised sheets are very little better; consequently, quoted prices are difficult to realise. Wolverhampton reports are very similar, trade being disturbed by numerous failures. Some of the iron works are closed, and many only work irregularly. Unless a great change takes place, several tin-plate works in South Wales will cease production. Demand is almost nil, and it is as much as makers can do to obtain cost price. Prices of sheet steel, £7 10s. to £8 10s.; sheet iron, £6 10s. to £7 10s.; tin plates, Bessemer steel cake, 12s. to 12s. 3d. I.C., best charcoal, 13s. to 13s. 9d. I.C., block tin, £89 10s. to £90 per ton.

CYCLE TRADE.—In the Midlands, trade still shows signs of activity, notably in Coventry, Nottingham, and Leicester, many of the firms working overtime. There is a tendency to reduce wages, the fitters and turners in one establishment having to submit to a reduction on the ground that foreign competition is so keen, and foreign-made machines are flooding the markets.

SILVER AND CUTLERY TRADES.—One of the largest Sheffield firms has found it necessary to place their men upon three days per week, and smaller firms have not been able to treat their *employés* so well. The dulness also affects the razor and scissors trades, so that the improvement which took place a short time ago has not been sustained. Few orders are coming in from the States, and the general opinion amongst business men is that there will be no improvement in trade until the Presidential and General Elections are accomplished facts. Another large Sheffield silver firm is bringing out a new process of decorating silver goods by hydraulic pressure, representing chased, embossed, and engraved work generally. The present difficulty is the matching of different sized articles of the same shape.

BOOT AND SHOE TRADE.—There is not the business stir that generally runs with the first of workers' holidays. In London, the best hand-sewn work is looking more brisk. The Union Machinery Co., Ltd., the Campbell Machinery Co., and the Rockingham Machinery Co., have combined together, and formed themselves into the Union Boot & Shoe Machinery Co., Ltd. This alliance of three good companies should be of great trade benefit to more than those directly concerned.

BUILDING TRADE.—In Rochdale and district, matters still keep in a very prosperous condition. The prosperity is having its effect on the workmen. The bricklayers' labourers having given notice of an advance of a halfpenny per hour, and it not being conceded by the masters, the men struck work.

ENGINEERING TRADE.—Increased depression marks the Manchester trade in almost every department, with, perhaps, the exception of boilermakers, who report a fair amount of new work coming forward. The large Lancashire textile machinists continue fairly busy with orders in hand, but the future prospects in this section are by no means encouraging. Marine engineering in the Lancashire district is in a most depressed state—the only work of any importance secured by the principal Mersey firms being in connection with the conversion of compound marine engines into those of the triple expansion type; one or two Liverpool firms have a fair amount of this kind of work in hand at present. In recognition of the depressed state of trade, the skilled workmen in the Mersey shipyards have accepted a reduction of 5 per cent. upon the rates lately prevailing; while the fifty-three hours movement appears to have been abandoned by the engineers in the Liverpool district. In the Barrow district, shipbuilders continue busy, and both engineers and boiler-makers are still well employed. The unsettled condition of the iron trade continues, and the majority of the furnaces in the north of England are damped down. There is scarcely any disposition to buy, and the demand for both raw and manufactured material is small.

JEWELLERY TRADE.—There is but very little to be said of the jewellery trade in London. That a slight movement is observable is without question, but it is confined to inquiries and demands for this or that article on "appro.," and in most cases it is returned within a day or two. One of the signs of bad trade—*i.e.*, prolonged stock-taking or intermittent attacks of stock-taking—is still present. Altogether, the traveller's job is not, at present, a very enviable one; neither is the workman's, for that matter, for if the one cannot book orders, the other cannot have the job to execute them, and to show new goods now is to spoil the market when the trade does wake up. One hears the same story of very little to do from nearly all branches—engravers, enamellers, and stone dealers included.

MINING TRADE.—Wheal-Eliza sett and materials are offered for sale. It has been very rich in its time as a semi-private undertaking, £70,000 having been paid in dividends. It still employs 250 hands, while it is practically the sole representative of mining left in what was once one of the most famous mining districts of Central Cornwall. Tin ticketing.—300½ tons of tin ore on offer at Redruth brought the average price of £50 18s. 2d., against recent prices of £51 4s. 1d. and £51 2s. 1d.

TIMBER TRADE.—Some 3rd white matching FAS mark was sold recently for 2s. 9d. per square, a price which could not have given much profit to the importer. As the demand for this class of goods is very limited, and the supply large, it will account, in some measure, for the small amount given. Among other lots were the following: 10 ft. 3 by 11 2nd pine, £14 5s.; 12 ft. 3 by $\frac{8}{10}$ 2nd pine, £15 15s.; 13 ft. 3 by 11 1st pine, £23 5s. (a small lot only); 13 ft. 3 by 9 3rd spruce, £7 15s.; HAB 3 by 9 3rd yellow, £13; PFW 3 by 9 4th yellow, £9 15s.; ABA 3 by 9 6th yellow, £5 2s. 6d.; S×W 1¼ by 7 3rd yellow flooring, 9s. 6d.; S×W $\frac{7}{8}$ by 7 3rd yellow flooring, 6s. 9d.

SHOP:

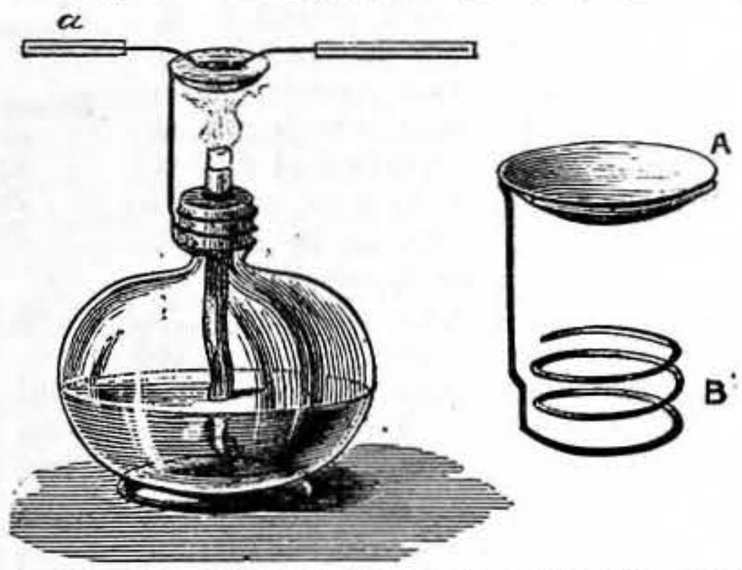
A CORNER FOR THOSE WHO WANT TO TALK IT.

I.—LETTERS FROM CORRESPONDENTS.

Lactitis.—W. J. F. (*London, E.C.*) writes:—"There would seem to be little connection between milk and ivory at first glance; but our clever and inventive transatlantic relations have discovered a method by which the former liquid can be changed into hard and strong 'lactitis,' which is the name given to this newly discovered way of obtaining ivory, and which, being both hard and strong, is suitable for the manufacture of such articles as billiard-balls, combs, knife-handles, and penholders. This important discovery was explained at some length in the scientific chronicle of a recent issue of the *American Quarterly Catholic Review*, and some of the readers of WORK may possibly be interested in the following extract, which fully explains the *modus operandi* to be followed:—'The milk is first coagulated, as in the process of making cheese. This is then strained, and the whey rejected. Ten pounds of the curd are taken, and mixed with a solution of 3 lbs. of borax in three quarts of water. This mixture is now placed in a suitable vessel over a slow fire, and left there until it separates into two parts—the one as thin as water, the other rather thicker: somewhat resembling melted gelatine. The watery part is next drawn off, and to the residue is added a solution of one pound of a mineral salt in three pints of water. Almost any mineral salt will answer—for example, sugar-of-lead, copperas, blue or white vitriol. This brings about another separation of the mass into a liquid and a mushy solid. The liquid is again got rid of by straining, or better, by filtering. At this point, if desired, colouring matter may be added; if not, the final product will be white. The solid is now subjected to heavy pressure in moulds of any desired shape, and afterwards dried under very great heat. The resulting product, which has been named "Lactitis," is very hard and strong.' Such a discovery as this cannot fail to prove profitable to those who have found it out."

Testing for Accuracy.—J. C. K. (*London, N.W.*) writes:—"I read the statements of tests, and that is why I remarked upon them. To test when the work is finished is a doubtful plan, and what a bungle to alter then! Assuming true square of angles and lengths of sides of frame, where and why the necessity for testing? And if the work shows inaccuracy by the diagonal tests, to re-mitre the corners—for they would be all wrong—if there were any visible errors? Suppose a framing of 4 ft. by 5 ft. to be tested diagonally by the lath-rule and the bit of chalk; and to be quite accurate in chalk marking, a square must be set on floor or flat surface, to mark up true in the acute angle, or if outside the frame, a mate must put his finger to the end of the lath-rule while the measures are made, after asking, 'Now, are you right?' and the important chalk or pencil mark is made for one diagonal. Then the measure of the others becomes momentous, and the injunction for the mate's finger-tip to do its duty is—'Now, be sure you're right.' If alike, how exultant must be man and mate! But if wrong? The head is scratched, perhaps there is a clicking of tongue—'te! te! te!'—of disappointment, and the square is applied to the corners to find out which of two are in or out of square; then perhaps lengths of order of frame are measured, and the twist of frame looked to. I have seen it done, and pointed out to men that it is an unscientific hedge-carpenter's plan—near enough for gates and hurdles, if the eye is not trained for accurate estimate of measure of such rough work. Three places to test winding is better than two. G. P. says the opposite sides of a trapezoid are not equal in length. If the sides projecting from a base-line are not equal, how can it be a trapezoid? J. S. says it is a 'storm in a teapot'; he is right, as storms there are so harmless. But I want the readers of WORK to be right as two 'T's,' and not go the wrong way to work. We all mean the same, and I am pleased to meet such genial fellow-workers, as it is obvious the intentions of all are for the welfare of WORK."

Soldering Connections.—C. H. L. (*Falmouth*) writes:—"The following is an arrangement for soldering joints in electric bell work, and for electrical connections generally. This arrangement serves to illustrate the old adage that 'Necessity is the mother of Invention.' In the course of my electrical pursuits I have often found the 'soldering-bit' to be inconvenient, for various reasons: fire not being available, awkward position of wires, etc. I found it necessary that some method must be adopted. I have never come across anything of the kind in my experience, so hope this will prove of service to others. All the apparatus required can be made by an amateur, and for a very small outlay. In the first place, an ordinary methylated spirit lamp, as shown in the diagram below, is necessary. Then, from a piece of sheet-copper, make a receptacle for the solder, about the size and shape of an ordinary watch-glass. This copper can be 'hollowed' in the



Lamp and Soldering Apparatus complete, with Wire being soldered—A, Copper Receptacle; B, Wire twisted to fit over Neck of Lamp.

following manner: Procure a short piece of metal tubing about 1¾ in. in diameter, and the gong of a bell about the same size. By placing the sheet-copper over the hole of the tube, and forcing the bowl-shaped part of the gong inwards, the copper is compressed into the tube, and becomes the required shape. The edge of this copper vessel is then bent around a piece of wire, which is twisted as in the design, and serves to hold it over the flame. A little solder is put in the copper vessel, and the lamp lit. The wire to be soldered is bent a little rounding so that the joint can be immersed in the molten solder after the 'flux' has been applied. Joints can thus be soldered with surprising ease, and in a very little time, thus doing away with the excuse, so often given, why the joints are allowed to be 'dry,' which is the cause of a majority of faults in electrical work: this, no doubt, prejudicing a large number of people against electric bells."

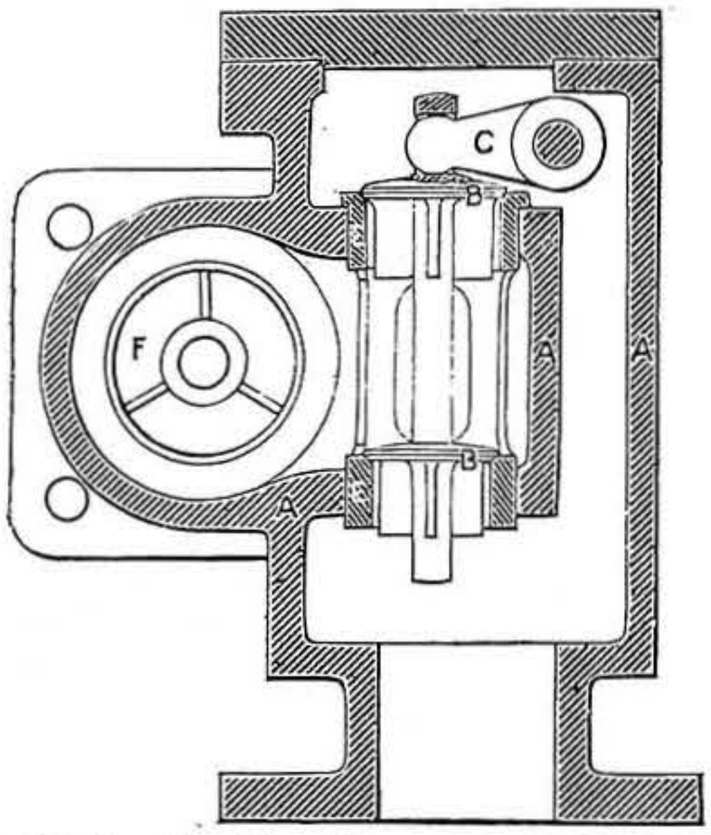
II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Gas Burners.—E. T. (*Dolton*).—Peebles burners are made in eight different sizes. They may be procured from any ironmonger, and are usually sold at 1s. 3d. each. They are fitted with a patent governor, which checks the pressure of gas, thus ensuring a steady flame and economising the consumption.—T. W.

Greenhouse and Dovetailing.—F. C. (*Bath*).—Articles on Building a Greenhouse appeared in Nos. 12, 14, and 15, and on Dovetailing in Nos. 129 and 148.

Mandoline and Graining.—W. W. C. (*Salford*).—Articles on Mandolines appeared in WORK, Nos. 66 and 153, and on Graining in Nos. 55, 58, 62, 65, 69, 72, 76, 79, 84, 89, 93, 95, 98, 100, and 103.

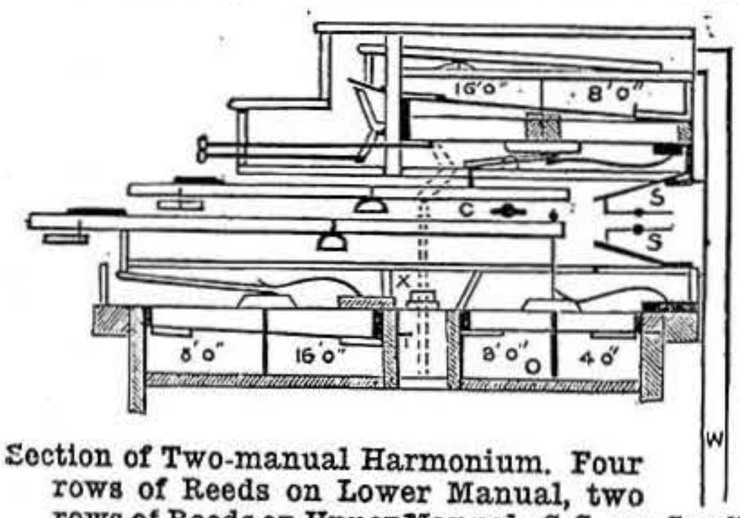
Throttle-valve. — AMATEUR. — The butterfly throttle-valve is simpler and easier to make than any other equilibrium valve. I send a sketch of the form often used on large engines. A A A is the main casting, B B the double beat valve moved by the arm, C; E E is the valve seating. The steam enters from the stop-valve, F, *between* the two discs of the equilibrium valve, which are very nearly, though not absolutely, the same size, since the lower disc



Equilibrium Throttle-valve combined with Stop-valve.

must pass through the upper seating. The butterfly for the ¼ h.p. engine is shown in the sheet of details on page 328 at Fig. 29. It is provided with a central stem, or chucking piece, so as to enable it to be turned to ⅛ in. diameter when at an angle of 45 degrees with the axis. This is all that is necessary to make it fit well enough to stop the engine; it is not steam-tight, and need not be, since there is the stop-valve as well.—F. A. M.

Harmonium.—C. J. S. (*Battersea Park*).—If you want a coupler to your two-manual harmonium, I think both key-boards will have to be balanced or centre-hung. The section of pan sent would do well for bottom key-board; but I think two manuals involve two separate pans. Be sure to obtain reeds of various scales, and regulate them to different degrees of power, or your instrument will be a very monotonous affair. Messrs. Dawkins, of Charterhouse Street, supply narrow and broad reeds, reeds with curved tongues, as well as special sets for oboe, musette, voix celeste, etc. I give a section as a suggestion, which only needs explaining that the stop levers of lower manual must be of thin brass, and that the keys must be reduced to allow them



Section of Two-manual Harmonium. Four rows of Reeds on Lower Manual, two rows of Reeds on Upper Manual; S, S, are Swell Shades; C, Coupler; T, Space for Stop-action for Lower Manual; W, Wind Trunk; X, where full Organ may be applied.

to pass between. If, however, the action is from each end, like an organ, this cutting of the keys will not be necessary. The section is not to scale, and C. J. S. must be prepared to make a full-sized drawing, which will not be difficult if he first obtains or makes pans for the reeds he wishes to use, and keys to suit pans, using the sketch sent as a suggestion. The swell doors, marked S, should be actuated by knee levers; and although the upper action may be held by side irons, the wind trunk must be movable. "Grand jeu" may consist of a rod, with levers to act upon the tables at X. This is really too large a subject for "Shop," and therefore many omissions must be expected and excused.—B. A. B.

Stirrup.—MECHANIC.—Your stirrup has been examined by a well-known horseman, qualified to pronounce an opinion on stirrup improvements, and yours in particular. From your inexperience, you have not comprehended the fact that one of the causes of accidents in the hunting-field is the release of the foot of the rider from the stirrup at "taking off" or "landing" at a jump, and, with young riders, losing their tread in a stirrup. These accidents are so frequent that many patents are taken out to retain the foot in the stirrup. The accidents from dragging by the foot in a stirrup when thrown is of rare occurrence, and need never occur if the rider has a safety stirrup, such as was described and illustrated in WORK about a year back (see Index). It is both a retaining and releasing stirrup, and with spring safety latches on which to hang the stirrup-leathers, safety is doubly assured. Even some of the safety latches have the demerit of letting the leather slip off when a horse rears or rises at a high bank, causing the best of horsemen to slide back out of his seat on to the ground. In riding, the aim should be to keep in the saddle, and the feet in the stirrups. Unfortunately, your stirrup opens so easily that it would be difficult to use it without its opening, which is a fatal objection. You should read "Riding: The Use and Misuse of Reins and Stirrups." The whole art of horsemanship is condensed comprehensively.—J. C. K.

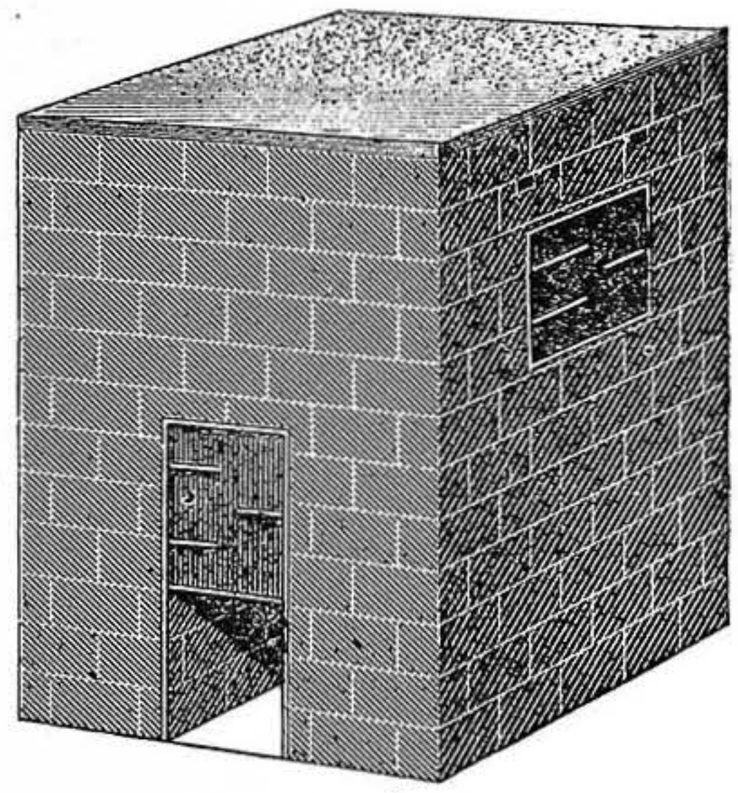
Parchment Papers.—J. S. (*Amsterdam*).—In giving the names of the manufacturers of chromo and parchment papers, it may be mentioned that these productions are confined to a few mills in Great Britain. To give a full list of dealers would, I am afraid, occupy too much space in WORK. In parchment papers there are many makes—real and imitation—in the market, and many wholesale stationers sell parchment papers of foreign manufacture. The following are the British makers of chromo papers: Dickinson & Co., Apsley Mill, Hemel Hempstead, Herts; Olive & Partington, Dover Mills, Glossop; Potter & Co., Hollins Mills, Darwen; J. & J. Makin, Wallhead Mills, Rochdale; J. Collins, Stoneywood Paper Mill, Denny, Stirlingshire; Inveresk Paper Co., Musselburgh, Scotland. The English makers of parchment papers are the Ekman Pulp and Paper Co., Northfleet, Kent; Ramsbottom Paper Mill Co., Ramsbottom, near Manchester; Spicer Brothers, 19, New Bridge Street, London; Hythe End Paper Co., Staines, Middlesex; and J. Cropper & Co., Burneside Mills, Kendal, Westmoreland. As before stated, the list of stationers and paper makers' agents in a position to supply chromo and parchment papers is so extensive that I cannot do better than refer your correspondent to "Kelly's Directory of Stationers, Paper-makers, etc." Some useful information may also be obtained from the "Directory of Paper Makers," which contains a list of wholesale stationers in London. The publishers are Marchant, Singer & Co., St. Mary Axe, E.C.—F. G.

Box Battery.—J. A. P. (*Leicester*).—The fault mentioned by you is one common to all primary batteries, but is specially noticeable in some, including those in which bichromate of potash is employed. It is a prominent feature in all single-fluid cells, but is lessened by using chromic acid instead of bichromate of potash. As the box battery described in WORK, Vol. II., pp. 591-2, is composed of single-fluid cells, it is liable to the fault common to all this class, but may be said to be the only one that can be used in furnishing current to an electric lamp. The current flags shortly after the circuit is closed through the lamp, because a film of hydrogen forms on the carbon plates, and thus increases the internal resistance of the cells. Keeping the plates or the solution in motion washes off this film, and checks this nuisance, which is named polarisation. Severing the carbon plates with a sharp tool, so as to roughen their surface, will partially mitigate this fault, but a perfect depolariser for a single-fluid cell has yet to be discovered.—G. E. B.

Cement for Tinfoil.—ELECTRICIAN.—If you think the ordinary flour paste not strong enough because the tinfoil is thick, use good hot thin glue instead of paste. The adhesive properties of paste and of glue are much enhanced by closely fitting and smooth surfaces. See to it, therefore, that the foil is made to fit closely and lie smoothly to the wood.—G. E. B.

Medical Coil.—W. T. K. (*Darwen*).—The core of a coil, whether medical or spark coil, must be of iron wire. Steel wire is altogether unsuitable. Iron wire is better than a solid rod of iron. Get and study the "Induction Coils" articles in WORK, Vol. IV.—G. E. B.

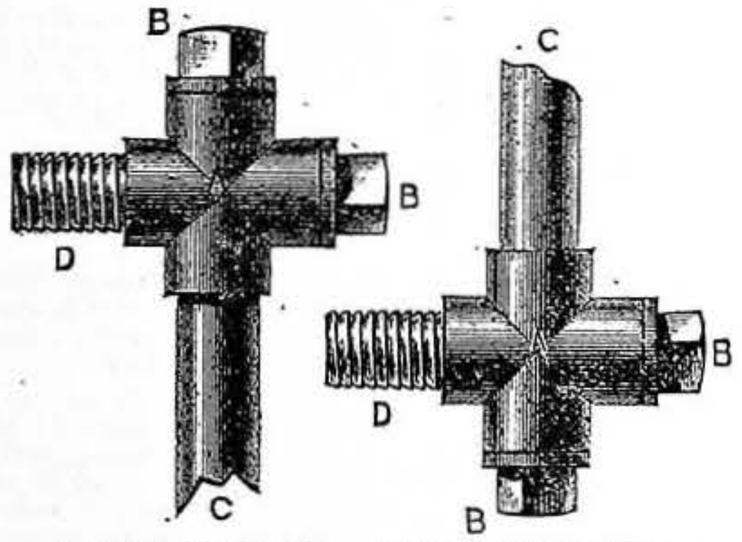
Chimney-pieces.—OVEN.—Without knowing the amount of work you want to do at once, it is rather difficult to give you size of oven. In some works they are large enough to contain one hundred pieces at once, and may be from 12 ft. to 15 ft. long, 6 ft. to 8 ft. wide, and 8 ft. to 9 ft. high; lined with fire-bricks, with arched tops and tight-fitting iron doors. They are heated by a furnace and flues under the floor. The temperature will be from 80° to 120°. If you only want to experiment, and if you have not done any of this work before, I should recommend you to make a small oven similar to sketch, about 1 ft. 6 in. square inside. A furnace with iron door and grate bars is formed underneath. This should be one brick thick, lined with fire-brick above the bars, the furnace covered with a 3 in. fire lump, and the oven built on this with fire-bricks—half brick thick, if inside; if outside, make it one brick thick, so as to retain the heat. An iron door is fixed at one side, and two small holes above fitted with plugs, so that you can insert a thermometer. Cover the top with a fire lump, and carry the flue from furnace up one side of oven, and connect to a chimney. If you have no chimney near, an iron stove-pipe or some sanitary pipes may be used. The materials for this will cost about £2 10s. You would most likely build it yourself; if not, it might cost 10s. If you want to do something larger, you can make the oven longer, but it will be better not to increase the width, as fire lumps are cheaper than arching. The materials for making the enamel may be purchased from a wholesale chemist, the address of whom you may obtain from any local chemist, or from a directory. I suppose you know how to mix them, as you will have little chance of success if you do not, the mixing being a trade secret. The slates are first polished till



Small Oven Sketch.

smooth, then coated with enamel, and dried in the oven; then ground a second and third time, and coated each time. After the third time they are polished with rotten-stone. If you want to go into it as a business, your best plan will be to advertise for a competent manager, and erect the works under his supervision. The following are some proportions for enamels, but I cannot guarantee them: Calcined flint (ground), 3 parts; minium, 4 parts; nitre, 2 parts; and borax, 1 part. For blue, add to this 1 or 2 parts of oxide of cobalt to 10. Green: 1 or 2 parts of oxide of chromium to 6. Violet: peroxide of manganese, 1 or 2 parts to 30. Yellow: chloride of silver, 1 or 2 parts to 6. Black: oxide of copper, oxide of cobalt, and oxide of manganese, 1 or 2 parts to 15 parts of the first.—M.

Small Portable Forge.—J. B. (*Carrick-on-Sea*).—It is with great difficulty that I can decipher many parts of your letter, so that you will excuse me if I fail to interpret your meaning aright. In the first place, you ask if the forge described (pages 705, 706, No. 149) would weld 1 in. square iron bar. I should certainly advise you not to try. If you put a great weight on the top of bellows, and worked very hard at the handle, you might be able to do so, but even then it would be a great strain on the framework and nozzle, and would very soon wear the machine



Air Tube and Fittings for Portable Forge.

away. For bending and forming 1 in. iron bar, I have no doubt it would be all sufficient, but certainly not for welding two pieces together as you seem to require. Your next question is, Should not the nozzle be higher? I have not specified any height from the bottom of tray, so you may place it to suit your requirements. If you are going to treat rather large work, you might have it higher than shown; but for small work it is plenty high enough. Of course, if you have a fire-clay brick bottom, as I suggested in my article, the height will be of no consequence, as the brick will withstand any amount of heat. You are mistaken about the fuel to use. Breeze is by no means ashes, as you say, but very fine dry coal. Your next question is how to

bend the tube to shape, and keep it in order. In order to bend the tube to the required shape, you must heat it to a good red heat (not white), and then quench the end for about 4 in. in water, and bend round the anvil nose to the required shape. This sounds very easy, but requires great care not to flatten the tube in the operation. Your next suggestion is with regard to having plugs for cleaning the tube. The arrangement is a good one, but on a small forge, such as I have described, it is hardly necessary, as cinders are not very liable to get down the nozzle. In case, however, you wish to make your forge with such an arrangement, I give a rough sketch of tube and fittings. A, A, are two four-way iron gas elbows, tapped at each opening for ¾ in. iron gaspipe; C C is the ¾ in. iron pipe to convey the draught; B, B, B, B, are four square-headed plugs to screw into the open ends of elbows, so as to be easily removed for cleaning; D, D, are two long iron nipples screwed outside to fit into the elbows, the top one fitting through the back nut, tray band, and into the iron nozzle, and the bottom one fitting into the middle board of bellows. I think this will be about plain enough for you to understand. With reference to the forge made by the Britannia Company, of Colchester, I have not seen their list, so cannot advise you. If you send them a legibly written letter, I have no doubt they will give you full particulars.—CYCLOPS.

III.—QUESTIONS SUBMITTED TO READERS.

**** *The attention and co-operation of readers of* WORK *are invited for this section of "Shop."*

Setting Tiles.—PEN writes:—"Will someone kindly instruct me, through WORK, how to fix tiles round a sink-stone? Please give all details."

Fretwork.—W. J. H. (*Shepton Mallet*) writes:—"Will any kind reader of WORK inform me of a buyer for fretwork?"—[Any fancy dealer in any town would be disposed to consider photo frames and the like, if the price suited him. Look up the names and addresses of fancy trades dealers in the directories. Meanwhile, buyers should advertise their addresses in WORK.—ED.]

Ice.—J. J. McQ. (*Drogheda*) writes as to the best way for keeping ice when one has not got a refrigerator.

Armour.—C. J. F. (*Eastbourne*) writes:—"Will any reader of WORK give me the addresses of makers of suits of decorative armour? In London preferred."

F. T. Monogram.—E. A. T. (*Burnham*) writes:—"May I ask if any reader of WORK would kindly give me a monogram of the letters F. T. for painting on a box?"

Stereoscope.—F. (*Bedford*) writes:—"Can any fellow subscriber tell me how to make the interior and exterior of a good stereoscope, to hold, say, fifty slides: one that would, by the turning of a knob or button, bring another view before the eye? I saw one several years ago, and would much like to make such a thing. Also, where could the lenses be got? A working drawing would be much appreciated."

Mackintosh Stains.—J. H. M. (*Co. Meath*) writes:—"Would any of your readers kindly let me know the best way to remove stains from a white waterproof coat mackintosh? I fear soap would injure the texture."

Copper Surface.—W. H. (*Londonderry*) writes:—"Would someone kindly give me a wrinkle to obtain a reddish-pink colour on the polished surface of copper?"

Swing Cot.—W. P. F. (*Wellington*) writes:—"Would any fellow reader of WORK kindly give me instructions how to make a swing cot? I want to make it all of wood (red deal), and stain and varnish it. What I want to know is: what size and kind of joints, whether smaller in the bottom than on the top, and what height the hood ought to be; also, what sort of bearings to rest upon. I have directions for making stand—No. 122, Vol. III."

P.H.P. Monogram.—VULCAN writes:—"I should be obliged for the initials P. H. P. I wish to carve them in relief, so as to stand about ¼ in. off the work."

Working Model.—APPRENTICE CARPENTER writes:—"Would any reader of WORK tell me how to make a model steer itself so that it would come back again, supposing it were a large lake?"

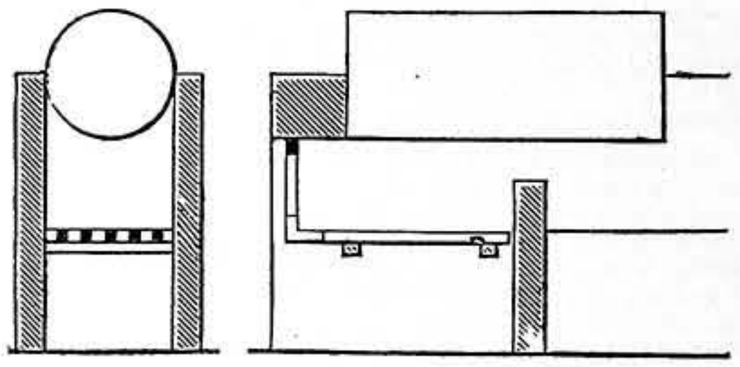
Movable Shed.—AMATEUR MECHANIC writes:—"I want to build a movable shed in *sections*, to rest on brick-work foundation; dimensions: 20 ft. long, 12 ft. wide, 7 ft. high at eaves, and 11 ft. at ridge. Will one of your readers kindly give me the proper scantling of timber for uprights, sills, rafters, to ensure stability without unnecessarily adding to the weight? To be roofed and covered with corrugated sheets. Also, the best size to make the sections for convenience in moving. I thought about 6 ft. by 7 ft. Also, the best way to frame and bolt the corner sections together, and if the roof can be made in sections also, so as not to nail rafters to wall-plate. Would angle-irons to fix rafters to upright and plate be strong enough for a building of this size, and at what distance should they be fixed? I shall mortise all the framework; and I am rather in a difficulty as to the strength and best mode of proceeding with mortises and tenons at the corners (as the house is to be movable). Any other hints, or sketch, will oblige. Will the roof require a tie-beam or rod, or more than one? and are 24-gauge sheets heavy enough?"

Plant Propagator.—BARRA writes:—"I shall feel obliged if some reader would give me, through Shop, details of how to make a propagator for raising plants from seeds, etc., with dimensions and a few working plans."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Working Drawings.—M. (*Bishop Auckland*) writes to CEYLONESE COLOMBO (see No. 153, page 782):—"You will most likely obtain these from some of the following books: 'Cast and Wrought Iron Bridges,' by Wm. Humber; 'Bridge Construction,' by W. D. Haskell; 'Trusses of Wood and Iron,' by W. Griffiths; 'Iron Bridges,' by F. Campin; 'Cranes,' by J. Glynn, from Crosby Lockwood & Son; 'Bridges,' by H. Haupt; 'Long Span Railway Bridges,' by B. Baker; 'Bridges,' by J. W. Grover; 'Bridges,' by R. H. Bow; 'Cranes,' by H. R. Toune, from Spon, Strand; 'Pattern Book for Cabinet-Makers,' from Batsford, High Holborn."

Model Boiler.—M. (*Bishop Auckland*) writes to P. E. G. (*Great Bridge*) (see No. 155, page 814):—



Section of Boiler Setting.

"I send sketch for setting boiler. Use fire-brick above the bars, and form a bridge at the back end of bars, and carry a flue to the chimney."

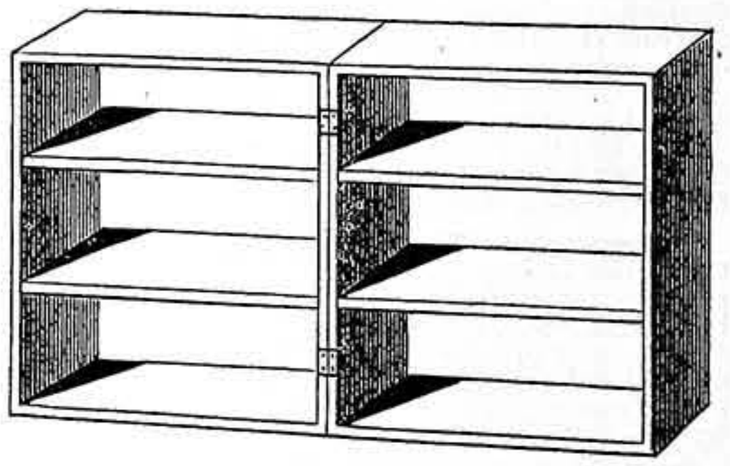
Saw.—W. W. (*Caverton*) writes:—"If E. J. (*Borough, S.E.*) turns up WORK, Vol. III., No. 126, he will find all he requires to make a saw like the one I have."

Upholstery.—M. (*Bishop Auckland*) writes to V. L. (*Bayswater*) (see No. 153, page 781):—"'The Upholsterers' Pattern Book,' price 6s., gives instructions for cutting and making mantel-boards, overdoors, window and bed drapery."

Corrosion in Steam Boilers.—G. T. (*Maindee*) writes to AJAX (see No. 151, page 750), inviting him to test Tweedy's boiler composition.

Glass Tubes.—H. B. S. (*Liverpool*) writes to DROFSABA (see No. 156, page 830):—"You ask for address of glass blower who will supply glass rod, tube, etc. I doubt whether you will get such address. You can get the tube, rod, etc., from any dealer in chemical apparatus. I have always found Burgoyne & Co., of Coleman Street, E.C., very moderate in their charges. The price of tube and rod is about 1s. per lb. Chemical and physical apparatus may also be obtained there. I have no address of manufacturer of these glass things in England. Most of those who supply apparatus are put down as manufacturers, but whether they are so or not I cannot say. They are mostly made in Germany."

Bookcase.—M. (*Bishop Auckland*) writes to R. S. (*Chorley*) (see No. 154, page 798):—"I send sketch of bookcase hinged in the centre; when



Centre-hinged Plain Bookcase.

folded to be fastened with two hasps and lock. If not suitable, if you write again, giving more particulars, I will send you another sketch."

Electric Motor.—M. (*Bishop Auckland*) writes to C. H. (*Clerkenwell*) (see No. 155, page 814):—"Your best plan will be to get a set of castings for the motor from some electrician, the addresses of several of which have been given in WORK; they will supply you with the wire, and give you instructions for making. If you have no lathe, you had better get the armature turned ready and the commutator fitted. You will require one of suitable size for driving a sewing-machine. Would it not be better to light the lamp direct from the battery?"

Amber.—D. (*Holyrood*) writes to S. M. A. D. A. (*Tunbridge Wells*) (see No. 154, page 798):—"I unfortunately broke an amber mouthpiece short off at the thread. I found that I could drill the amber readily by *slightly warming* the drill, and tap the thread in by also slightly warming tap, letting tap remain in until amber hardens again. If too hot, amber will spoil."

Oil Light.—D. (*Holyrood*) writes, in reply to G. C. (*Pendleton*) (see No. 154, page 798):—"The Wells oil light, and others of a similar make, depend on pressure of air or steam forcing the oil through a burner, which is so constructed as to partially, at any rate, vaporise the oil by the heat of the flame itself before it issues from mouth of burner. To start it, of course burner requires to be heated by an independent flame. The vaporised oil burns readily with a large powerful light. It is only suitable for large powers and outside use."

Adhering Composition.—M. (*Bishop Auckland*) writes to F. W. (*South Darenth*) (see No. 152, page 765):—"You might try Prout's elastic glue."

Softening Indiarubber and Metals.—M. (*Bishop Auckland*) writes to LUDOVICUS (see No. 154, page 798):—"You will find a good description of Indiarubber Stamp Making in Nos. 38 and 40."

Cottage Architecture.—M. (*Bishop Auckland*) writes to DORKIN (see No. 157, page 14):—"The following would, perhaps, suit you: 'Cottage Building,' by C. B. Allan, price 1s. 6d. (Crosby Lockwood & Co.); Palliser's 'Model Homes,' 5s.; or 'Cottages,' by W. S. Gerhard, 4s. (Spon)."

Leather Work.—J. H. H. (*Robert Town*) writes, in answer to J. B. M. (*Blairgowrie*) (see No. 156, p. 830):—"Leather work is a work which would be difficult to learn by book. You should write to W. H. Wood, Ashton Clough Road, Liversedge, for information as to materials, etc."

Magnetism.—EDDIFRA writes to BEGINNER (see No. 152, page 765):—"Bars of steel may be magnetised by inserting them in a hollow bobbin of thin wood wound with several layers of thick copper wire. A powerful current is then sent through the wire, contact being made and broken several times. They can also be magnetised by stroking with the poles of a powerful electro-magnet."

Ornamental Brass Castings.—A. G. (*Sheffield*) writes to J. P. (*Accrington*) (see No. 152, page 765):—"For these, apply to Messrs. Horton & Son, Brass Works, Bailey Street, Sheffield."

Mill Bills.—AN OLD HAND writes to W. H. J. (see No. 155, page 814):—"Mill bills, or mill picks, require very careful forging; any increase of temperature above a blood-red is detrimental to the quality of the steel. When carefully forged down to the required thinness, you may heat them to a blood-red, and quench them quickly in the following: three gallons water, 1 oz. of oil of vitriol, 2 oz. of common soda, and, say, a tablespoonful of salt. Let the bills remain in until they are cold. If the stones are French burrs, the following is very good: three gallons water, 3 oz. each of spirit nitre, spirit hartshorn, white vitriol, sal-ammoniac, alum; add a handful of salt, and use as above."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—C. E. W. (*Leeds*); H. A. H. (*Chatham*); AMATEUR LITHO.; G. J. S. (*Arundel*); J. H. (*Leeds*); CAP-A-PIE; CONSTANT READER; J. E. (*Harrogate*); J. E. B. (*Butterwick*); H. & S. (*Manchester*); L. S. & SONS (*Redditch*); V. L. (*St. Leonard's-on-Sea*); D. W. H. (*Tredegar*); J. J. T. (*Liverpool*); LUDLOW; S. & J. (*Lhanbryde*); G. E. E. (*Mildmay Park*); T. D. (*Gateshead-on-Tyne*); S. & CO. (*London, E.C.*); X. Y. Z. (*Liverpool*); A. M. (*Glasgow*); S. R. (*Withington*); F. M. (*London*); ANXIOUS; A LADY READER OF "WORK"; F. T. (*Stoke-on-Trent*); E. H. (*London*); S. M. A. (*London*); W. C. (*Banbury*); W. J. (*Birkenhead*); W. B. (*Newton Heath*); W. H. (*Leeds*); ANXIOUS; AMATEUR; H. G. (*Lewisham*); A. E. S. (*Glasgow*); J. K. (*Bradford*); G. A. H. (*Leeds*); M. I. N. E.; INCLINE BRAKESMAN; A YOUNG READER; VULCAN; A. B. C. (*Darlington*); E. P. (*Southampton*); W. C. G. (*Bowes Park*); Q. J. D. (*Fairfield*); J. O. R. (*Culross*); KORRIC; A. W. J. (*Phipps St.*); H. B. (*Finsbury Park*); G. C. (*Longton*); J. E. S. (*Leytonstone*); H. S. (*Pimlico*); T. E. H. (*Leeds*).