WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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WORK WORLD.

ALUMINIUM is used for railroad carriage window frames in Switzerland.

* *

A small electric fan, for domestic use, is driven by a single dry cell.

* *

Screw propellers of the new Cunard liners are made of Parson's manganese bronze.

* *

The largest telephone switch-board in the world, at Berlin Exchange, has a connection of 7,000 wires.

* *

A farmer, sinking a well, has struck a rich lode of tin in the neighbourhood of Redruth, Cornwall. The yield is estimated at one hundredweight per ton of ore. A rich find!

* *

"It's an ill wind!" The cholera scare has sent up the price of bleach and other chemicals to a high rate in the North of England chemical factories.

* *

The largest American flag ever made will float from the lofty "Liberty pole" in front of the Administration Building at the World's Fair.

* *

Nottingham lace companies think that America is the place for the industry, and some are preparing to move their plant there. Nottingham mill lace machines are being shipped. Smart America!

* *

A treaty of commerce between Germany and the United States of Colombia will enable the Colombians to send tobacco, nuts, coffee, and sugar in exchange for all kinds of German manufactures.

* *

Some industrial establishments in the States are to fight the fifty-five-hour law. The Singer Company, employing over 4,000 operatives, has revolted, and after obeying the law for one week, resumed the old hours.

Slot machines for issuing railway tickets are used on the Berlin "belt railway." The machines can deliver tickets at the rate of forty-three per minute. Wanted—something of the kind on English excursion lines.

* *

Rhymers made with twisted or spiral flutes are handy for rhyming out the holes in small bosses where the keyways have been cut. This would be impossible with a straight, fluted rhymer. The twisted flutes will cross the keyway at an acute angle.

* *

Electric welding is fast becoming universal. The use of a flux is unnecessary. Electricity is now employed for making forgings, augers, railroad spikes, ball bearings, and many other articles hitherto made by hand.

* *

A new French explosive, Herculite, is a yellowish-grey powder, composed of sawdust, camphor, nitrate of potash, and several substances that are kept secret. It cannot be fired by sparks, flame, or detonation. At a trial, a half-pound charge of the compound displaced a block of stone of thirty tons.

* *

The Welsh tin-plate trade is depressed, and about sixty tin-plate works in South Wales are stopped. Large numbers of operatives have sailed for the United States of America, where new mills are being erected by Welsh proprietors. So much for the McKinley tariff.

* *

The Valorrette Falls, Switzerland, are to be utilised. 6,000 horse-power can be obtained. One establishment — an aluminium factory—is taking 1,000 horse-power. One turbine is connected to a dynamo, which gives 4,000 ampères at 500 volts.

* *

A new method of hardening plaster casts consists in tempering the plaster with a concentrated aqueous solution of dialysed silica, which causes the plaster to set rapidly. The work may be immersed, or receive several coats of the same solution, after which it is cooled by a solution of baryta heated to 60° centigrade.

A simple and ingenious device may soon be attachable to all bottles containing poisons. It consists of a mechanism so arranged that every time the bottle is lifted or moved it rings a little bell. This should prove useful, but where people *will* take poison, "Big Ben" or a whole peal of bells might prove useless.

* *

Californian wine cellars are overstocked, and grapes are sold for one-third of the price four years ago. San Francisco dealers have 12,000,000 gallons stored in their vaults, and it is estimated that the producers have from 50,000,000 to 60,000,000 gallons on hand, and are making from 20,000,000 to 25,000,000 gallons each year. $14,400,000 or so are locked up in the wine casks of California.

* *

Hitherto, the artistic skill of the Japanese has been turned to the production of beautiful ivories, bronzes and pottery, and daintily lacquered and painted fans, screens, and umbrellas. Now the "Japs" are taking contracts for swords and rifles, which need not surprise anyone, since the excellence of their work enables them to undertake the whole range of hardware, even to rifled guns, steel projectiles, and armour plates.

* *

A railroad fare of $1 to Chicago during the World's Fair for all working men in the United States living within 1,500 miles of Chicago is broached. The railroads can carry the business with a margin of profit. So also might the railway companies of this country do infinitely more for the British workman. Why should he, on a wage reduced to its very minimum, be forced to pay fares to and from the scene of his employment, which seriously hamper his efforts for those dependent upon him?

* *

The difficulty caused by leaky boiler tubes seems to have been overcome in the case of H.M.S. *Thunderer* by using malleable cast-iron ferrules entering the tube for a length equal to its diameter, but it only bears—with a driving fib—upon the tube for about half its length, *i.e.*, well inside the tube plate. The rest of the ferrule is turned down clear of the tube, and its outer end is made clear of the projecting end, and bears against the tube plate. The end of the tube is encased and protected.

ORIGINAL DINING-ROOM BUFFET.

BY F. JERMAN.

INTRODUCTION — SIZES — STYLE — ACCOMMODATION AND DESCRIPTION.

THE chief desiderata in a dining-room buffet are—fitness for the purpose for which it will be used, simplicity of construction, convenience of access to all the parts, and character or style which shall most reflect its use ; and I think this design will be found to embrace all these points. Meaningless ornament and not-get-at-able cupboards I have eschewed, as they are entirely out of place in such an article. On plan, the best form it should take is a square ; canted corners could be introduced, and would be very useful if the buffet is intended for a small room, but such an arrangement would entail more work in framing the different parts together, and there would be less room for side dishes and "removes." This latter accommodation is a great object to be desired in a buffet, and for the purpose of giving still more room, a cupboard front or the two sides are arranged in some examples to fall down, being supported on brackets or otherwise.

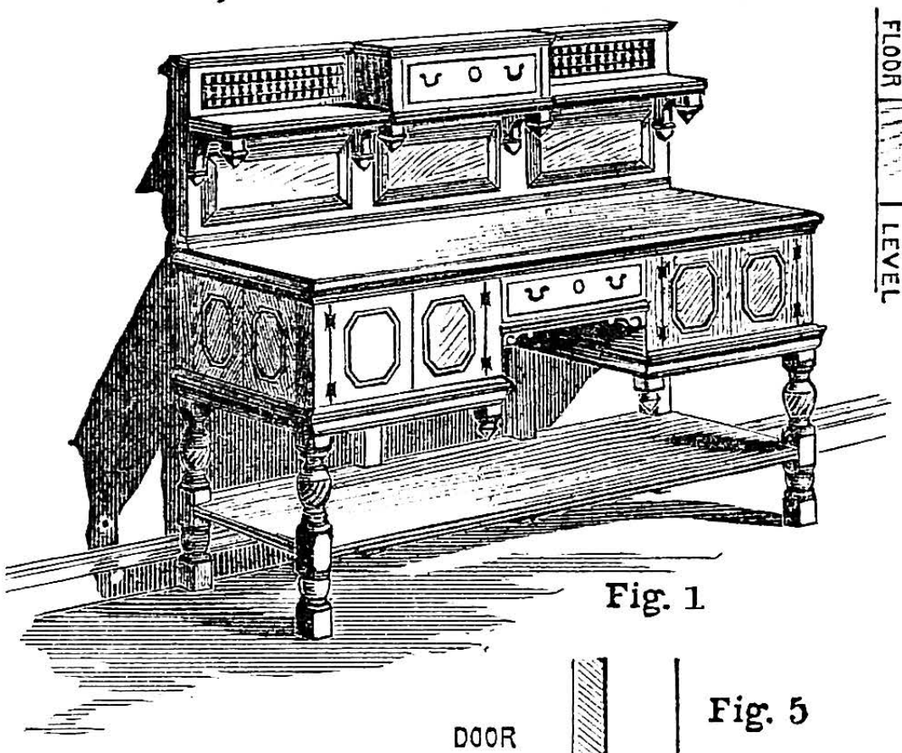


Fig. 1

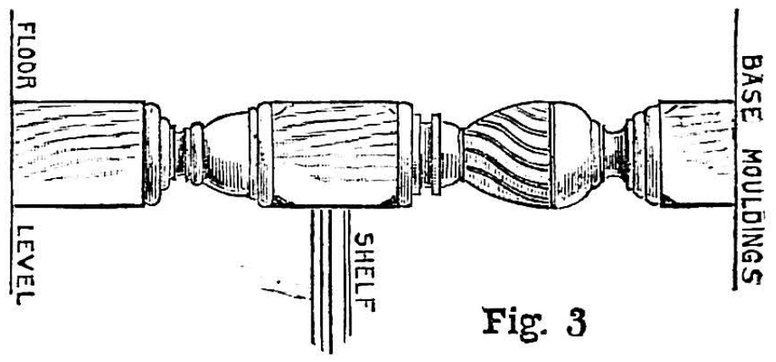


Fig. 3

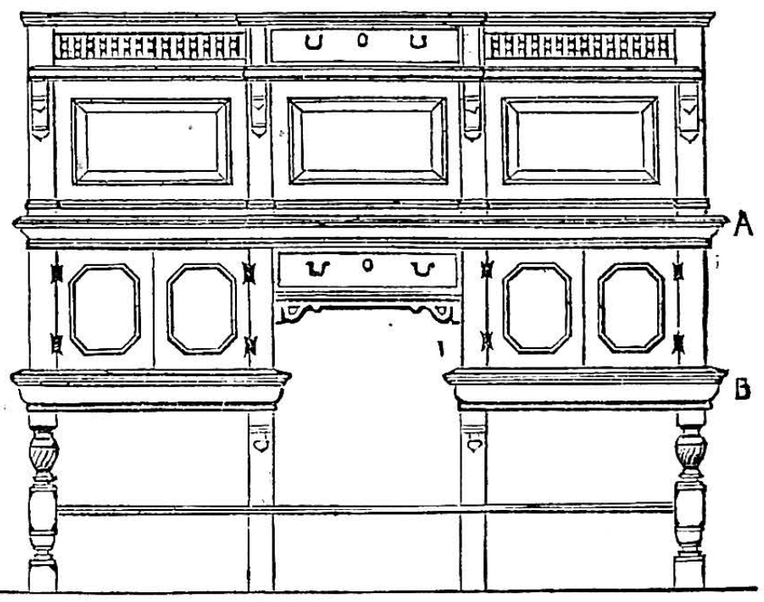


Fig. 2

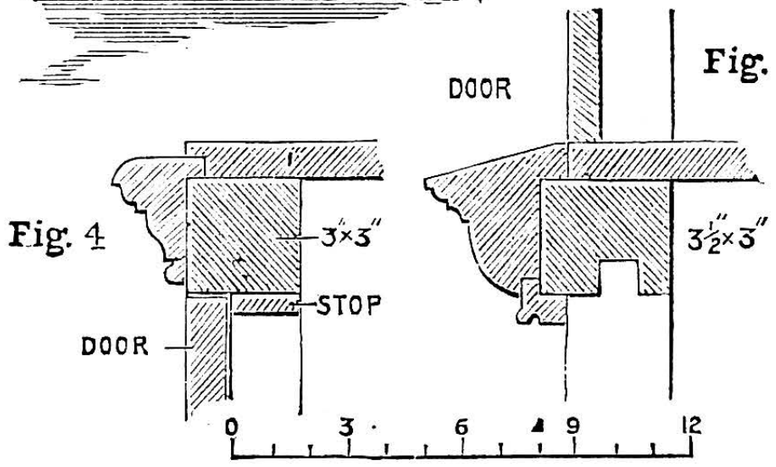
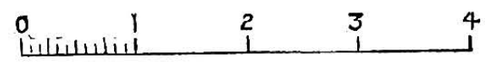


Fig. 4

Fig. 5



Dining-Room Buffet. Fig. 1.—Perspective View. Fig. 2.—Front Elevation. Fig. 3.—Detail of Turned Legs. Fig. 4.—Detail at A. Fig. 5.—Detail at B.

The size of this sideboard or buffet (please pronounce the word *buf-fay*) is 6 ft. long and 2 ft. 3 in. wide. Heights, 3 ft. 3 in. to the top, 4 ft. 6 in. to the shelf, and 5 ft. the total height. The space under the lower shelf is 9 in. There is a great advantage in fitting it at a good height above the floor, as in this example, because free access is allowed for the dusting brush, and the space below can be thus easily cleaned without lifting about the buffet, which will be found to be rather a lumpy article.

As regards style, I should say the design has a Jacobean feeling which is betrayed by the square massive appearance, the mouldings, and other details.

The framing is 3 in. by 3 in., and the turned posts and pendants are the same size. For details of the posts, see Fig. 3. Of course, the best wood to use is oak, the darker the better, rubbed down, when finished, with oil. The brackets can be made out of 2 in. stuff, and for shelves 1 in. will be sufficient.

A table-cloth drawer is provided in the buffet, with ornamental brackets below and a two-leaved cupboard or cellarette on each side. The method of giving the octagonal shape to the cupboard doors is to make the framing and panels up square in the usual way, and stick on triangular pieces in corners of the panels, making them level with the frame ; then run moulds all round the octagon, carefully cut at the joints. In the framing of the back, instead of the three wood panels, bevelled mirrors might be introduced, and would have a very good effect. The top shelf is a handy stand for glass, and the small drawer in the middle is intended to accommodate cigars, etc. The two open spaces at the back of the shelf are filled in with spindles ; they should be turned somewhat similar in style to the legs in Fig. 3, but reduced to about 1 in. or ¾ in. in diameter.

TURNING AND THE TURNERS' COMPANY.

IN October the Worshipful Company of Turners propose holding their Twenty-third Annual Prize Competition, which it is to be hoped will be productive of a good collection of creditable turning. We draw special attention to this competition because among the tens of thousands who subscribe to WORK a very large number are lathe workers. What strikes us particularly in connection with this prize competition is the extreme poverty—for a City Company—of the prizes offered to journeymen and apprentices to induce them to exhibit. It is unreasonable, indeed, to expect that workers —whether professional turners or amateurs who use the lathe as a hobby—will be moved to great efforts or risk their handiwork in transit to and fro for rewards which would come out ridiculously mean if calculated at an amount per hour. A City Company should be able to rise superior to this kind of liberality, and offer inducements at any rate superior to those of the commercial man and private tradesman. If we mistake not, the Turners' Company do plead poverty, though on what grounds is not so clear to us. Surely the actual prize money indicated in the announcements of this approaching competition cannot be all that a great civic company—pledged to the interests of the turners' craft—would spend, annually, to conserve and advance the art with which they are so greatly concerned ! If so, British workmen had better throw up the sponge. Another matter. This year we note the Competition Committee have cut out the amateur class altogether. This, we submit, is a very ill-advised step. It is true that the "Certificate" given in this class may have the value of 6d., or less. Nevertheless, amateurs particularly regret the disappearance of a section which, we unhesitatingly assert, always proves one of the most interesting features in any competitive exhibition. Much regret is expressed by amateurs on this point. One—an amateur turner of great ability and good position—writes to us :—

"I have attended these exhibitions some four years on prize day, but no speaker has ever alluded to the amateurs, though in 1889 the *Yorkshire Post* said, 'The show was only saved from absolute condemnation by some exquisitely beautiful work of an amateur.'

"The amateurs do more for turning than any other class, because having money, they try new schemes and inventions—most of which are failures, but a few are great advances.

"I know a manager of a large works who has taken up ornamental work as a hobby, and he is greatly disgusted that he cannot show multiple spirals cut out in separate strands upon an ordinary guide screw lathe —all the tools made by himself."

So much for the cause of the amateurs, who it seems a folly to neglect, seeing that the Company are anxious to get in touch with technical colleges and institutions ! The amateur element is the backbone of these technical schools, wherein an apprentice joins classes not merely to qualify himself in his particular trade, but to enable him to gain an insight into some allied trade, which he should know, but to which he has not been indentured. Thus these two aspects of the forthcoming Turners' Competition clash with each other. For the sake of the professional element, however, who are invited to compete, we could have wished that the inducements had been on a more liberal monetary scale. As it is, we can only hope that the exhibition will prove a success ; that the old grievances about preference for work done by particular lathes will not find vent again ; and that the Company itself will have reason to be sufficiently moved to a fuller sense of the widespread interest it could, and should, arouse by more liberally stimulating these annual competitions. Hard cash is what a professional workman wants to pay his expenses and to buy tools for his lathe which he cannot otherwise get.

WATCH AND CLOCK CLEANING AND REPAIRING.

BY A PRACTICAL WATCHMAKER.

CLEANING A GENEVA WATCH.

THERE are two reasons why a watch should be cleaned : first, it may be dirty—that is, particles of dust, grit, fluff, etc., get in through the openings in the case, or are

introduced by the key, and clog up the pinions; or, secondly, it may be perfectly *clean*, by reason of the cases fitting well and good usage, but the oil with which it was oiled, say three years ago, has now all dried up, and got sticky; thus pivots stick in their holes, the coils of the spring stick together, and the watch refuses to work. It is well that it does so; for if it still went on after the oil had dried up, careless wearers would let it go till it "struck" and the pivots had worn completely off. They very soon do this if they run without oil.

The remedy for either is to take it all apart, as before described, and put the parts in a pot of pure benzine for a few moments. This dissolves off all the old oil, and loosens any dirt there may be. After taking the parts out of the benzine, they are dried. They soon dry if left upon the paper a minute or two.

I may here say that great care must be exercised in uncovering the benzine-pot *near a gas-jet:* a flash may ensue, and endanger, perhaps, the sight of the operator.

When dry, a soft watch-brush, charged with a little dry chalk (billiard chalk does capitally), is used to clean and polish up the plates, wheels, etc. The pieces are meanwhile held in the hand in a piece of tissue-paper, to prevent moisture from the hand soiling them. If the reader buys a *new brush* for this purpose, he had better scrape the hair well over the sharp edge of a knife, and charge it with chalk, and brush hard and continuously over a piece of burnt bone; then wash it in soap and water, and dry thoroughly. This will take the rough edges off the hair, and fit it for brushing delicate objects like 'scape-wheels, etc.

Now, taking the watch we have before us in pieces, put the plates, cocks, and wheels into the benzine; then, taking the barrel, pull out the mainspring. Put the barrel, cover, and arbor into the benzine with the rest, and fold up a small piece of tissue-paper, and, holding this in the tweezers, thoroughly wipe the mainspring free from all grease. If it is very sticky, dip the paper in benzine and wipe as before. Take out the barrel, cover, and arbor from the benzine, brush them quite clean, and take one of the pieces of pegwood from the bundle. Sharpen this to a point, and with it clean out the holes in barrel and cover. This done, the spring must be replaced. It is very easy to put a mainspring into its barrel if it is set about the right way. It will be observed that inside the barrel is a hook, very shallow, but sufficient to hold the spring. Upon this hook place the outside eye of mainspring, taking care that it is coiled round the right way—a moment's thought will decide this—then slowly coil the spring in, beginning with the outside coil, and pressing each one down as you go till it is all in.

This description applies only to a ¾-plate movement—the most common; but if a bar-watch is being cleaned, the barrel-work will be found altogether different. In this case the barrel, etc., comes away with the bar as if it were in one piece. Having unscrewed this from the plate, first remove the brass cap covering the ratchet at the top of the bar; then remove the stop-work underneath the barrel, prize off the cover with a screwdriver, and take out the spring. This done, grasp the winding-square in the jaws of the sliding-tongs, and take hold of the steel arbor inside the barrel by its *largest part* with a pair of pliers, taking care not to injure the hook, and, using some force, unscrew it from its centre. When off, the barrel, bar, and arbor all come apart easily. The large part of the arbor which was unscrewed locks the whole together. Occasionally this does not screw on, but is pinned through, in which case the pin must be pushed out with a steel point held in the pin-vice. Fig. 15 shows the arrangement of bar, barrel, arbor, etc.: A is the part that screws off and liberates the whole.

When apart, clean all as before, and put together again. To do this, hold the square in the sliding-tongs or a "Birch" watch-key, put a *small* quantity of watch oil (obtainable at watch materials shops), by means of the oiler, upon the shoulders where the bar and barrel turn, put the latter in position, and screw on the arbor-nut once more, taking care it is the right way up. This can be ascertained by noticing the direction of the hook, and remembering that the pull of spring tends to screw up the arbor. This done, hook on the *inside* eye of mainspring, and wind it in with a key on the winding-square, guiding the outside coil of the spring into the barrel with the thumb of the left hand. When the spring is in, see that the outside eye is upon the barrel-hook. If so, all is right. Apply a considerable drop of oil to the top of the coils, another to the bottom of barrel inside, to lubricate the spring, place a little on shoulder, where the barrel-cover turns on arbor, and snap the cover on. For a guide to placing the cover on in the right position, a dot will be found on the edge of the barrel, outside, opposite which the opening in cover must go. If a ¾-plate watch, serve the spring the same as regards oil, put some on shoulders of arbor where barrel and cover turn, and snap cover on.

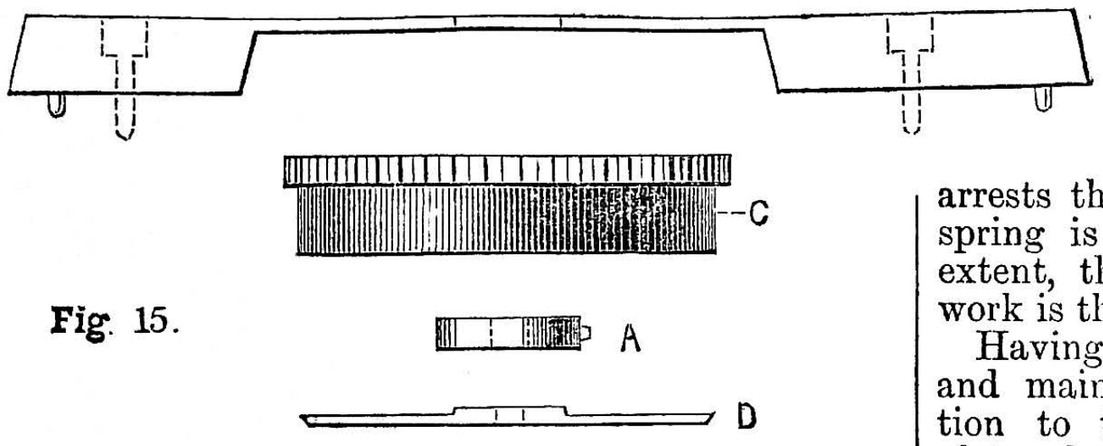


Fig. 15.

Fig. 15.—A, Screwing-off Part; B, Arbor; C, Barrel; D, Cover.

We will now consider the stop-work, which is the same in both cases. Fig. 16 shows the arrangement. Without any stop-work the spring would make about five turns of the barrel, and when wound up would strain both the eye of spring and the barrel-hook. Therefore, for the purpose of utilising the middle four turns of the spring, and saving the strain when wound up full, stop-work is introduced. It will be seen to consist of two pieces: a star-wheel and a stop-finger. The star-wheel has five notches in it, and of the five solid pieces between, four are curved hollow and the fifth is left round, forming an abutment for one of the shoulders of the stop-finger. Now, if the winding-square is held firmly, and the barrel given half a revolution in the direction which winds up the spring, the star-wheel being placed in position on the cover—if, when like this, the stop-finger is placed upon its square on the barrel-arbor in the position shown in Fig. 16—it is evident the barrel cannot return. In other words, the mainspring will be permanently wound up, or "set up," half a turn. This is as it should be. Now, in this position it can be wound by means of the key or sliding-tongs (holding the barrel in the hand) *four turns*, at the completion of which the shoulder of stop-finger again comes into contact with the solid division of the star-wheel, and arrests the winding half a turn before the spring is actually wound up to its full extent, thus saving all strain. The stop-work is the same in all Geneva watches.

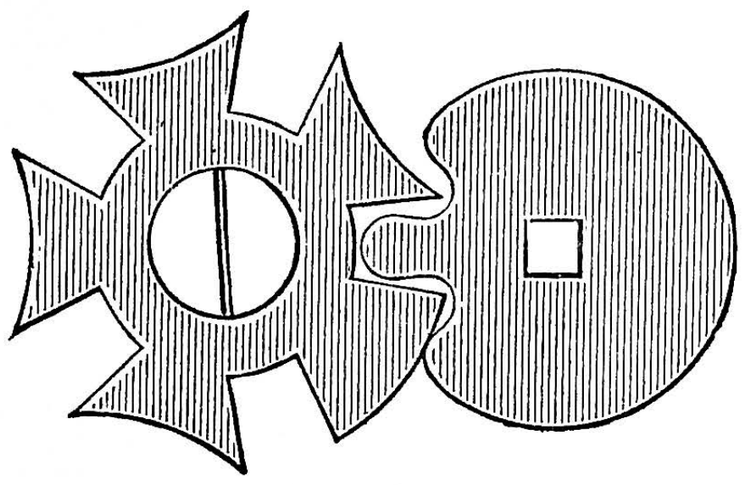


Fig. 16.

Fig. 16.—Stop-Work Arrangement.

Having thoroughly cleaned the barrel and mainspring, we will turn our attention to the parts in the benzine—viz., plates, bars, and wheels—all, in fact, except the balance and accessories. Take these out one at a time, dry them, and brush clean, putting them aside carefully when done. All pivot-holes must be cleaned out with a fine-pointed peg. Pivots are dug hard into the pith to remove any traces of benzine. The spaces between the leaves of the steel pinions must be carefully cleaned out with a pointed peg. The 'scape-wheel needs especial care: it is so brittle and fragile, and its pinion so small, that great care is necessary in pegging it out clean.

Having cleaned all these parts, the movement may be put together again so far. Take the plate in a piece of tissue-paper in the left hand, and with the tweezers in the right, place the barrel in position, first oiling its pivots slightly. If a bar-watch, the process scarcely needs any directions, except that care must be taken to screw all bars *home*—not to force anything. The centre-wheel pivots must be oiled before putting the wheel in; the third, fourth, and 'scape-wheel pivots are oiled after the wheels are in.

If a ¾-plate watch, put in barrel and centre-wheel, oiling their pivots as before; also the third and fourth wheels. Then place the top-plate carefully upon the pillars, and with the tweezers place the third and fourth wheel-pivots carefully in holes in top plate, and in no case use much pressure in pressing it down, or broken pivots will result. Screw it down, and see that all the wheels run quite smoothly and free. Each one should have perceptible "end-shake" between the plates—that is to say, they must lift slightly up and down. Then place the 'scape-wheel in position, and screw the cock down carefully. If it has no "end-shake," before screwing down the cock, place a minute piece of tissue-paper under the inside end, and screw down again. If it has too much (it should only be *just perceptible*), put the paper under outside end instead. See that this also runs free. Now push in the centre arbor, and, turning over the movement, push on the cannon-pinion, seeing that all goes well home. If a bar-watch, the winding-work will already be in position; but if a ¾-plate, put the steel ratchet-wheel on the winding-square,

polished side up, and the "click" in its place, and screw on the cover again, as before the watch was taken apart.

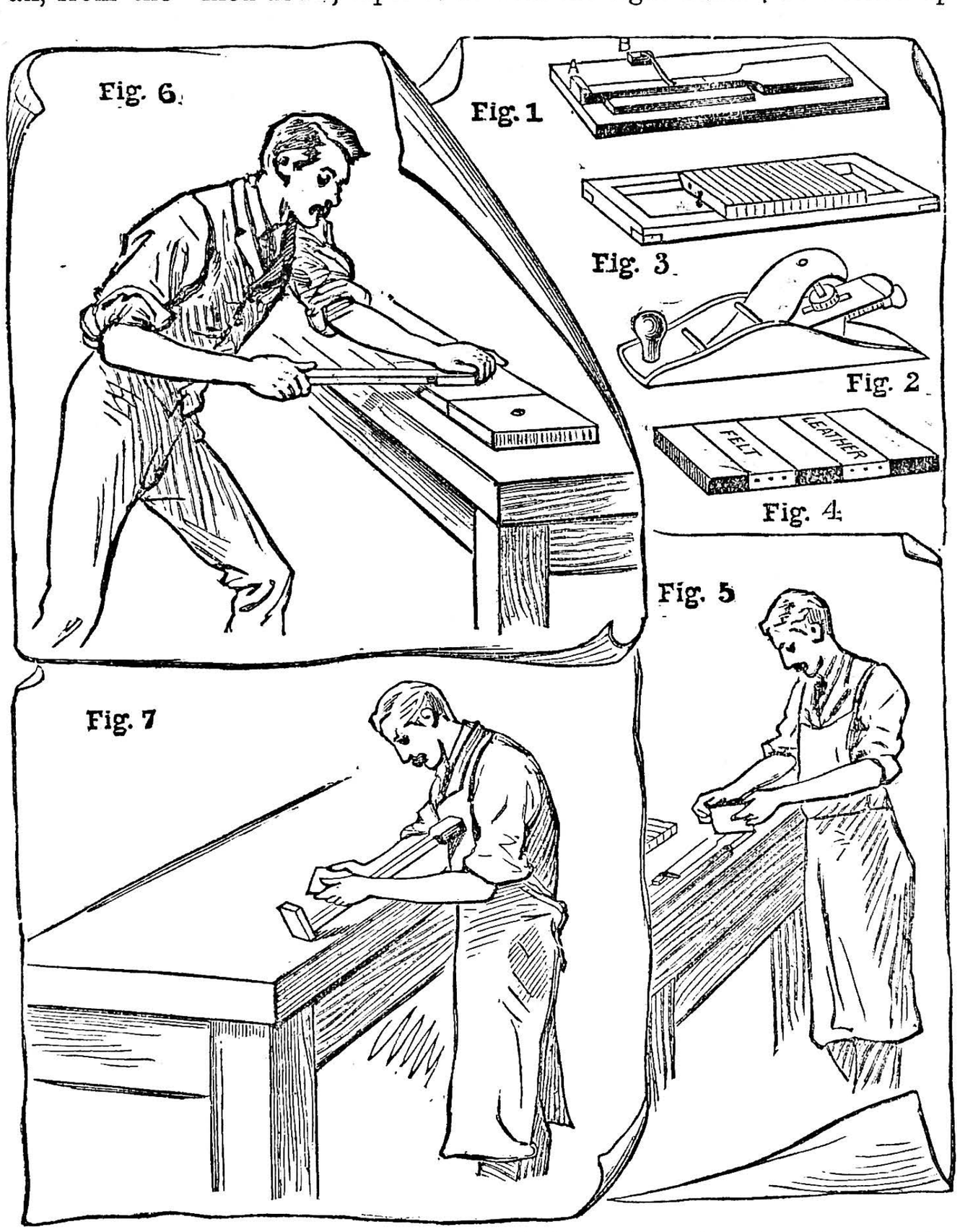
We now come to the balance—the heart and lungs of the watch—and more care than ever is needed in its treatment.

Before anything can be done in the way of cleaning it, we must disconnect the balance from the balance-cock. It will be seen that the outside end of the hairspring is passed through a hole in a brass stud affixed to the balance-cock, and kept there by a small pin. Do not disturb this, but detach the spring, stud and all, from the balance-cock. To do this, rest the edge of the brass, close against the stud, upon the end of the vice, and with the point of the tweezers push it through from the top. This done, the balance and hairspring will come apart from the balance-cock. The latter can be taken apart and cleaned with benzine, etc., as before, and screwed together again, the hole being pegged out carefully, and the "end-stone" wiped clean. The balance-pivots are cleaned with pith. The cylinder, its axis, is pegged out carefully, and very lightly brushed. The rim of the balance may be cleaned by resting it on a piece of cork in the vice and rubbing with pith. When done, place a minute droplet of oil in the top pivot-hole, and, laying the balance-cock flat upon the board, place the balance on it in position, and press the hairspring stud carefully home again. See that the hairspring plays freely between the two pins in the regulator.

Now take the movement, and apply oil in minute quantities to the bottom pivot-hole of the balance, a little to each tooth of the 'scape-wheel, to the 'scape-wheel top pivot, and the top pivots of the third and fourth wheels. The balance can now be very carefully put back in the watch and screwed down, care being taken to see that it is quite free and has correct end-shake. This can be obtained by means of tissue-paper, as before described. The watch can then be wound. If correct, it will at once start off.

If the watch in hand is keyless, the keyless wheels will have to be cleaned in the same way as the other wheels, and oil applied wherever there is friction in winding. Care must be taken to replace everything exactly as it was found. Any directions as to details of the keyless work would be quite useless, on account of the numerous varieties of keyless work in use. Hardly any two watches met with at random are alike. I will merely say that very often one of the large steel wheels upon the top plate or barrel bar, as the case may be, is fixed on by means of a *left-handed screw*. If this is borne in mind, it may save a lot of time and temper in trying to withdraw it as if it were a right-handed one.

Having put the entire going part of the watch together, it must be laid upon a clean part of the paper on the board, dial side up, and all the bottom pivots properly oiled. The motion-wheels can then be brushed and replaced, and the dial cleaned and put on again. If a pinned-on dial, and the pins are bad or deficient, file up fresh ones with the pin-vice, resting them on a piece of boxwood screwed in the vice. The boxwood has a shallow groove in it to accommodate pin. As the pin lies in the groove, the pin-vice is revolved in the left hand; while it is being filed down, taper to fit with the right hand.



Keys of Musical Instruments. Fig. 1.—Block to hold the Keys for planing, scraping, and glass-papering. Fig. 2.—Suitable kind of Plane. Fig. 3.—Frame for Organ and Harmonium Keys. Fig. 4.—Polishing Board. Fig. 5.—Position on the Bench as regards Light and Method of holding the Scraper. Fig. 6.—Polishing Keys. Fig. 7.—Holding the Keys for scraping the Woodwork at the Back.

The hands can now be put on and the movement returned to the case, which is also to be thoroughly cleaned and freed from dust.

This is the whole process of cleaning a Geneva watch. Repairs will be dealt with in the next and following papers.

HOW TO IMPROVE THE KEYS OF MUSICAL INSTRUMENTS.

BY LIFEBOAT.

PLANING AND SCRAPING — POLISHING IVORY—POLISHING CELLULOID—FRONTS OF KEYS—CLEANING THE WOODWORK — ENAMELLING THE FRONTS—NOTES AND USEFUL HINTS.

Planing and Scraping.—To hold the keys, we shall require a block, as shown in Fig. 1. Take a piece of wood about 20 in. long, 4 in. wide, 1 in. thick. Screw this on the bench. Lay a key on about 1 in. away from the front edge and 2 in. from the left end. Now take two pieces of wood ½ in. thick, 1 in. wide, 6 in. long. Lay these on each side of the key, bringing the front ends against the shoulder of the key. Nail or screw them in position, so forming a groove.

It should be here noted that the keys at the extreme ends of the key-board are wider than the others. In fastening on these strips, use as a guide a G, A, or D key, which have shoulders on both sides. The end keys may be worked up separately.

Organ and harmonium keys may require a ⅝ in. hole bored through the board, to allow the regulating-screw or coupler-stud to pass, or the key will not bed level.

To keep the keys from jumping up when planing or scraping, it is advisable to put a grooved block at the tail end, as marked A in Fig. 1, though personally I prefer and use a spring, as marked B, for the purpose. An action or pedal spring is used, one screw only being used, so allowing the spring to turn on or off as required. The small American iron planes, as sold at about 1s. each, will be found a useful tool; but such a one as shown in Fig. 2, and sold at about 2s. 6d. each, is preferable, as by the milled nut at the top of the plane-iron they can be regulated to such a nicety. Should neither of these be available, a sharp, finely-set smoothing-plane will render good service, though I have seen scores of sets of keys done by the aid of a steel scraper and glass-paper. The plane, which must be sharp and finely set, is of use only in the case of ivory and bone. For celluloid it is useless: the scraper must be relied upon. From this it will be seen that, though a plane is useful, it is not absolutely necessary, since, in capable hands, the steel scraper will do all that is required. For instructions how to sharpen a scraper we refer our readers to an article by "Chopstick" in No. 134, page 474, Vol. III.

Having at hand a supply of No. 1 and No. 0 glass-paper (sheets cut in four), and a cork rubber about 3 in. long by 2½ in. wide, such as can be bought at most cork shops and tool dealers for 4d., put a key in the block, and, by the aid of plane or scraper, take a few shavings off, taking care not to go down lower on one side than the other. This done, take the rubber and a piece of No. 1 glass-paper, rub lengthways till it looks quite smooth and level, and finish with No. 0, taking it up from the block to set on the board again in the order in which it was taken up. Whilst still holding the key in the left hand, with the right hand take a piece of No. 0 paper, and take off all sharp edges previous to polishing.

Polishing Ivory.—As the bulk of our

readers will require to do only one or a few sets, it is needless to speak here of the machinery, such as revolving bobs, as used in the factories, especially for celluloid. For our purpose it is enough to procure a piece of board about 2 ft. long, 8 in. or 9 in. wide, 1 in. thick. Plane up one side and edges. To the top of this, on the left-hand side, must be affixed a piece of felt or cloth; on the right side a piece of chamois, buff, or wash-leather. This must be affixed so that no nails or tacks show themselves on the upper surface. This means that the felt, etc., must be long enough to allow it to be fastened on the front and back edges, as shown in Fig. 4. The board being screwed to the bench, and the felt or cloth well rubbed with clean whiting, and made fairly wet with methylated spirits, and the chamois sprinkled with dry whiting, or, better still, putty-powder, take the keys one at a time, turn face downwards, and rub the ivory to and fro on the felt, putting on pressure with the left hand, as shown in Fig. 6. With a clean piece of rag wipe off any surplus wet and whiting, and polish dry on the leather.

Polishing Celluloid.—It is better not to use the same board indiscriminately for both kinds of keys. For celluloid we require a similar board, but instead of whiting and spirits on the felt or cloth, we require either putty-powder and linseed oil, or very fine pumice-powder and benzoline, though I have found pumice-powder and Russian tallow answer the same purpose. These ingredients to some readers may seem so contrary in their composition; so is celluloid. In practice it will be found that one set will take a better polish than another, and some better with putty-powder than pumice. Personally, I prefer the latter, on the score of cheapness and cleanliness, as any oil on the wood will, unless scraped off, cause dirt to cling to it. If one plan does not give a satisfactory polish, try the other, or both in combination. In any case, finish off with dry putty-powder. Some remove any trace of greasiness that may be left by rubbing with the palm of the hand, first dipping it in flour.

Fronts of Keys.—We have so far only treated of the tops of the keys. If the fronts are covered with the same kind of covering as the tops, they will need the same treatment. Should they, however, be faced with wood, either moulded or plain, as will be found the case in the older class of instruments, a wonderful improvement will be gained if the fronts are enamelled to match the tops. But of this more anon.

Cleaning the Woodwork.—All the fronts and tops having been polished to our satisfaction, take the house bellows and dusting brush, and remove all the dust from the instrument—first taking out the black keys, and placing them on a separate board—taking care not to remove the cloth or paper washers, which will probably be found on the front key-pins. Before putting the keys back in their places, a still further improvement is gained if the woodwork part at the sides, from the front to the shoulder and the back, is cleaned. This is done by the scraper. The sides are done first, holding the scraper in the right hand, the key in the left. For the backs, however, we shall need a piece of wood, fastened on the bench, against which to press the end of the key, holding the scraper in both hands, as shown in Fig. 7, and finishing, if necessary, with glass-paper wrapped round a flat piece of wood.

Enamelling the Fronts.—If the fronts are left in wood and have turned brown with age, cleaning with methylated spirits and rag in the case of the moulded ones, and scraping in the case of the plain ones, then giving them a coat of white hard varnish, is an improvement. Should this not be deemed up to the mark, and it is decided to enamel them to match the tops, we must, *previous* to the scraping of the woodwork, put the keys back again in their places (white keys only). We then require a strip of wood 3 in. wide, ¼ in. thick, of a length that will reach the whole width of the key-board. This we insert under the whole of the keys, letting it rest on the front row of pins, and projecting forward about 1 in. Insert a piece of paper or cardboard at the extreme ends, between the last key and the key-block, to prevent the enamel getting thereon.

The enamel is made by mixing some "flake white" with white hard or transparent spirit varnish. Carefully strain before using. But it is far better and cheaper to buy a small tin ready prepared. I have found the Foochow brand (4½d. per tin) to be good. It should be carefully applied to the fronts with a camel-hair brush several times, till the desired result is gained. If the tops of the keys are not quite white, as in the case of ivory, it will be found that the enamel is *too* white. The required tinge to make them match properly can be gained by adding to the enamel a small quantity of ordinary brown polish or varnish.

Allow an interval of at least fifteen minutes to elapse between each coat. After the last coat, allow an interval of at least an hour to elapse before removing the strip of wood. Then let them stand overnight to thoroughly harden. Then take them up, and scrape off the surplus enamel, sides and backs, as previously advised.

Notes and Useful Hints.—This improvement of keys may from this appear to be a tedious affair. This is not so; for if the fronts are not enamelled, which necessarily takes time to harden, it is quite possible to do a set in four hours. It is desirable that all planing or scraping be done in daylight, with a good side light, as shown in Fig. 5. Keys, especially celluloid, may by artificial light appear quite white, whereas by daylight they appear quite yellow in places. Intending purchasers of musical instruments might do worse than take this fact to heart, and select their instruments by daylight. To keep the keys in good condition, keep them free from dust, and clean occasionally with a clean piece of rag just damp with methylated spirits, and on bright light days leave the keys exposed to the influence of sunshine.

The celluloid collars and cuffs now much worn may be effectually cleaned by this process of rubbing with fine pumice-powder and benzoline, and exposure to sunlight, the deep yellow stains being first removed by well rubbing with strong naphtha or naphtha spirit.

BROWN LEATHER BOOTS.—To keep brown Russian leather boots and shoes a good colour, wash them with a damp sponge or a very soft brush. For the parts that are dirty, or dark through wear, use a little yellow soap. The water should be clean and cold. Then, when the leather is dry, give them a coat of brown cream (Propert's), and when this has nearly set, polish with a soft cloth.

HOW TO PUT ON A LOCK.

BY E. DICKER.

THERE are several things to be considered in putting on a lock successfully—that is, so that it works properly. It is, comparatively speaking, a very simple matter to *put on* a lock; the most important point to be borne in mind is, that it works nicely when it is on, also that it is the most suitable kind of lock for the purpose.

There are so many different sorts of locks, each adapted for its own particular use, that the first question which generally presents itself to the average amateur is: What sort of lock do I want? If he does not know, he asks an ironmonger, with the result that the ironmonger (whose business it is) sells him a lock: sometimes it is the right sort, but more often not; and even if it is the right sort of lock, it invariably happens that it is the wrong hand.

In ordering a lock for a door, it is a very good plan to make a rough sketch, showing how the door is hung, and on which side or hand you want the lock to be, and which way the latch-bolt is bevelled (if there is a *latch*-bolt). A lock is said to be "right hand" when it is on the right-hand edge of the door, viewed in all cases from the outside, and a "left-hand" when it is on the left-hand edge. It is assumed that a door opens inwards, or away from you when you stand outside.

If a door opens outwards, or toward you when standing outside, this order is reversed "in the case of a rim lock or latch," unless you want the lock to be on the inside, and in that case it is called a "reverse latch-bolt," either right- or left-hand, as described in the preceding paragraph.

This right- and left-hand business has always been a bone of contention between buyers and sellers of locks; in fact, so difficult is it to remember which hand a lock is, or to persuade the ironmonger that your version is the right one, that it saves a lot of trouble to take a little sketch as described above.

Nearly all mortise locks are now made with reversible bolts; so are rim locks, but in the case of rim locks you not only have the difficulty of "hands," but there comes the further complication of "reverse bolts," according to which side of a door the lock is fixed.

There are some very ingenious methods resorted to by some makers to get over the complexity of rim locks, but unless you want a number to keep in stock, they are rather too expensive for ordinary doors, and the little sketch serves every purpose.

Sometimes when a new key is wanted for a lock, the locksmith or ironmonger will tell you that it will be cheaper to buy a new lock; sometimes this is so, but, before buying a new one, see what it is he proposes to sell you in its place, and if it is not exactly a replica of the old one in every respect, have the old one repaired and a key cut to it, even if it costs you more than a new one would, because it is very often ever so much more trouble to make a new lock fit the place of an old one (unless it is exactly the same) than it is to put a lock on a place where there has not been one before. The keyhole is very often the seat of most of the trouble, then there are the screw-holes, the striking plate; and last, but not least, modern locks being more compact than the more ancient ones, they very often show a nasty-looking mark all round them on the door, drawer, etc., as the case may be, and very often this is most important; so do not be

persuaded by what the ironmonger says, see for yourself.

I give below sketches of some of the locks most frequently required, with their names.

Figs. 1 and 2 are rim locks; the way to fix these is to first let the projecting lip of the face-plate into the edge of the door, and then, holding the lock in its position, mark through the key and spindle-hole with a scribing tool, or small bradawl, on to the face of the door, remove the lock, and bore the keyhole top and bottom right through the door with a bit, that the shoulder of the key will pass comfortably through, and then finish keyhole with a keyhole-saw or small chisel, taking great care to only make the keyhole large enough to just allow the key to pass through comfortably, for if the keyhole is too large it does not guide the key exactly to the hole in the lock, but allows the key to strike the lock, and not go directly into the keyhole, and nothing is more annoying. Next bore the hole for the spindle exactly square with the face of the door. This should be done with the greatest nicety, for if the hole is not exactly square with the face of the door, you will find that when you come to screw up the knobs they "bind," and will not allow the latch-bolt to spring back freely when the knobs are turned. The lock should now be screwed on to its place; "round-headed" screws are mostly used for rim locks, and ordinary countersunk screws for the face-plate. Now put on the knobs and spindle, and the escutcheon, or keyhole plate; this plate is generally fixed with escutcheon pins.

The knobs and spindle, together with the escutcheons and finger-plates, are generally termed "lock furniture" in the trade; and always ask for rim or mortise lock furniture, as the case may be, as there is a distinct difference between the two. And I here take the opportunity of cautioning you against buying the old-fashioned knobs and spindle, where the knobs are simply secured to the spindle with a small screw, a most unsatisfactory arrangement, and one that is bound to give trouble at an early date. There are an innumerable number of "patent knobs" in the market, and some of the best of them, strangely enough, are the cheapest, and cost very little more than the old-fashioned sort.

The "box staple" is next screwed on to the door frame, adjusting it by letting it in a little way or packing it out a trifle if the door requires it, and just making the latch catch comfortable; if there is a moulding round the frame the "box staple" must be let into it, fitting it very carefully.

Fig. 3 is a night latch, and the fixing is somewhat similar to that described above, with the exceptions that after you have let in the lip of the face-plate you press the lock into its place, as it were, and the projecting pin in the centre of the keyhole makes an indent in the face of the door indicating where the keyhole is to be made. The escutcheon for a "night latch" is generally a little different from an ordinary one, and as the lock is constructed so as to be opened from the outside with a key only, knobs are not required, one being provided on the lock for the inside.

Figs. 4, 5, and 6 are "mortise locks." The fixing of these locks is rather beyond the scope of the average amateur, and requires special tools, etc., but I will describe their fixing in a separate paper later on.

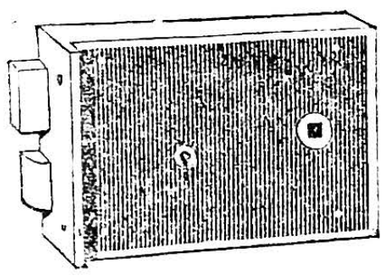


Fig. 1.

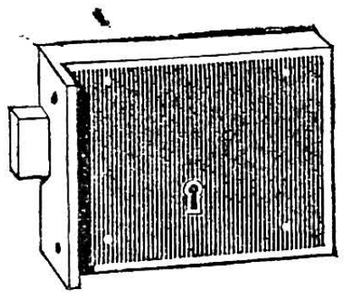


Fig. 2

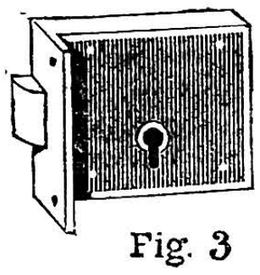


Fig. 3

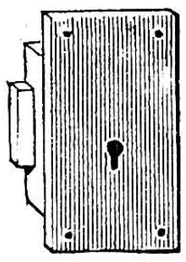


Fig. 7

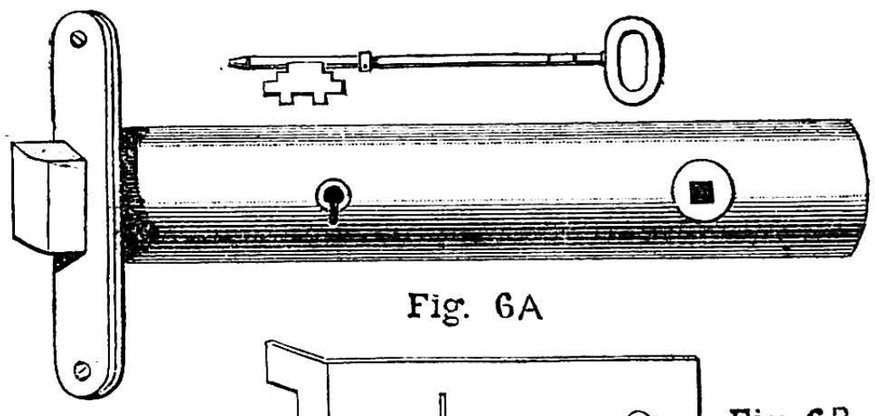


Fig. 6A

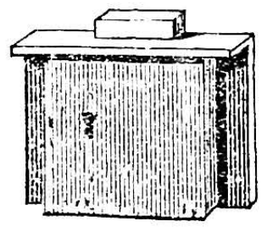


Fig. 9.

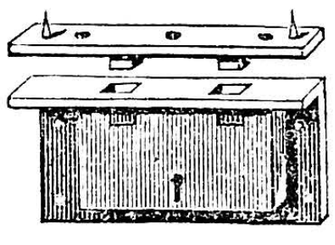


Fig. 10

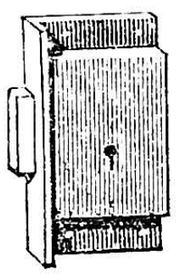


Fig. 8

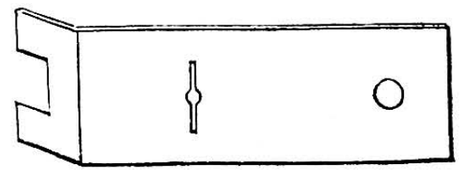


Fig 6B

Fig 6C

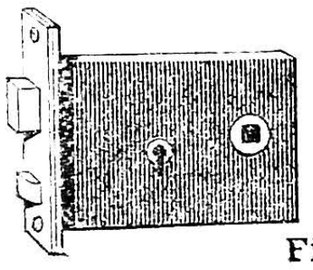


Fig. 4.

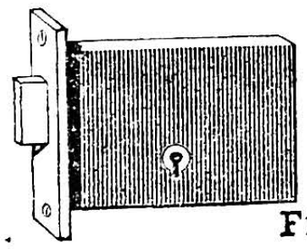


Fig. 5

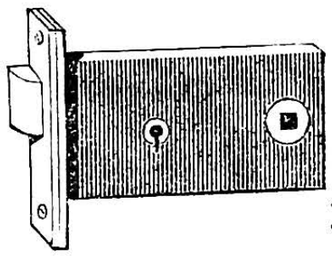
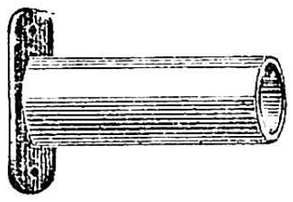


Fig. 6



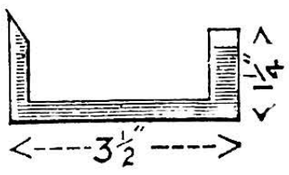


Fig. 11

Names of Locks. Fig. 1.*—"Two-Bolt Rim": suitable for all ordinary Doors that are required to lock as well as latch. Fig. 2.*—"Rim Dead": for Doors that require to be locked one side only, such as Wine, Beer, and Coal Cellars, also large Cupboard Doors. Fig. 3.*—"Rim Night Latch": for external, and all Doors that require to be made secure on one side only. Fig. 4.*—"Two-Bolt Mortise": all Classes of Internal Doors, also other Doors where Fig. 1 would be an objection. Fig. 5.*—"Mortise Dead Lock": for Doors requiring to be locked both sides. Fig. 6.*—"One-Bolt Mortise": Lock and Latch in one Bolt. Fig. 6 A.—"Tubular Reversible Mortise Lock": used for same purpose as Figs. 1, 4, and 6, but more readily fixed. Fig. 7.—"Straight Cupboard Lock": for all ordinary Cupboard Doors. Fig. 8.*—"Cut Cupboard Lock": for better class of Cupboard Doors. Fig. 9.—"Drawer" or "Till" Lock: for Drawers of all Descriptions. Fig. 10.—"Box Lock": for Boxes and Chests; the same make of Lock, but with the Face-Plate bevelled to suit Slope, are called "Desk Locks." Fig. 11.—Drawer Bolt Chisel. Those marked with an asterisk are "Handed."

Fig. 6A is called a "tubular mortise lock." Now *this* is a "mortise lock" that any person can readily fix if a certain amount of care is taken, and the direction and appliances for fixing are supplied with the lock. So much faith have I in this lock that I have no hesitancy in recommending it to my readers.

Fig. 6B is the template for marking the exact position of the key and spindle holes.

Fig. 6C is termed "the twist-bit guide," and all you have to do is to temporarily screw this on to the edge of the door, taking care that it stands exactly in a line with the face of the door, then pass the twist-bit through the "guide," and bore a hole the exact size of the lock. Now remove the guide and push the lock into its place, and by marking the centre of the screw holes in the face-plate on the edge of the door you get the exact centre for boring two more holes with the same twist-bit to take the face-plate of the lock; the same twist-bit bores the proper size sinking for letting in the striking plate. This brings the putting on of a mortise lock down to a mere matter of boring a series of holes perfectly true.

Fig. 7 is a "straight cupboard lock," the fixing of which is very simple, as it merely wants screwing flat on the door, the position of the keyhole being got by measurement, and as the bolt shoots out on both sides it is both right- and left-hand, and this fact, combined with the facility of fixing, makes its use very general.

Fig. 8 is a "cut cupboard lock," and is intended to be let in flush in fixing; sometimes the back-plate is not let in, but as this class of lock is generally used for the sake of appearance in preference to Fig. 7, it should be let in, unless, as it sometimes happens, the peculiarities of the fixing of the striking plate prevent it. In fixing, the keyhole is bored first, and then get the keyhole of the lock and the hole in the door exactly opposite, and see that the face of the lock is exactly flush with the edge of the door; then mark with a pencil round the body of the lock and the length of the face-plate, and let these in until the back-plate lies on the back of the door (but not let in); this will enable you to try the key in the lock, and see that it enters readily before finally letting in the back-plate; and if the key does not enter exactly, you can shift the lock a trifle, and to do this after the lock has been let in entirely just spoils the job.

Fig. 9 is a till or drawer lock. In fixing, first find the centre of the width or length of the front of drawer, and measure the distance the keyhole is down from the face-plate of lock, and make the keyhole, and then hold the lock inside with the keyhole opposite the one made in the front of the drawer, and mark round the body, and proceed in the same manner as described for a "cut cupboard lock."

It is sometimes a very awkward job to make the hole for the bolt of the lock to shoot into. Fig. 11 shows a tool specially made to do this.

Fig. 10 is a box or chest lock. This is fixed in exactly the same manner as a drawer lock, but a little care is required to fix the link-plate. To do this, place the link-plate in the lock when it is fixed, and lock the lock, and then slam the lid of the box down sharply. Now unlock it, and the two pins will hold the link-plate in position on the lid, and by carefully opening the lid the link-plate will be found ready for marking round exactly over the place you want to let it in.

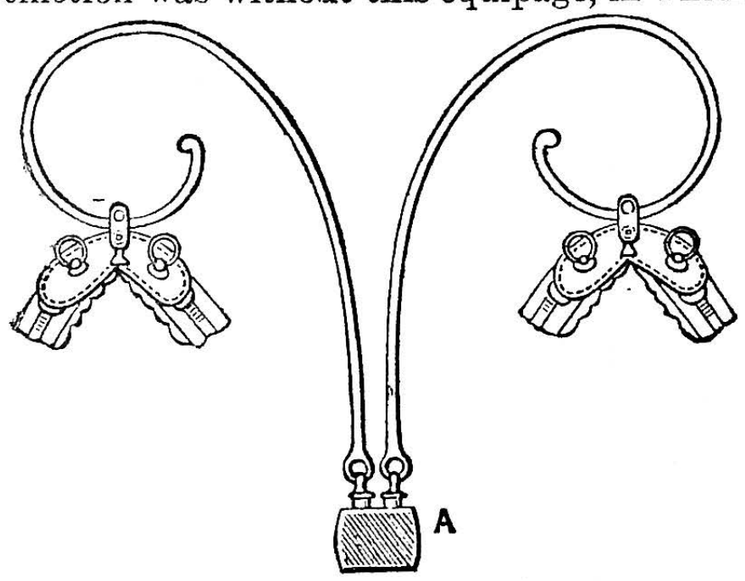
CURRICLE HARNESS.

BY H. C. KING.

AMONGST the revivals in the carriage and harness trade in England, one of the most distinguished light pleasure carriages seems to have long waited its turn, and the wait seems, like many things else, to have been for the necessary essential scientific improvements that tend toward perfection, where imperfection before retarded advancement. The curricle has a distinguished ancestry from the currus of the racing contests of antiquity.

At the French Centennial Exposition, the perfect bronze remains of one of these curricles was built up with new woodwork. All the old metal parts were perfect, from the axle, wheels, nave, metallic "spoke"—the same as the modern "Sarven" hub "spoke-hoops"—to the whip-hook and floral ornaments that adorned the car body.

The modern curricle was conspicuous in England at the end of the last century and early part of this. No family of any distinction was without this equipage, in which



Curricle Harness—A, End Section of Pole.

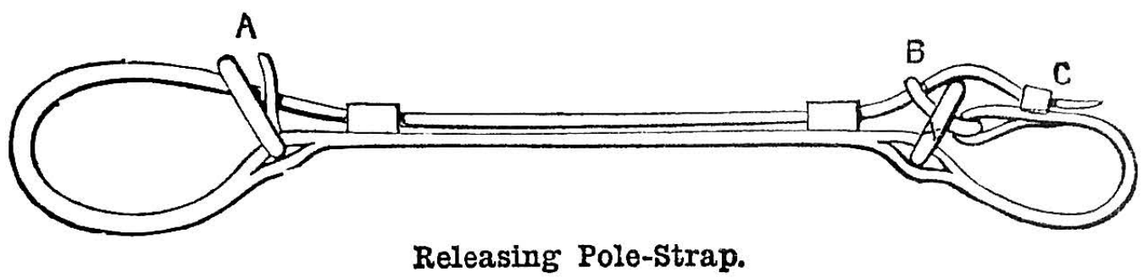
was used the finest horses, with the most stylish harness; but there was a drawback to its use. The mode of suspension to a pole, and its attachment to the harness, was by a yoke-bar of steel fitting across the backs of the horses, where the ends of the yoke-bar passed through a terret in each harness-pad, which allowed a certain degree of lateral motion to each horse. The yoke-bar had a strap-loop in the middle, by which it was held to another strap fixed to a flat spring under the pole; a girth chain from the girths of each horse passed over the pole to prevent it rising too much. With all this elaboration of fittings and fixings, the attachment of a pair of horses to a curricle was not safe from derangement. If one horse reared, the harness fittings were strained. If a horse fell, one or both terrets were torn out of the pads; then the equipage was useless: even one horse could not use it to draw it along a short distance. This was the reason for its disuse.

One who is of a family of curricle drivers has rectified the defects by simply using a separate attachment for each horse to the pole—a light steel whip-spring looped to an eye in a spring-plate on the pole, the whip-end of the spring being loosely looped to the roller swivel-terret in the harness-pad, so that a horse may rear or fall without affecting the other horse or his harness. These whip-springs take both up and down pressure on the horses' backs; no other attachment is required, and with the addition of swivel-terrets to pads, any harness suits. The gracefully curved steel springs above the backs of the horses have a bold, handsome appearance. The invention may do something to revive one of the old glories of road travelling in England.

RELEASING POLE-STRAPS.

BY J. C. KING.

How the shrewd workers of one craft have to scheme devices to compensate for the bungling or jobbery of another craft! Road-making, as it should not be, seems to be a paying game for the many engaged upon it. Formerly the study of road-makers was how to give horses good foothold and at the same time produce durable roads; now these two main factors are ignored by road-makers—if they deserve the name! Coachmen do not think so. The cruelty to horses on roads purposely made without foothold in wet weather is a disgrace to our municipal authorities. Over and over again have good systems of foothold wood-paving been brought to their notice, but the potent "tip" to the right man has not been given; so horses suffer, harness is wrecked, and shafts and poles are strained and broken.

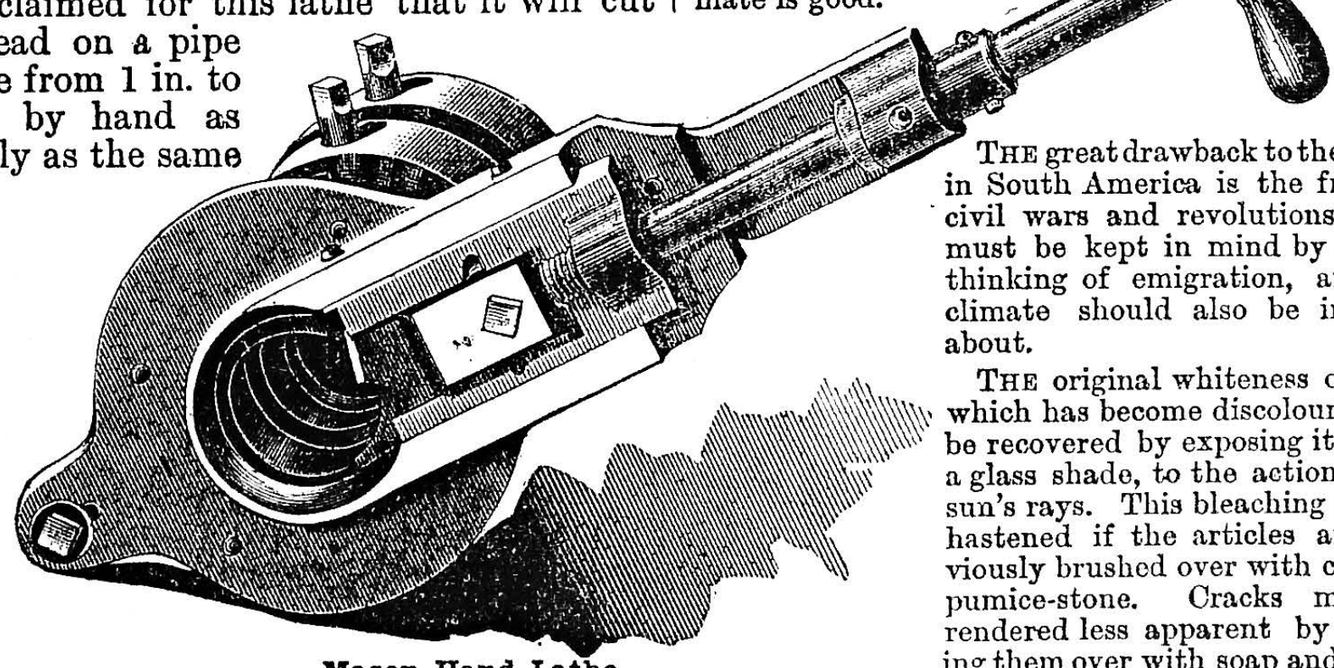


Releasing Pole-Strap.

To aid in quick release of fallen horses, the releasing pole-strap is designed. A is the usual buckle fastening; B is the releasing end, very simply effected by a bight-loop, B, which passes through a bar-frame. The bar is marked by a ×. The strap-point passes through the bight-loop, and is held tight in its place by the pull of the pole-strap loop, and fixed to the horse's hame-ring of collar. To release the strap, the point C is pushed out of its retaining loop and out of the bight-loop, and the strap is released automatically by the horse itself in pulling. It is quite easy to manipulate, and no dearer than ordinary pole-straps, which cannot be unbuckled when a horse's weight hangs on the buckle. This invention is brought out by Messrs. Whittingham & Wilkins.

HAND LATHE.

THIS is an American Hand Lathe for cutting threads on steam, gas, and water pipes. It is claimed for this lathe that it will cut a thread on a pipe in size from 1 in. to 6 in. by hand as quickly as the same could be cut by an engine lathe. It will cut the thread with the standard taper and will make a nipple of any length. This lathe has no dies to break, and there are no bushings to change in cutting different-sized pipes. The lathe is secured to the pipe by a universal chuck, and to change from a 2½-in. pipe to a 6-in. pipe requires but a minute's time. It is made in two sizes, cutting from 1 in. to 2 in. and from 2½ in. to 6 in. Another size, to cut from 6 to 12 in. inclusive, is now in course of preparation. All parts are made of the very best steel. The manufacturers state that it has given satisfaction wherever used.



Mason Hand Lathe.

We do not know that this is yet in the London markets, but WORK tool advertisers should know. They keep most good things.

NOTES FOR WORKERS.

THE Metropolitan Fire Brigade includes 55 land fire-engines, 4 river or floating stations, 215 fire-escapes, 706 firemen of all ranks, 25 men under instruction, 17 pilots, 73 coachmen, and 133 horses.

THERE are at present two hundred and six central electric lighting stations in operation in Europe.

ELECTRIC motive power is being applied to all the hand looms in St. Etienne, the French centre for producing silk ribbon. The 18,000 looms in use are in the houses of the workers, who will be charged 3½d. per day per loom for the power, but will be able, in consequence, to greatly increase their work.

IT is intended that an additional 1,292 boys shall enter the Royal Navy during the present year, and in consequence the composite sloop, *Miranda*, 6,1,130 tons and 1,020 horse-power, will be fitted as another training-ship.

THE London General Omnibus Co. have now sixty pocket electric lamps of 1 candle- or 2 candle-power, for the use of their ticket inspectors. They only weigh 2 lbs. each, and the cost is 8d. per lamp per week.

AN electric crane is now at work on the Peterson Quay, in Hamburg, removing merchandise from the holds of vessels alongside the quay to waggons adjoining.

THE highest central electric station is at Pontresina, Rhætia, 6,000 ft. above sea level. A waterfall of 430 ft. supplies 520 horse-power of energy, and every shepherd's hut has the electric light.

PERU covers about 500,000 square miles, and has a scattered population of about 3,000,000. It has rich agricultural and pastoral lands, great mining wealth, vast petroleum fields, and virgin forests in which is every variety of timber. The climate is good.

THE great drawback to the States in South America is the frequent civil wars and revolutions. This must be kept in mind by anyone thinking of emigration, and the climate should also be inquired about.

THE original whiteness of ivory which has become discoloured may be recovered by exposing it, under a glass shade, to the action of the sun's rays. This bleaching will be hastened if the articles are previously brushed over with calcined pumice-stone. Cracks may be rendered less apparent by brushing them over with soap and water.

AN excellent solder for tinware can be made from the lining of tea-chests.

EEL-PIE ISLAND, in the Thames, is being transformed into a "charging station" for electric launches, which will be able to renew their charges here before going higher up the river.

COCOA butter is made from cocoanut oil, the rancid flavour and colour of which are taken out by treatment with alcohol and animal charcoal.

"BRUSH" dynamos are to be used for the purpose of public lighting in the thoroughfares of the City of London.

WORK

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INTERNATIONAL MANUFACTURES.—It is a common notion that the so-called "sweating system" is so rampant in foreign countries that foreign manufacturers are able thereby to produce goods so cheaply that, notwithstanding freightage and other expenses, they can sell these goods at a lower price than similar home-made goods can be sold at. This reveals a very crude notion of the principle that regulates international exchange. The price at which foreign commodities are sold in our markets has nothing to do with the cost of their production in the countries they come from. Indeed, commodities that are produced more cheaply here may be undersold by foreign commodities. Suppose that over some other country we have fourfold the advantage in the making of textile fabrics, while our advantage in the making of toys is only twofold; that other country, though it is put to twice the expense that we are in toy-making, will yet be able to undersell our toy-makers. The reason is obvious. One Englishman, by the supposition, can weave as great a quantity of textiles as four foreigners; in toy-making, however, he is equivalent to only two foreigners. The commerce between this country and the foreign country will consist of exchanges of woven stuff for toys, and the rate at which these commodities will be interchanged will be the produce of one English weaver for between two and four foreign toy-makers' produce. These foreign toys also will be sold at a price dependent not on what it costs the foreigner to produce them, but on what the textiles given for the toys cost us. This may be a complicated question and difficult to understand; yet the sooner it is understood the better it will be for this country, with the grave industrial problems, clamouring for solution, that are right before it; for the erroneous opinions that prevail respecting foreign commerce are simply obstructing clear views of the real cause of our difficulties.

THE PEOPLE'S FOOD.—The returns of the cereal crops of the United Kingdom are not satisfactory reading. Summed up briefly, the whole of this year's wheat crop will not yield 8,000,000 qrs. of a second-rate quality, so that we shall have to import from 22,000,000 qrs. to 23,000,000 qrs. of wheat from abroad during the coming food year, which is reckoned from harvest to harvest. The land acreage for wheat is diminishing year by year; last year it was reduced from 2,388,147 acres to 2,150,000. Unfortunately some of the best wheat land has been laid down to grass at ruinous cost. The returns of wheat growth should show forty bushels per acre if the best land were used and the dressing by home-made manures. For indifferent land thirty-five bushels per acre should be a fair average in an ordinary season. Now it is anticipated that twenty-seven bushels per acre will be the average of good and bad land, or ten bushels per acre less than should result from free farming. By free farming is meant unrestricted methods of cropping by tenants, now hampered by conditions inimical to good farming by intelligent farmers. It has been said the more corn we have to import the better for manufactures, as we have to send them out to pay for the corn; by extending this theory to an extreme view, better save the labour on corn-land and import it all for the sake of sending out more manufactures to obtain it, which would be as absurd as it is to send the length of the kingdom for loaves of bread, instead of getting them in the next street; or as is done by the farmers, send to the Pacific Ocean 16,000 miles off for guano, when manure nearly as good could by proper arrangement of our sewage be had close to the crops to be manured. This dependence on a foreign supply of a necessary of life for two-thirds of the year is a national peril; and in view of the existence of 8,000,000 acres of wheat-growing land now lying waste and a million of able-bodied paupers wanting work, is a disgrace to the country and to an enlightened age.

HARDENED COPPER.—It is well known that in the earlier ages of the world—before furnaces capable of dealing with iron were constructed—copper was used for cutting instruments, and also for other tools which are now made of steel. This so-called copper has, by many metallurgists, been believed to be a kind of bronze—or we might say a copper—steel, in which the principal ingredient is copper. It now appears that a blacksmith of Quebec, Ferdinand Allard, has rediscovered the art of hardening copper. This material is stated to have been tested at the Government ranges, with the result that a bullet, fired from a distance of forty yards, flattened and split against a plate of hardened copper one-sixth of an inch thick. This material will now be tested in the English dockyards, and it is expected that its introduction will lead to alterations in our system of armour-plating. It is only recently, comparatively speaking, that the production of steels other than that formed by the association of a small quantity of carbon with iron has attracted that attention which it deserves; and there is no doubt that research in this direction, if it is properly followed up, will lead to results of great importance. Manganese steel, nickel steel, and mitis iron have already taken permanent places on the market, and phosphor bronze is largely used for castings of various descriptions. Although vast strides have been made in metallurgical science, much yet remains to be ascertained.

ABOUT BORDER ORNAMENT.

BY CHARLES KELSEY.

ANTHEMION BORDERS.

INTRODUCTION — DEFINITION AND ORIGIN—DESCRIPTION OF THE ILLUSTRATIONS—APPLYING TO MODERN WORK—AS OBJECTS OF STUDY—CONCLUSION.

Introduction.—Amongst the many types of border ornament, probably not one has been used more frequently and by a larger variety of nationalities than the type chosen for illustration with this paper. The readiness with which it may be utilised, and the property it possesses in a high degree of lending itself to modification, may account for this extensive use. Its popularity remains undiminished at the present day.

Definition and Origin.—This type is variously known by the terms "Anthemion," "Honeysuckle," "Palmette," and "Flower and Knop" patterns. The first—perhaps the one most frequently used—is here adopted.

The earliest perfect specimens of this type are met with in Assyrian work. Examples discovered amongst the ruins of Nineveh are now exhibited in the British Museum.

Many authorities have supposed that the Greeks acquired the type from this source; it appears in the Ionic order, which is generally supposed to have had an Asiatic origin. Others have urged the possibility of the Assyrians deriving it from textiles, etc., introduced from India, the common starting point of the Aryan races.

Modern nations unquestionably derived these patterns from Grecian sources; it is to Greek artists that we owe their development, and it is to their influence, through the example of their works, that they owe their wide and long-lived popularity.

By some authorities the Greek examples have been considered to be conventional renderings of the honeysuckle flower—hence that name; but, though partaking somewhat of that character, an examination of the examples upon Greek pottery does not confirm that view. There it is obviously a type of ornament which would, as it were, grow under the brush of the artist.

It is evidently "brush-work"; the individual lobes of the pattern are strokes or "flicks" of a brush or "pencil" fully charged with colour, broad at the point where it first touches the article, growing finer as it is gradually taken away by a downward motion of the wrist and hand. Similar forms are developed in work of those modern decorators who "set out" and execute their ornament with the aid of the brush alone, as may be seen in the better class hand-worked decoration upon papier-mâché and similar goods.

The impulse which led the Greek artist to combine these "flicks" in the particular form shown most likely was due alone to the appreciation of the decorative value of radiating forms, or possibly to the recollection of some ancient device, which may have been derived from Assyria or from

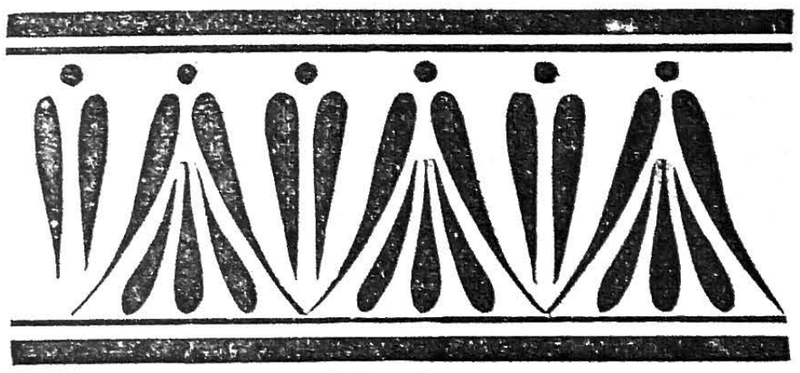
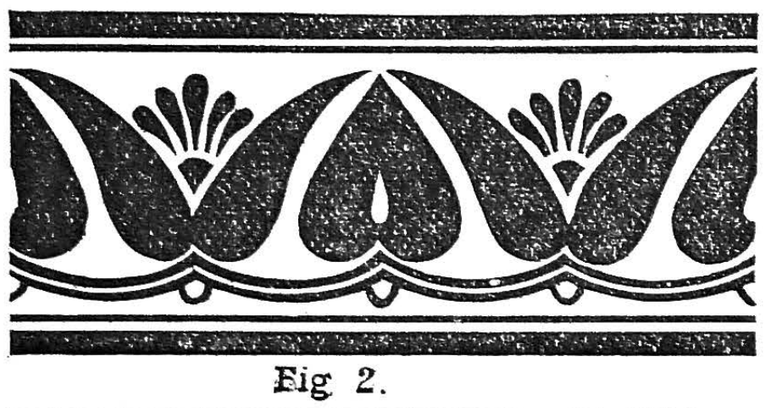


Fig. 1.



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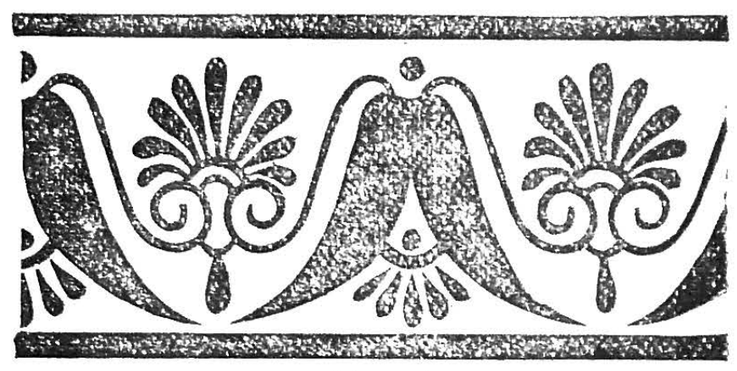

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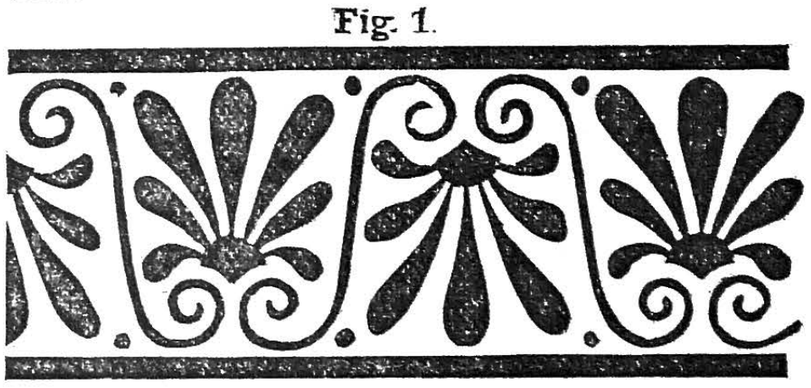

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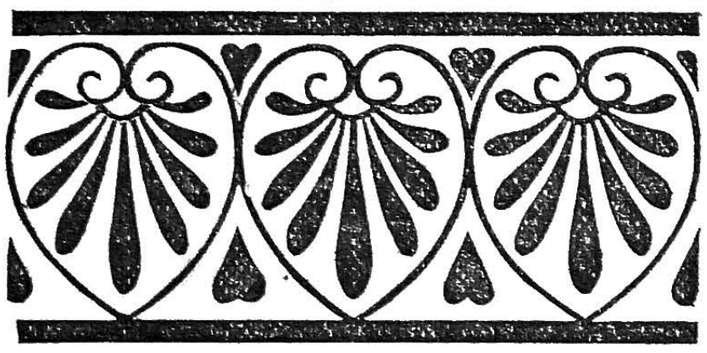

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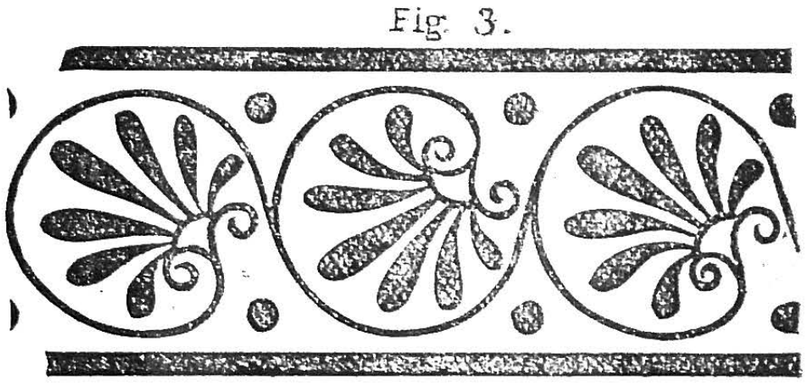

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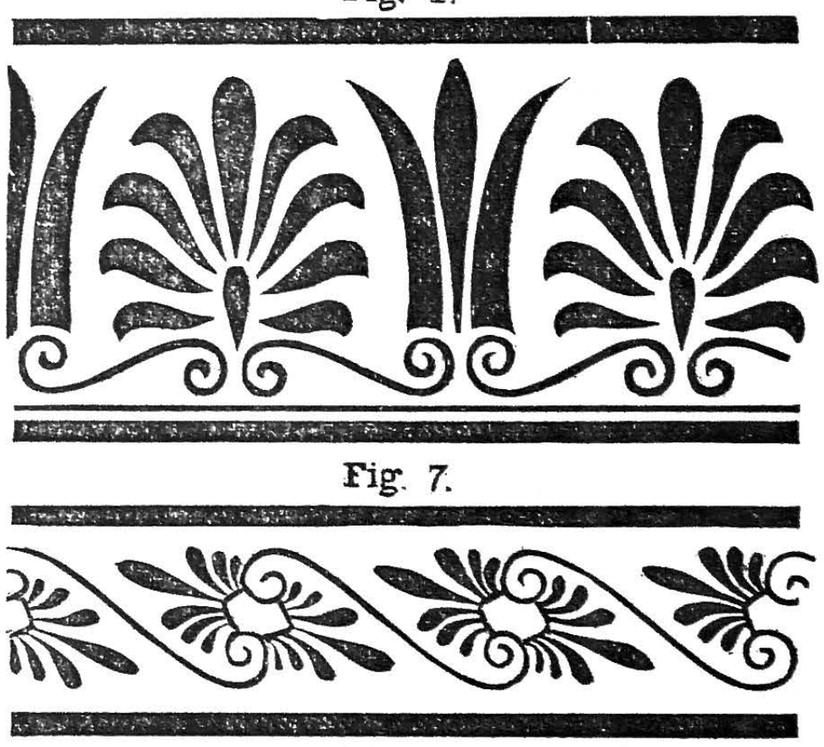

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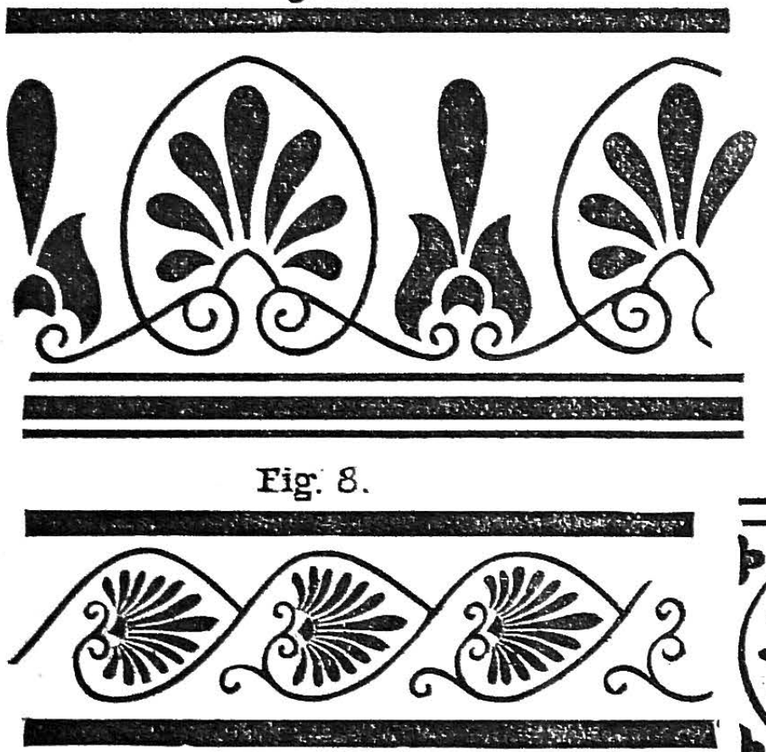

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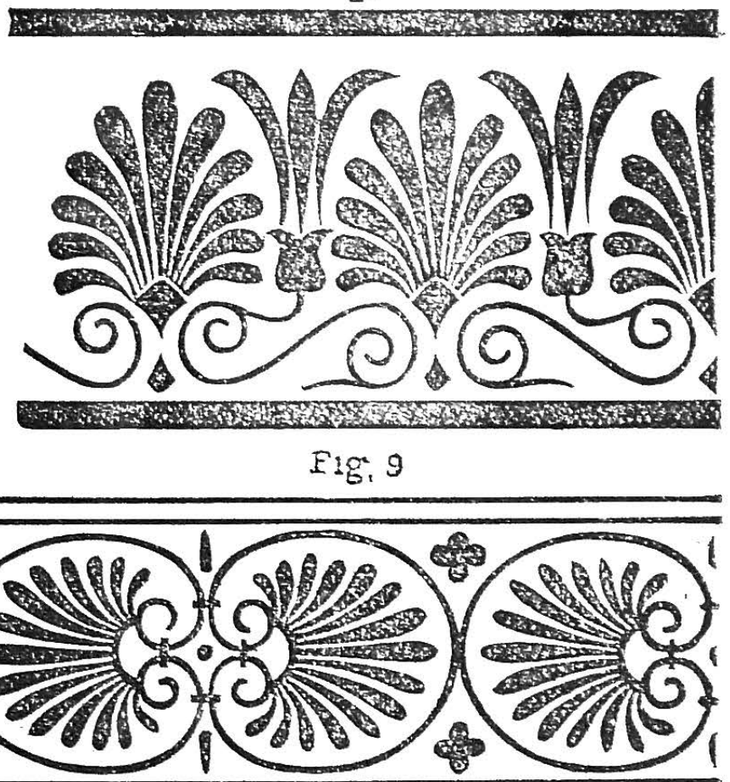
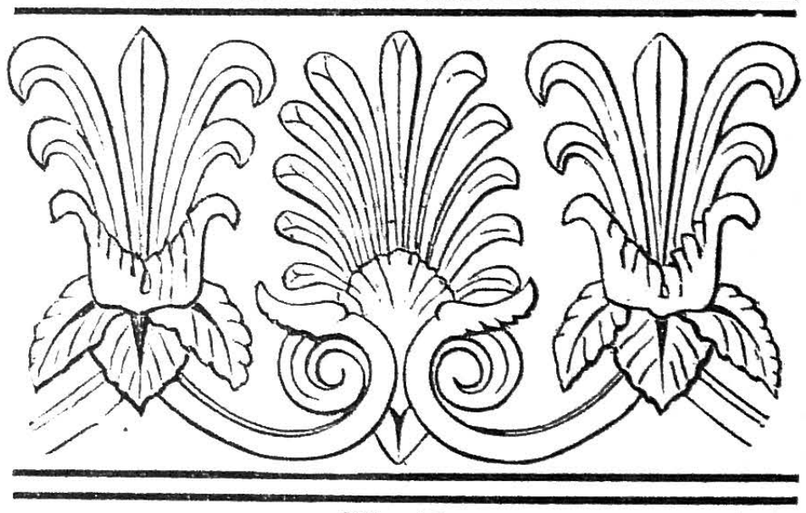


Fig. 9

Fig. 10.

Fig. 11.

Fig. 12



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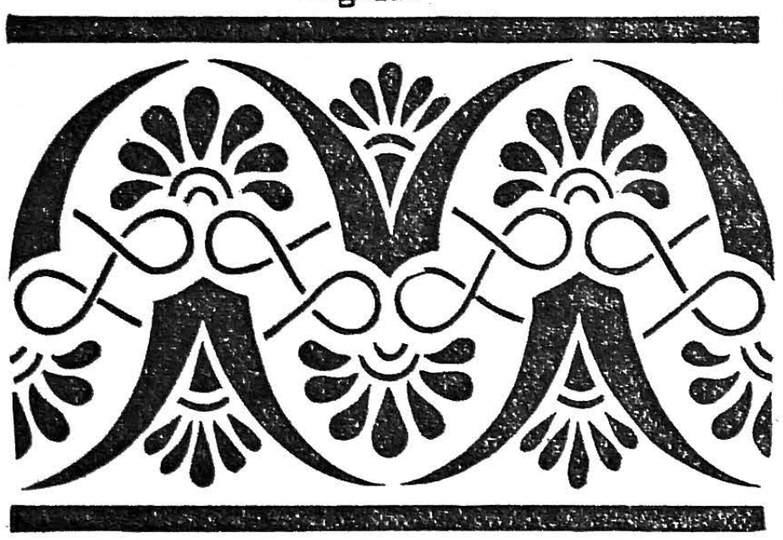

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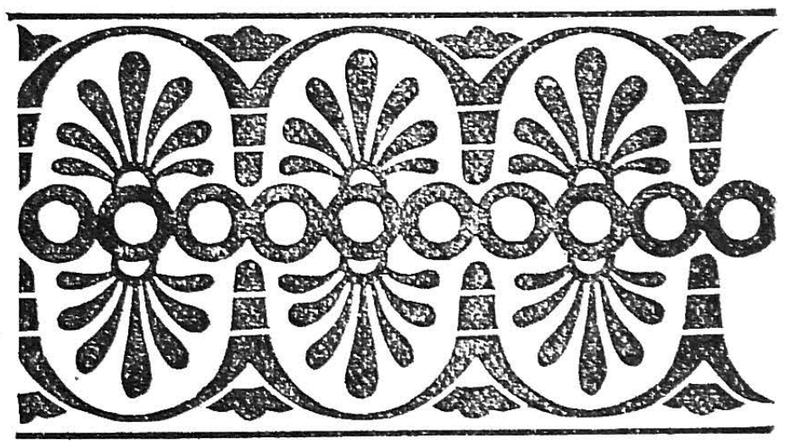


Fig. 15

Anthemion Borders. Figs. 1-3.—Archaic Greek Painted Pottery. Figs. 4-8, 10, 11, 15.—Greek Painted Pottery. Figs. 9, 14.—Greek Painted Moulding Enrichment. Fig. 12.—Reversed Patterns. Fig. 13.—Greek Carved Stone.

some prehistoric stock common to both peoples.

The variations made whilst in Greek hands are so many, and of so great decorative value, that the present paper will be restricted to Greek examples, reserving the variations made by the workers of other nations for treatment in a separate paper.

Description of the Illustrations. — These patterns were very popular in ancient Greece. We find them used largely upon their pottery, a craft always one of the first to be practised by every nation. Hundreds of examples may be seen in the vase-rooms at the British Museum, from which source the pottery examples here given have been culled.

Figs. 1 to 3 are very early examples—evidently the archaic prototypes of the more perfect examples. The brush-work character is seen well in Fig. 1. Fig. 5 is a simple arrangement, possessing much simple beauty. Figs. 4 and 12 show reversed, and Figs. 6, 10, and 11 undulating, varieties. Figs. 7 and 8 are specimens with an intervening feature, which was elaborated and formed the most important portion in many later modifications of these patterns. Fig. 15 is a double variety, with a guilloche-like form in the centre. Many elaborate specimens of this type are exhibited.

Fig. 9 is an example met with both upon pottery and as a painted architectural ornament—a moulding enrichment. Fig. 14 is a double variety—a painted architectural enrichment. It is curiously like the archaic specimen (Fig. 3).

Fig. 13 is a carved example from the necking of the Ionic capital, now in the British Museum, which formed part of the temple known as the "Erechtheum," at Athens. It may interest Londoners to know that the Ionic Order used in St. Pancras' Church, in the Euston Road, is a faithful transcript of that in this famous temple. These patterns are also met with upon works executed in bronze and other metals, in ivory, bone, and various other materials.

Applying to Modern Work.—This group of examples should prove useful to WORK readers; they may be utilised by workers in every art and craft. Few articles there are that may not be beautified by the application of some of the varieties of these patterns; they will, perhaps, be most appropriate upon those articles which exhibit a simple beauty of form akin to Greek work, but they may be easily elaborated to harmonise with the most florid and complicated shapes. Truly of them it may be said that their beauty has proved a joy for ever; they seem possessed of a perennial youth, and look as well upon a modern article as they did when first applied twenty centuries ago.

As Objects of Study.—The decorative principles of radiation and repetition are those best exemplified by this type of patterns. These principles are of the highest decorative value, and are used extensively in all varieties of ornament.

The principle of radiation may be best explained by referring to the varieties of it seen in two well-known objects—the wheel and the fan. Both these objects possess a certain amount of beauty apparent to all; upon analysis it will be found to be due to this principle of radiation, present in varying forms in each. The wheel exhibits a variety of radiation formed by the straight-lined spokes radiating all round the central hub; this is the star or stellar variety, used both in the formation of individual ornamental forms—as in the rosette, the patera, etc.—and also in distributing a series of elements to form patterns, as seen in geometric tile and linoleum patterns. This is radiation of a simple nature—not of so high an order of beauty as that seen in the fan variety. This latter variety is exhibited in the form taken by the blades of a fully or partly opened fan. It is a beauty recognised by everyone, and is very similar to the variety seen in the central features of these patterns. This fan-like type of radiation is extensively used, and is of the highest decorative value in the composition of ornament.

Radiation is, perhaps, more beautiful in those instances where the individual radiating forms do not actually meet, but merely indicate such a meeting if they were continued. Most of these examples exhibit this, the individual lobes being in some instances stopped before they converge; in others they butt upon an arch-shaped form inserted at the base of the group.

Students should also notice the proportional decreasing of the lobes on either side of the central one, and the sensitive manner in which the lower ones conform to the shape of the supporting volute—both features which enhance the beauty of the composition and deserve study.

Note, again, how the upper edges of the lobes conform to an imaginary line which is parallel with the boundary curve, thus repeating its form and giving it a higher decorative value. In designing ornament the artist has many opportunities of suggesting beautiful lines by processes similar to this, and, if fully alive to the practice, can thus impart an additional charm to his work. Such beauties in ornament are none the less effectual because suggested rather than displayed. Work full of these concealed beauties should be aimed at. It is the highest art which conceals the art or means by which it is obtained.

It should be realised that ornament, like all other work, increases in value in proportion to the amount of brain-work expended in its production. Good work is not arrived at haphazard; it is not a matter of drawing a few idle scrawls, having no backbone or cohesion. The knowledge of these decorative principles is required, combined with the facility of using them to the best advantage.

The decorative value of repetition has been previously referred to. In these patterns it is well displayed in its simple form; also that variety of it got by the process of reversing an ornament on either side of a central line is seen to perfection. This expedient cannot be too highly valued, and should be utilised in designing patterns for those mechanical processes which lend themselves to this process. By its means elaborate and beautiful patterns are frequently produced, with a small expenditure of labour. The cards used in Jacquard weaving may be instanced as a case in point; they can readily be reversed in their action on the loom. For this reason this expedient is largely employed in weaving figured textiles, and the textile origin of many of the "turnover" patterns in use on other materials may thus be traced.

Conclusion. — The following paper will show some of the modifications which subsequent workers have evolved from these patterns, and will prove suggestive, to those modern workers who press them into their service, of further possible variations.

WORK fulfils an unique and valuable mission in steadily providing its readers with teaching and example respecting the great and ever-present matter of ornament.

CARPENTRY FOR BOYS.

BY McDONALD.

INTRODUCTION — TOOLS — TRESTLES AND THEIR USES—SAWING AND LINING TIMBER—CONSTRUCTION OF TRESTLES—MATERIAL—REMARKS ON TIMBER.

Introduction.—In starting anything in the carpentry and joinery line, the first things required, as everybody knows, are some tools, a bench to work upon, and a place to work in. Some of our youthful chips—as apprentices and others—are no doubt provided with these to begin with, and to them any remarks on the same may appear superfluous and monotonous. But all are not so fortunate. There are thousands of mechanically inclined youths who have neither one thing nor another, but yet are fully disposed to possess them. For their information, and by way of introduction, a short description of the rudimentary requisites of the craft becomes a necessity that cannot very well be here passed over; and for this reason, if for nothing else, perhaps the more advanced youth or amateur, as well as the professional reader, may not consider the same altogether valueless or uncalled for.

Tools.—In Fig. 1 some of the tools are shown, but it must be understood that these are not all that would be required to constitute a useful kit. In addition to the two planes shown, which are a jack-plane and a hand-plane, a trying-plane or half-long must be included. The chisels must be augmented to a set for paring, from $\frac{1}{8}$ in. to $1\frac{1}{4}$ in.; three or four mortise-irons, from $\frac{1}{4}$ in. to $\frac{3}{4}$ in.; and a few gouges, from $\frac{1}{4}$ in. to 1 in., or so. The brace must be accompanied by at least a dozen bits, from $\frac{1}{8}$ in. to 1 in., including centre-bits, shell-bits, auger-bits, and a countersink-bit or two. Besides the cross-cut saw shown, two more—a ripping saw and a tenon or sash saw—would be required; also three or four gimlets, from $\frac{1}{8}$ in. to $\frac{3}{8}$ in., and some half-dozen bradawls. Even with all this our kit is nothing like complete; but it should do very well for a boy or youth to commence with. Tools for special purposes, and which are but rarely used, will only be noticed as occasion arises. They may be procured at any time, just as they are needed; and it may be said that this is not a bad way to adopt with the most of them, for the best lesson in the use of any tool is actually to see the good of it or realise the want of it.

The prices of tools need not be detailed here, as they vary so much in different localities. The cost of a kit can easily be ascertained by getting price lists from one or two advertisers in WORK, and comparing quality and prices. Like other things, good tools, though a little dearer, are more satisfactory and cheaper in the end. When buying or selecting them, the novice would do well to take a practical man's advice if he can get it.

Trestles and their Uses.—Before constructing a bench, it may be as well for our beginner to make a pair of trestles. They need not be dressed, their function being chiefly to line off and cut wood upon, as may be seen from a glance at Fig. 2. Cutting across the grain or fibre, as at R, is cross-cutting; that at S, in the direction of the grain, is called ripping.

Sawing and Lining Timber. — Cross-cutting and ripping cannot be successfully performed by one saw. The cross-cut saw is used for the former; the ripping saw for the latter. The teeth in these are quite different in size and mode of sharpening; but it would not be advisable for the

beginner to attempt to sharpen his saws until he gets better acquainted with them and their uses. When they need this he should give them to a saw doctor; or, if one is not near at hand, a joiner or cabinet-maker may do it for him.

When working with a saw, he must take care not to force it through, but press it smoothly and regularly forward; neither must he allow it to bend or bulge to either side of the line: it should be kept straight in it, and as near as possible at right angles to the face of the plank.

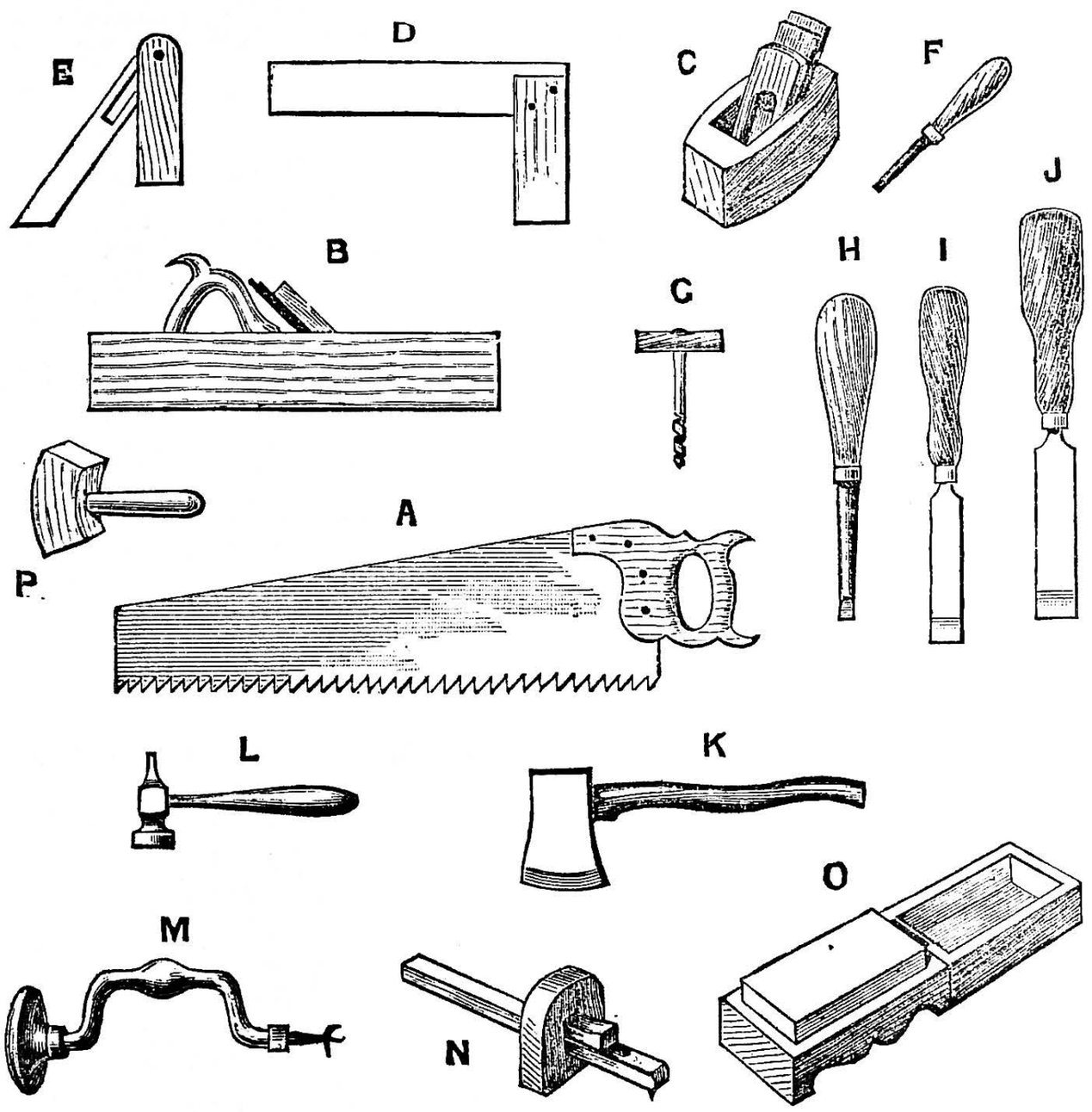
Lining off a plank or board for ripping, when rough on the edges, is commonly done with a straight-edge or chalk line. If square-edged it can be done as at x (Fig. 2), by the rule and pencil. The rule is held in the left hand, measuring off on the board the breadth to be ripped, and the forefinger placed against the edge to act as fence. The pencil is held in the right hand to the end of the rule on the board. Both hands are then moved simultaneously, and the required line is traced backward or forward, as may be desired. Lines for cross-cutting, when square across or at right angles to the edge, are readily obtained by the square, keeping its blade flat on the board or plank and its stock hard to the edge. For lines at an angle to the edge the bevel-stock is set and applied in the same way as the square. For this and similar purposes the young worker will perceive that this tool differs from the square only in having the blade movable, and capable of being adjusted at any desired angle with the stock by means of the screw attached.

Construction of Trestles.—The trestles here given as examples are extremely simple in construction. The tops and ends are merely cut square, and nailed together at the joints. The pieces on the bottoms of ends are also nailed to them. They are shaped as shown to give better stability to the trestles. The under hollows are taken out with a large paring chisel; the upper corners may be cut off by either that or the cross-cut saw. The stays or braces on the sides may be cut to the bevels before being nailed, or they may be nailed on first and cut flush with the tops and ends afterwards. When two or more pieces are said to be flush on a side, it is meant that each has a face in the plane of that side. Thus the top and ends of one of the trestles are flush on the edges, while an end and its bottom pieces are flush on both sides.

Material.—The material for these may be of the cheapest quality, as spruce or white pine or inferior yellow pine. The sizes of stuff can be easily obtained from the scale drawings (Figs. 3 and 4), which the learner might with advantage extend to full size at the outset, and work from, not only in this, but in all the examples given in this paper. For the purpose of deducing the scale, he will find the lines representing the principal dimensions all figured throughout. For a single trestle the sizes are: Top, 3 ft. × 9 in. × 1½ in.; ends, 1 ft. 9 in. × 9 in. × 1½ in. each; bottom pieces, 1 ft. 6 in. × 4½ in. × 1½ in. each; stays or braces, 2 ft. × 3 in. × 1 in. each.

Remarks on Timber.—The timber usually employed in ordinary carpentry is the pine species, as yellow, red, pitch, and white pine. The former is best for inside work, such as house finishings and articles of furniture to be painted, or in which beauty of grain and polish are not required. For the latter, pitch pine, polished or varnished, answers pretty well. Red pine is best for exposed work; and white pine, being inferior in quality and lower in value, is used for all purposes where cheapness is a consideration. Yellow pine is obtainable in logs or deals of 9 in. or 11 in. × 3 in. These can again be cut longitudinally to any size, as scantling or quartering, when used for framing purposes, or boarding when used for covering or panelling purposes. The other varieties are also to be got in the same way, while red and white are frequently sold in battens of 6½ in. × 2½ in., 6 in. × 2 in., 5 in. × 2 in., or 4 in. × 2 in.—this, of course, refers to what is usually kept in stock in sawmills and timber-yards; also flooring, 1⅛ in. thick; lining, ½ in., ⅝ in., or ⅞ in. thick; and rough sarking, from ⅝ in. to ⅞ in., of red or white pine, all commonly kept ready for use, the flooring and lining generally machine-dressed, and grooved and feathered.

These few hints may serve to give our youthful followers an idea of how to procure their timber, as it cannot be expected that they all have a stock of it beside them. If, however, circumstances would permit, to keep a few well-seasoned pieces and boards always to hand would be an advantage.



Carpentry for Boys. Fig. 1.—A, Saw; B, C, Planes; D, Square; E, Bevel-Stock; F, Bradawl; G, Gimlet; H, Screwdriver: I, J, Chisels; K, Axe; L, Hammer; M, Brace; N, Gauge; O, Sharpening Stone; P, Mallet.

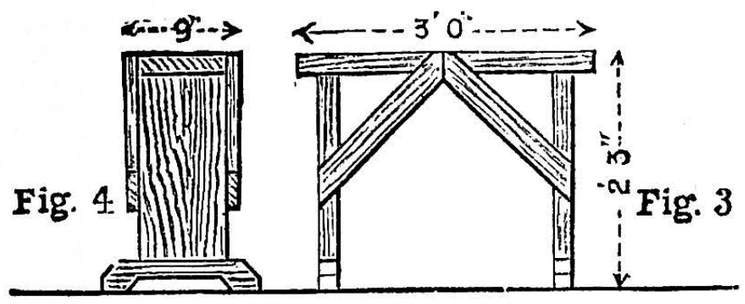


Fig. 4. Fig. 3

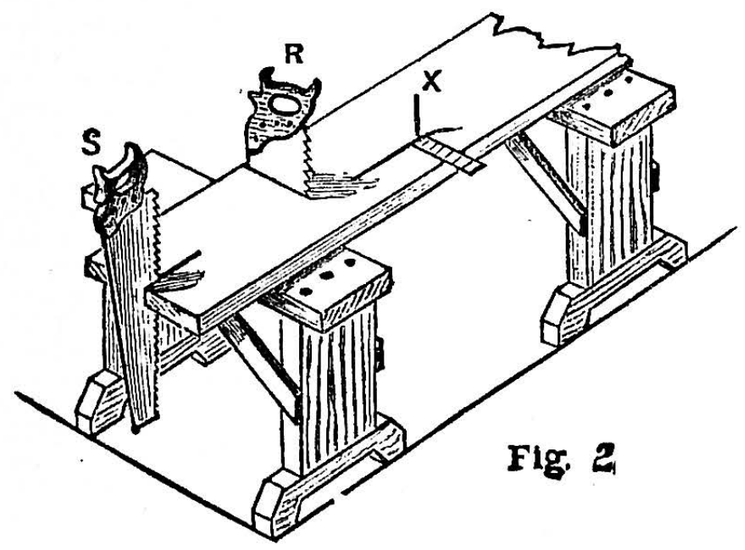


Fig. 2

Carpentry for Boys. Fig. 2.—Trestles—R, Cross-Cutting; S, Ripping; X, Lining with Rule and Pencil. Fig. 3.—Side Elevation of Trestle. Fig. 4.—End Elevation.

HOME INDUSTRIES AT A VILLAGE EXHIBITION.

The annual Cottagers' Horticultural and Industrial Show, which took place lately at Ascot, Berks, gave an opportunity for a display of some very good work.

The chief feature of the show every year is the bent-iron work. The East Berks Iron Works, entirely conducted by Miss Barnett, of Sunninghill, gives employment to the men and lads she teaches throughout the year, and supplies large London firms, besides executing many private orders.

The same good work which Miss Barnett has done for Sunninghill is accomplished in Ascot by the Rev. Herbert Wilson, whose stall attracted much attention by the artistic merit of the designs and the excellence of the work.

The first prize was awarded for a lantern to Joseph Longhurst, a pupil of Rev. H. Wilson's.

The table for carvings occupied a prominent place at the show, and among the competitors were two who won kindly notice at the Work Exhibition two years ago: John Abbott, a young carpenter, who, entering a carved alabaster panel, found his first opportunity of exhibiting at the Polytechnic; and Miss P. Clive Bayley sent the replica of a chip-carved pearwood box, which was shown on that occasion.

The best chip-carving work came from the boys taught by Rev. J. Lawson, of Sunningdale; and the work-boxes, frames, and tables found a ready sale. An example of a comparatively new handicraft was exhibited by Miss M. Clive Bayley, in the shape of a large chest done in poker-work; but the introduction of colour relieved the sameness of the burnt-wood work, and gave the effect of inlaying.

In the class for drawings some very good work was shown; but the first prize was awarded to Mr. Vine, a professional chimney-sweep, who employs his leisure in sketching, and who received a special notice from the judges. Other classes of interest were: the handwriting competition, the washing competition for girls, and the basket-making by boys. A plaid, made from the wool of the black-faced Highland sheep, by Mrs. Fowler, of Inverbroom, and some beautiful specimens of Swedish hand-weaving, were exhibited to show what is done in other places in the way of home industries. Village industries exhibitions should be all over the kingdom.

TRADE: PRESENT AND FUTURE.

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

STEEL TRADE.—Only an indifferent amount of business is being done in the steel trade, and prices of raw materials are falling slightly.

JEWELLERY TRADE.—In London this is extremely dull.

CHEMICAL TRADE.—There is a dispute at one of the St. Helen's chemical works as to the wheeling of cinders on Sundays. The men want terms paid at other works.

IRON TRADE.—An exceptional condition of quietude characterises the Lancashire iron trade, although prices for foundry qualities of pig iron are being well maintained. Naturally, the recent advances in prices have had the effect of checking business, and, except for immediate requirements, buyers are waiting for the anticipated lowering of the rates.

TAILORING TRADE.—There is no change in the tailors' dispute at Liverpool, though attempts are being made to bring about a conciliation. The men grumble at the work being sent to outsiders, who are mostly Jews working at their own homes.

ENGINEERING TRADE.—Although the improvement recently noticed in the condition of the Lancashire engineering trade is still maintained, there are, as yet, no signs of a marked revival of activity in any branch of the industry, and, generally speaking, the outlook is still very unsatisfactory. The chief feature is a number of inquiries for locomotives, chiefly for abroad. These orders are being very keenly competed for, and they will, in all probability, be taken at ridiculously low rates in order to keep works going. The leading machine tool makers are still fairly busy, and boiler makers also report an improvement in that branch, as there is a moderate amount of new work coming forward.

COTTON TRADE.—A deputation from the Federation of Master Cotton Spinners is attending meetings of master spinners in various districts, with a view to induce private spinners and limited companies to support a 5 per cent. reduction in wages. In the meantime, the condition of the trade is growing gradually worse, and in some cases mills are being closed without any prospect of reopening. In general, trade is in a bad state throughout the Rochdale district, though not so bad as in some of the surrounding towns.

FLANNEL TRADE.—This holds its own fairly well, though it cannot be said to be in a prosperous state.

BUILDING TRADE.—In Rochdale and district trade is getting very slack. The strike of plasterers is over, the masters having agreed to the demands of the men as to increase in wages and allowance for walking time.

TIMBER TRADE.—Deals and battens show an increase of 835 standards, and floorings and matchlinings a decrease of 743 standards. Floated timber has an increase of 135 loads. There has been a large addition to the stocks of spruce and pine in the Surrey Commercial Docks. On account of the "fever" scare, there has been a good demand for $\frac{5}{8}$ in. matchlining, 1 in. tariff boards and scantlings, and prices for matchlining were firm; but at the sale $\frac{5}{8}$ in. by 6½ in. fell to the ruinous price of 3s. 3d. per square. Reports from Cardiff, Sunderland, Bristol, and Liverpool show that the timber trade is fairly brisk. The mahogany sales at Liverpool realised an average price of about 5d., prices ranging from 3½d. to 1s. 3d., one log of 498 ft. fetching 10d., and a small log of exceptional richness sold for 5s. 6d. per foot.

CYCLE TRADE.—Auction rooms are busy. Solids, cushions, and pneumatics may be had as bargains. Riders prefer putting their mount away for sale rather than store it for the winter, trusting to be able to procure one of whatever type may be the fashion next season.

IRON AND STEEL TRADES.—Sheffield prices are unaltered, hematites being from 58s. to 60s. per ton.

COAL TRADE.—House coal in the vicinity of Sheffield has been advanced 6d. per ton.

SILVER TRADE.—Little doing beyond racing trophies. The Britannia metal trade is also slack. In the nickel silver plated department there is a demand for forks and spoons, and also for metal-handled steel table cutlery.

CUTLERY TRADE.—This is still depressed, with a demand only for champagne and sportsmen's knives.

EDGE TOOL TRADE.—Good trade is being done in nearly every line. There is little demand for shipbuilding tools.

FILE TRADE.—Short time is the order of the day. Complaints are still abroad as to the marking of machine-cut files as hand-cut.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

I.—LETTERS FROM CORRESPONDENTS.

Technical Education for the Army and Navy.—W. G. F. (*London, S.E.*) writes:—"This is, indeed, one of the most interesting of the many problems now under the consideration of the public, and it is to be regretted that the question of technical education in relation to the army and navy has not in the past been pushed more to the front than it has been. It is to be hoped, however, that readers of WORK will respond to the invitation on p. 344, and do all they can to suggest and promote some feasible scheme whereby the positions of our soldiers and sailors may be improved when their term of service has ended. This question affects soldiers even more than sailors; for whilst the former find the labour market on land is surfeited by those seeking employment, sailors, as a rule, do not find it so difficult to obtain a livelihood, as the seafaring life can only be successfully adopted by a class of men similar to themselves. The sailor who has served in the navy has, in some respects, at any rate, the advantage over a soldier who is left but badly equipped for the competition of labour when his period of service has expired. At the same time, it would be unjust to promote the interests of the latter while ignoring the claims of the former. Some plan such as the following might result in benefiting Tommy Atkins:—Every soldier shall compulsorily devote a certain portion of his time (to be determined according to his capabilities and length of service) to the learning of some handicraft or trade. Qualified teachers and workmen shall be employed to teach the recruits the theory and practice of the profession they may adopt; and at the end of their service, before being discharged, they shall be examined by experts, and certificates awarded them according to their merits and proficiency. Of course, this is only a crude idea, but the adoption of a similar plan would, at any rate, be a step in the right direction. Exception may possibly be taken to the compulsory aspect of the training, but such a question as this of handicraft training for soldiers must be handled firmly; and surely every man would see that the result of the apparent arbitrariness could not fail to act beneficially, since it would fully equip him for the inevitable struggle for work and wages when he returns to a civilian's life. Finally, whilst the public may desire to do good by discussing the problem, it must be remembered that nothing can be brought to a successful issue without the co-operation of the ruling military and naval powers; so that the sooner this question is more prominently placed before the authorities the better will it be for Jack Tar and Tommy Atkins."

Costly Cup.—H. S. G. (*London, S.W.*) writes:—"£8,000 has been paid for a cup, which can be seen in the British Museum. Whatever is it made of to be worth so much money? Well, it is of gold; but that will not account for more than about £200 of its cost. Its value is derived from the fact that it once formed part of the Royal Treasury of England, and it is mentioned in the inventories of Henry VIII. and Elizabeth. It is supposed to have been brought from France by Henry V., and to have belonged to Charles V. The historical interest is, therefore, great, and it is chiefly on that account that the Treasury, the Goldsmiths' Company, and three or four rich connoisseurs have subscribed the necessary amount for its purchase for the nation. It has artistic as well as historical value—chiefly on account of the wonderful richness of its enamelling. There is much more to be said about it, but this will suffice for the present, as we shall be shortly giving an illustration and a description of its enamel work. It is in the Gold Ornament Room, to gain admittance to which a bell has to be rung."

Hobbyists' Emporium.—E. D. (*London, W.*) writes:—"It is hardly worth while replying to THOMASO, who writes in No. 177, the more so as he apparently has no personal interest whatever in the object in view—his hobby and excess energy appearing to be that of reading (in a very superficial manner and with a pre-disposition to antagonism and insult) the *primary* suggestions of others, and therefrom forming his own conclusions, which are, in many respects, totally wide of the intentions and ideas of the writers. At the same time, he is unable or, at any rate, unwilling, to offer the crudest suggestions himself; but, commencing with a spiteful classification of amateur workers in general, he descends to the marine store, and concludes his pessimistic wanderings in a manner totally uncalled for, and fortunately foreign to the usual kindly and courteous columns of 'Shop.'"

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Ship Carpenter.—LOVER OF THE SEA.—Our correspondent has a good foundation to work upon, but appears to have had no experience in the very matter he seems to wish to follow. His best course would be to get employment in a shipbuilder's yard, where he would be able to gain some insight into the kind of work he would have to do with, and when he felt himself capable of tackling it, should then get an engagement in a ship making short voyages, so as to get accustomed to the sea, to the routine, and the duties required of him; and when he feels he can undertake the duties, he might then apply to a marine superintendent of some line, where he might get taken on if there happens to be a vacancy. He will find it rather difficult, we fear, to obtain what he desires on the old-established lines, as fathers and sons, uncles and nephews, brothers and cousins—of whom there are always plenty in such places—generally secure such berths as are vacant; still, it is worth trying, and it might happen by a chance he may succeed. At any rate, try, and again try! We should think that at Goole, Middlesboro', Hull, or Grimsby he might find employment at some of the shipyards, or even on the Tyne, the Wear, or the Tees.—C. E.

Patents.—A FITTER.—In reply to our correspondent's queries, no doubt a cheap, efficient, and simple article of the kind he names would go down with those who require to use them, but it would be an act of extreme folly to put the plan before any manufacturer without his right to it being secured. We do not think he could secure his right, either by registering or by a trade-mark, it appearing to us that it is not a fit subject for either. As we have not seen it, we cannot decide this point; but it seems to us to be the proper subject for a patent, which would cover various modifications of the principle, whilst registration would only cover the precise thing shown, and a trade-mark would only cover the goods he might make or sell, but *not* the principle on which they are made. No article registered or trade-marked, and exposed to the public, can be patented afterwards. One of the most essential features required in a patent is *novelty*—that is, it must not have been known to the public prior to making application for the grant; therefore our correspondent must be very careful in his proceedings before he applies for his patent. We do not know of any makers of such articles; but a reference to a Birmingham directory would, no doubt, enable him to select a suitable firm to apply to, to ascertain if they would be disposed to take it up.—C. E.

Corrugated Carbon Cell.—OBLONG.—The cell inquired about, and of which you send a sketch, is the corrugated carbon cell invented by Mr. R. Applegarth, and sold by him to Judson & Sons, who are now, I believe, the proprietors of the patent. The cells are made of powdered carbon compressed by machinery into a mould fitted with a corrugated core. This leaves the insides of each cell ribbed or corrugated, hence its name. The outsides of the cells are coated with a waterproof varnish. Apart from this peculiarity, the cell may be regarded as one of the Leclanché type without a porous cell. At the bottom of each cell is placed some peroxide of manganese. A rod of zinc is suspended above this to a porcelain cover, and the zinc is enveloped in cotton-wool wetted with a saturated solution of sal-ammoniac. The carbon cell itself is the negative element, and to this is fixed a binding screw for connections. To repair this cell when exhausted, empty it of all its contents, well soak the interior in several changes of warm water, then put in a few ounces of broken peroxide of manganese, clean the zinc, and envelop it anew in cotton-wool soaked in a saturated solution of sal-ammoniac, and replace it in the cell. The cotton-wool must be well wetted, and pressed in tight around the zinc. This cell has been used for electric bell ringing, but is not in great favour, because of its high internal resistance. I do not think you could make the cell, even if the patent rights were expired.—G. E. B.

WORK to Natal.—G. H. (*Pietermaritzburg*).—Twelve months' subscription to WORK, forwarded by post to Natal, weekly, as published, is 6s. 6d., payable in advance.

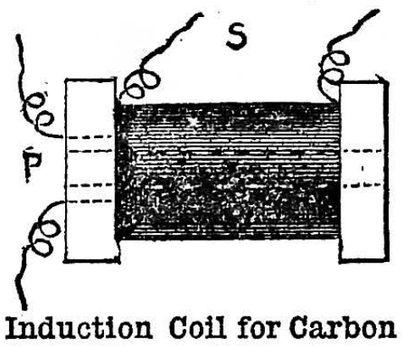
Vertical Boiler.—MOTOR.—You can see drawings of the nozzle you require in *Engineering* for February 8 and February 15, 1889. The subject is hardly of sufficient general interest to warrant us in going to the expense of preparing wood blocks necessary for illustration.—J.

Incubator.—L. S. (*Ripley*).—If your regulator does not open the damper soon enough, the remedy is easily found. Use a longer rod or more mercury in the tube.—LEGHORN.

Patents.—N. N. (*South Stockton-on-Tees*).—By the Patent Convention which now exists between this and several other foreign countries and colonies, it is provided that any person taking a patent in any one of them has the right of priority with that patent over any other person in all the others for the term of *seven months* from the date of his application, during and before the expiry of which term his application must be recorded in the country he intends to apply in. Of course, he can apply after the term is up, but then he must do so before he files his complete specification, supposing he has applied in England first, and he encounters the risk of someone having applied before him for the same thing. In the United States, America, he may apply at any time within two years of his first application elsewhere, but he will have no priority

of right over anyone who may have applied at the expiry of the seven months, during which time he had the right of priority. Not knowing the nature of the invention of our correspondent, we are unable to advise him as to the best course for him to follow; but we give him the particulars of how the matter stands in regard to foreign patents, so that he may see his way in considering what he should do.—C. E.

Coil for Transmitter.—INDUCTION.—This instrument, which is only necessary for long lines, may be made as follows: Two pieces of hard wood, such as walnut, for ends, 1¼ in. square and about ¼ in. thick. These are joined together by a bundle of soft iron wire, which constitute the core, this bundle being about $\frac{3}{10}$ in. The primary coil is wound with No. 22 B. W. G. double silk-covered copper wire, about 1¼ oz. being sufficient. The secondary coil is wound with No. 40 B. W. G. double silk-covered—2 oz. will be necessary. Before winding on the primary, a layer or two of paraffined paper should be wrapped round the iron core, and another layer should be wound between the primary and secondary coils. It will be well also to steep the whole when finished in melted paraffin wax, and after having allowed it to dry in the heat, cover it with a piece of velvet or cloth of some kind. The sketch given above shows it full size. Of course, two will be required, one for each instrument. The method of connecting is very simple—the primary coil is connected directly to the microphone, and the secondary to the distant receiver.—W. D.



Induction Coil for Carbon Transmitter.

Cracks in Floor.—H. J. G. (*Hastings*).—There is no known composition for stopping up the cracks between your floor-boards that is equal to the insertion of wedge-shaped strips of wood, well glued, and driven home by a mallet or hammer. If this is done, and allowed to stand all night previous to planing down level, and the smaller interstices and nail-holes filled up with putty coloured to match, you would have a floor far more satisfactory and cheaper to yourself than the use of any composition worthy of the name could possibly give. Should you adopt this plan—which I strongly advise—it will be well to remind you to punch all nails below the level of the boards. These holes and the smaller cracks must be filled up with putty coloured to match the floor as intended to be finished, and must be used *after* the staining is done and is perfectly dry. If done before, or if plain putty is used, its oily nature will prevent the stain striking in so deeply as in the parts untouched, so giving a patchy appearance. I have seen several jobs spoilt by the want of this precaution. I have presumed that your floor is one of the common ones of deal. Should it, however, be of the better class, you will find many useful hints on referring to "Making the Best of a Bad House," in No. 145 of WORK, p. 649. If it is one of this class of floor you have in hand, and the cracks are not so wide as to allow the composition to run through, you might use equal parts of resin and beeswax, or, for a harder composition, refer to and use hard-stopping, as advised in No. 150, p. 726.—LIFEBOAT.

Curing Mole Skins.—MORGANWG.—It is not usual to cure the skins of small animals either by tawing or tanning—alum is the usual dressing. This alone will suffice, either in powder or as a solution. Some add saltpetre or bay-salt, and some corrosive sublimate. In Vol. II., pp. 294, 718 (Nos. 70, 96), are recipes for such compound dressings. Some tack the skin to a board for the few days during which it needs attention, then dress two skins, lay them flesh sides together, and roll them up. When dried, the skins are made pliant by rubbing.—M. M.

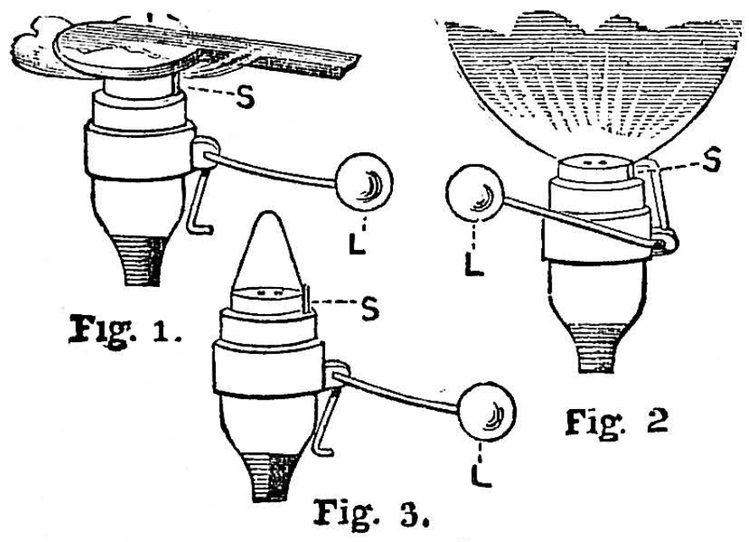
What makes an Electric Bell Ring?—H. C. (*London, W.C.*).—As there may be other readers circumstanced like yourself, by being blessed with little boys who ask such difficult questions, I will try to give an explicit reply. You say it is not enough to tell him that the electricity travels through the wire from the battery to the bell, and rings it. Well, then, take off the little box covering the works, and you will see two reels filled with green silk-covered wire fitted on two cores of soft iron. Now, soft iron is non-magnetic—that is, it will not attract to itself another piece of iron, as a magnet does. But electricians know how to make soft iron magnetic or otherwise at will. When a rod of soft iron is enveloped in several turns of silk-covered copper wire, and a current of electricity is sent through the turns of wire, the soft iron becomes converted into a magnet, and will attract other pieces of iron as long as the electric current is passing through the coils of wire wound around the core. When, however, the continuity of the current is broken, the iron loses its magnetism. In the works of the bell you will see a strip of iron attached to a spring, and placed across the iron cores above mentioned. The hammer shaft is connected to this iron armature. When the push is pressed, the current from the battery passes through the wire wound over the cores, converts them into magnets, and, attracting the armature, causes the hammer to strike the bell. At this instant the continuity of the current is broken, and the spring pulls the armature back. As this closes the circuit, the iron is again attracted, and it is this to and fro movement, rapidly repeated, which rings the bell.—G. E. B.

Repairing Shocking Coil.—A. B. (*Westminster*).—Thanks for your sketch of coil. From it, I see that you have an old style form of medical or shocking coil, with a separate rheotome or contact breaker. The two fine wires are the ends of the secondary coil. Solder two lengths of copper wire—any size—to these, pass them along beneath the stand to the studs attached to the handles, and secure the bare cleaned ends to the tangs of the cleaned studs. The wire from one of the battery studs should go around the electro-magnet of the break, and then to the coil. This is the primary wire. A pint bichromate of potash battery cell will work this coil, but I prefer one of the dry battery cells, such as the E. S., the E. C. C., or the Hellesen dry cells. These are always clean, give no trouble nor fumes, and are ready for work at any time.—G. E. B.

A Profitable "Idea."—C. E. (*Finsbury*).—Our correspondent, having an "idea," but not having developed it to ascertain whether it is practicable, or how it is to be carried out in reality, does not possess anything that can be turned to a practical account, or be "profitably disposed of." A man may have an "idea" that a balloon may be steered or controlled as to its course, but unless he can show *how* it is to be done, has nothing at all of any use to anyone, or anything he can sell or turn to a profitable account. The only thing that can be successfully dealt with is a manner, method, or mode of achieving a given result, which is novel, useful, and not in use, or described, at the time he makes the discovery. A man with an "idea" is anything but a useful member of society, and such may be found by thousands; but if they get no further than the mere "idea," of what use are they, either to themselves or the world? A visit to Hanwell or Colney Hatch will soon satisfy anyone that there is no want of men with "ideas." What the world wants is men who can start good, sound, and useful ideas, and then bring them into such a shape as shall be of public benefit, and unless they can do this, the fewer there are of the kind the better. Until our correspondent has tested the feasibility of his "idea," and ascertained how it is to be done or carried out, he has nothing whatever of any commercial value, and nothing, consequently, that he can negotiate for or with. Under the circumstances named, we cannot see how to advise our correspondent, nor what would be the course he should pursue, especially as to the "profitable disposal of the idea."—C. E.

Water Motor.—W. C. (*Wallington*).—The address cannot be given in "Shop." If you send stamped addressed envelope to the Editor, the address will be sent.—M.

Tool-Heating Gas Burner.—J. H. A. (*Southwark*).—These burners are introduced to the trade by Mr. W. H. Bishop, of Walsall. The three small



Tool-Heating Gas Burner.

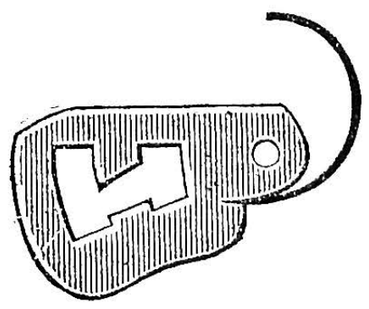
diagrams show their principle very clearly. Fig. 1 shows the burner in action with the tool on; Fig. 2 in ordinary use as a lighting burner; Fig. 3, as it appears when the tool is removed.—R. A.

Burglar and Time Alarum.—C. E. M. (*Finsbury*).—As you are a new reader, and space in "Shop" is too precious to allow a lengthy quotation from previous numbers, will you kindly get Nos. 12, 18, 20, 27, 31, and 33 of Vol. I. of WORK? These can be obtained through any bookseller, or direct from the office. From them you will learn how to make, fix, and arrange a system of electric burglar alarums to protect all your doors and windows. If to these you add No. 32, Vol. I., of WORK, you will learn how to construct an electric time alarum, or fix such an alarum to your clock. Following on this article, there are several suggestions in the same volume for fitting up clocks of different styles with electric alarms. Nearly all of these are illustrated, and form a very good collection on the subject.—G. E. B.

Plumbers' Work.—A. R. F. (*Falkirk*).—There are a great many works on the above subject. A very good one is by Hellyer, published by Batsford; another, entitled "Plumbing: a Text-Book to the Practice of the Art or Craft of the Plumber," by W. P. Bucan, published by Crosby Lockwood & Co. Watch for papers in WORK.—E. D.

Steam Engine.—D. W. S. (*Liverpool*).—In answer to your query, I should advise you to write to Cassell's for, or obtain through a newsagent, the following numbers of WORK: 106, 110, 121, 125, 131, 136, 141, 145, 149, in which you will find a series of articles entitled "How to Make a Quarter Horse-power Steam Engine," and which, with letterpress and working drawings combined, explain thoroughly how to build an engine of the size mentioned, the bed-plate being some 2 ft. long. No. 110 specially treats of the parts and arrangement of the valve. You say that you want the engine to drive a sawing machine, but do not say what size the machine is, and as I have no idea, I must leave you to judge the size of engine required to drive the same, unless you write again, giving more particulars of it. Should you, in your judgment, require a smaller or larger engine than the one shown in the drawings, you must reduce or enlarge every dimension in the same proportion as you lessen or increase the diameter of the cylinder.—P. B. H.

Lever Lock Spring.—C. M. (*London, N.*).—Drive out the broken spring with a fine bradawl, and fix the new spring in the same slot that held the old one, bending the spring into the shape shown in sketch.—T. W.


Lever Spring.

Oak Polish.—SUBSCRIBER TO "WORK."—Oak may be polished by means of wax polish, egg shell or antique, or French polish. The first is suitable for, and generally used on, floors, rendering them fit for dancing purposes, though it is often used for dados and panelling round rooms, etc. Its simplicity in using renders it of service to those who have had no experience in French polishing. For this purpose we require beeswax dissolved by heat; then add turpentine in proportion of one pint to one pound of wax. This is applied to the woodwork by means of a brush or flannel; elbow grease does the rest, of which any amount may be laid on, the more the better. Egg shell or antique is used, as its name implies, on old furniture, giving to the work thus treated a gloss instead of a shine. For this purpose the foundation is worked up as for polishing—*i.e.*, it is "oiled," "filled in," and "bodied up." Then after standing overnight for the polish to harden, it is rubbed down with a felt rubber and fine pumice-powder till sufficiently dull, then finished by "wax polishing," of which you will find fuller particulars in No. 52 of WORK, page 826. French polishing requires more experience and tact than the former processes. It has been fully described in Vol. III. of WORK, both in papers and "Shop" (see index). Briefly, it may be said to be as follows: See that the work is free from dust; then, assuming that it requires no staining, wipe over with raw linseed-oil; then fill up the pores of the wood as much as possible with a mixture of dry finely crushed whiting, coloured to match your wood by the addition of a little dry yellow ochre. Mix into a paste the consistency of thick paint with turpentine. Apply with rag, rub well in crossways of the grain, and wipe off clean; it is then ready to polish. Prepare a rubber of white wadding, in size according to the job you have in hand—a piece 6 in. square will make a useful workable size—and wet it with polish. Cover the rubber with a piece of clean soft rag, and twist the ends together, bringing it tight over the face of the rubber, which, in shape, should now resemble a pear cut in half; then proceed to rub over your job in a circular motion; glide on, glide off, and keep constantly on the move. When dry, wet again with polish, this time putting a spot or two of oil on the face to prevent it from sticking. Thus continue to work till you have a sufficient body of polish on; then set aside for at least a few hours to allow for sinking. Take up the work again, and proceed as before, till the grain appears quite full, and all appears perfectly level; then gradually thin out the polish in your rubber by using more spirits and less polish, till the work looks semi-lustrous or cloudy with oil, to remove which we require a rubber of clean wadding prepared as for polishing; and on the use of this depends whether our work can be classed good, bad, or indifferent. Its object is to remove the oil and increase the lustre. Make the rubber fairly damp (not wet) with methylated spirits, and apply gently to your work, rubbing lengthwise, using pressure as it gets drier. Repeat till satisfaction is gained. I need hardly remind you that no oil is used in finishing, and that all polishing should be done in a good light, and a clean and warm room. The polish can be made by dissolving about 6 oz. of best orange shellac in one pint of methylated spirits, or rectified naphtha: some prefer the former, as it works slower, and is more agreeable to use. The more experienced, or, rather, those who wish to get over their work more quickly, prefer naphtha. In conclusion, I would say *Nil desperandum*.—LIFEBOAT.

Sewing-Machine for Fret Cutting.—H. W. (*Halifax*).—As you can cut the frets fairly well by hand, and desire to cut them more quickly, the policy of buying a sewing-machine to convert into a fret-machine is not one of the happiest. You would find yourself handicapped in many ways, unless you are a skilled mechanic; and to call in any such help would add greatly to the cost. Far better, to my mind, to go on cutting by hand till such time as you can afford a machine made specially for the purpose, which can now be done very cheaply.

Write to the firms who advertise in WORK for catalogues, not forgetting the Britannia Company, who often have, I believe, some second-hand ones on sale. You might also write to E. Preston, tool merchant, Snow Hill, Birmingham; also Paul Metz, Bull Ring, Birmingham. The latter firm can supply a German-made machine that can be affixed to any table or bench, and works by means of a wheel somewhat similar to a sewing-machine, only that the wheel is more conveniently situated, or he sells same machine with an adjustable treadle attachment. Had you already got in your possession a stand and machine the case would be different, then I should advise you to obtain No. 138 of WORK, November 7th, 1891, and turn to page 540, where you will find an illustrated reply in "Shop" to a query similar to yours. For further particulars on fret-machines, refer to No. 114, page 155, and No. 133, page 461.—LIFEBOAT.

Weights and Measures.—I. H. K. (*No Address*).—I think the book entitled "Weighing and Measuring, The Science of, and the Standards of Measure and Weight," by H. W. Chisholm, Warden of the Standards, price 4s. 6d., is the one that would suit you best. I do not know the publishers, but you could obtain it through the Britannia Co., Colchester.—E. D.

Telephone.—D. B. (*Glasgow*).—You ask for instructions for making a mechanical telephone, and, in your letter, go on to describe what you have done, which seems to cover the whole ground. I would advise you to stick to the ferrotype for the diaphragm, and use two rings of indiarubber back and front to insulate the sound. Be sure that the diaphragm is flat and taut like a drumhead, and that the conducting wire is straight out from the centre of the plate. It is not necessary to rivet the wire to the plate; you could use a small brass nut. It does not matter whether the wire has to go straight or turn corners. It must, however, be strained very tight, and at corners an insulator of rubber must be used to pass the wire through. The great point is to keep the line from touching any object whatever, except the insulators. There is a special wire sold for the purpose. The usual method of calling attention is by tapping with a wooden instrument upon the nut or button of the diaphragm. I shall be pleased to help you further if you are not successful. There is no need of a sketch, as a box of any shape, with an opening in front to serve as mouthpiece, is all that is required.—W. D.

Optical Lantern.—A. J. S. (*Canterbury*).—Your question is not very definite, and I am in doubt as to whether you intend to purchase the condensers and objective ready mounted, or desire to mount the lenses yourself. In the former case, you will need a 4 in. compound condenser mounted in a brass cell; also an objective having a focus suitable to your requirements. The condenser is simply made to slide into the collar of the stage plate (Fig. 21, page 624, Vol. II.), to which it is secured by means of a bayonet catch, so that it is removable at will. The objective mount is made to screw into a flange or collar brazed on to the outer end of the draw-tube of the stage front in the manner shown by Fig. 2, page 205, Vol. III. This draw-tube is a 5 in. length of tubing made to slide over the tube of the outer stage plate (see Fig. 24, page 624, Vol. II.). Should you desire to mount the lenses yourself, you can mount the condenser in the manner described in answer to J. H. J. J., page 413, Vol. I. The lenses shown in Fig. 1 on the above-named page should be placed about $\frac{1}{8}$ in. apart. For the objective, you can employ a pair of plano-convex lenses, placed about $\frac{1}{2}$ in. apart, as shown in Fig. 2 on the above-named page. You will find much additional information respecting better class of objectives in the reply to F. J. D., page 219, Vol. II.; and Fig. 44, page 776, shows clearly the disposition of the various portions of the lantern body.—C. A. P.

Tower Bridge.—W. R. (*London*).—The only certain method of obtaining a fully dimensioned set of drawings for the purpose of making a cardboard model, correct in every detail, would be to gain the engineer's consent to your preparing tracings or copies of the working drawings; but, should this be granted, you will find it a long job, as there is a great deal of machinery in connection with this structure.—F. C.

Hydraulic Power Machine.—NOVICE.—The reason why screwing down the inlet-valve does not reduce the *quantity* of water used is that the cylinder must be filled at each stroke, and water being practically inelastic, the quantity will be the same for each complete stroke. The effect of screwing down the inlet-valve is to reduce the *speed* of the machine.—F. C.

III.—QUESTIONS SUBMITTED TO READERS.

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

Razor Grinding.—SHAVER writes:—"I would be much obliged for any information as to rigging up an appliance, wheels, etc., for razor grinding."

Fret Machine.—A. B. D. (*South Shields*) writes:—"Will any reader kindly give me the necessary information to make a fret machine of wood with small lathe attachment?"

Foot Lathe.—CONSTANT READER OF "WORK" writes:—"Would any kind reader give me a sketch of a foot lathe, as I should like to make one myself?"

Catching House-Flies.—W. W. (*Wembley*) writes:—"I shall be glad to know how to make the sticky solution that is put on those papers called the 'Fly Cemetery'; also to know where they breed and when, and if there is any really effectual way of keeping them down."

Sofa or Couch.—G. H. (*Ashford*) writes:—"Will some kind reader of WORK give me a rough sketch of an easily constructed sofa or couch, to be about 5 ft. 6 in. long, and constructed from teak?"

Crane.—J. W. (*Askam-in-Furness*) writes:—"Will some reader give me particulars as to how to fit up a jib-crane with rack, for a foundry 40 ft. long and 30 ft. wide, the crane to lift about 3 tons; also the best means to adopt in making kitchen ranges, etc.?"

Pyrotechny.—C. A. J. (*Manchester*) writes:—"As a subscriber I ask if some reader could kindly inform me of a good book on the science of pyrotechny and pyrotechnic chemicals?"

Minor Industries.—TERRANOVA (*Newfoundland*) writes:—"I want to establish some minor industries here, such as album-making, toys, brass photo frames, purses. I wish to know whether I can get books which describe the manufacture of these articles."

Indiarubber.—S. H. S. (*Barnsbury*) writes:—"Could any reader of WORK kindly inform me how to dissolve indiarubber and cast figures, also the kind of mould used?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

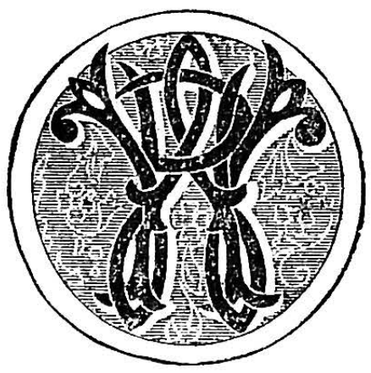
Monogram "S. W." for Painting.—C. K. (*Stratford*) writes:—"In WORK, No. 160, page 62, S. W. (*Chesham*) asks for a monogram. I trust this one may suit him."

"S. W." Monogram.

Newtonian Telescope.—O. K. (*No Address*) writes to H. W. (*Byfield*):—"If H. W. applies to Messrs. Holland & Son, 42, Newington Green, London, N., he will be able to obtain speculum and flats that he requires."—[Surely, too, Caplatzi, who advertises in WORK, keeps these in stock!—ED.]

Small Power Engine.—E. C. W. (*Clapham*) writes, in answer to HALIFAX (see No. 166, page 158):—"Your exhaust port in your cylinders should not be less than $\frac{5}{8}$ in. by $1\frac{1}{4}$ in.; by having these too small you incur back-pressure; also your crank shaft should not be less than 3 in. diameter. Piston-rods should be $\frac{3}{4}$ in. diameter *steel*, and the supply pipe for both cylinders $1\frac{3}{4}$ in. diameter. You might use the same size—viz., $1\frac{3}{4}$ in.—for exhaust of each engine. Your fly-wheel should be about 4 ft. diameter, and not weigh less than 4 cwt. If you are not going to drive off this wheel, you may have one as large as 5 ft. or 5 ft. 6 in. In this case it would be as well to have a bearing each side of wheel. Your engine, if at all suited for coupling, should give better results when coupled than separated. With cylinders 4 in. bore and 8 in. stroke, and boiler pressure at 50 lb., your engine would be about equal to four-horse power."

"W.H.R." Monogram.—F. J. K. (*Tufnell Park*) writes:—"I shall be pleased if this monogram will suit W. H. R. (*Commercial Road*) (see No. 168, page 190)."



"W. H. R." Monogram.

Mail-Cart Design.—M. (*Bishop Auckland*) writes to POOR FATHER (see No. 176, page 318):—Designs for three different mail-carts are given in Vol. I., No. 30, of WORK."

Asphalte Paths.—M. (*Bishop Auckland*) writes to W. R. (*St. Albans*) (see No. 176, page 318):—"Prepare some broken stones about 1 in. or $1\frac{1}{2}$ in. mesh. Then boil the tar and pitch, and cover the stones with it, turning them over till all are coated. The stones should be perfectly dry, and should be mixed under cover. Lay a foundation 3 in. thick of broken stones, and lay the tarred stones $1\frac{1}{2}$ in. thick and roll with a heavy roller. Then cover with fine chippings or gravel about $\frac{3}{8}$ in. mesh, and roll till level. Paths made in this manner will last many years."

Lathe Change Wheels.—M. (*Bishop Auckland*) writes to TURNER (see No. 177, page 334):—"You can procure these from Richard Lloyd & Co., 135 and 136, Steelhouse Lane, Birmingham."

Firewood Splitting Machine.—M. (*Bishop Auckland*) writes to MERCHANT (see No. 177, page 334):—"You can procure splitting and bundling machines for firewood from M. Glover & Co., Pottersdale Works, Leeds."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—P. F. A. (*Lewisham*); W. E. J. (*Blackburn*); A CONSTANT READER; S. C. S.; A. B. (*Burslem*); A. W. (*Liverpool*); W. E. E. (*Manchester*); WORKER; G. M. T. (*Lambeth, S.E.*); C. H. C. (*Pimlico*); MARINE ENGINEER; H. T. H. (*Merthyr*); LATHE; CAM; W. A. (*Edinburgh*); GUNMAN; A WORKER; F. W. (*Walsall*); H. B. J. (*Hailsham*); J. B. (*Accrington*); A. F. (*Bow*); A. J. (*Leytonstone*); F. S. (*Manchester*); J. S. (*Glasgow*); H. C. G. (*Islington*); G. W. E. (*Leeds*); AGATE.

"WORK" PRIZE SCHEME.

FOURTH COMPETITION.

"Tourists' Road, Water, or Rail, Travelling Requisite" Competition.

To give zest to, and widen the field of original research, such an outfit might, for instance, combine with it some useful appliance to be used in case of emergency—such as life-saving, or in pleasure hunting while holiday bent. This we must leave to our readers' judgment, and feel sure that anything to make travel more enjoyable will be welcomed by the public and the readers of WORK who have to travel. By the time this announcement is made most of us will have had some experience of holidays and the pleasures (?) of luggage. For the three best suggestions for an "Improved Tourists' Travelling Requisite," the following prizes will be awarded—

First Prize, £3;

Second Prize, £2;

Third Prize, £1.

CONDITIONS AND RULES OF THE "TOURISTS' TRAVELLING REQUISITE" COMPETITION

will be found in No. 181 and subsequent issues.

All manuscripts intended for the "Tourists' Travelling Requisite" Competition must be addressed to the Editor of WORK, c/o Cassell and Company, Ltd., Ludgate Hill, London, E.C. They must reach him on or before SATURDAY, OCTOBER 29, endorsed, "Tourists' Travelling Requisite" Competition.

"WORK" WEEKLY CONTENTS.

SEVERAL subscribers have kindly made the suggestion to exhibit a weekly contents bill of WORK in their workshops and elsewhere, for the benefit of fellow-workmen not already subscribers.

Doubtless many others who write expressing their indebtedness to WORK may be similarly disposed. If so, and they will furnish their names and addresses to the Editor, such a bill for exhibition will be sent to them by Messrs. Cassell & Co.