WORK

An Illustrated Magazine of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

VOL. I.—No. 10.] SATURDAY, MAY 25, 1889. [PRICE ONE PENNY.

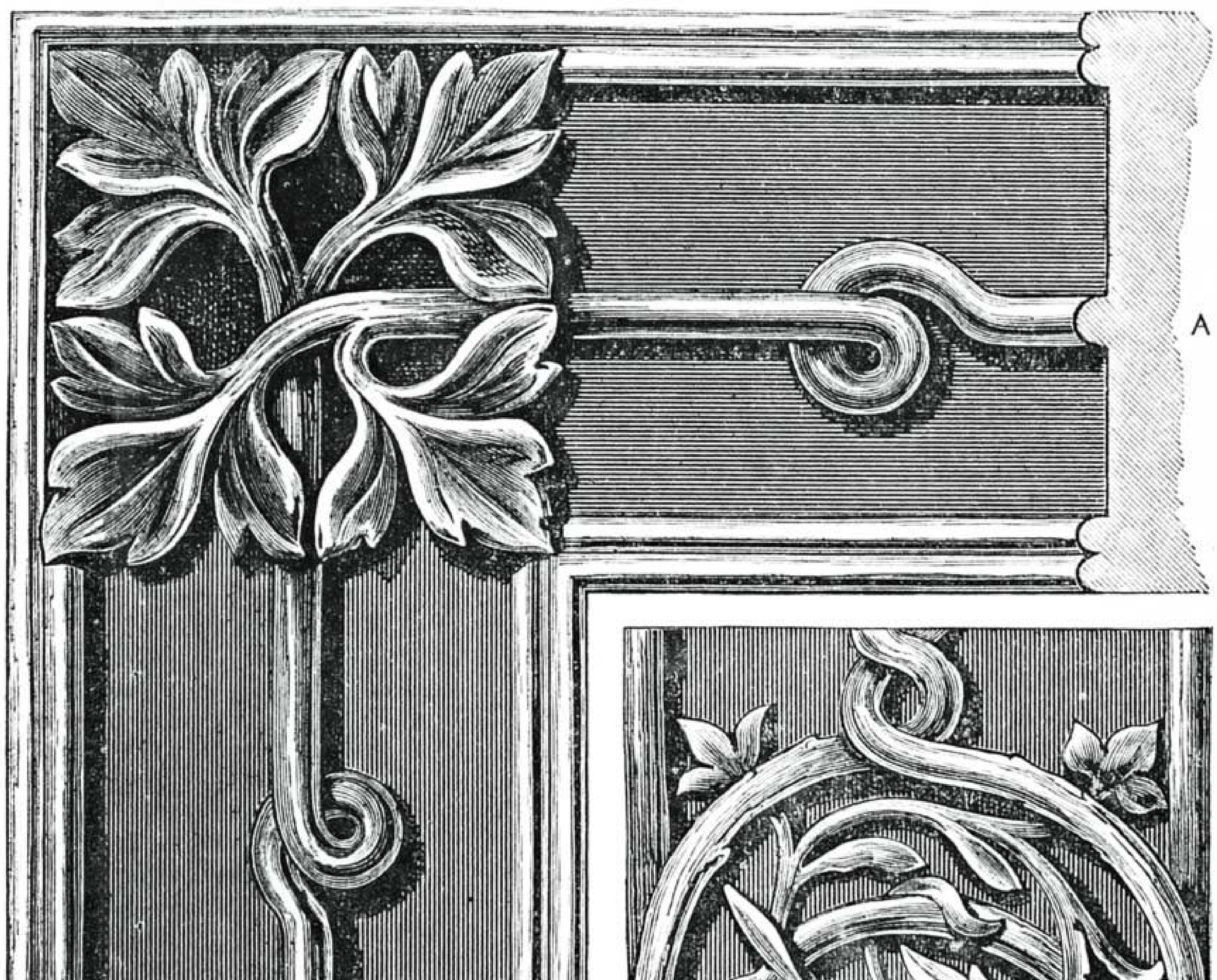
STUDIES IN WOOD CARVING.

BY FRED MILLER.

I.—TWO CORNERS FOR PICTURE FRAMES.

SINCE the introduction of *carton-pierre*, carved frames have become almost works of the past; but seeing the scope the craftsman has to exhibit his skill in a carved frame, the tyro should certainly try his hand at something of the kind. The two designs given with this number of WORK are very simple in character, and present no difficulties to even beginners in the craft. Fig. A is an adaptation of a tolerably familiar pattern, used in the "bosses" of Gothic wooden roofs. The corner consists of two double leaflets interwoven, and forming the termination of the twisted stem that occupies the rest of the frame. It would be easier when the frame is mitred and glued up to glue an extra piece, say, $\frac{1}{4}$ of an inch or $\frac{3}{8}$ of an inch deep, at each corner, so that the corners are in higher relief than the stems running along the four sides. The four bosses can then be carved out of the pieces glued on, the "grounding out" being taken to the depth of the pieces glued on, and *not* to the depth of the flat upon which the twisted stems lie. The corner is given full size for working, and a tracing should be made, and the four corners might have a little Chinese white brushed over them; and when this is dry, transfer the design of the bosses by means of a hard point and black carbonised transfer paper, to be obtained of any artist's colourman or stationer. Having "grounded out," carve away the leaves as they approach the edges of the bosses, so that the centre is the highest part of the corners, and the edges of the leaves only slightly higher than the thickness of the four pieces you glued on. Let the veining be simple and in the direction of the way of the leaf. Get the contour of the leaves sharp and angular, and let the carving be crisp and executed in a broad, free manner.

The stem running along the sides of the frame should be about $\frac{1}{8}$ of an inch in relief. The length and height must be divided up so that the twist or knob comes at regular intervals. The stem should not be smooth, but have a sort of bark-like surface running the lengthway of the stems. The background would look well if worked over with a punch instead of being left plain.



Two Corners for Picture Frames. Fig. A.—Adaptation of Gothic Boss. Fig. B.—Hispano-Moresque Arabesque.

Fig. B is adapted from a Hispano-Moresque piece of carving, and is only intended to be like a fret upon the flat. Consequently the grounding out should not be taken deeper than $\frac{1}{8}$ of an inch. Some portions of the design should be lower than the others. Be very careful to get the curves correct, and not broken, as the beauty of these designs is their flowing, interwoven character. The rest of the frame can have the double arabesque running the whole length of the frame, and terminating at each corner.

Such designs as these Moorish arabesques would make good fret work designs, and, in fact, a frame might be decorated in this way by cutting the design out as a fret, and gluing it on the flat. Those who have not yet tried their hand at carving out of the solid, but may have ventured to relieve fret work, which they have executed by a few touches put in here and there, by aid of gouge or chisel, may be led on to wood carving by working in the manner suggested, and venturing to impart a little more relief and variety to their work by means of carving tools proper, without which it is impossible to carry out the simplest carving effectively.

SMITHS' WORK.

BY J. H.

I.—Development of Art of Metal Working—Twofold Division of Subject—Ancient Hammer Work—Copper Work—Bronze Castings—Celts—Ancient Riveting—Iron Working among the Ancient Greeks, Romans, etc.—Iron Manufacture in the Middle Ages—Smelting in Sussex—Casting—Fagoting and Welding—Hot Blast—Processes of Heath, Bessemer, and Siemens.

Having undertaken to write a succession of articles for this magazine upon the work of the smith and of the boiler maker, I propose to preface those articles by a compendious sketch of the general lines of development of the art of metal working. I shall then proceed with my first series on smiths' work, to be followed by a second series on plating and boiler making.

All metal work is readily divisible into two broad classes — cast and hammered. This distinction is sufficient for our purpose, although it does not entirely cover the field, because nearly all malleable iron made by modern processes and all mild steel are cast before they are puddled, hammered, or rolled. Neither does this take account of the method of electrotyping. Both casting and hammering were employed in prehistoric ages, and both methods have continued in use until the present time. It is comparatively easy to produce intricate forms by casting, but the forging of such forms taxes the very highest skill and patience of the craftsman. Most of the specimens of prehistoric art which have been preserved to us are in the form of castings, but the more delicate hammered works are mostly of historic dates, or belong to periods immediately antecedent thereto.

The work of the blacksmith is of comparatively recent origin in human history. Skill in the working of iron dates only from a few centuries before the Christian era. In the Homeric period, iron was a rare metal of great value. One of the prizes at the funeral games of Patroclus was a self-fused mass of iron and iron fit for making arrows. — (Iliad xxiii.) Previous to the introduction of iron, bronze was the metal employed for weapons of war and defence, and for articles of ornament and domestic service. The ancients had acquired very great skill in the composition and use of this alloy, as is attested by the vast number of cutting tools and utensils which have rewarded the researches of archæologists. The origin of the age of bronze is lost in remote antiquity. No hard and fast chronological line separates it from the preceding neolithic or new stone age, when men polished their celts and implements of flint and chert. But the discovery of the use of the metals copper and tin marked a most distinct advance in the history of civilisation; and in this broad sense we are justified in regarding the bronze-using period as a very important age or era in the history of the race. It is considered probable, and in some isolated districts it is a fact, that there was also a period when pure copper, unalloyed with tin, was employed. But as a rule the advantages in increased hardness which were gained by alloying tin with copper were so evident, that in most cases bronze, and not pure copper, was used.

The evidences of a copper age are chiefly found about the Lake Superior district, in North America. Here native copper occurs in great abundance; and here the metal has, in most cases, been hammered, and not cast, though there are exceptions. In the State of Wisconsin alone, upwards of a hundred axes, and spear-heads, and knives formed of pure copper have been found. In Central India, at Gungeria, copper instruments have been found. But it is doubtful if either of these remains is of great antiquity, and they are only instanced as illustrative of the probability of a copper age having, in some cases at least, preceded that of bronze in countries where no direct evidence of such has been discovered. As a matter of fact, nearly all the primitive implements of metal as yet found in the old world are made of alloys of copper and tin.

The composition of the prehistoric bronzes varied extremely. A good bronze mixture, as used by engineers, contains about 88 or 89 of copper to 12 or 11 of tin respectively. Many of the ancient bronzes contained proportions approximating to these, but some contained a much less, some also a much greater proportion of copper. Very considerable traces of lead, nickel, silver, and iron also occur in the early bronzes, the modern art of the purification of copper from the foreign ingredients present in the ores being, of course, unknown to the early smelters.

These castings were made in regular foundries, the remains of which have been found in many districts in England. Moulds, lumps of rough copper in cakes and ingots, worn out and broken implements intended for remelting, gates or runners, cores, etc.—all these have been found in large quantities, so that there is no mystery at all about the method of manufacture of the early implements.

It is, to some extent, matter of conjecture how the metals were cast, but crucibles of clay must have been employed. At Robenhausen, in the old Lake dwellings, such crucibles have been found with small lumps of bronze still sticking in them. The moulds used were made in various materials—loam, sand, stone, and metal. In some moulds the upper portion was left open, in others, closed moulds were used, and hollowed parts of the castings were made of cores of sand or of metal. Spear-heads and celts—chisel-like implements—were cast in divided moulds, whose halves were guided into coincidence by means of dowels on the joint faces, the halves being bound together during casting with thongs, pins for the encircling cords being cast upon the outside of the mould. The metal was poured through holes in the joints.

In the case of socketed chisels, the interior core was formed sometimes of loam, sometimes of metal. This would fit into the upper portion of the mould; and the founders did not always get their cores central any more than they do now, as is evidenced by the thick and thin metal on opposite sides in specimens of castings still in existence.

In no essential did the methods of moulding and casting differ from those carried on at the present day. Yet these relics date from a period long anterior to the Christian era, how long, none can say even approximately; probably, almost certainly, many are from 2,000 to 4,000 years old. Dr. Evans thinks the bronze age began in England some 1,200 or 1,400 years B.C.; and that it lasted about a thousand years, but he believes that the knowledge of copper and tin may have much antedated this.

Among the articles fabricated by the early bronze founders were the celts, or typical cutting tools, whose uses were probably multitudinous: long narrow chisels and gouges, sickles, knives, razors, daggers, swords, spear-heads, lance-heads, hammers, shields, helmets, trumpets, bells, pins, bracelets, rings, ear-rings, buttons, caldrons, etc. Some of these were riveted to their handles, and in the case of caldrons and other vessels, the plates of which they were composed, were also united with rivets.

The introduction of iron brought about a revolution in the art of metal working whose ultimate developments are but dimly foreseen, even in our own age. The date of its discovery is lost in obscurity. But we may venture to affirm that it was a metal which was little known at the period of the Homeric poems, and that it was in common use by the second or third century before the Christian era.

The significance of the passage in the "Odyssey" is unmistakable—"As the smith plunges the loud hissing axe into cold water to temper it, for hence is the strength of iron" (ix. 393). The metal was known in ancient Assyria, a few iron articles found by Mr. Layard being quite sufficient to prove that the use of iron was not unknown. A few remains have been exhumed by Mr. Schliemann from the site of ancient Troy. There are abundant evidences of its use in Egypt, probably seven centuries or more before the Christian era. Mr. Fergusson even gives cogent reasons for believing that iron was known in Egypt fifteen centuries before our era, and in the Mediterranean shortly afterwards. And it is certain that the metal has been smelted in the rude Indian furnaces from time immemorial. This summarises nearly all our knowledge of the early use of iron. But when we come to within five or six centuries of our era, the evidences of the age of iron become more abundant.

In the days of Hesiod iron had become very common. The poet gives to Hercules a helmet of steel and a sword of iron; and to Saturn, a steel reaping hook. Some centuries before the time of Herodotus, the manufacture of iron had been practised by the Chalybes, on the shores of the Euxine. Their country was full of iron ore, and covered with forests, from which the charcoal for smelting was obtained. The steel of Sinope was reputed for smiths' and carpenters' tools; that of Laconia for files, drills, and masons' tools; and that of Lydia for files, swords, razors, and knives.

Two or three centuries before the Christian era, iron was in abundant use. The Isumbrian Gauls who fought with Flaminius were discomfited because of the softness of their iron swords, which bent in action. The swords of Noricum, in great repute during the Augustan age, were of iron. Iron is mentioned by Strabo as being among the products of Britain. The Veneti, in the Morbihan, when attacked by Cæsar, had their galleys fastened with nails of iron and moored with chain cables of iron.

The knowledge of steel must have been contemporaneous with that of iron. It is impossible that it should have been otherwise, because in the primitive smelting furnaces, which must have been practically identical with those which are in use in India, Burmah, Africa, and Catalonia, at the present day, the conditions of the reduction of the metal are such that iron or steel is produced almost at the will of the smelter. The nature of the resulting product depends on the temperature, the quantity of charcoal present, and the period of time during which the metal remains in contact with the fuel. Any given grade of malleable iron, steel, or steely iron, can thus be usually produced at the will of the smelter by the regulation of these matters. But it often happens that the product is other than that desired. Or, as in the Catalonian furnaces, every grade will be produced during one and the same smelting, so that the various qualities of metal have to be sorted according to the appearance of their fractured surfaces.

Although the art of casting in bronze was practised in a remote antiquity, yet the majority of the early work in iron appears to have been wrought under the hammer. The making of huge castings is a comparatively modern branch of metal work. The only distinctions made by the ancient and the early mediæval iron workers were those into malleable iron, and steel. Cast iron, though produced in the furnace, was an abnormal product, for which no use could be found. And the malleable iron they made was superior to our best, because it was smelted only with charcoal. Small quantities only were produced at one time, just as in the Hindoo, Burmese, African, and Catalonian furnaces; but the quality was admirably adapted for the best and most delicate smiths' work. Probably the early smiths could not have produced such excellent work as they did if they had been compelled to use our inferior bar iron.

During the Middle Ages, iron in small quantity was produced in England by a rude process of smelting, the ore being simply dug from a pit and transported to the localities where fuel was plentiful for smelting. The best iron was then imported from Spain and Germany. Historical documents prove that iron has been continuously smelted in the French Pyrenees from 1293 A.D.

The revival of the English iron manufacture first took place in Sussex, where the proximity of the iron-stone to the great oak woods had fixed the location of the industry, even in the time of the Roman occupation.

Iron at this time was so precious that, though cannon were cast and forged in the metal, the balls were hewn out of stone. The first cannons cast entire in England were made at Buxted in Sussex, by one Ralph Hogge, in 1543, whose assistant was Peter Baude, a Frenchman, the art of casting guns having been invented in France. Baude afterwards set up in business, and many of his guns, both in brass and iron, are preserved in the Tower. The low state of the art of casting in England at that time is illustrated by the fact that most of the early founders were Flemings and Frenchmen, who, driven by religious persecution to this country, brought their skill with them to the enrichment of England. That this was the revival, and not the creation, of an industry is clear from the fact that many of the old English andirons or firedogs date from a period anterior to the fourteenth century.

Toward the close of the reign of Elizabeth, the iron manufacture of Sussex was at its zenith. The fortunes of many great families had been built upon it. Ordnance was now exported. During the reign of James I., about one-half of the iron produced in the country was made in Sussex. But by-and-by the authorities became alarmed at the rapid clearing away of the forests, pit coal not having come into general use for fuel, because of the great prejudice with which it was regarded. An Act was passed in 1581 prohibiting the destruction of timber within fourteen miles of London for the purpose of iron making. New iron works were forbidden to be erected within twenty-two miles of London. These, and similar enactments, caused the emigration of many of the Sussex ironmasters to South Wales and elsewhere. About the middle of the seventeenth century, the civil wars gave another and more serious check to the iron trade in the destruction of the Royalist and royal iron works. By the latter end of the eighteenth century, the whole of the Sussex iron works were closed.

The smelting of iron, an art in which the English had now for so long excelled, was threatened with absolute extinction by the thinning of the forests, and legal restrictions imposed upon the further making of charcoal. In one locality after another the industry suffered, or became extinguished altogether; and iron again, as heretofore, had to be imported from Spain and Germany. In these circumstances the smelting of iron with pit coal occurred to many, and some patents were taken out with that object; but prejudice was strong and the practice unsuccessful. And so things continued until Dud Dudley took out a patent in his father's name, on the 22nd February, 1620, for smelting iron with fuel made from pit coal. The ironmasters of that period feeling, like the silversmiths of Ephesus, that their craft was in danger, pursued Dudley with unremitting hostility, and the civil wars subsequently swept away the fruit of his labour and reduced him to poverty.

To Abraham Darby, the Quaker, who commenced the casting of hollow ware in 1700, and who shortly afterwards opened the Coalbrookdale Works, in Shropshire, the iron trade owes much. Previous to this the hollow ware was imported from Holland. He too had experienced the difficulty of carrying on his work in consequence of the scarcity of timber, and resorted to the use of coke. The business was continued by his sons, then by Reynolds, who married a daughter of one of the Darby's. It was at Coalbrookdale that the reverberatory furnace was invented and first employed, the credit of the invention being due to two foremen, brothers, named Cranege. By its invention the operation of puddling for the making of bar iron was effected better than was possible in the old finery worked with a blast. Then there was the patent of Peter Onions, of Merthyr Tydvil, in 1783, for working the pasty mass of puddled iron about on the end of a rod, collecting it into a lump, and hammering it under the forge hammer.

Finally, Henry Cort, in 1783, patented the method of fagoting the bars of puddled iron, and welding and rolling them into one homogeneous mass. Cort introduced the practice of rolling bar sections in grooved rollers; and generally, he fixed the details of the practice of puddling and rolling as carried on in the present day.

During the period immediately preceding Cort's patents, the iron trade in this country was in such a bad way, chiefly because the ironmasters were debarred from the use of charcoal, and had not yet learnt how to adapt their processes to eliminate the impurities present in the coal and coke, that the Government would not use the wrought iron made in England, and the cast iron was considered rotten. Cort's processes have enriched thousands of ironmasters, but he, in consequence of a most unfortunate partnership, died in poverty, broken in spirit. To his inventions mainly, the Crawshays and the other great ironmasters of the present century owe their enormous fortunes.

On the first day of January, 1760, Dr. Roebuck, a Sheffield man, a physician, and the friend of Watt, opened the famed Carron Works in Stirlingshire. He was a man of large mind and of daring enterprise, but was ruined by the magnitude of his own projects, and died poor and in obscurity.

The black-band ironstone, whose use has quickened so vitally—indeed almost created the industry of iron smelting in Scotland—was discovered by David Mushet, in 1801.

In 1828, Neilson patented the application of hot blast to the smelting of iron. By its introduction a great saving in fuel has been effected, the black-band ironstone utilised, enormous fortunes made in consequence, and industries created.

About the middle of the last century, Huntsman invented the process of fusion of blister steel for the making of homogeneous cast steel, and the methods and details still pursued are, in all essentials, identical with those invented by Huntsman. It is not a little singular that although the method of fusion had long been followed in India in the production of wootz, the practice is so recent in England.

In 1839, Josiah Heath patented the addition of manganese to cast steel, by which the quality is so much improved, that inferior blister steel will yield cast steel of superior soundness and weldability. The addition of manganese is also absolutely essential to the strength and toughness of Bessemer and Siemens' mild steels.

In 1855 Bessemer patented his method of blowing air through melted iron for the production of mild steel. By this process, no less than 7,500,918 tons of steel were produced throughout the world in 1887.

A few years later Siemens invented the open hearth methods, the regenerative furnace and gaseous fuel, by which 1,672,340 tons of steel were made in 1887.

Simultaneously with the development of the Siemens' open hearth process for the manufacture of mild steel, a great revolution has been taking place in the methods of manufacture of malleable iron. The dry puddling process, perfected by Cort, is being rapidly supplanted by the wet puddling, or "pig boiling" process, in which the grey cast iron is melted on the hearth of a reverberatory furnace, in contact with substances rich in oxygen, by which operation the carbon and the foreign elements are oxidised, and the metal rendered malleable. The preliminary cost of refining the grey pig to white is thereby saved.

My summaries in this article have related to *metal*; my next will relate to *men* and their work.

(To be continued.)

ARTISTIC FURNITURE
EASILY MADE AND CHEAPLY PRODUCED.

BY DAVID ADAMSON.

II.—A Screen Secretary.

Uses—Construction—Principal Dimensions—Shaped Brackets—Writing-Flap—How to Fix It—Backboard—Shrinkage of Wood—Interior Fittings—Candle-Sconce—Shaped Bottom Pieces — Castors — Screws and Screwing — Fasteners for Lid — Lock — Lining of Writing-Flap — Mouldings — Flutes—Other Uses.

The little piece of furniture shown in Fig. 1 is distinctly a "fancy" article. It holds no recognised place among the things usually looked upon as necessary in domestic furniture, but is one of that large class of more or less useful and ornamental oddments of the "here-to-day-and-gone-to-morrow" kind. For want of a better name I have called it a screen secretary, fulfilling as it does the purposes of a writing-table and draught- or fire-screen. Perhaps a small writing-desk and shelves, self-supported, would be a better definition, for the screen is merely a necessity of its construction. Still it may be used as the latter article.

Whatever it may be called, however, it is a useful little thing, and ought to be a welcome addition to our home comforts. It occupies little floor space, very little more indeed than an ordinary fire-screen, while for writing at it is at least as handy and convenient as the common davenport. Those who require a large writing-table will, of course, not find it suited to them, though there is no reason why the same principle of construction should not be applied in much larger sizes than those named for the small one about to be described. This will be found useful enough for occasional writing, and its portability is a recommendation. In winter it can be moved near the fire, while in summer it affords a convenient table by the open window. Any amount of ornamentation can be lavished on it, but in accord with the object of these papers it is purposely shown with little or no decoration. Those who wish to add this will readily see that carving on the ends and front of the writing-slope affords a ready means of ornamenting, as does fretwork or the application of marquetry panels. However, plain as it is, and of old packing-case stuff though it may be, if cleanly made and finished with enamel paint, it will form by no means an unsuitable piece of furniture even for a drawing-room. So far as utility is concerned, it will, however, not be out of place in any room, and those who want to give something more than useless knick-knacks to bazaars will find this a very welcome change. Those who have some knowledge of joinery will hardly need any instructions for making such a simple thing, and novices need not despair of turning it out satisfactorily, if they will make good use of the square, and take their time over the work.

For the general principles of the work, I must refer to remarks in a former chapter where the construction of an overmantel is described, and proceed at once to say what may be necessary about the special features of the thing in hand. Fig. 2 shows the front of the contrivance; Fig. 3 the end with the shelves, fall, back, etc., in section, the fall, or writing-flap, being shown shut in both of them. The scale to which Figs. 1 and 2 are drawn is $1\frac{1}{2}$ in. to the foot, so that each $\frac{1}{8}$ in. of them represents one inch in actual size, or approximately so, for very small dimensions cannot be accurately gauged from diminutive working drawings. Though large enough for illustrative purposes, I strongly once more recommend the maker, before cutting his wood, to set out a full-sized drawing. This need not give more details than are shown on Figs. 2 and 3, where any that would be likely to confuse are purposely omitted.

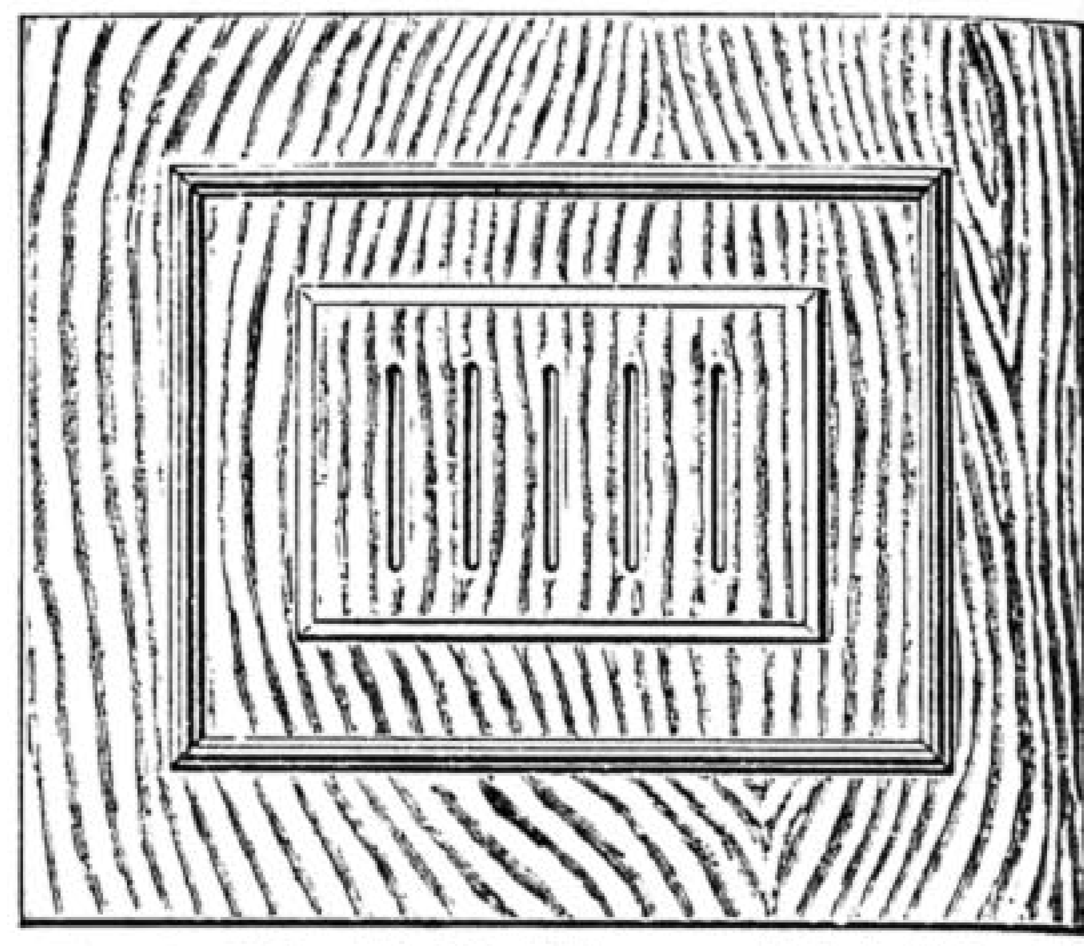
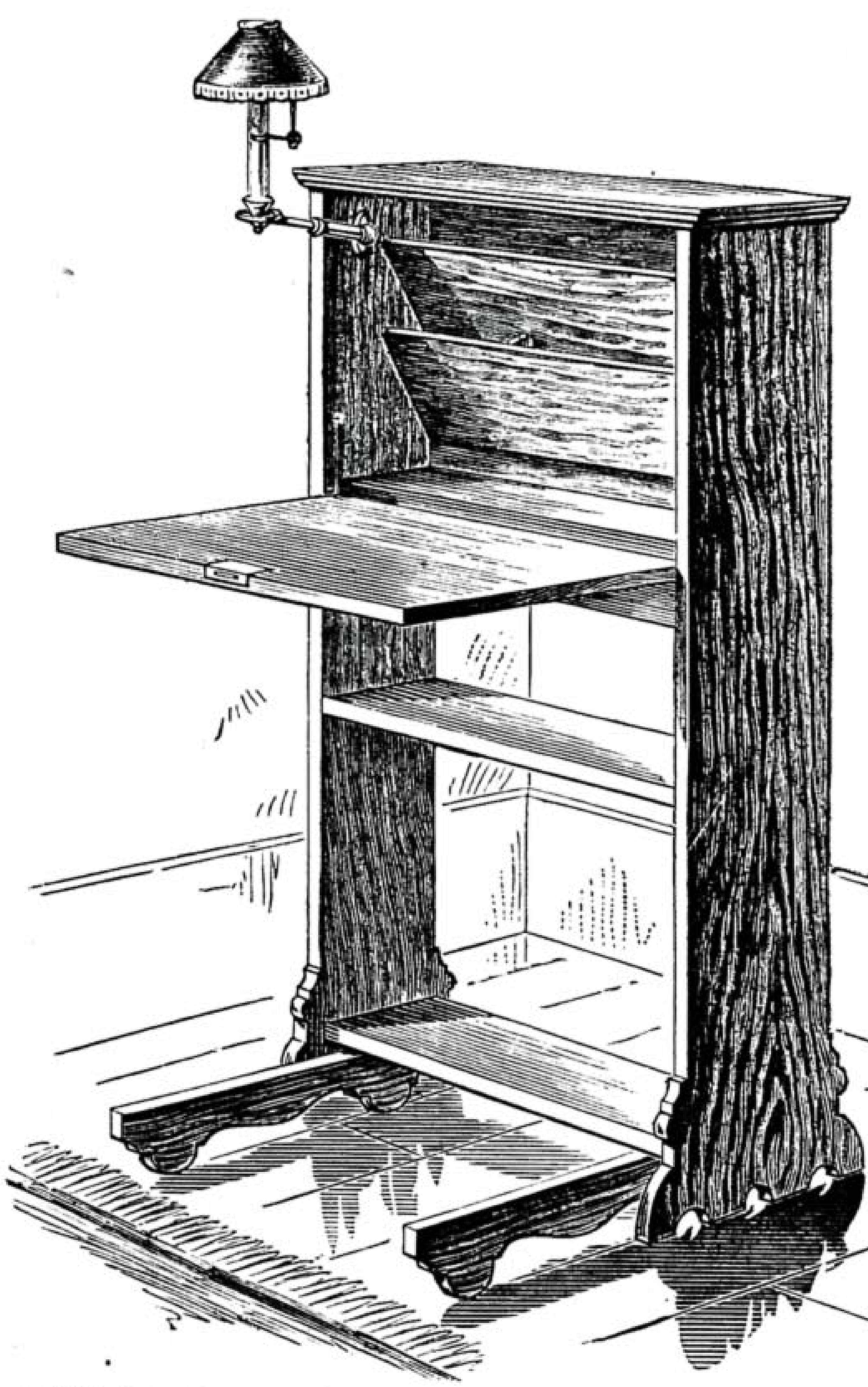


Fig. 9.—Lid with Mouldings and Fluted Panel.



Artistic Furniture. Fig. 1.—A Screen Secretary: Perspective View.

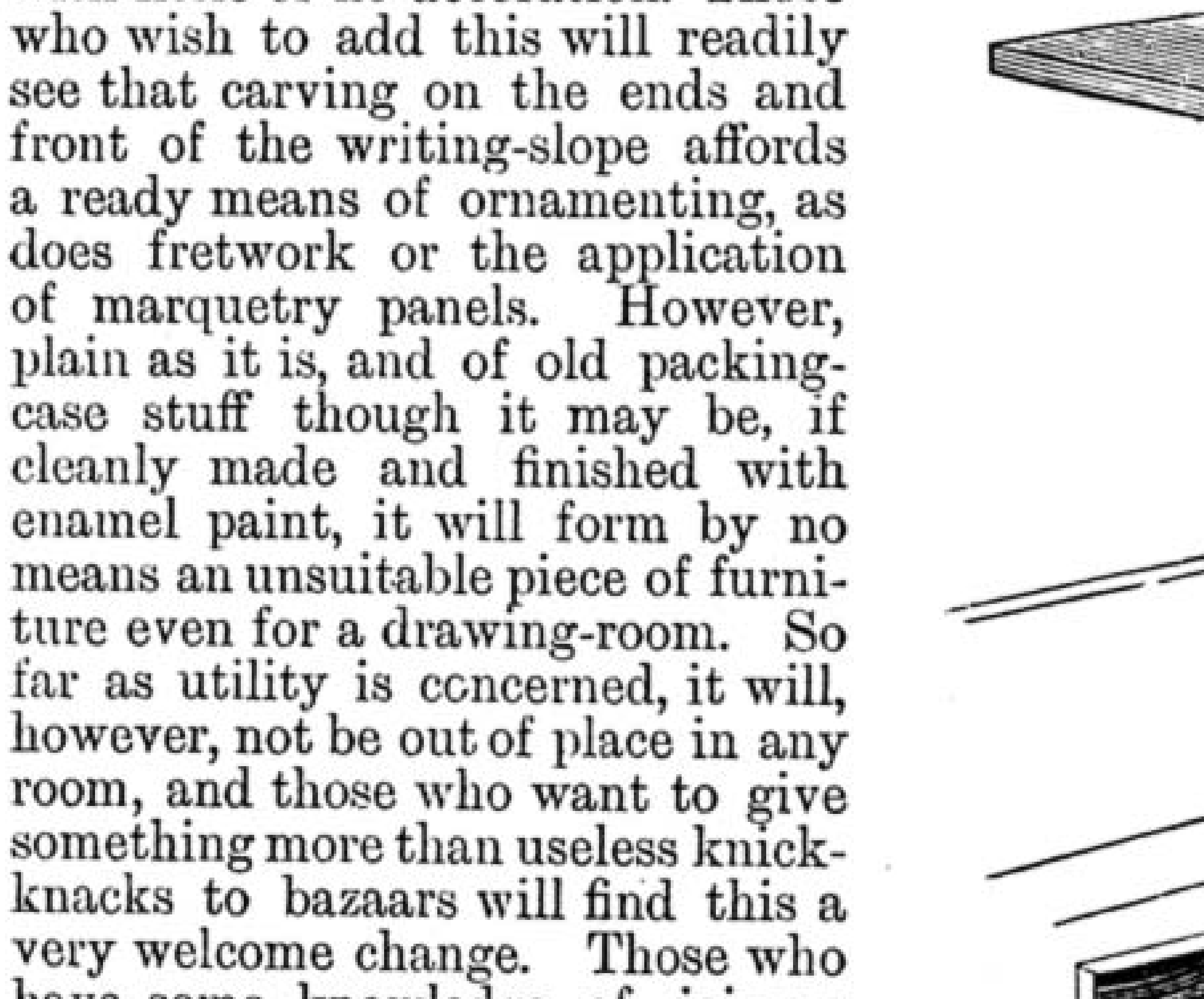


Fig. 11.—Another Arrangement for Interior.

By the drawings we find that the principal dimensions are as follows:—height, 3 ft. 8 in.; width from side to side, 1 ft. 8 in.; depth from back to front, on top, 6 in., and at bottom, 12 in. Taking the thickness of the ends, and, indeed, all the rest of the material, as 1 in., the top piece will be 1 ft. 6 in. long. This, as will be seen from Fig. 2, is nailed within the ends, like the two lower shelves and the bottom of the writing part, all of which must consequently be exactly the same length as the top piece. Three nails in each end of a shelf will be sufficient to hold it.

The two shaped brackets under the shelf at the bottom of the fall will serve to stiffen the work, which, without some such contrivance, might be apt to be strained. They, therefore, not only serve to break the monotony of straight lines, but are placed for a structural object, and should not be omitted, though *on paper* they may seem superfluous.

When this part of the work has been done, the writing-flap may be made to fit accurately into its place, for, as it will have to be made of several pieces, it may be supposed that to save time it has been previously jointed up, and left rather full, so that it might be reduced afterwards to the right size exactly. Though not absolutely necessary, it will be better for the grain of the wood to be from top to bottom instead of across the flap. See that both surfaces are planed as smooth and level as possible, for one will be visible when the flap is closed, and the other is, of course, the desk side. The former must be level for appearance, the latter for comfort's sake, so that any ridges at the joints must be carefully worked down.

Now the hingeing of the front or flap will demand some attention from those who are not accustomed to this kind of work, though, like a good many other matters, it is simple enough when it is understood. In Fig. 2, just below the dotted lines, will be noticed a nail driven through each end into the flap. In Fig. 3 the nail is indicated by a dot in the corresponding part of the drawing. On these nails, or centres —for there is a special kind of hinge for similar positions, known as centre hinges—the flap works. With a flap so hung it is evident that on pulling its top forward the part below the nail swings backward and upward till it is stopped by the narrow shelf indicated by the dotted lines on Fig. 2. Were this shelf not there the flap would fall into an almost vertical position. Recognising this principle, it is merely a matter of adjustment of the relative positions of this shelf and of the centres or hinges to get the writing-flap either level or at any slope that may be most convenient. It will be understood the slope is not variable at will. When once the hinge is fixed, the angle of the board is also, so it will be well to decide on what seems likely to be suitable before fixing either the narrow shelf or the hinges. For all practical purposes, however, the shelf, which really forms the bottom of the desk, may be fixed at the distance shown in the illustrations, above the one below it—viz., about 2 in. By merely placing the hinge more or less distant from the lower edge of the flap, sufficient range of choice can be got.

To make this clearer, Fig. 4 is given, showing the position of hinge, *i.e.*, its centre or pivot when the flap is to be horizontal; and Fig. 5, with a considerable slope. These diagrams, I imagine, are more explicit than any verbal description, and will enable any one to set out the slope for himself. It is columns. The important matter of the position of the hinge being decided, it must suffice to say that a large screw-nail working freely in the ends and screwed into the flap will do very well as a substitute for the proper centre hinge. The head may be sunk and the hole covered with a small turned button. Those who want to know more about centre hinges may be referred to the articles on Hinges and Hingeing, in Nos. 5 and 7, pages 74 and 103.

The board enclosing the back—and by "board" it will be understood that two or more may be jointed to get the necessary of view, is quite serviceable when the wood is perfectly seasoned and dried before fixing together. All that can be done is to allow some play wherever it may be convenient, and in the present case rabbeting and precise joinery cannot be considered so. In all such circumstances the utmost that can be done is to take care to keep the direction of contraction as limited as possible, which means that the grain of the wood will run across from end to end, not from top to bottom.

I do not know whether I have already said in these articles that wood does not

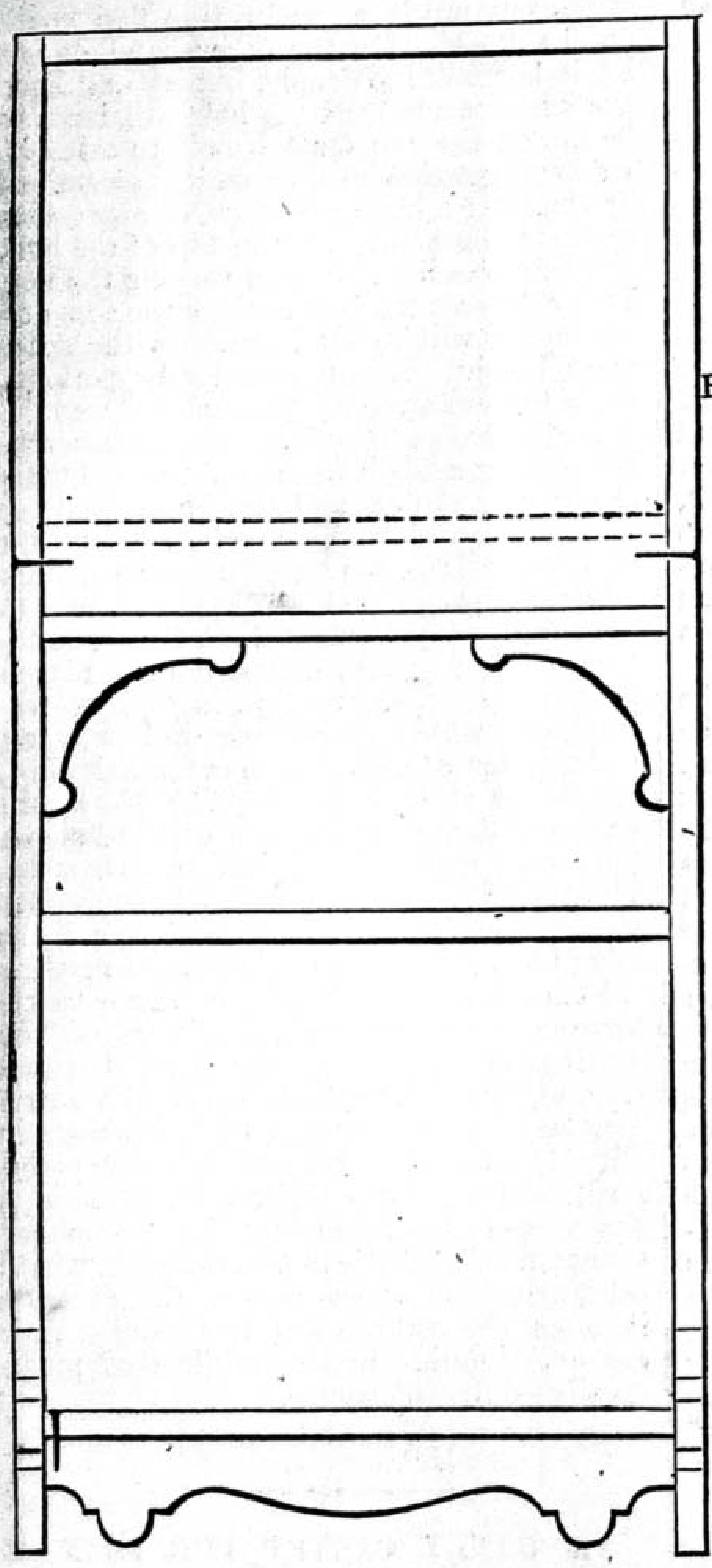


Fig. 2.

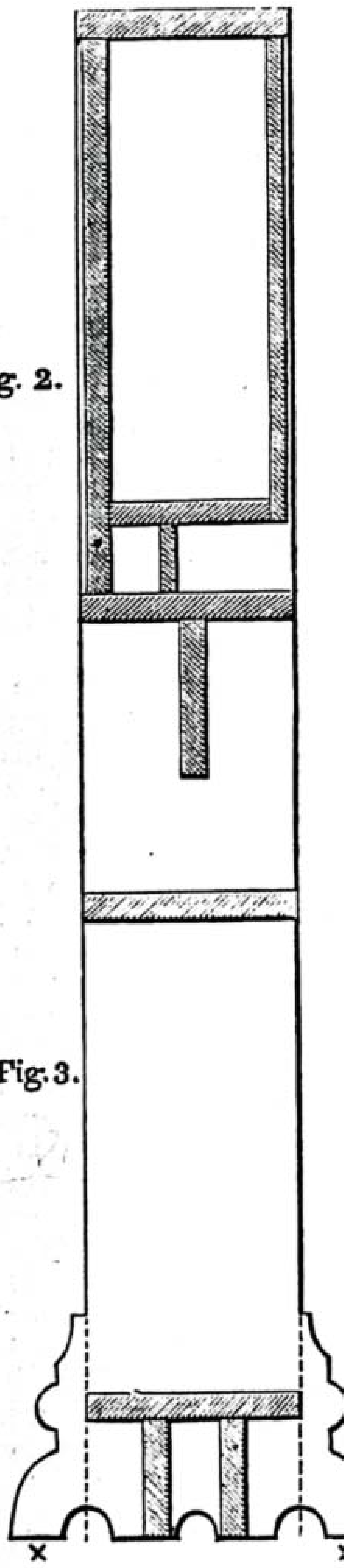


Fig. 3.

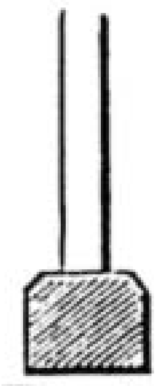


Fig. 6.

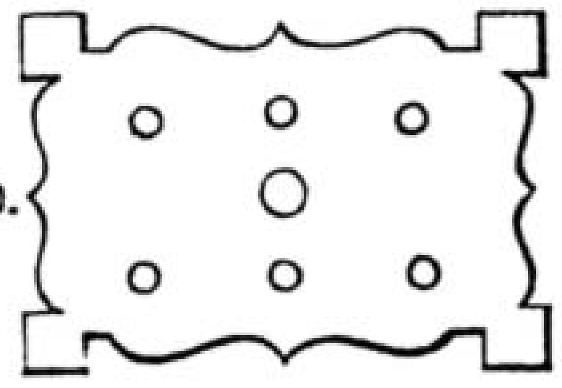


Fig. 10.

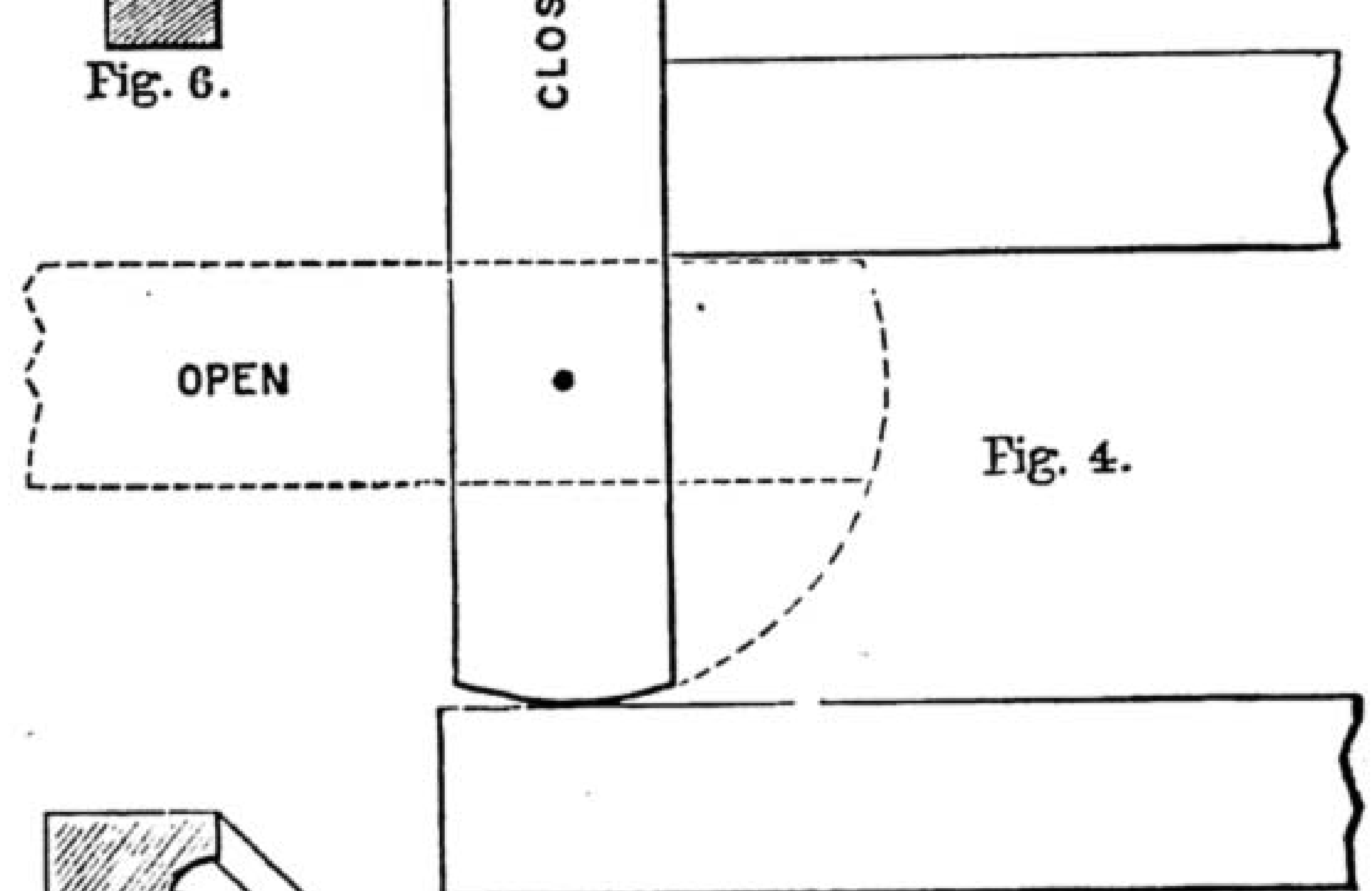


Fig. 4.

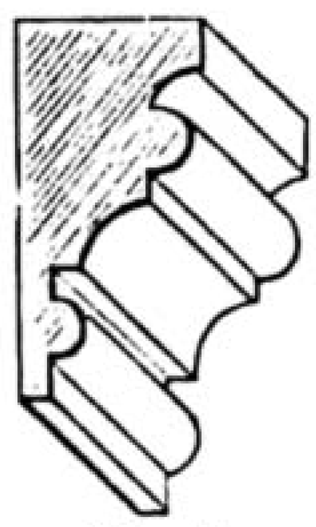


Fig. 7.

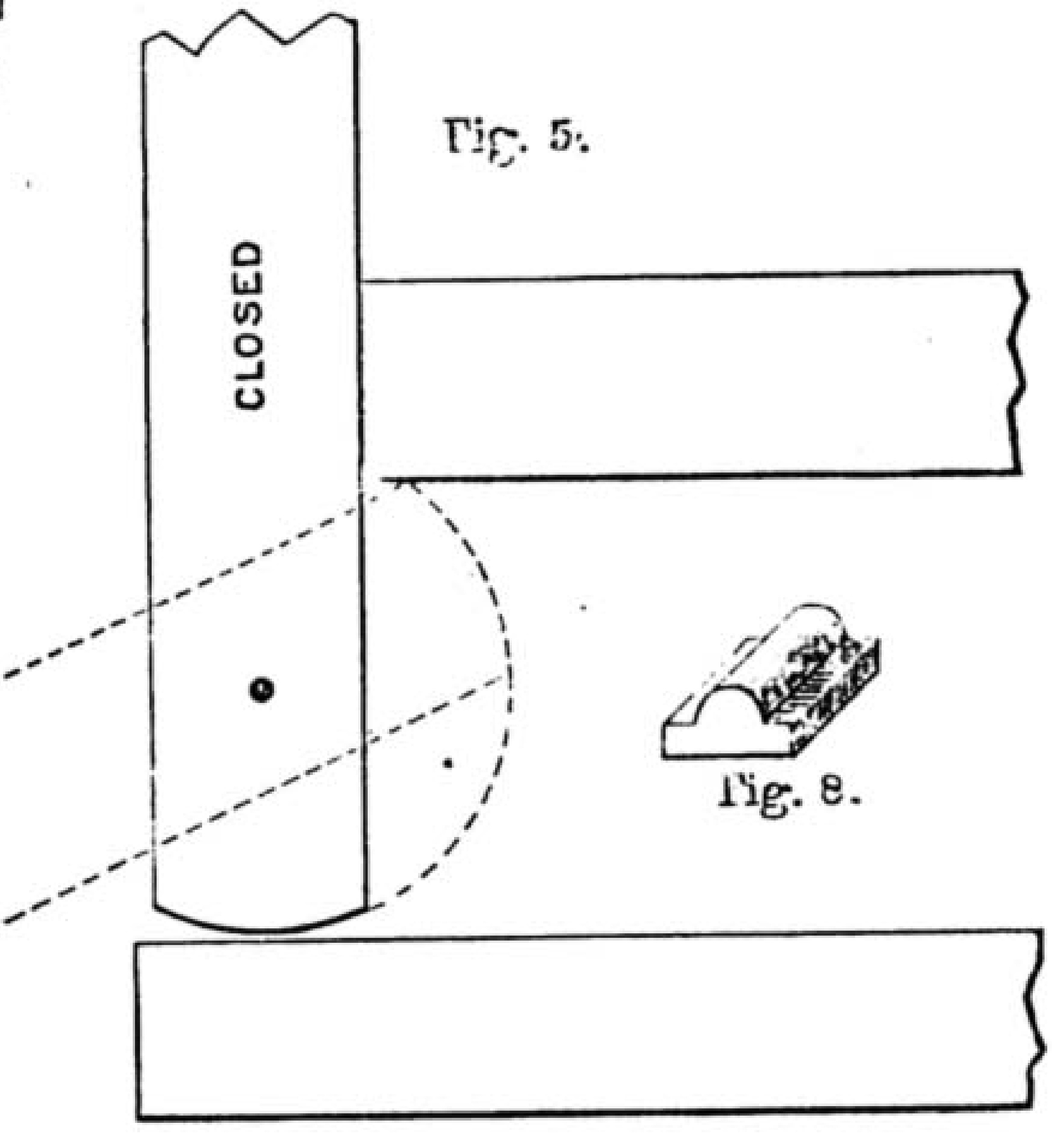


Fig. 5.

Fig. 8.

Artistic Furniture. Fig. 2.—Front. Fig. 3.—End (Scale, 1½ inches to 1 foot). Figs. 4, 5.—Diagrams showing Mode of Hingeing. Fig. 6.—Section of End, with Block for Castor. Fig. 7.—Moulding, Elliott's Registered Design, No. 1071. Fig. 8.—Moulding, Elliott's Registered Design, No. 1001. Fig. 10.—Shaped Panel.

only a matter of compasses and measuring, and it will be more beneficial to exercise a little thought than simply to be told to place the hinges at such or such a distance for any particular angle that may be required. If work is to be of any value to the worker in an educational sense—and it may freely be conceded that novices' work is not worth much in any other—it is better to understand the principles than to work only to measure to definite directions. Without a knowledge of principles of his craft no man can become a competent worker, however good he may be at routine work. Hence about this hingeing no precise measurements are given now, but those who want them and cannot work them out for themselves may apply through "Shop" width—is fastened to the back edge of the compartment bottom, and underneath the top, through which one or two nails are driven to hold it securely, in addition to one or two through the ends. I am aware that this is not particularly good joinery work, as, unless the back is thoroughly dry, almost baked, in fact, it will, through having no opportunity for play, be apt to split. It may stand, and probably will, if the wood is quite dry. In all joinery theory is one thing and practice another; so it may be some consolation to the amateur to tell him that many thousands of articles of furniture are made every year without any allowance being made for shrinkage or expansion, and that such work, defective though it be, from a purely theoretical point shrink in length, but in width; if I have, the fact being an important one will bear repetition, as the recognition of it will save many a constructive error. For this reason it will generally be found that in good cabinet making the grain of the wood is in the direction of the greatest measurement—viz., length not breadth. As will be seen from Fig. 3, this backboard may be of some thinner material than the rest of the job—½-in. stuff will do very well—and it will also be observed that it is set in a little, that is, the hinder edges of the top and ends project a little beyond its outer surface.

While we are at this part of the work it may be as well to call attention to the interior fittings, which are made of thin wood —¼-in. stuff; but even thinner than this will do. The bottom, which stops the flap, will do very well to hold ink, pens, etc., while the sloping racks will afford storage for note paper, envelopes, etc.; and as requirements will differ, it has been thought best just to indicate the method of utilising the space by a simple arrangement. The ends of the sloping boards are supported on thin slips of wood glued to the ends. The boards then rest on them, and, if necessary, are further secured by a glued block or two behind. Any partitions may be easily fixed without grooving by cutting them neatly and securing with a little glue and a few small brads or needle-points. If preferred, of course the sloping boards may be placed level as shelves, but by having them as shown, larger paper can be kept in them. Those who want something simpler even to keep their papers tidy will, no doubt, be aware that convenient little receptacles may be made by nailing tape across, leaving, of course, the spaces between the nails sufficiently loose for the purpose. The same use may be made of the ends, which are large enough for post-cards and envelopes, while a couple of cup-hooks, screwed into the back, will support a ruler. Indeed, by economising space, and with a little contrivance, it is astonishing how much in the stationery line such a little thing will hold.

The candle-sconce is another suggestion which may be welcome to some. It is merely one of the kind commonly seen on pianos, so that it can be folded inside when the lid is closed. It may occur to some that a sconce, or one at each end outside, would be not only a useful but an ornamental adjunct. If so, there is no reason why they should not gratify their tastes, only to be in harmony with the screen, the sconces should not be over elaborate in design.

Nothing so far has been said about the shaped bottom pieces, by which stability is given. They are merely small pieces cut out and glued to the edges of the ends, as indicated by the dotted lines in Fig. 3. Care must of course be taken that these shaped pieces are of exactly the same thickness as the ends, and also that they are uniform at the bottom, or otherwise the structure will not stand firmly, but rock in an unpleasant manner, when in use. It may seem ridiculous to call attention to this, but the novice, who has never tried it, will probably find the difficulty of "truing" the ends somewhat more difficult than he imagines. It may be done after a fashion, so that there may be no rocking; but this will hardly suffice to satisfy a critical eye, as, in addition, the upright surfaces must be perpendicular. Indeed, if I may so express it, squares, levels, and perpendiculars are the proper signs by which we may know that the work has been thoroughly done. If these are wanting there is something amiss.

Now, the bottom ends, widened as they are, ought to be enough for stability in the screen form, but it will be evident that some additional support will be necessary when the lid is down and being written on. Unless the shelves are loaded with books, or something heavy to counteract the leverage of pressure on the flap, there would probably be an upset. Such a catastrophe could be easily avoided by making the ends wider still at the bottom, but then look at the space they would occupy; and be it remembered, compactness is one of the chief features of this little writing screen. If it is to spread itself over the floor twenty inches or so, whenever it is wanted as much out of the way as possible, well one of its great recommendations is gone. Better have a regular writing-table instead. But we can still get the necessary stability by having hinged supports underneath the bottom board. These are shown extended in Fig. 1. Their shape is shown in Fig. 2, and their relative positions when closed in Fig. 3. They are hinged to the bottom shelf by a large screw driven through each at alternate ends, and as near the ends as convenient. If the screw is driven in from above, as indicated in Fig. 2, the hole in the board should be large enough for it to work freely, not loosely mind, but just enough to let the tighter hold of the thread in the movable piece remain undisturbed. Perhaps the appearance of the screw-head may be deemed objectionable. If so, run the screw in from below, through the thickness of the swinging bracket, and in this case the thread must bite in the shelf, therefore, the hole in the bracket must, in this case, be the larger of the two. It will be seen that the screw acts as a centre hinge, precisely as already indicated for the writing-flap. The ends of the brackets or supports will have to be rounded off to give clearance and allow them to be turned; and if they are cut to exact length, the free end will require a little bevelling off to its inner side; for it will be clear, that if a tight fit, and cut quite square on the end, it will jamb on attempting to move it. When not required for use, these hinged supports are out of the way, and rather ornamental than otherwise in appearance.

Possibly, some may prefer to have the whole thing on castors, so that it may be moved from place to place without lifting. If so, I would only say that "pin" castors should be used. These are so-called to distinguish them from the socket castor, as they have a screw or pin which can be let into the wood. Obviously, a socket into which a leg might be fitted would be unsuitable here. If castors are used—mind, I do not recommend them for this screen—they should be placed as near the ends of the bottom as possible: two to each end, as shown by the × on Fig. 3. Care must be taken that the plate of the castor is not greater in diameter than the thickness of the wood to which it is attached, if appearance be regarded. However, it may not be practicable to manage this, as the wood may be too thin to take a strong enough castor, and a weak, unserviceable one is nothing but a nuisance, whatever piece of furniture it may be on. Some of the "direct bearing" castors are good enough in their way, many of them perfect, till they are tried; but when all is said, there is nothing better for general purposes than the ordinary style, when of good quality and properly fastened, and, of course, sufficiently strong for its work.

In the round plate referred to will be seen some holes. They are for screws to support the central one, and let them be long enough. The little paltry screws, *hammered* into common furniture, are no use at all. If for any reason a castor-plate larger than indicated is advisable, this is how it may be fixed: Along the bottom, underneath the ends, fasten a rail as shown in section, on Fig. 6, and screw the castor into it. The screws will also hold better by this arrangement, as they will not be driven into end grain. Those who do not want castors on the ends may think that they will be a convenience on the hinged supports, and wish to have them there, but beyond giving the hint, any minute instructions can hardly be requisite.

Some sort of fastening will be required to keep the lid up when it is not in use for writing purposes; a spring catch may be used, or if it is desired to keep the contents of the case from prying fingers, a lock. The kind required will be a "till" lock, a space for which must be cut out where shown in Fig. 1. No difficulty should be experienced in doing this with a chisel, the principal caution I would give being, to see that the surface of the back of the lock and that of the writing-lid are equal. The part of the plate through which the bolt works will take care of itself, so far as projecting beyond the wood is concerned, for if it sticks out much, a well-fitting flap could not be closed. On the other hand, do not let it be sunk too deeply, but try and keep the surfaces uniform. A hole will have to be cut in the top for the bolt to catch in. Its exact position may be easily ascertained by smearing a little gas black, or any colour that may be handy, on the top of the bolt, shutting the lid and then turning the key. This will force the bolt against the top, and an imprint will be left just where the space must be cut. Rough and ready perhaps, but a thoroughly good "workshop" way.

But we have supposed the lock to be working without a key-hole. To form these neatly is not easy at first, and the power to do so can only be acquired by practice. The shape of a key-hole is too well known to require any description, and all I would say to the novice at present is this: Cut it as accurately as you can, and if it does not, in the end, look sightly, get a "plate" escutcheon, which is nothing but a small plate of brass, with a hole cut for the key, and screw it in position. The plate will hide any defective shaping of the hole in the wood, and be, in itself, an ornament. The thread escutcheon which is sunk into the key-hole may be used instead, but the other form is better, for the reasons given.

I am compelled for want of space to reserve my remarks on the lining of the writing-flap, mouldings and flutes in panel (Fig. 9), and other uses to which the secretary may be put. One of these is shown in Fig. 11, which I think sufficiently explains itself, and warrants us, almost, in naming the screen so fitted as the "Smoker's Companion." What's in a name? Ah, what! otherwise from appearance of the contents it might be called the teetotaler's *vade mecum*. Liquids to be partaken of medicinally—only—of course.

(*To be continued.*)

A HANDY CASKET FOR COIN COLLECTORS.

BY ONE OF THEMSELVES.

ABOUT COIN-KEEPING—CHARACTER OF CASKET—DIMENSIONS—JOINTS—CARCASS—BASE STRIPS—FEET—LID—TRAYS—SWEEPING OF COINS—HOW TO KEEP COINS IN PLACE.

WE coin collectors are accustomed to speak of our treasures in the lump as "a Cabinet of Coins," but this does not imply that every one of us keeps his collection in a cabinet, in the strict sense of the word. I for one do not. Granting that a cabinet has its advantages as being the most accessible of receptacles, it has also its objectionable points. Our hoards have an intrinsic value, and are attractive to the too-appreciative burglar; and it is, in my opinion, well to keep them in something which can, when occasion arises, be more easily removed to a place of safety than a cabinet.

My plan, therefore, is to arrange my collections in a sufficient number of handy boxes. During the years that I have made a study of numismatics, I have devised and tried many methods of disposal, and may, therefore, be able to throw out suggestions worth the consideration of my brother collectors. The box—or call it a "casket," the word sounds better, and is, indeed, more appropriate, both in respect of its ornamental shape and of the value of its contents—the casket, then, which I am about to describe is one of a series, and is the outcome of some experience. I think I may claim that three or four of such caskets, when set out to view in a room, are decidedly sightly things, and that they are easily stowed away in some secure and secret nook when safety is an object; also, they have this advantage, they enable one to arrange a greater number of coins in a given space than could well be done in any cabinet. The casket before us, with an internal measurement of only 10 in. by 6 in. by 4½ in., holds, as fitted by me, nine trays, which give a surface of some 540 square inches. This means room for the exhibition of a very considerable number of specimens.

But before speaking of the internal arrangements, it will be well to give such a description of the box itself as will enable any one with a fair knowledge of the handling of carpenters' tools to make it for himself. My own casket, as will be seen from the illustrations, is carved, but made of some ornamental kind of wood the thing would look very well without carving.

A general view of it is given in Fig. 1, and in Fig. 2 is shown the front piece, drawn to half-size. Its dimensions are 11 in. by 4½ in. It is of ½-in. oak, as are also the back and the ends. The back is like the front, only it is not carved. The carving is of that simple kind which is worked almost entirely with the gouge and the dividing-tool, and which, though effective when finished, does not take long in the doing. The end pieces measure 6 in. by 4¼ in. No separate illustration of them is given, as the carving is almost identical with that on the front, the only point of difference being that in the ends the conventional foliage on each side of the half circle is a trifle wider.

At each end of the front (Fig. 2) are shown the screws, three in number, which fasten the box together. Probably a professed carpenter would not have been happy unless he had dovetailed these joints. I have enough of the craft to have dovetailed them had I been so inclined. But I knew that I could give abundant strength to my work in the more simple manner, and I chose to have the screws and to make a decorative feature of them. Dovetailing would have interfered with the ornamental character which I wished to give to my corners. The bottom of the box is merely a piece of ¼-in. deal, which is screwed to the front, back, and ends. The edges of this are completely hidden by the carved base strips (Fig. 3) which are screwed over them.

I first fitted the carcass of my box together, and having got it to my satisfaction, unscrewed it and worked the carving on front and ends; but it was not till I had put it together for the second and last time that I scolloped out the corners at front and back with a large gouge, as shown in the perspective drawing (Fig. 1), and indicated at the ends of Fig. 2. This scolloping was but the work of a few minutes; it does not weaken the casket, and it adds very much to its ornamental character.

In Fig. 3, a portion of one of the base strips which run along the bottom is drawn at full size. These strips were cut from ¾-in. stuff, but worked down so as not to be more than about ⅝ in. broad and deep. The front and back strips are 12¼ in., the end strips 8¼ in.—or rather were so originally, for the finishing off at the corners, which is done after they are fixed in place, reduces their length by ¼ in. These are fixed to the edge of the bottom by slender screws. The back strip is left uncarved.

One of the feet is seen in profile at Fig. 4, and in plan at Fig. 5; both these figures are of the actual size. The feet are of ¾-in. wood, 3 in. long, and 1½ in. wide at their widest part, but decreasing to ¾ in. at front. They project at the corners about ½ in. beyond the base strips and 1 in. beyond the box itself, as is indicated by dotted lines in Fig. 5. Each foot is fixed by two screws, one driven upwards into the bottom of the box, and one driven downwards through it. These screws are shown in both the diagrams, and are both on the diagonal line (*a*, Fig. 5) drawn from the corner of the box.

The lid is cut to overhang the front and ends by ½ in.; it therefore measures 12 in. by 7½ in. It is of ¾-in. board, and is, for the sake of appearance, planed down at the edges to ¼ in., as seen in the section, Fig. 6. The slight enrichment cut with the gouge along its front and end edges is shown in Fig. 7. The former illustration is half-size, the latter full-size.

It has been mentioned that the internal arrangement for displaying the coins was by a series of trays. The casket is 4½ in. deep, and as it was intended for heavy examples (chiefly tokens), the trays had to be strongly made. Half an inch was allowed for each, which gave nine trays. Had the coins been of a lighter description, as, say, a series of English silver pennies, trays of a slighter build would have sufficed; by allowing ⅜ in. only for each, room might have been found for twelve trays.

In Fig. 8 is shown a section, to half-size, of one of the trays as actually made. It is of ⅙-in. deal, ebonised at the edges, and secured by small screws at each end to a narrow strip of hard wood. A slip of coloured leather (*b*, *b*, Fig. 8) fixed to the under side of the hard wood by a tack, serves as a handle by which to lift the tray. This tray is strong and simple, and easily made.

My earlier attempts in this direction were not exactly as above. My first trays were made with rims running all round, and the coins were arranged loose in them. Now, if no examples came to one's hands but such as are perfectly distinct and legible, this plan might suffice. But such is not the case. Many pieces there are to which even an expert has to give close and careful study before he can decipher them, and such coins, when once made out and identified, it is desirable to keep distinct, each with its own proper description; or one may have the same work to go through again.

Therefore my later plan has been that shown in Fig. 9, and when this is adopted no sides are needed to the trays. A piece of millboard is cut to fit the tray, and through the board round holes are punched with the gouge, each to serve as a compartment for a coin. Before the millboard is fixed to the tray a sheet of writing paper is pasted over its lower side. This makes a bottom to the compartment, and prevents any danger of thin coins slipping between millboard and tray. Then the board is fastened down with a few neat brass tacks. On the paper at the bottom of the compartment one can write any short needful description of the coin that is to occupy it; and whenever, in those rearrangements which must needs occur in growing collections, a different coin has to be substituted, it is easy to cut out a circular piece of paper, write the new description on it, and paste it into the hole over the old.

It may be objected that the varying sizes of coins will render rearrangements difficult—that the new examples which we wish to place in certain situations may not fit the holes. This may happen, and if it should do so—if a larger hole is absolutely necessary—the millboard, which is only tacked down, can be detached from the tray, a larger hole punched, and a separate piece of paper pasted over it. But in arranging coins, the necessity for keeping all of one reign together, regardless of size and value, does not appear to me to be absolute. A grouping of pieces which do not greatly vary in size may frequently have as much completeness and interest.

Take, for example, our silver pennies. Of these a complete series from the days of the Heptarchy to the present reign may be disposed in compartments $\frac{8}{10}$ in. in diameter; and if the recent pieces do but indifferently fill their holes, the decreased value and importance of the coin is all the more forcibly illustrated. And a most instructive series is one of pennies ranged alone. Through Saxon times the silver penny was all but our only money; it was absolutely so through Norman times. The silver penny of those ages explains to us the now almost unmeaning terms of a "pennyweight," and of a "pound" as applied to value, for down to Edward I. the penny, by the old Tower standard, weighed 24 grains; 20 pennies made an ounce; and 240 pennies a pound of silver, alike by weight and by tale. By modern Troy weight these pennies weighed 22½ grains, from which, by successive curtailments, they had sunk in Elizabeth's reign to the meagre proportions of the "Maundy" penny of to-day—that is, to 7¼ grains (Troy). These latter degenerate pennies will fail to fill their holes by some $\frac{3}{10}$ in., which will not, however, involve any very serious loss of space.

Or the eighteenth century tokens, the numbers of which give them an importance in every collection, might be instanced. This prolific coinage was so generally an issue of halfpence, that pieces of other denominations look out of place in it, and may well be—as they have been from some of the most comprehensive collections—culled out to find a place elsewhere. Compartments of 1¼ in. diameter will take all these halfpennies.

Similarly, the seventeenth century tokens, issued so abundantly in the few years preceding 1672, are almost exclusively of a small farthing size, and might, with few exceptions, be relegated to uniform holes ⅞ in. in width.

All coins cannot, however, be made to conform in this respect; and at Fig. 9, one half of the tray given has been divided into uniform $\frac{8}{10}$ in. compartments, and the other into holes of such varying sizes as best economise space. This diagram also shows how the respective trays are numbered.

Caskets of this description have, as the writer has found to his sorrow, one weak point unknown to stationary cabinets. In careless lifting—as for dusting, etc.—coins may be jerked from their places and hopelessly mixed together. This has been remedied by fitting over each tray a second piece of millboard, which, closing upon the holes, keeps every coin in its proper place. Indeed, these shutters, being covered with writing paper, can be turned to very considerable advantage. They are numbered like the trays, and each compartment having also its number, the shutter can be converted into a register of such information about the coins beneath it as is too

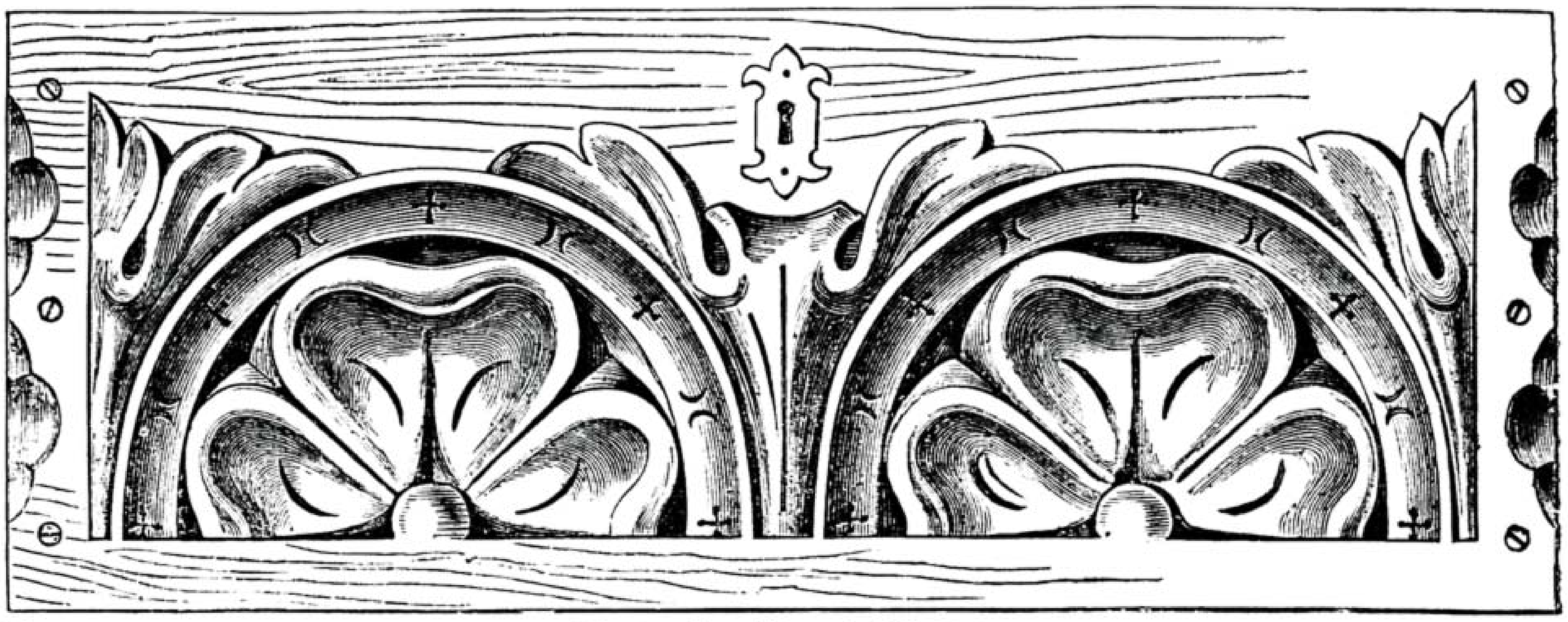


Fig. 2.—Front Board of Casket.

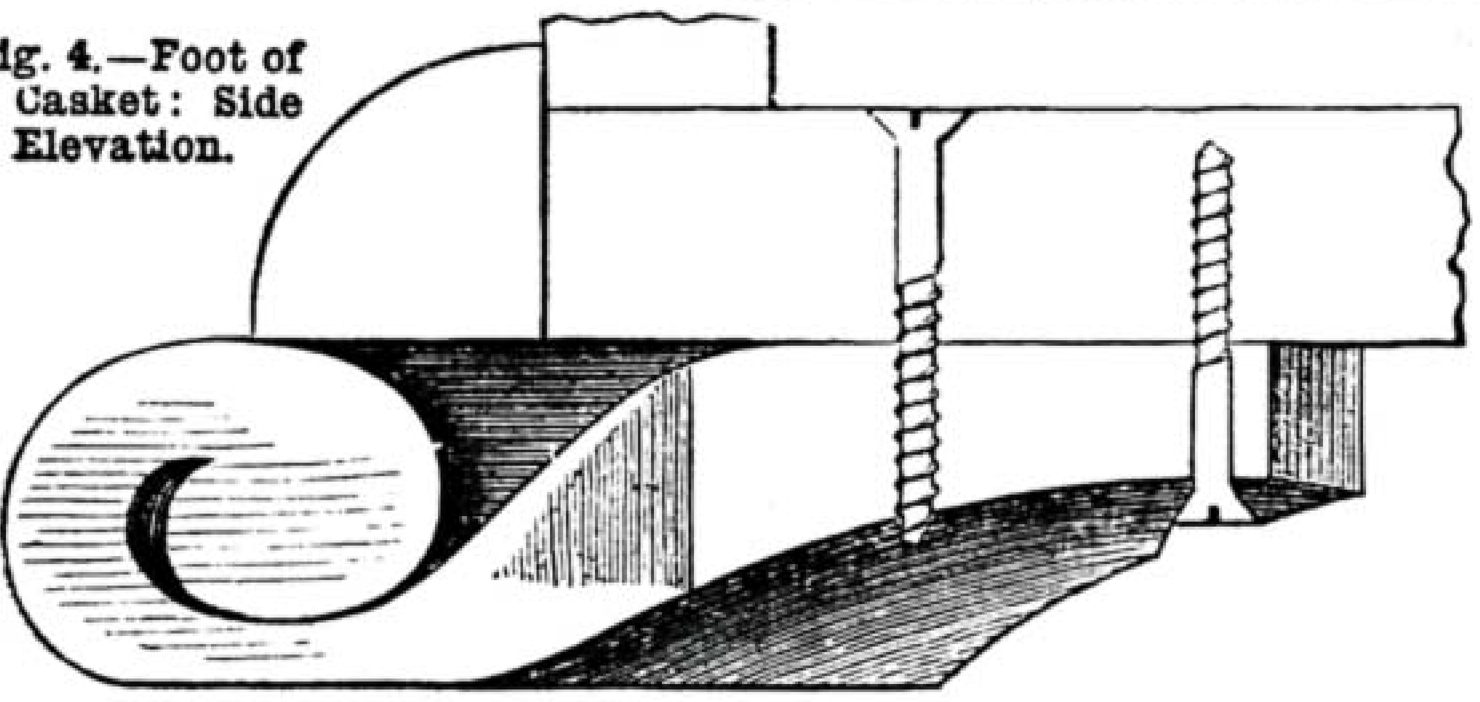


Fig. 4.—Foot of Casket: Side Elevation.

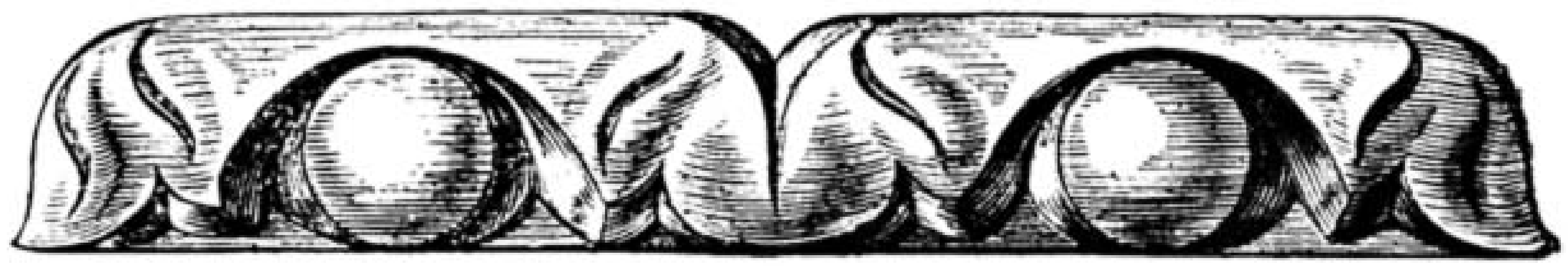


Fig. 3.—Base Strip.

Fig. 7.—Edge of Lid.

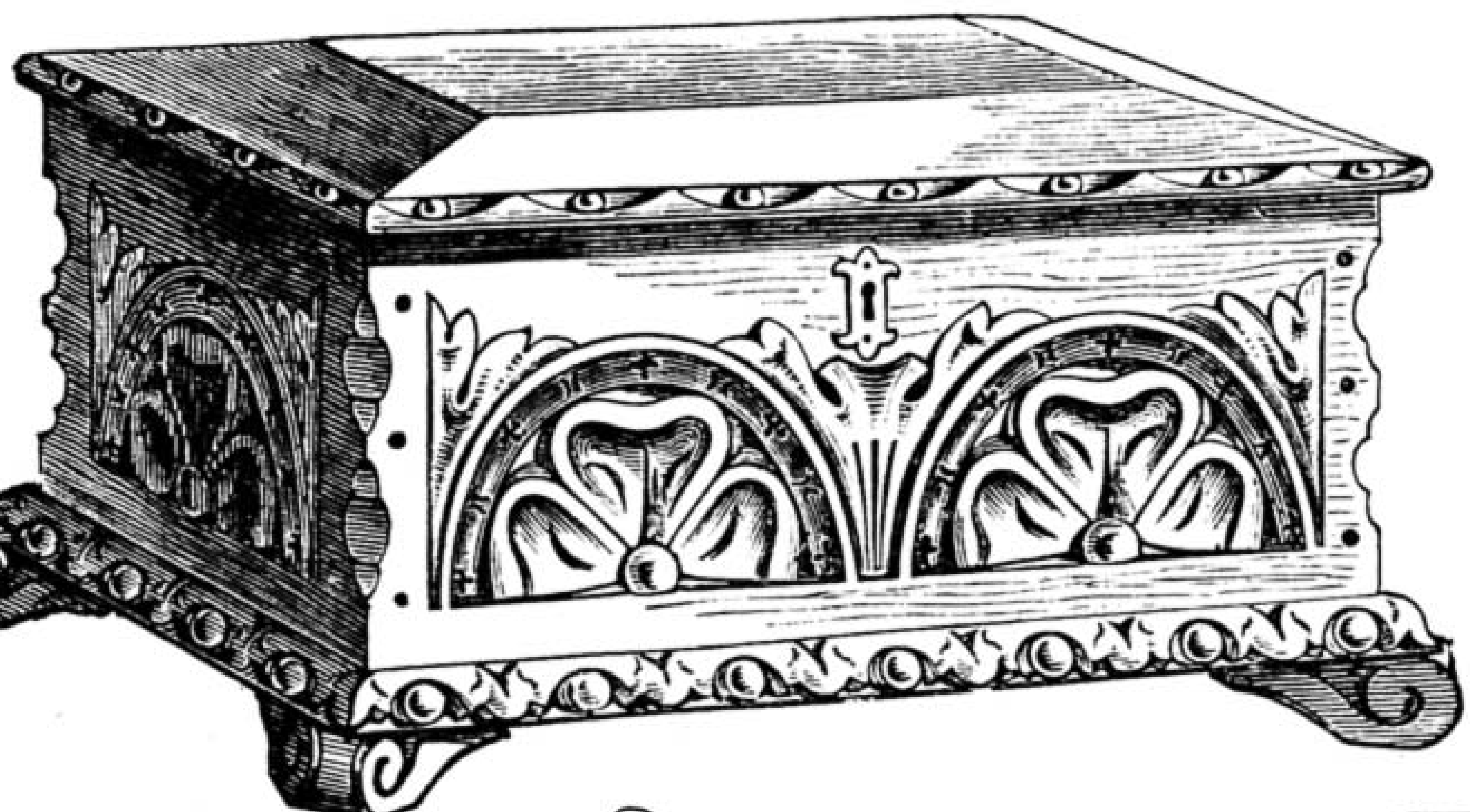


Fig. 1.—Casket for Coins.

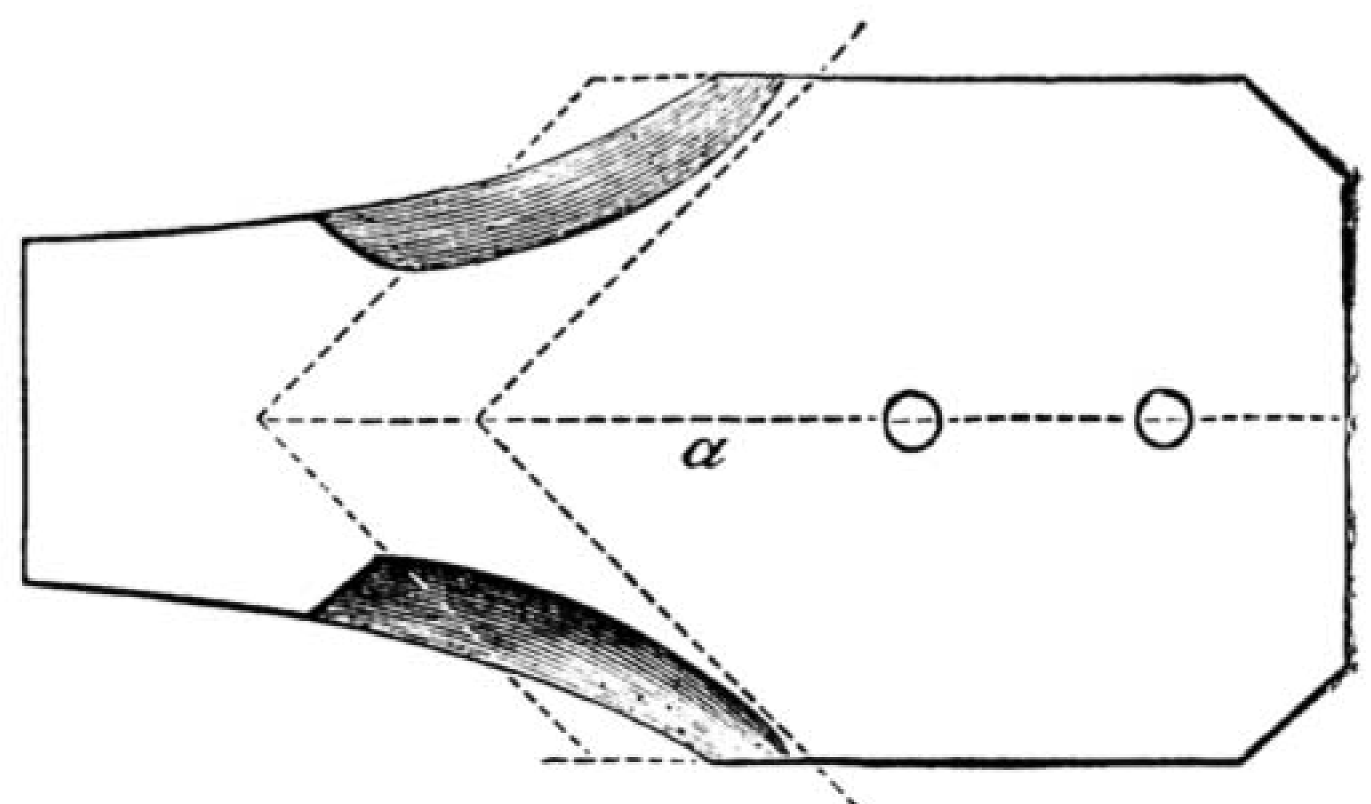


Fig. 5.—Foot of Casket: Plan from above.

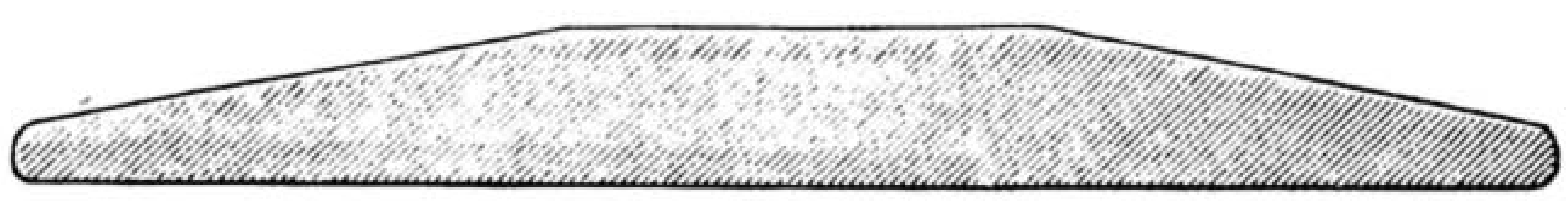


Fig. 6.—Section of Lid.

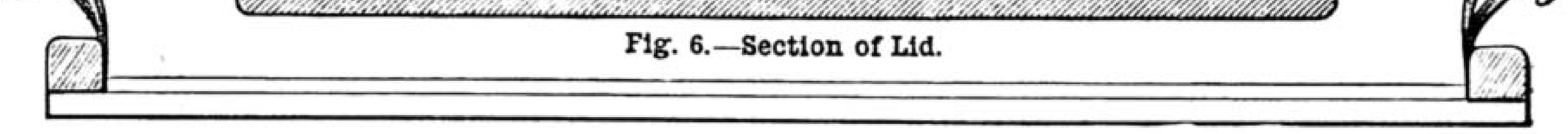
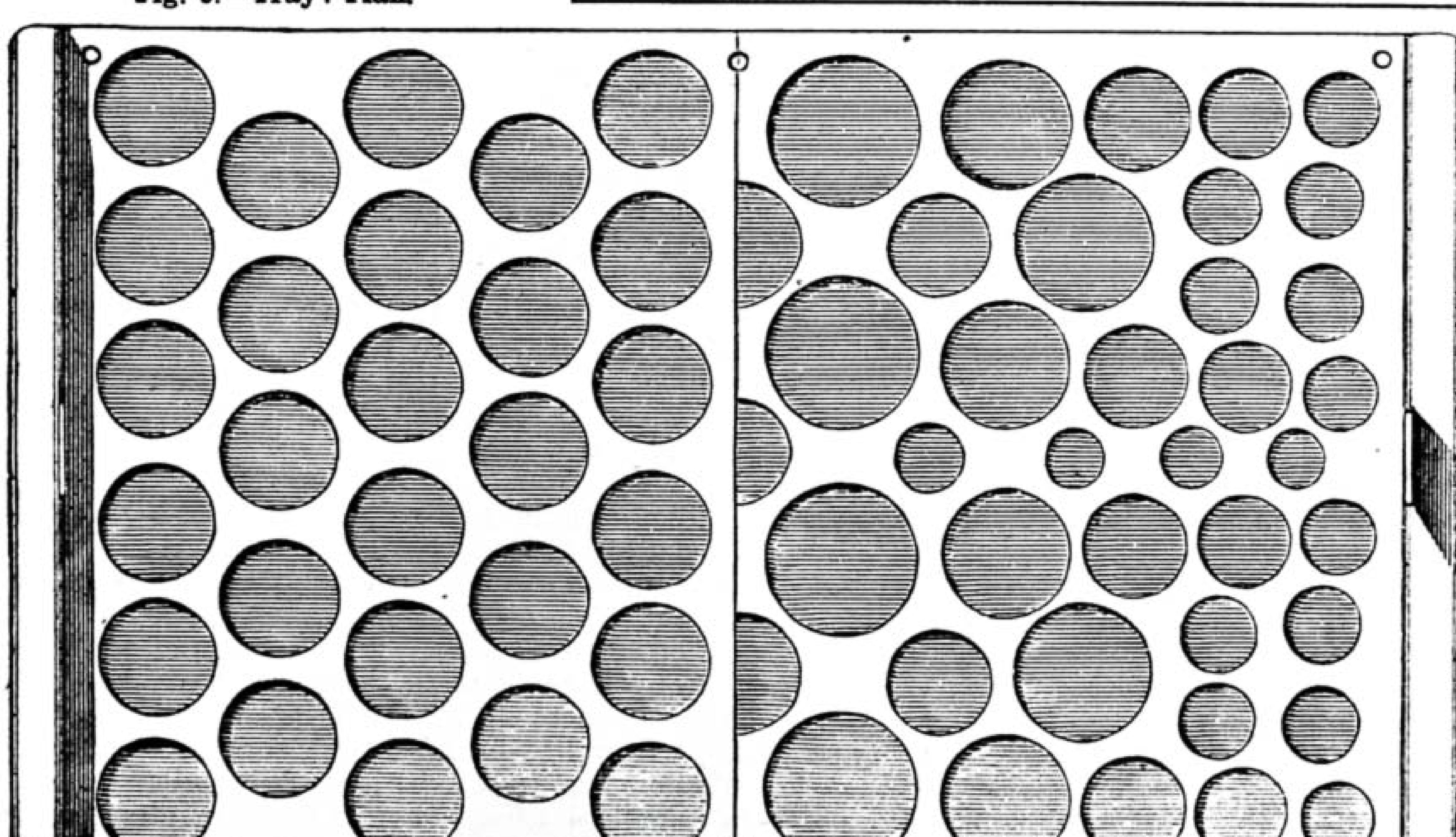


Fig. 8.—Tray for Coins: Side View.

Fig. 9.—Tray: Plan.



bulky to be written in the compartments themselves—such as where and when the example was found, how it was obtained, and from whom, the price given for it, etc. I have used one side only for this purpose; the other I have appropriated to such general numismatical memoranda as one desires to be able to refer to easily when looking through a collection—such as, for instance, the reigns in which pieces of the different denominations were first struck, or ceased to be issued, variations in weight under different kings, the rarity or abundance of this or that; and in connection with Roman coins, explanations of the abbreviations used; with other similar matter. These shutters are thus converted into a highly useful adjunct to the collection, and renders it far more valuable if any necessity arises for disposing of it.

LATHES AND TURNING APPLIANCES.

BY F. A. M.

V.—THE DIVISION PLATE AND INDEX.

PRINCIPLES OF DIVISION PLATE—SIMPLE APPLIANCE—HOW POWERS OF LATHE ARE AUGMENTED—REGULATION OF DIVISIONS—MATERIAL FOR PLATES—DRILLING HOLES—PEG—ADJUSTABLE INDEX—TABLE OF DIVISIONS—COST OF DRILLING.

THOSE who are acquainted only with plain turning, whether in wood or metal, may well wonder when they see the beautiful regularity with which ornaments and other enrichments are spaced round turned work. The flutes upon a column, for instance, are so correctly spaced, that no inequality can be detected by the finest measurement. The teeth of cogged wheels too—produced with such wonderful accuracy—what kind of apparatus can give so many equal divisions, ending always in a whole number, and never in a half tooth breaking two spaces into one? All this can be done by means of the division plate and index.

Let us suppose that you have turned a stand, and wish to mark the holes for the insertion of six legs or ornaments; or, that you have turned up a blank for a six-sided nut, and you wish to mark six equi-distant lines upon it, to guide you in filing it up. You can, of course, do this rather awkwardly with the dividers; it will take some time, and you will not get the work very exact, besides the trouble of repeating the process for every nut or other object requiring division. But suppose you began by dividing the pulley on the mandrel into six, making a mark at each division, and providing a fixed pointer; or, still further, if you were to drill six small holes at these six divisions, and fix a spring pointer with a little peg that would enter the holes and hold the mandrel fixed at the six angular positions; you would then have constructed a division plate and an index peg, and it could be used to divide any number of circles into six divisions.

I think my readers will understand from these simple examples the principle on which the division plate is constructed, and also be led to see that it is really an important and valuable addition to a lathe; it allows of equally spaced divisions being placed around circular work, enables us to determine and draw angles upon flat surfaces, and, by means of the index, to hold the work fixed whilst we scribe or draw lines upon it, or operate upon it with drills or revolving cutters.

As to scribing or marking lines upon the work, such, for instance, as the six lines which would be drawn upon a circular blank, to guide the workman in producing a hexagonal nut; or, again, in marking the angular divisions on a protractor, something is required to guide the scribing point; the top of the T-rest is indeed sometimes used, but only when accuracy is not required. A very simple appliance is shown at Fig. 16. This is only a flat-rimmed saucer of hard wood, about 3 in. diameter, having a round stalk or pin which fits the socket of the T-rest. If the hole in the T-rest socket be vertical, and at right angles to the lathe bed and the line of centres, then the saucer will provide a support and guide for the scriber seen lying upon it (Fig. 16), which will keep its point in one plane, and enable

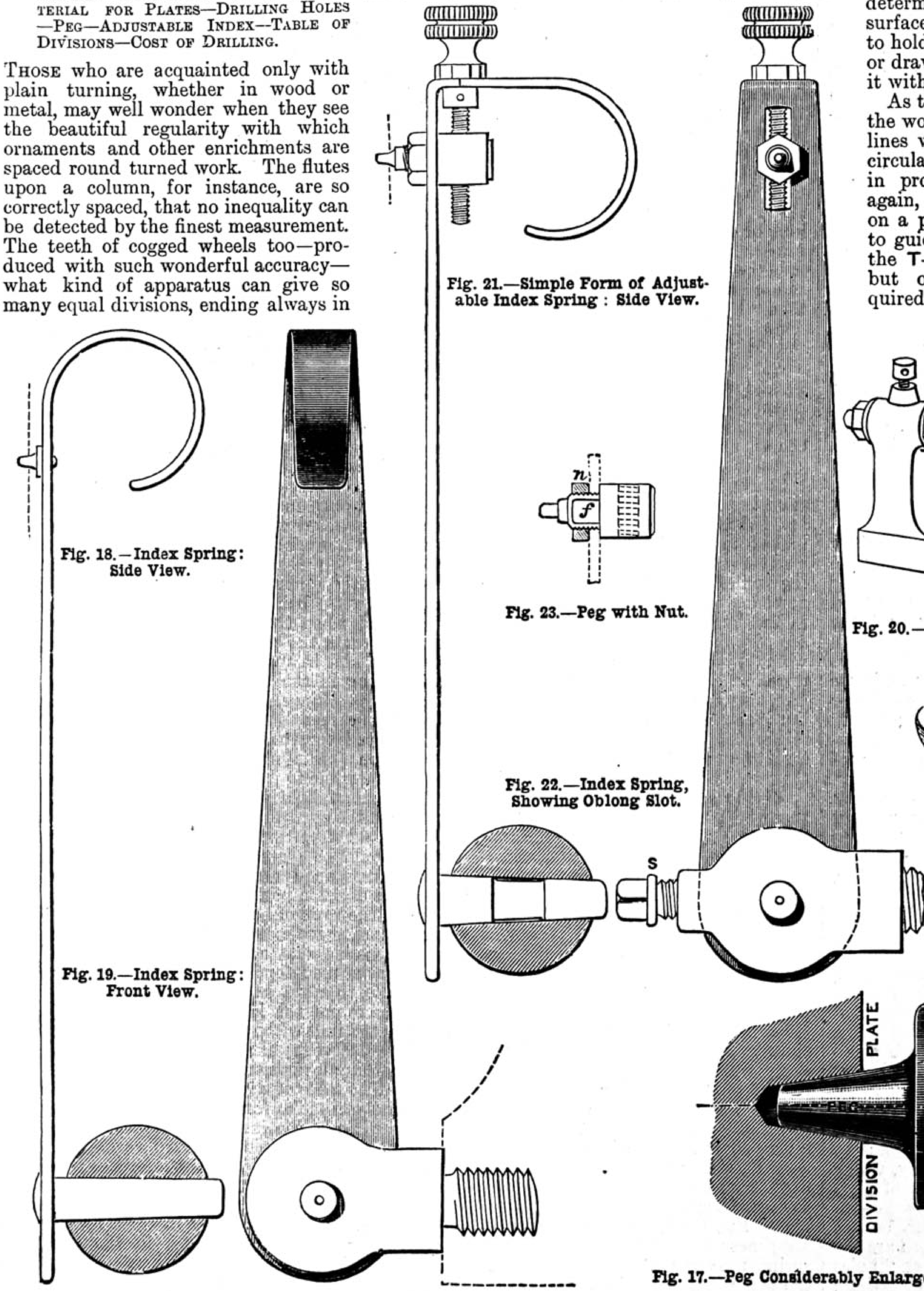


Fig. 21.—Simple Form of Adjustable Index Spring: Side View.

Fig. 23.—Peg with Nut.

Fig. 22.—Index Spring, Showing Oblong Slot.

Fig. 18.—Index Spring: Side View.

Fig. 19.—Index Spring: Front View.

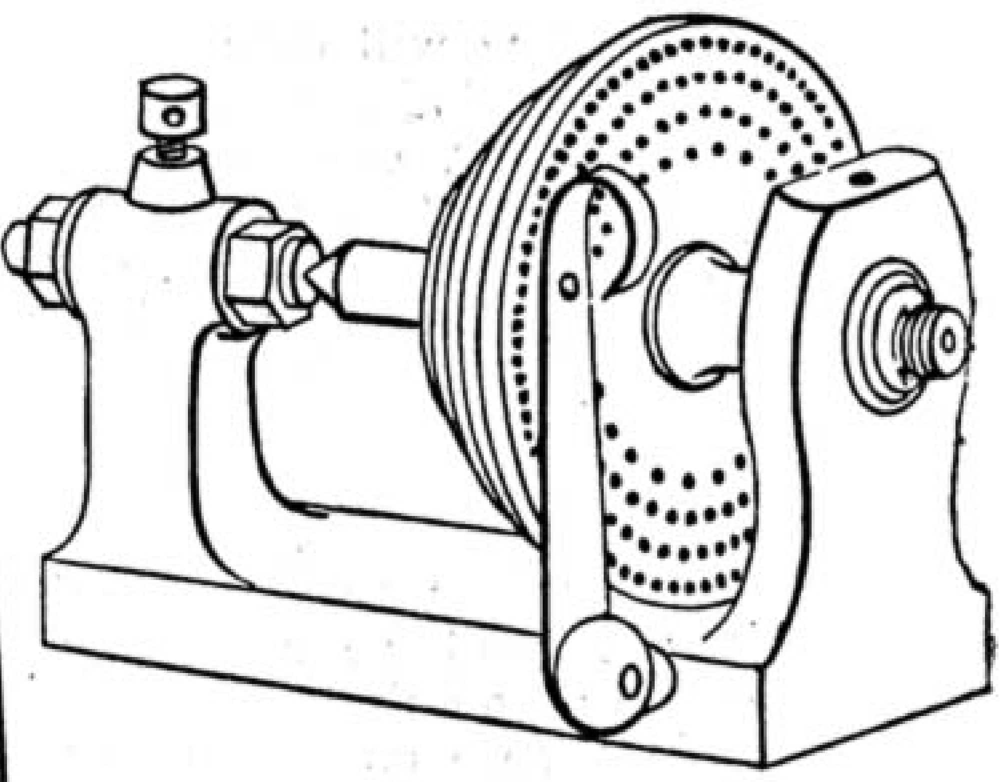


Fig. 20.—Application of Spring to Pulley.

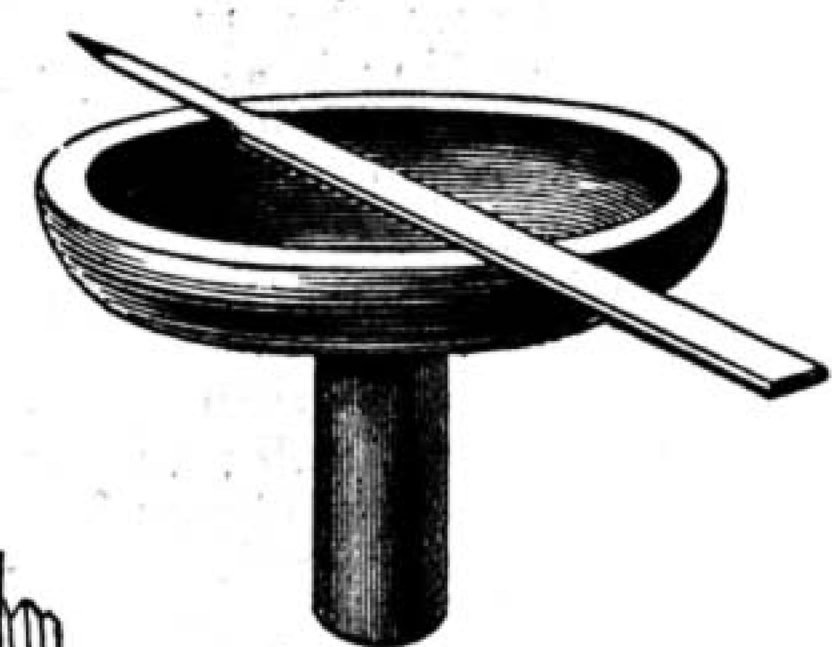


Fig. 16.—Guide for Scribing Point.

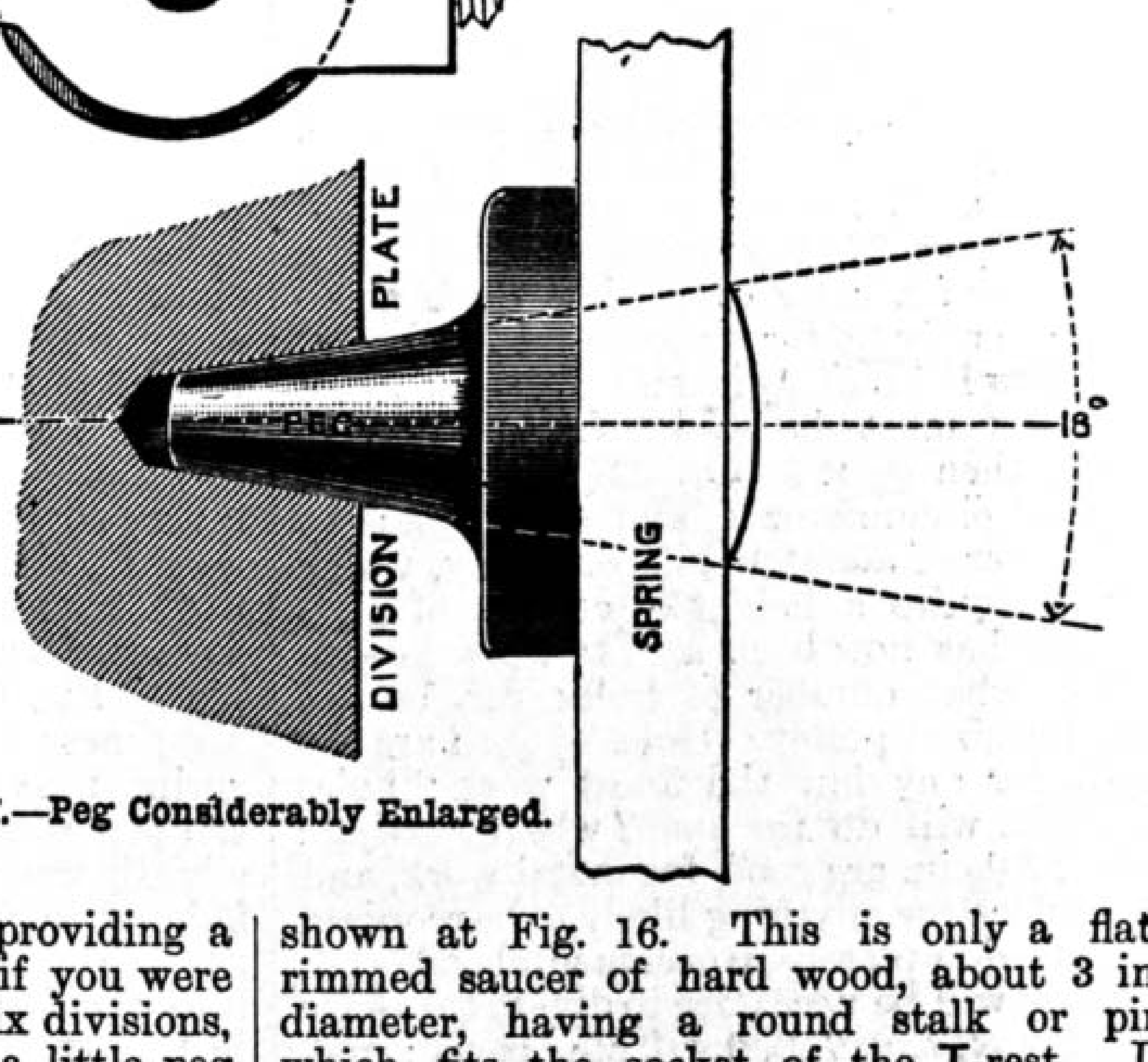


Fig. 17.—Peg Considerably Enlarged.

lines to be struck upon uneven surfaces, if only the scriber point be first adjusted to the exact height of the centres of the lathe. For this kind of work the band is simply thrown off the pulley, and the lathe is at rest. But, when drilling is to be done, or the revolving cutters are to be driven, then the treadle and wheel, not being required to drive the mandrel, are available for driving these by means of the overhead motion. We may consider the *plain* lathe as a machine for revolving work whilst it is being cut by stationary tools held either in the hand or in a slide rest. When, however, we add to a lathe the division plate and index, and the overhead motion, the lathe proper may simply hold the work stationary, whilst the cutting is done by revolving drills and cutters. By revolving the *work only*, circular and flat work can be done; by revolving the *cutting tool*, work of almost any regular shape can be accomplished, and the powers of the lathe are immensely increased. It must, however, be clearly pointed out that a division plate and index *alone* will only serve for marking out work as already explained; if fluting, slot drilling, eccentric cutting, etc., are to be attempted, not only the division plate, but also the overhead motion and the slide rest, are necessary, besides the driller, eccentric cutter, universal cutter, etc., which hold the small revolving tools, and are themselves held in the slide rest, whilst being driven from the overhead.

We will now proceed to consider how many divisions it will be convenient to have, and this will be determined partly by the class of work we intend to do, and partly by the size of the pulley, and the number of rows of holes for which we have room. The larger the pulley, the more holes we can get in; if we are going in for wheel cutting, we shall require rather larger holes than for ornamental turning; but in every case you require to choose those numbers which have the greatest number of divisors; 360 is a most useful number, having more divisors than any other not much greater than itself; and it was for this reason that it was chosen for the number of degrees in a circle. There is some difficulty in getting in so large a number, since the pulley of a 5-in. lathe will not be much more than 7 in. diameter. If we put the centres of the holes only $\frac{1}{16}$ in. apart, and allow $\frac{2}{3}$ of that distance for the hole, and $\frac{1}{3}$ for the space between the holes, we get holes of $\frac{1}{24}$th, and spaces of $\frac{1}{48}$th; then we shall require a circumference of $360 \times \frac{1}{16} = 22\frac{1}{2}$ in., corresponding to a diameter of a little over 7 in. Such small holes are only fit for ornamental work. If you allow holes of $\frac{1}{16}$ in. and spaces of $\frac{1}{32}$ in. the holes must be $\frac{3}{32}$ in. from centre to centre, then $\frac{3}{32} \times 360 = 33\frac{3}{4}$ in. gives the required circumference, and corresponds to a diameter of about $10\frac{3}{4}$ in. of pulley, which would require a height of centres of 7 in. Enough has now been said to show how to reckon what number of holes can be got into any sized pulley. Holes of $\frac{1}{24}$th are too small for any but the finest work; holes of $\frac{1}{16}$ in. will do for *small* wheel cutting; holes of $\frac{1}{12}$ in. are good for metal work, and will suffice for anything likely to be required of a division plate. In ornamental and other work, it will be necessary to divide the circle into 2, 3, 4, 5, 6, 7, 8, 9, 10, etc., parts; and, therefore, the most useful numbers of holes will be those which can be divided by as many of these numbers as possible, without leaving any remainder. Such numbers can be found by multiplying together two or more of the above numbers. For instance, we may multiply 8 and 9 to get 72 holes, a very good number, since it contains multiples of 2, 3, 4, 6, 8, 9, 12, 18, 24, 36. Here we have all the first-named numbers but 5, 7, and 10. Now 5 is already contained by 10; if then we make up another number by multiplying 7 by 10 to make 70, we get another number of holes, which will allow us to divide the circle by any number up to 10. This will suffice to show how these numbers are chosen, and also that the chief difficulty is with the prime numbers, 1, 3, 5, 7, 11, 13, 17, 19, etc., which are not divisible. The first four of these we have managed to include; the second four are seldom required, except in wheel cutting. It is possible—though probably not worth while—to include them by placing them all in one line, or circle of holes. Beginning from one zero hole, divide the circle first into 11; then beginning from the same zero, divide the *same* circle into 13, then into 14 (for 7), then into 17, and lastly, into 19. If this be done on a $6\frac{1}{2}$-in. circle, with $\frac{1}{16}$-in. holes, they will not clash. It would be well, however, to choose higher numbers than 70 and 72, and we may sometimes have a good many rows. In the ornamental turning lathes by Messrs. Holtzapffel & Company, the numbers chosen are 360, 192, 144, 120, 112, and 96; there is no necessity to have 96 as well as 192, except that it sometimes facilitates the counting; also, many of the chuck wheels are divided into ninety-six divisions, which makes it convenient to have a circle of that number on the pulley. If ornamental turning is the object in view, it is of some importance to adopt these numbers, because, in the books treating of that art, patterns are given with directions for cutting them, which directions could not well be followed upon circles having other numbers. If, therefore, they can be adopted, it is well to do so; but if there be not room for the 360 row, it might be well to substitute a row of 180 (half that number) between 192 and 140, as that would, at any rate, enable the workman to divide a circle into divisions of 2°. If there be room for only three rows of holes, 180, 144, 96, or 180, 96, 84 would do well.

Cast iron is the best material for a division plate, being the most durable, and least likely to be indented or bruised; gun metal is the most usual material, and it shows up the numbers and marks well; yellow brass is too soft for such a purpose. The point of the index peg should be carefully rounded, lest it should scratch the plate.

In many division plates the holes are simply drilled straight in, about $\frac{1}{10}$ in. deep, whilst the peg is slightly coned, so that it only bears upon the mouth or edge of the hole. The holes should be coned to an angle of about 18°, being drilled by a very short and special drill, made to cut upon its sides; the peg must then be turned to the same angle, and should be very short, so that the spring will come up close to the plate. Fig. 17 shows the peg enlarged about six times; Figs. 18 and 19 show the index spring bent round at the top for the finger, the peg being riveted in. At the bottom, a slightly tapered pin is riveted into a second hole, $4\frac{1}{2}$ in. from the first. This tapered pin fits into an iron or steel ball, which is screwed into the base of the headstock, seen dotted in Fig. 19. The shoulder of this ball would have to be gradually turned away until, when screwed up hard, the spring comes upright when the peg is in position, as at Fig. 18. The spring itself will require to be about $\frac{1}{16}$-in. thick, and this arrangement is known as the *plain* index. Its application to the pulley is illustrated in Fig. 20.

Figs. 21, 22, 23, show a very simple form of *adjustable* index. It was made from the plain one just described, by heating the top of the spring, and bending it to the form at Fig. 21. The peg of the plain one was driven out, and two holes were drilled above and two below the original hole into which the peg had been riveted; these five holes were then filed into one oblong slot, as seen at Fig. 22. The new peg, Fig. 23, was then turned and fitted with a nut (n) to bind it fast to the spring, and prevent the slightest possibility of shake. The screwed part had two flats (f) filed, one on each side, so that it would fit rather tightly into the long slot, and could be moved up and down by the screw. A thoroughfare hole was then drilled through the top of the spring, and then, with the tapping sized drill, continued through the body of Fig. 23; then the adjusting screw of steel in one piece, with its milled head, was fitted, and the small retaining collar fixed, and pinned through as close as possible, so as to avoid all looseness. The milled head has its collar divided into about ten divisions, and there is a mark on the spring to correspond, but the explanation of the uses of that addition would too much prolong the present paper. The advantage of the adjusting index as compared with the plain one is considerable. It will often enable the workman to bring his flute, or his tooth (in wheel cutting), or his pattern (in ornamental work), to correspond with a part already finished. The ball in Fig. 22 is slightly different to that at Fig. 19, the screw (s) being added. This screw being fixed when the work of dividing is begun, prevents the possibility of placing the peg in a hole in another row; it fixes the conical fitting in the ball, so that it can no longer act as a hinge.

The zero marks of the circles of holes are placed together, but they are not placed upon a radial line, because then it would be impossible to pass from one circle to another without slightly turning the pulley, or altering the adjusting screw of the index. The zero holes from which each circle counts should be placed upon an arc of a circle struck upon the pulley with the point of the division peg.

The rows of holes should be, at least, $\frac{1}{4}$ in. apart, that there may be room for figures of a visible size, and for the dots, and other marks made opposite every 5th, 4th, or 3rd hole, to assist in the counting, by enabling one to put the index peg in every 5th, 4th, or 3rd hole without making a mistake, which would very likely spoil the work, since nothing looks worse than a false cut.

The table of divisors about to follow any one can make for himself, and the present one can be continued. It would be a good plan to copy it out on a card, varnish it, and keep it by the lathe for reference; or, at any rate, that part of it which corresponds to the numbers of holes in one's own division plate. Eleven convenient numbers have been chosen and written down in the column headed "No. of Holes"; then comes, in a horizontal line, the row of "Divisors," containing every number up to 20, except the primes 11, 13, 17, 19.

Looking along the first horizontal line, underneath the divisors, we find that a circle of 360 can be divided without remainder by twelve of these numbers..

Numbers 240 and 180 come next in value, since they can be divided by eleven of the divisors; 120 by ten; 300 and 144 by nine, etc. 112 and 70 have the fewest, but they contain multiples of 7. It would, however, be necessary to continue the table to make the comparison quite fair.

TABLE OF DIVISIONS.

No. of Holes.	Divisions. 2	3	4	5	6	7	8	9	10	12	14	15	16	18	20
360	180	120	90	72	60	—	45	40	36	30	—	24	—	20	18
300	150	100	75	60	50	—	—	—	30	25	—	20	—	—	15
240	120	80	60	48	40	—	30	—	24	20	—	16	15	—	12
192	96	64	48	—	32	—	24	—	—	16	—	—	12	—	—
180	90	60	45	36	30	—	—	20	18	15	—	12	—	10	9
144	72	48	36	—	24	—	18	16	—	12	—	—	9	8	—
120	60	40	30	24	20	—	15	—	12	10	—	8	—	—	6
112	56	—	28	—	—	16	14	—	—	—	8	—	7	—	—
96	48	32	24	—	16	—	12	—	—	8	—	—	6	—	—
72	36	24	18	—	12	—	9	8	—	6	—	—	—	4	—
70	35	—	—	14	—	10	—	—	7	—	5	—	—	—	—

The cost of drilling a division plate is about six to ten shillings for each row, and a plain index and ball cost about six shillings. By beginning with a worm wheel or segment engine, the writer was able to drill his own division plate, but an account of how this was done must be reserved for another time.

(To be continued.)

NOTES AT THE ARCHITECTURAL AND BUILDING TRADES' EXHIBITION, 1889.

(Continued from page 107.)

AN important exhibit, not reviewed in our previous report, was that of Messrs. E. Jacobs & Company, 105, Queen Victoria Street, London, E.C. That firm of engineers and machinists have, for some years past, shown a knowledge of the requirements of wood workers, which gives to the machines produced by them a reliability and practical value which cannot be over estimated. Among the pieces of mechanism sent to represent them at the recent exhibition, a "Panel-planing and thicknessing machine," an "Improved hand feed surface planer," and the "Newington" mortising and boring machine, were, perhaps, the most important. The first named is made in two sizes, to suit various purchasers, the larger size being capable of planing up to 15 in. wide, and from ¼ in. to 4 in. in thickness. The timber is fed up to the cutters by two geared top rollers and two bottom friction rollers, the table being easily adjustable, by hand wheel and screw, to admit the thickness of wood required. The knives, being arranged to work spirally, give a shear cut; an improvement of great importance in the execution of good work. The "Improved hand feed surface planer" is intended for use by joiners, builders, cabinet makers, packing-case makers, pattern makers, and, indeed, most other wood-working trades, and contains the latest improvements calculated to perfect the operations of taking timber out of twist, surfacing straight or taper, bevelling, chamfering, squaring up, making glue joints, and a dozen other purposes beside. Of cabinet work and furnishing items the number of exhibits was somewhat small, but, notwithstanding that, some very good things were shown by those who did put in an appearance. Messrs. S. G. Vaughan & Company, 26, Great Eastern Street, E.C., fitted up a stand thoroughly representative of modern taste in furnishing, and the freedom from any taint of the French in their goods was most gratifying to the lover of national art in handicraft. Drawing-room furniture was shown in the richest of rosewood, inlaid with ivory and decorative woods, a mode admitted to be *par excellence* for that apartment; and the free and graceful forms marked out therein, and further embellished by silk brocatelle upholstery, spoke well for the bent of modern taste.

The development of furnishing in the nocturnal apartment was illustrated by a bedroom suite in walnut, and the wardrobe being made with accommodation for writing purposes, after the manner of the old-fashioned secretaire, showed that firm's knowledge of the requirements of to-day.

Another representative of the cabinet-making trade was the firm of Messrs. W. H. Vaughan & Company, 332, 334, Old Street, E.C., who provided a good display of drawing-room, dining-room, and bedroom furniture. Such goods as there is a certain demand for in these times were shown by those makers, and as they were just selected from the ordinary stock kept by them, their capabilities in that direction could be well judged therefrom. A fine sideboard, in walnut, was particularly noticeable, and for those who still adhere to a liking for saddlebag upholstery, Messrs. Vaughan proved themselves to be in a position to suit all tastes in that direction.

Mr. Ferdinand Falet, 10 Gray's Inn Road, W.C., displayed a very attractive variety of wicker furniture; and, for the Spring season, some of their dainty little wicker chairs, dressed up as they are with dhurries and other Oriental materials, would be quite the thing.

Now that the sunny season is approaching, the matter of window blinds assumes some importance, and the variety of those articles shown at the Building Exhibition left little room for complaint. Messrs. S. Mitchell & Son, 32, St. Martin's Lane, Charing Cross, W.C., exhibited their improved "Outside Sun Blinds," and in them offered an admirable solution of the difficulty. The objection that has hitherto been advanced against the majority of outside blinds, viz., the necessity of wood framing with deep facia and side wings with wood jambs and slides, is, by the present invention, entirely removed. The blind in question requires neither wood jambs nor metal grooves, and draws up under about six inches of facia. It travels on iron rods, preserving the convenient form of the Spanish blind, and the hood portion allows of being raised or lowered to any height.

Among those little annoyances which ruffle the temper and yet have long been without remedy, is the difficulty of adjusting the laths of Venetian blinds to any required angle. Messrs. Mitchell have, however, produced an invention bearing upon that question; and, as far as it is possible to judge by a cursory inspection, we should say that it is fully calculated to answer its purpose well.

Another exhibit in the same line of things was that of Mr. Andrew Smith, 57, Ashbourne Grove, East Dulwich, S.E. The speciality which formed the chief attraction of that stand was certainly one of the greatest utility, and may be briefly described as follows:—It consisted of a patent whereby the headpiece generally used in connection with Venetian blinds is rendered unnecessary, being substituted by fittings which, when fixed, enable the blind to be removed and replaced in a few seconds, no side cords being necessary for altering the position of the laths. This is a contrivance which would greatly facilitate all such operations as spring cleaning, and would bring joy to the heart of the cleanly housewife.

Among the most attractive as well as the most sanitary of modern methods of decoration, the utilisation of glazed tiles takes a first place. When we say modern methods, it is, of course, in reference to the recent revival of the art of tile making; for, it is needless to say, tiles were among the first materials employed by the decorative artists of earliest ages. Reference to the existing records and ruins of Pompeii, the Alhambra, Granada, and other such spots, fully establishes their antique pedigree: and as antiquity is, in society, generally considered to be synonymous with respectability, no further argument on their behalf is necessary.

Messrs. E. Smith & Company, Coalville, Leicester, have done much to imbue the manufacture of modern tiles with real artistic feeling, and their display was well worth seeing and studying. Whereas, not so very long ago, it was considered a bold innovation to introduce tiles into a fireplace, now we get them in furniture of all sorts, from wash-stands to flower-stands; and their introduction constitutes a pleasing departure from old methods, forming, as they do, such a pleasant contrast with the various woods with which they are brought into connection.

The greater scope thus given to tile manufacturers has led to the production of designs, colourings, and forms, whose name is legion; and to attempt to describe such a collection as was shown by Messrs. Smith, would be almost as futile as attempting to pourtray a flower garden by mere description. Suffice it to say that terra-cotta, floor tiles, wall tiles, mosaic, hearth tiles, and decorative faïence, were fully represented in their most modern developments.

Mr. H. J. Rust, 353, Battersea Park Road, S.W., showed examples of his mosaic work, and those whose fancy inclines in the direction of that eminently durable and most antique method of decoration would do well to get particulars of his productions. There is, of course, mosaic and mosaic, but that of the maker in question bears the stamp of good workmanship, and has a peculiarly fine surface.

It would be possible, of course, to fill pages with even brief remarks on the many useful and beautiful objects that met the eye in every part of the Exhibition; but to do this would be not only unnecessary, but wearisome to the reader. We shall only encroach on his patience for a limited space in another number, and then bring our "Notes" to a close.

(To be continued.)

OUR GUIDE TO GOOD THINGS.

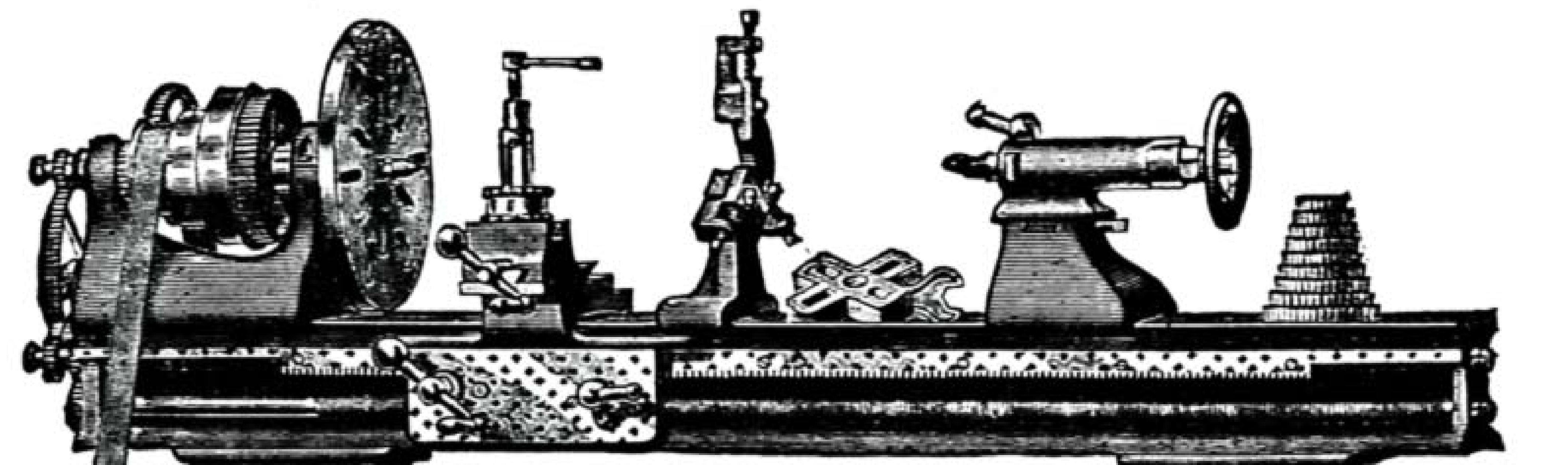
39.—Thompson's Improved Address Holder.

Address holders for portmanteaus, etc., and for the names of seat holders in church, made in brass for the most part, are common enough, but the principle has only just now been applied to business purposes in Mr. Thompson's "Improved Address Holder," an illustration of which is given in this page. Between the address holders to which allusion has just been made and Mr. Thompson's invention there is just this difference: that in the former the address card that is inserted may be withdrawn by merely sliding it out through the space left for its introduction between the frame and the wood to which the frame is attached, and may even slip out if the frame could be placed in a position convenient for its escape; but in the latter, the card, when once introduced, is so safely and securely retained that it cannot possibly fall out or work out. The frame, or address holder itself, is made of malleable cast iron neatly japanned, and is pierced with four holes countersunk, for the introduction of screws, by which it may be fixed to crates, boxes, cases, etc., for the transmission of goods and to the ends of barrels, casks, etc. If used for hampers the address holder must be screwed on to a piece of board, and the wood, in its turn, be tied to the hamper. When the frame is fixed, it will be found that its outer edge rests on the board, while there is a space of about $\frac{1}{16}$ inch between the board and the inner edge. The corners of one side of the card on which the address is written are introduced, under the nicks, A, A, in the frame, and the card is pushed on until it has been passed entirely under three sides of the frame. The edge that remains uncovered may then be easily passed under the fourth side, if the card be long enough. A semi-circular indentation will be noticed at B, at which the card may be pushed forward again, and raised by the nail if it be desired to withdraw it. The advantages of the address holder are: the security of the address card, the ease and rapidity with which it can be introduced when once the frame has been screwed on, and the preservation of barrels, boxes, etc., from injury by nails or tacks, to say nothing of its cheapness, durability, and utility. A single sample will be sent to any part of the United Kingdom, post free, for five stamps, by the agents for its sale, Messrs. W. and A. Jarvie, general ironmongers, 200, Parliamentary Road, Glasgow. Net prices, carriage paid, are: 4s. 3d. per dozen, £1 2s. 6d. per half gross, and £1 17s. 6d. per gross.

Thompson's Improved Address Holder.

40. — Barnes' Screw-Cutting Foot Lathe, No. 5, with Foot Treadle.

The accompanying cut gives a graphic representation of Barnes' Screw - Cutting Foot Lathe, No. 5, with the ordinary treadle as found in English lathes. It is an American lathe, and is supplied by, and may be seen at the warehouse of, Messrs. Charles Churchill & Co., American importers of tools and machinery, 21, Cross Street, Finsbury, London, E.C. It differs from Barnes' usual form of lathe in being fitted with the foot treadle instead of the seat for the turner and cranked axle, by which the lathe is driven by the action of the legs in the same manner as a bicycle or tricycle. With regard to dimensions, it is a $5\frac{1}{2}$-in. centre lathe, and $3\frac{1}{4}$ in. over the tool carriage, and is just 34 in. from centre to centre. As may be judged from the illustration, the lathe is substantially built, and to this it may be added, that it is thoroughly well made in every particular. The headstock has a hollow steel spindle that will take a $\frac{7}{16}$-in. rod through its entire length. The boxes are accurately fitted to the spindle, with provision to keep them true and take up wear. The poppet, or "tail stock," as our American cousins style it, can be readily set at any desired point, or be removed altogether from the lathe bed at pleasure, thus leaving the lathe free for face-plate work or chuck work. It can also be set even for turning tapers. The spindles of both headstock and poppet are of steel, with taper holes for the reception of the centres that are positively true; moreover, the poppet centre is self-discharging. The tool carriage, which, as it may be seen, is gibbed to the bed, is a model of convenience and accuracy, and is such that the tool can be set to the work in any position, or at any angle desired, and also to bore a taper hole or turn a ball. All the works are securely protected from chips and dirt, which has the desirable effect of insuring long wear and durability to the most costly and vital parts of the lathe. The gearing that is furnished with the lathe can be combined to cut screws from 4 to 40 per inch. As a screw-cutting lathe, the maker claims that it is complete. All the gearing is cut from solid metal in the best machinery known for gear cutting, and is as true as possible, and works noiselessly. The entire weight of the lathe is 3 cwt. 29 lbs.; its price £22 10s.; a set of eight tools for metal is supplied for 12s. It is unnecessary to enter further into details of construction, for these are self-evident from the illustration.



Barnes' Screw-Cutting Foot Lathe, No. 5, with Foot Treadle.

41.—Winder's Banjos and Banjo Fittings.

Mr. J. G. Winder, Maker and Teacher of the Banjo, 16, Jeffreys Street, Camden Town, London, N.W., has asked me to call attention to his brackets for pulling banjo vellums tight, and has sent me a specimen of them, and a photograph of his "Special Banjos," which, as far as I can judge from the photograph itself, appear to be nicely made and well finished. The bracket sent is certainly well made, as the screws on the threads and nuts are deeply cut, and there is no fear of the screw threads slipping. It is of the best pattern, and is heavily nickel-plated. These are supplied at 6s. 6d. per dozen, but another pattern may be had, also plated, at 3s. 6d. per dozen, and brass brackets at 3s. per dozen. I mention Mr. Winder's specialities with pleasure, as I have reason to believe that a great many workmen like to have a turn at the banjo in leisure half hours, and even make instruments for their own use. It is not always an easy matter to get fittings in small towns and out-of-the-way places, but application to Mr. Winder will soon put an end to any difficulty that may exist.

42.—Pocket Technical Guide, etc., for the Building Trades.

Messrs. Crosby, Lockwood, & Co., 7, Stationers' Hall Court, London, E.C., have recently produced the fifth edition of Mr. A. C. Beaton's "Pocket Technical Guide, Measurer, and Estimator for Builders and Surveyors." This handy little book, which may be stowed away in the waistcoat pocket, contains technical directions for measuring work in all the building trades, with a treatise on the measurement of timber, complete specifications for houses, roads, and drains, and an easy method of estimating the various parts of a building collectively. It has been carefully revised, and prices stated according to the present value of materials and labour. It may be said to be a *multum in parvo vade mecum*, not only for those for whom it is specially intended, but for all house owners and those who are interested in house property. The information given is briefly put, and neither words nor space are wasted.—The Editor.

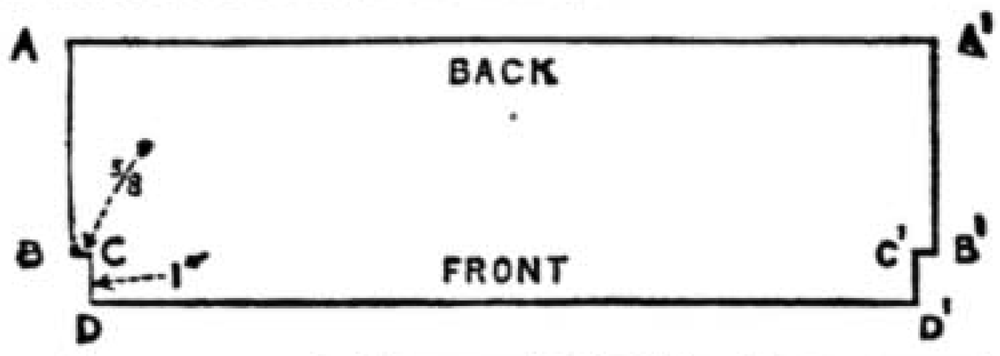
SHOP:

A Corner for Those who Want to Talk It.

*** *All Communications will be acknowledged, but Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

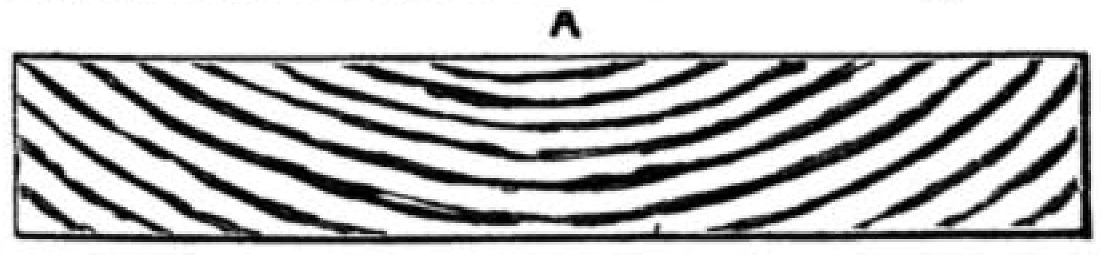
I.—Letters From Correspondents.

A First Attempt.—Kildonan writes:—"In to-day's issue of Work I observe you reply to S. (*Edinburgh*) with reference to definitions, and I think both he and also R. S. C. (*Leeds*) deserved each sharper replies even than those you gave them. You tell S. that 'those who read Work are certainly supposed to know the uses of lathes and tools.' If that is so, sir, then I must apologise for having dared to become a subscriber, for I never handled a tool in my life. Stay; yes I did. When a very little boy I used to watch for hours an old joiner at work, and one day, while the old man was outside arranging his little store of wood, I thought I would try my hand with a plane. I proceeded to *plane the bench!* Rip! went the iron over many an aged nail, and when I looked at the edge its serrated condition told even my childish brain that there would be a row. Stealing softly out, I disappeared, and for months afterwards the sight of the white apron and broad bonnet of old 'Tirly' sent me flying up the nearest cross street with winged speed. That was my apprenticeship. My next venture in the mechanical arts was when a junior telegraphist. Left alone on night duty, I proceeded to 'take down' an ordinary single wound galvanometer, so as to explore its construction, and I shall never forget the fear and trembling with which I awaited the arrival of the superintendent next morning. But this by the way. Galvanometers and more complicated pieces of apparatus have been investigated since then. But I want to tell you what Work has done for me. Lend me your ear, sir—softly—*I'm beginning to build my nest.* Well, No. 2 brought with it Mr. Adamson's overmantel. *She* approved of it. My landlady's husband, a working carpenter, has a bench and a few tools—the greater part are at his employer's yard, where the men have to provide their own kit. I bought a tenon saw, a square (9 in.), a chisel (½ in.), and a claw hammer. There were two planes (well worn) and a gauge on the bench. Having invested 4s. 6d. in nice clean yellow pine, with many misgivings I started. Being on night duty, I had the greater part of the day to myself. I wrought slowly and carefully. In Mr. Adamson's drawings and instructions the shelves and tops are simply held by nails. I was more ambitious. I cut the shelves ¾ in. longer, and at each end cut out a piece thus (excuse freehand!):—



I made a groove in the uprights ⅜ in. deep, running from the back to within 1 in. of the front, so that the shelves are not dependent on the nails to support any weight placed on them. (B, C, and B', C',= ⅜ in.; C, D, and C', D',=1 in.) Knowing that the tops would be hidden by the moulding, I thought I would venture on dovetailing! I succeeded—in nearly splitting one of my uprights!—and they fit tightly enough, though, perhaps, they are not beautiful. The result is that my overmantel will stand the proverbial three removes. Another departure from the design is in the panels of the doors. I got the 'tip' in the same No. (2), in the paper on 'Decorative Work for Panels.' My panels are of zinc, and will be prepared as there directed; when ready *somebody* will paint a floral design on them, probably a bunch of 'lilies of the valley' in the centre. Now, sir, being a very tyro, it must not be supposed that I escaped a mistake or two. *Experientia docet*, and sometimes *does it* (ahem!) with a vengeance. My mistakes have thus far been knocking two corners off the feet of the uprights, and making the groove for the shelf *on the wrong side* of the left-hand middle upright! Being concealed by the frieze, and besides being within the left-hand cupboard, I did not make a new one. There is no weight on the top shelf. With all deference to the designer, I have taken the liberty of putting a back of ⅜-in. stuff, in order the better to protect my looking-glass. For this purpose I have reduced the *shelves* behind in proportion. My back is in three portions, and flush with the edges of the uprights. Although not quite finished, I have got the worst over, and I have taken the liberty of writing you to say that Work has been of some use already to one who is an entire novice, and perhaps to encourage those who are equally ignorant of the use of tools with myself. My 'kit,' as you see, is by no means extensive—one ½-in. chisel doing the whole of the small fittings. I intended to have given you a description of the old lathe used by the old turner referred to at the beginning of my letter. It was driven by a flexible pole fixed to the rafters overhead, with a rope twisted round the object turned, but I have already trespassed too much on your time and patience. I noticed in the 'Technical Educator,' in the papers on the lathe, the writer referred to this old form, which he 'believed' was still in use in some parts of the country, but which he had never seen. I have often had *tops* made by old 'Tirly,' and I know he used the same lathe for over half a century. Should a description of it be interesting to any of your readers, I shall be very glad to try, but, unfortunately, I am no draughtsman, and so cannot give a drawing of it."—[I am glad to give publicity to your letter. You yourself certainly know the uses to which certain tools are put, and have given practical proof thereof. I meant S. (*Edinburgh*) to understand that I saw no necessity when a hammer was mentioned to explain that it is "a tool used for knocking in nails," and occasionally for other purposes into which I need not enter. You certainly need not apologise for having become a subscriber to Work; and I hope it will ever be found week by week to present fresh charms and increased utility to "She" and "Somebody" and yourself, and all others who have determined to pair and build, or rather line their own nests, for I daresay your nest has been already built for you, and you have only the lining to attend to. I will take care that a nice baby's cot is described for you when increase and multiplication begin to take place in the nest, as I trust it will. I will not trouble you for a description of old "Tirly's" pole lathe. You say you are no draughtsman, but at all events your diagram of the shelf was intelligible enough. There is one comfort—you can always fall back on "She" for illustrations to your copy when you write if you continue to distrust your own powers.—Ed.]

Cabinet in Fret Cutting.—Artist in Wood writes:—"I have the plate issued with No. 1 of Work; it is a very good design. I think the pattern proper for fret sawing will do very well for inlaying, and take less time and care than the pattern proper for inlaying, and best for amateurs to try at. The method of inlaying sent by Inlay, and put in 'Shop' in No. 6 of Work, is the one I use for inlaid panels of all kinds; the white holly and ebony should be the thickness of saw-cut veneer. When the holly is in the ebony the waste piece of holly should be taken off and placed at the back, then a piece of paper glued over the front, and the two veneers pressed between two level boards. When dry the waste veneer is taken off with a knife; the inlaid veneer should be placed paper side down on a level board, and scraped with a fine toothing plane; now a piece of ⅝-in. mahogany should be planed level on one side and then toothed. This should be sized with thin glue size and let dry before the inlaid veneer is glued on; the paper on the front side of the veneer may be scraped off with the toothing plane; the natural veins of foliage can be put in by the aid of a grainer. When white wood is used for inlay it is important that flake white be mixed with the glue to prevent it staining the wood; the glue should not be made in an iron kettle—iron will stain all light woods; it will be best to mitre a strip of ½-in. boxwood round the edge of the doors to prevent the veneer from being split off when closing the door. If the end grain of wood that is to be veneered on shows any curved marks it is important to know the right side to veneer. For example, supposing the annexed cut to represent the section of a piece of



wood to be veneered, veneer on the side lettered A. To inlay on the method of Mr. J. W. Gleeson-White take four veneers, say, two of dark rosewood and two of satin wood; cut square through all four at once; glue the ground veneers on piece of paper; now dip the cut-out pieces in warm water to expand them, and they fit the ground veneer, and make a good joint. This plan should not be used for a design having so many small pieces in it."

II.—Questions Answered by Editor and Staff.

To Repair Harmonium Bellows, etc.—Woodman.—To prevent a harmonium from getting out of order, it should be kept in a place that is free from damp, and not subject to sudden changes of temperature. Moths do a deal of damage sometimes by destroying the cloth and felt of the action. If there are signs of any, two or three small linen bags should be made, and a piece of camphor about the size of a walnut put into each. These can be fastened by a couple of tacks to the inside of the reed pan (which may be opened by undoing the two hooks at the back of the keys). The jerking of the wind, when playing softly, is most likely caused by the spiral spring under the reservoir being too strong; a weaker one would, probably, improve it. Should this not be the case, unscrew the covered back, and fill the bellows with wind. If there is a sound of wind escaping examine the reservoir and wind trunks for any signs of breakage in the leather. By passing a lighted paper carefully along where the escape is likely to be, it will more easily be discovered, as the flame will be blown out when it comes to it. When the hole is found, glue a piece of leather over it; a piece of old kid glove will do if the appearance is not studied. Should the escape be in the front of the reservoir, it will be necessary to take the bellows out of the case in order to get at it. But before doing this it will be better to make sure that the leak is in the bellows, and not, as is often the case, where the reed pan shuts down on the wad. To prove this, unhook the action at the back, and lift it over. Take out the spiral spring from under the reservoir, and lay some paper over the hole in the top board of the reservoir; press this down tight by means of a book or flat piece of board, so that no wind can escape; then get some one to push up the reservoir, and if the escape of wind is not heard, the leak must be looked for round the wad. This may sometimes be cured by giving a turn to the screw eyes which the hooks fasten into, or by pinching up the wad, so as to soften it. It is possible that the bellows has dropped a little; if this is so, by unhooking and lifting over the action, the bellows will be found to be loose. To remedy this turn the instrument upside down, and drive a small wedge under each end of the supports. You might get a larger bellows in if there is sufficient room, but the present one will, no doubt, be found large enough if it is made wind tight. It is not possible to give any general hints on how to construct a harmonium within the limits of this answer.—G. N.

Plaster Cast from Clay Model.—Moulder (*Limehouse*).—This must be made by the waste-moulding process. Colour the water for inner mould with a few drops of ink, and mix fine plaster to the thickness of cream. With this cover the model to ¼ in. When hardened, brush clay water as thick as duck pool over it, then lay on outer mould, say ¾ in. thick, of coarse plaster, embedding iron bars in its outer surface, if the model is large, to give strength. If the model is in the "round" the mould will have to be made in two (or more) pieces, to do which attach a strip of clay edgewise against the model, where the dividing line is to be, to form the limit of the first piece of mould. Cast this, then remove the strip of clay, and brush clay water along the edge of the plaster. After this cast the second piece; the clay water will prevent the pieces sticking together. Remove the clay of the model, well wash the mould with soap and water, and the sooner it is filled the better. Mix fine plaster with plain water for this, pour in, and move mould about to spread it equally. Repeat this till the cast is thick enough; coarse plaster may be used for backing up. When the cast is set the outer mould may be broken off by a few strokes of the mallet and a blunt chisel; the clay water will make it separate from the inner one. The inner mould being of a grey colour from the ink will easily be distinguished from both outer mould and cast, and must be broken off more slowly and carefully. The thorough saturation which the mould has had in cleaning will prevent the cast from sticking too closely to it.—M. M.

Electric Lamp for Bunsen Battery.—G. K.—The small glow lamps used to obtain an electric light from current supplied by the Bunsen battery cannot be made by an amateur. The glass bulb containing the carbon filament is blown by experienced workmen; the filament is inserted in the bulb, all the air is exhausted from this by means of a special air pump, and whilst thus exhausted the neck of the bulb is fused around the wires connected to the carbon filament. Such lamps are sold at 5s. each by all vendors of electrical instruments. See replies to other correspondents on this subject.—G. E. B.

Connecting Electric Bell to Clock, etc.—R. M. D.—Use No. 20 cotton-covered copper wire for the lines. Carry a wire from the bell to the clock, and connect it to the works, or metal frame of the works. Fix a bit of platinum wire to the *wood* frame of the clock close to the dial, so that it can be bent in to touch the hour hand at the hour when you wish to rise. The minute hand must clear this wire. Connect this wire to a line wire leading to the battery; then from the other terminal of the battery lead a wire to the bell. Use two Leclanché or two Gassner cells; these are best for electric bells. Have a separate line from the battery to the door, and from the door back to the bell, then from this back to battery. You will need a contact trigger to the door if you wish the bell to only ring when the door is opened. This will cost 3s. 6d. If you can wait until my articles on Electric Alarums are published, you will learn exactly how to do the job, and will be guided by illustrations. Space cannot be given here in "Shop" to fully explain how to do it, but I hope to show in my articles how to make an electric alarum clock.—G. E. B.

Magneto-Electric Machine.—H. C.—The two inside ends of the coils must be connected together. One of the outside ends is soldered to the spindle which carries the bobbins. The other outside end is soldered to the insulated brass collar outside the bobbins, which forms part of the commutator. If this part is not insulated from the bobbins and the spindle by a collar and plug of ebonite or boxwood, no current will be obtained from the machine. Other causes of failure are badly shaped and fixed commutator, allowing no break at all or a break at the wrong time. The commutator should break contact with the spring just as the ends of the bobbins are passing the poles of the magnet. The spring may be too strong or too weak, the magnet may be weak, or there may be several other causes of failure. One cannot say without seeing and testing the machine. If you do not succeed, write again and tell us how you made the machine.—G. E. B.

Crystoleum Painting.—C. G. (*Lower Edmonton*).—If C. G. S. will look carefully on page 58 he will find his question already answered. In the second paragraph from top I have said, "All this is to be painted in the transparent photo." Need I say again that the photo is pasted to the concave side of the first glass? The first painting is made on the transparent paper, then the second glass is placed in the concave of the first, and the remaining painting is worked on the concave side of this.—O. B.

Sale and Exchange Column.—BERNHARD.—If you look at the last page but two in each number of WORK, you will find that space has been reserved for special advertisements at the foot of the third column. I agree with you that it is very desirable that a "Sale and Exchange" department should be started in WORK, and if it is found that readers have a disposition to support such a department—and this disposition must be evinced by letters and advertisements sent for insertion—it would be started and developed to the very utmost. At present, however, such advertisements must find a place in the page and column indicated, until their numbers render it necessary to give them a place by themselves, and to classify them as (1) "For Purchase;" (2) "For Sale," and (3) "For Exchange."

Soldering.—F. B.—Instructions on the art of soldering will be given in these columns at some future time. The subject is far too large to be properly dealt with in "Shop;" but if you will kindly specify the class of work you wish to solder, we shall have much pleasure in instructing you how to do it.—G. E. B.

Barometer.—F. B.—I may say that some two or three methods are adopted for exhausting barometer tubes of air and filling them with mercury. The most simple is as given here. Get some *pure* mercury, place in a clean Florence flask, and warm up on a sand bath. Clean the barometer tube with a strip of split cane and a bit of wash-leather. Warm the tube gently near the flame of a spirit lamp until it is hot enough all over to be handled without scalding the hand. Then pour the warm mercury into the warm tube in a very fine, thin stream from a lipped vessel through a thin-necked glass funnel. When the tube has been filled with mercury, close the open end with a gloved thumb and shake the mercury up and down the tube until all air bubbles have been expelled, and the clear, bright column of mercury strikes the closed end with a sharp click, thus denoting that there is a perfect vacuum at that end. Warm the tube by holding its closed end *close to*, but not *in*, the flame of the spirit lamp, and turning it round and round in the hands, gradually warming it all along until the open end is reached, then back again until hot enough. Unless these precautions are taken the tube will be liable to crack. Tubes will also crack if cleaned with a *wire* brush or mop. The mercury must be quite pure. By another method the tube is first filled with warm mercury, then heated inch by inch, beginning at the closed end, until the boiling mercury has expelled all the air. This is said to be a risky method for the amateur. Another plan is to warm the tube and invert it mouth downwards in a trough filled with mercury. A small quantity of the metal ascends as the tube cools. The tube is again heated whilst still inverted, and the operation is repeated again and again until the tube is full. All remaining traces of air bubbles are shaken out, as in the method first described.—G. E. B.

Litho Retransfers from Stone.—J. D. (*Perth*).—Take Scotch transfer paper, and damp the back with a sponge. Let it lie for a minute or two, when it will be ready to take an impression from the stone without sticking sufficiently to break the composition in lifting. Roll in the work with retransfer ink (stone to stone), which is sold by dealers in litho sundries, fan the stone till it becomes quite dry, and then pull the impression on the previously damped paper. It will be found to adhere firmly to the stone, and must, therefore, be peeled off slowly. If done with care, impressions from the retransfer will compare favourably with those from the original.

Sheet Metal Working.—J. F. (*Elgin*).—Wood working naturally has had a preponderance at first, because where one man can be found who is competent and willing to write on metal working of any kind, there are at least a score who can write—and write effectively—on wood working. Many subjects in connection with metal working are in preparation, and even in course of issue, as you will have noticed. Arrangements have been made for papers on sheet metal working, and these will soon be commenced.

Picture-Frame Making.—ASHMORE.—I am glad that the instructions to which you allude were of service to you. A paper or two on the mode of making ordinary picture frames from mouldings will be given for the information of yourself and others who are interested in this subject. The article on "Frames à la Mode" was a paper on art in picture frames, and not a practical paper on frame making.

Bogus Advertisements.—It would have been better for your friend's wife to have purchased the necessary tools and materials and have obtained some instruction in the art to which you refer in your letter before she commenced operations. It is not wise to trust to such advertisements as you mention. There is no royal road to wealth; and persons who trust to specious promises—far too specious, in truth, to afford any hope of fulfilment—must expect to lose their money. I do not see how I could "bell the cat" in the matter as you suggest. Papers on the work-bench will be given. Instruction in holding saws, files, chisels, etc., is, I think, scarcely needed.

Litho Bronze Blue.—A LITHOGRAPHER (*West Bromwich*).—The introduction of a little tallow into the ink would, most probably, have overcome the difficulty.

Litho Machine Transfer.—A. C. (*New Barnet*).—The fault, no doubt, lays with your transfer paper. Procure *Scotch transfer* paper; slightly damp same by placing between damp blotting paper and warm stone before laying down transfer upon it.—J. F. W.

Toning Bath for Black Tones.—A. P. (*Stockport*).—The following toning bath will give good black tones, but it must not be used until at least twenty-four hours after mixing:—Chloride of gold, 1 grain; acetate of soda, 30 grains; water (distilled), 10 ounces. Another good one, which must be used half an hour after mixing, is—Chloride of gold, 1 grain; borax, 30 grains; distilled water (hot), 10 ounces. To obtain the best results, the paper should be sensitised by the operator.—T. C. H.

Repairing Jewellery.—J. W. (*Manchester*).—There are two ways of repairing jewellery, soft soldering and hard soldering. Soft soldering is the method employed when the article to be repaired will not stand the heat necessary for hard soldering, such as enamelled articles and rings when broken at the shoulder, and when it is not advisable to take out the stones with which the ring is set. The tools and materials for soft soldering are very simple: a blowpipe, some blowpipe solder, soldering fluid, small file, pair of pliers, and shears. To mend a ring broken at the shoulder with soft solder, cut a plate from thin gold plating or metal the size and shape to fit nicely over part or all of the inside of head and part of shank; tin one side of it, by spreading over it a drop of soldering fluid, and then working in the gas till a small piece of solder laid on it melts and spreads all over. Tin the portions of the ring that the plate is to cover in the same way, using the flame from blowpipe very cautiously; wipe off any superfluous solder from plate and ring, then adjust the plate inside in the required position, hold it there with the pliers, and gently warm with blowpipe flame till solder melts, withdraw flame, and let the ring cool; if any solder has run out at edges it must be scraped off with point of an old three-cornered file; hard soldering is more difficult, and will be dealt with next week. All materials, tools, and stones (real and imitation) for jewellers' use can be bought at King's, 13, St. John's Square, Clerkenwell, London.

Lathe Motive Power.—WOODMAN (*Newcastle-on-Tyne*).—You say you have tried to convert one of Jones's sewing machines into a saw bench, to do grooving and other similar work, but could not get sufficient speed, or enough power, and you want to know how to construct a machine to obtain power and speed for cutting, grooving, and rebating, without such labour at the treadle. Your error lies in trying to put work upon a light piece of mechanism for which it is utterly unsuited. A sewing machine treadle and fly wheel is not designed for cutting wood, therefore it will not absorb and give out sufficient power for that purpose. But you can have no simpler piece of mechanism for such work as you require than the treadle and crank, with fly wheel. The next better plan is to get a heavy driving wheel, and let some one else turn that, and so drive your lathe or saw with a belt, just as turners do in heavy cutting on large lathes. If neither of these methods will suit you, then power must be obtained from an extraneous source, using a motor, a steam engine, gas engine, or water power, as most convenient. I should recommend you to look out for a second-hand treadle and fly wheel at the marine store dealers, and then rig up a framing to suit. In this way you can obtain ample power at small cost, and the labour of driving a heavy crank axle and fly wheel, supposing they are properly pivoted, and the parts well fitted, is comparatively slight.—J. H.

Cost of a Patent.—B. D. (*High Holborn*), in reference to reply given to G. B. B. (*Portsmouth*), writes to say, "The stamp on application for provisional protection is only £1, whilst if the application is 'complete' the stamp is £4." Attention has been already drawn to the oversight in stating the cost of provisional protection to be £1 10s., so there will be no occasion to insert any further letters on this subject.

Advertisements in "Work."—J. E. G. (*Leeds*).—I note your strictures on advertisements in WORK. Your suggestions are noted, and if at any time it is found that they can be adopted, they shall be followed.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Making a Cyclorn.—BON-AMIS asks:—"Could any reader of WORK inform me how to make a cyclorn?"

Joiners' Composition. — F. B. (*Guernsey*) writes:—"The other day I was in a cabinet-maker's workshop, and noticed, after veneering, there were a few defects in the joining, which were immediately filled with a composition which was kept heated for the purpose. This hardened very quickly, and, after being sand-papered, could not be detected. Being an amateur fret worker I took particular notice of this, and I think it would be a great assistance to amateurs to know of this preparation. Will any of your readers kindly give the recipe in 'Shop?'"

Trade Notes and Memoranda.

THE new Calais mail steamer, which has been built for the London, Chatham, and Dover Company, and which will be placed in the service in May, has been named the *Calais Douvres*, after the twin ship of the same name, now to be withdrawn from the service. The new vessel is built entirely of steel, and is divided into nine watertight compartments. It is expected that she will be the fastest cross-channel steamer afloat, and will make the passage easily in an hour. She will be lighted with electricity, incandescent lamps between decks, and arc lights for embarkation.

SIR JOHN FOWLER, addressing the students of the Crystal Palace School of Practical Engineering, recently, told them that England was the best place in the world for the engineer to learn his profession, and to get equipped, wheresoever his future might be. By the best equipped men, he meant, not necessarily those with certificates, although these were valuable, but those who had the best general record. He said that India, Canada, Australia, South Africa, and our other colonies and dependencies, offered vast scope for the engineer.

IT is stated in the *Revue Scientifique*, of Paris, that paper of best quality can be made from the stalk of the sugar cane; and the writer suggests introducing the industry into countries where the sugar cane is grown, and where, owing to over production of sugar, the industry is in a languishing condition.

A LARGE terrestrial globe is being constructed for the Paris Exhibition. It will be one-millionth the size of the earth, measuring about 30 metres, or nearly 100 feet in diameter. A millimetre on its surface will represent a kilometre on the surface of the earth. Paris will occupy about one centimetre, and will be a convenient unit for comparison. If this globe were revolved on its axis, a point on the equator moving at the rate of half a millimetre a second would represent the diurnal movement of the earth.

A CORRESPONDENT of the *American Machinist* relates his experience of an experimental working of steam hammers with compressed air. Water power was abundant, and the idea occurred to utilise this in compressing air for operating the hammer. Compressing apparatus and a storage tank were erected, and the air brought about 200 feet through a 2-in. pipe. He says that the hammers worked better than with steam, there was no steam blowing off, and no water dripping.

THE exhibition of the Turners' Company will be held at the Mansion House in October. The competition will be in hand turning of glass, wood and metal, with a special section for amateur turning. Particulars can be obtained of Mr. Edgar Sydney, 4, Hare Court, Temple.

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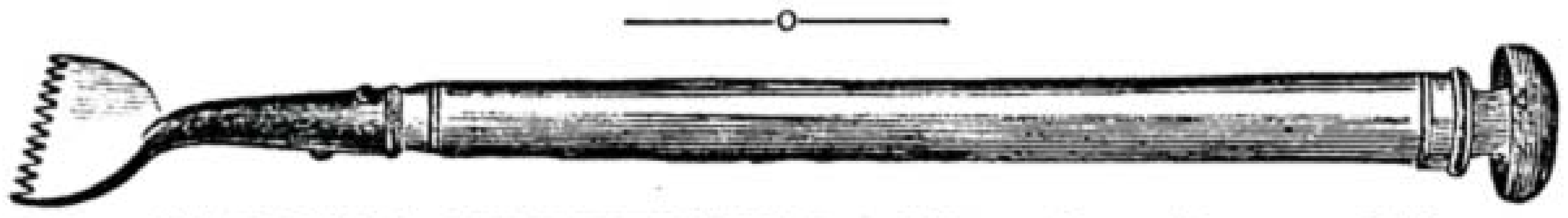
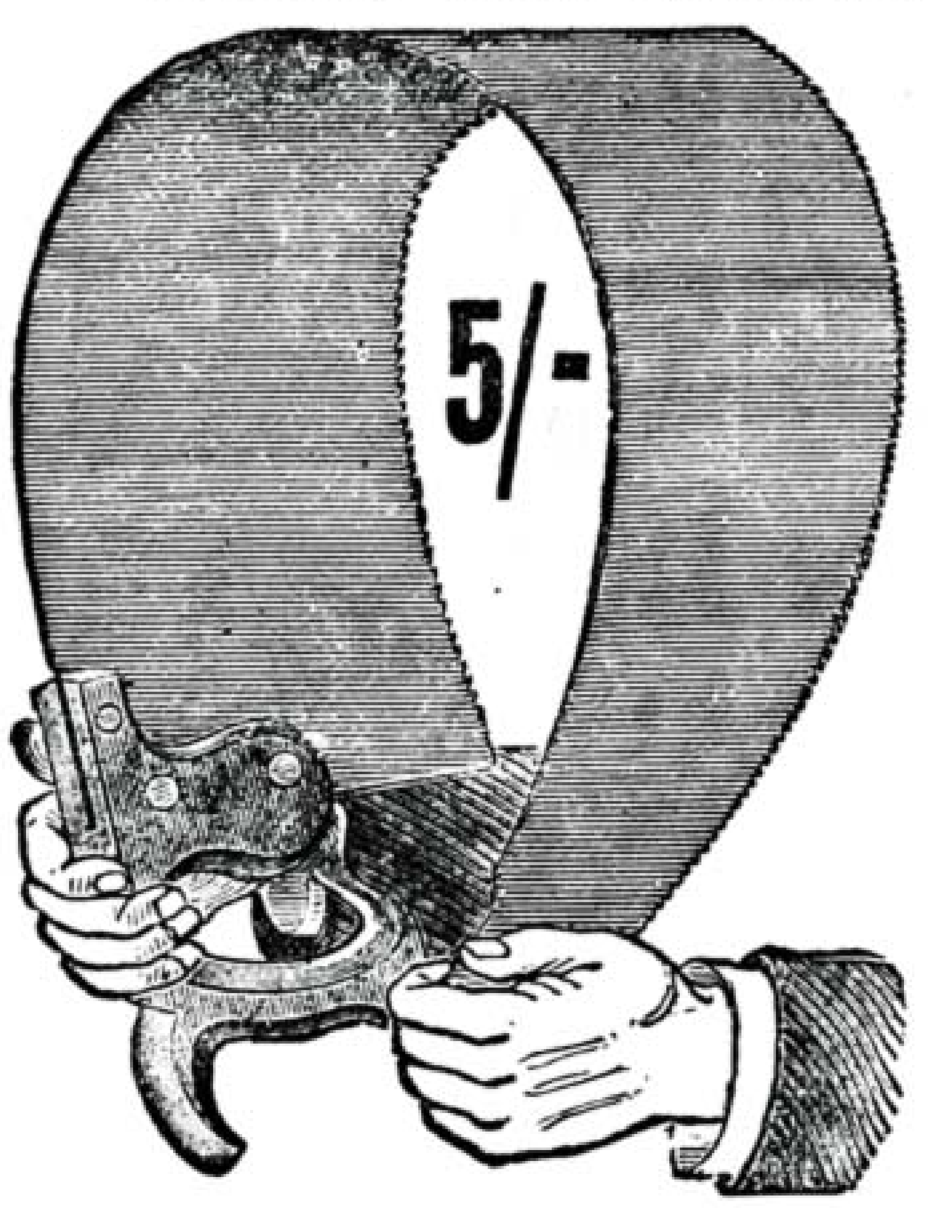


CARPET STRETCHER, 1/9; do., Bent, 2/6.



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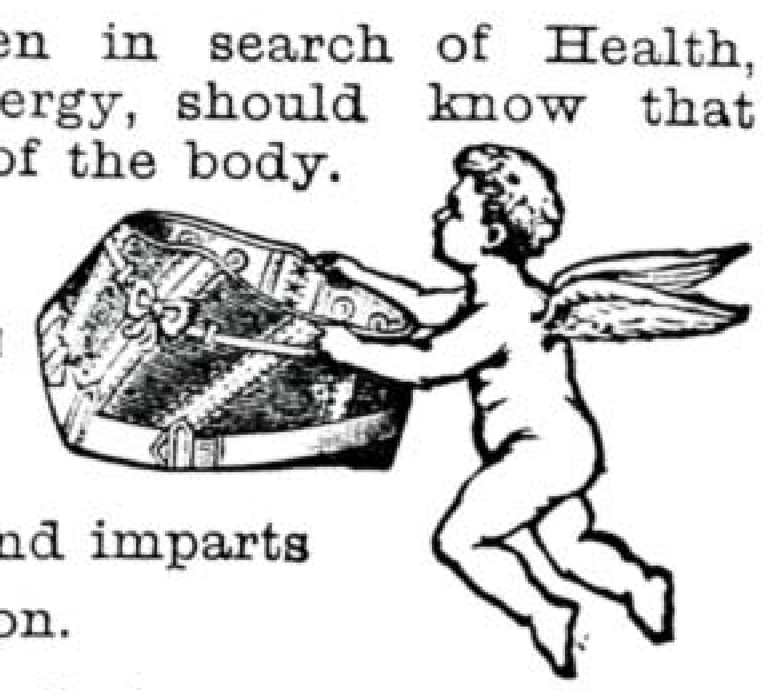

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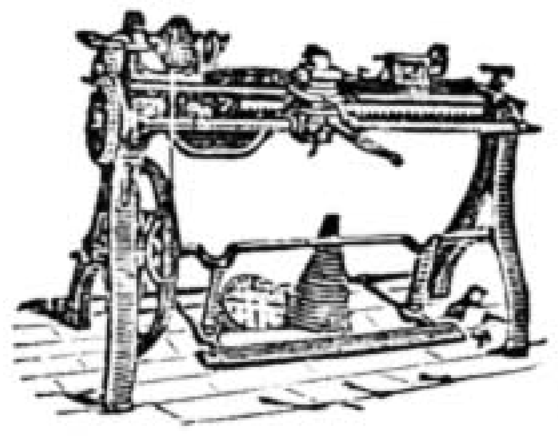

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