CASSELL'S

CARPENTRY AND JOINERY

COMPRISING NOTES ON MATERIALS, PROCESSES, PRINCIPLES, AND PRACTICE, INCLUDING ABOUT 1,800 ENGRAVINGS AND TWELVE PLATES

EDITED BY

PAUL N. HASLUCK

Editor of "Building World," etc

CASSELL AND COMPANY, LIMITED

LONDON, PARIS, NEW YORK & MELBOURNE MCMVII

REPRINTED BY BT&C BOOKS 2010

www.brooklyntoolandcraft.com

CONTENTS.

Gouges.—These have the same action as that of a chisel, but instead of being

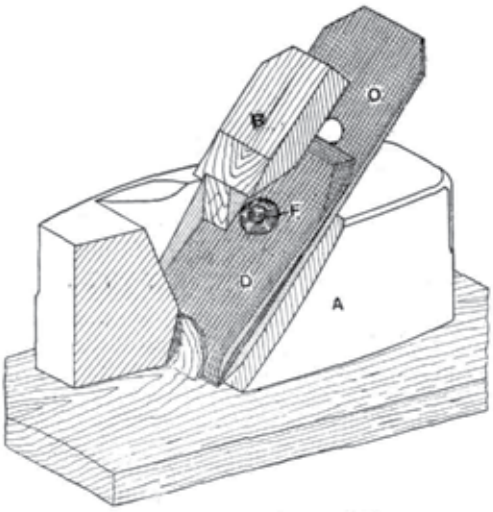


Fig. 59.—Sectional View of Plane.

flat their sections form arcs of circles (see Fig. 55).

Draw Knife.—The draw knife (Fig. 56) is used for roughing stuff to shape preparatory to working with finer tools.

Spokeshaves.—An ordinary spokeshave is merely a knife edge in a suitable holder (Fig. 57); it may jump if the iron is loose, or if the back part of the iron touches the work before the cutting edge. Spokeshaves are best made with iron stocks and with screws to regulate the cutting iron (Fig. 58).

Planes.—These are the tools chiefly used for smoothing work which has been sawn to approximate size. The simplest plane is a chisel firmly fixed into a wooden block. The construction of an ordinary plane is shown in the sectional view (Fig. 59), in which A shows the stock; B, the wedge; O, cutting iron; D, back iron; F, screw and nut for fastening the cutting and back irons together; the mouth through which the shavings pass upwards is shown. The jack plane (Fig. 60) is the first plane applied to the sawn wood; its parts are: the stock, 17 in. long; the toat, or handle; the wedge; the cutting iron, or cutter, about $2\frac{1}{8}$ in. wide; and the back iron. The trying or trueing plane (Fig. 61) is of similar construction, but is much longer, so as to produce truer surfaces. A still longer trying plane called the jointer is used for jointing boards in long lengths; since the introduction of machinery it is seldom used. The smoothing plane (Fig. 62) smooths the work to form a finished surface; for pine or other soft woods it is 9 in. long, and its iron is $2\frac{1}{4}$ in. wide on the cutting face. Some smoothing planes have iron fronts, as shown in the sectional view, Fig. 63; these can be adjusted for the finest shaving desired.

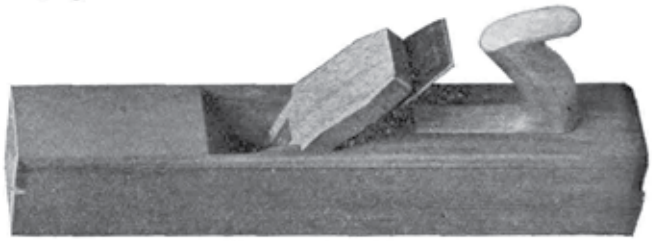


Fig. 60.—Jack Plane.

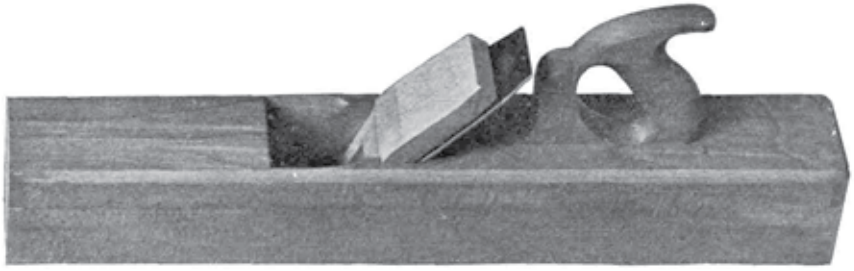


Fig. 61.—Trying Plane.

A good form of iron smoothing plane is shown by Fig. 64; this is intended for superior work. The rebate plane (Fig. 65) is without a back iron, and its cutting iron extends the full width

Fig. 62.—Smoothing Plane.

of the tool, thus enabling the angles of rebates to be cleaned up. Other varieties of planes include the bead plane (Figs. 66 to 68), used for working single and return beads and round rods. Hollows, rounds, etc. (Figs. 69 to 73), are used for working

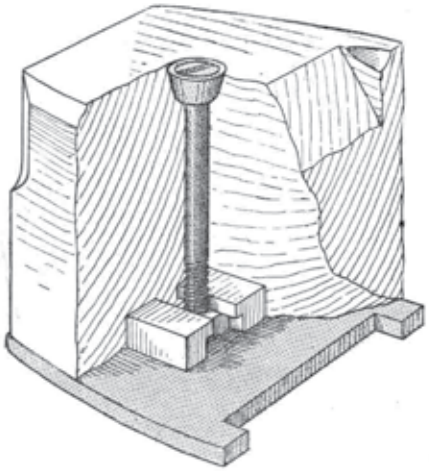


Fig. 63.—Iron Mouth-piece for Smoothing Plane.

straight mouldings of all kinds, but machinery has of late years been increasingly used for such work. Small planes of varying shapes are used for forming mouldings on circular work. The compass plane, used for forming the face of concave ribs, etc., was formerly made of beech wood. The one generally used at the present time is made of steel entirely. The sole of the plane is about 10 in. long, $2\frac{1}{4}$ in. wide,

Fig. 64.—Iron Smoothing Plane.

and $\frac{1}{32}$ in. thick. It is adjusted by means of a screw, and with it both concave and convex surfaces may be worked perfectly

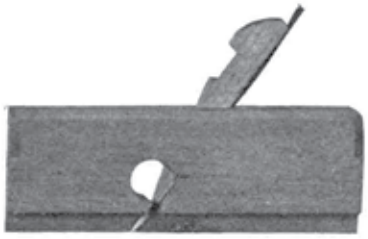


Fig. 65.—Rebate Plane.

true and even. There are also employed ovolo lamb's-tongue planes for forming the mouldings on sash stiles and

Fig. 67.

Fig. 66.

Fig. 68.

Figs. 66, 67, and 68.—Bead Plane.

rails. The sash fillister (Fig. 74) is generally used for making rebates adjacent to the back side of the stuff, its fence working against the face side. When rebates have to be made next to the face side of the work a side fillister (Fig. 75) is most useful;

its fence is adjustable to the face, allowing a rebate to be made of any width within the breadth of the plane iron. These planes,

Fig. 69.—Hollow Plane.

Fig. 70.—Round Plane.

and also the plough (Fig. 76), are principally used for grooving with the grain. They are not used so much as formerly, owing to the introduction of machinery in large

Fig. 71.—Sash Plane.

Fig. 72.—Sash Plane.

Fig. 73.—Ogee Moulding Plane.

shops, but they are still indispensable to most joiners. For the working of hard woods, to obtain perfect joints, gun-metal or iron planes known as the shoulder plane and bullnose plane are considered indispensable, as is also the steel smoothing

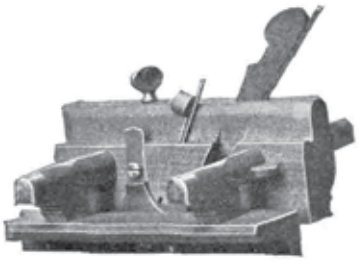


Fig. 74.—Sash Fillister.

plane which is used for cleaning up face work. The router, or "old woman's tooth" (Fig. 77), is used for working out the bottoms of rectangular cavities; the chariot plane (almost obsolete), is used for the small parts of work which the smooth-

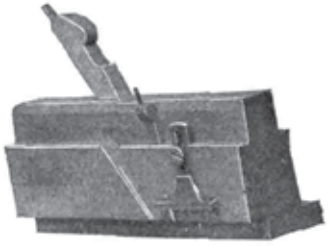


Fig. 75.—Side Fillister.

ing plane cannot get at, and for planing end grain and cross-grain work; chamfer planes are used for taking off sharp edges to form chamfers; mitre shooting planes

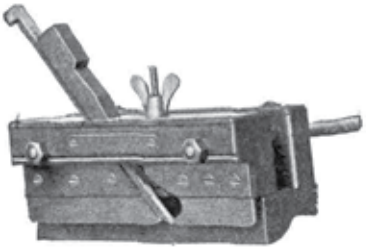


Fig. 76.—Plough.

are sufficiently described by their name; and the plough or plough plane (Fig. 76), used for cutting or "ploughing" grooves. There are many other varieties of planes; the names and uses of the more important

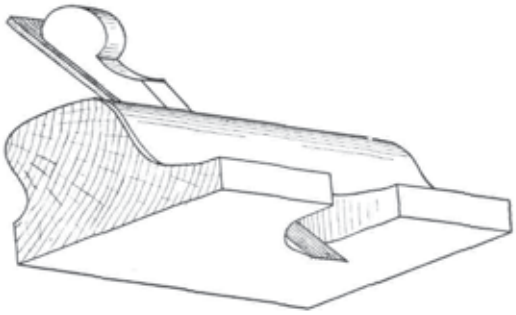


Fig. 77.—Ordinary Router.

will be treated upon in some of the following sections. Particulars of these may be found readily by reference to the index.

Hand Saws.

The saw cannot be classified with any other tool. It is essentially a tool for use across the fibre of the wood, and the separation is a cutting, not a tearing action, as fully explained in the work already alluded to. The carpenter and joiner has some six or eight saws, comprising the rip, cross-cut, hand, panel, tenon, dovetail, bow or turning, and keyhole. The hand-saw type includes the hand saw proper, the ripping, half-ripping, and panel saws, all of similar outline, but differing in dimensions and in form and size of teeth. There is no sharp distinction between these tools, as they merge one into the other; yet at the extremes it would be impossible to substitute the ripping and panel saws one for the other. The hand saw, however, which is a kind of compromise between extremes, is used indiscriminately for all purposes, especially by the carpenter. Fig. 78 is a saw with nibbed back. Straight back and skew back or round back saws are made, and the teeth of the latter do not require to be set. The typical hand saw has a blade which is from 24 in. to 28 in. long. Its blade is as thin as possible, consistent with sufficient strength to prevent the saw buckling under thrust; the taper of the blade is

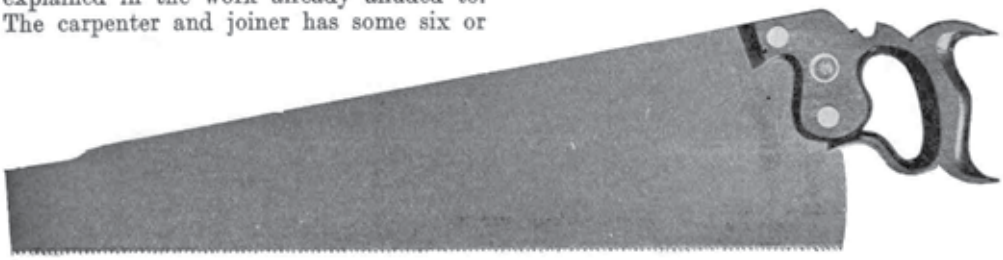


Fig. 78.—Hand Saw.

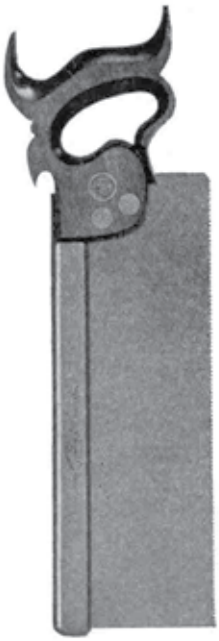


Fig. 79.—Tenon Saw.

Fig. 80.—Bow or Frame Saw.

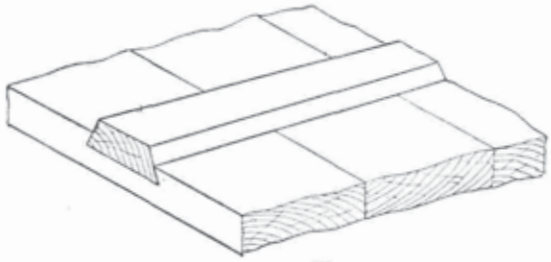


Fig. 292.—Diminished Dovetail Ledged.

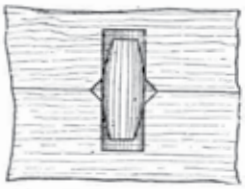


Fig. 294.—Dowelled Joint with Excessive Countersinking and Rounding.

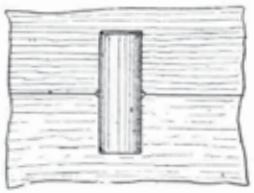


Fig. 295.—Dowelled Joint Correctly Made.

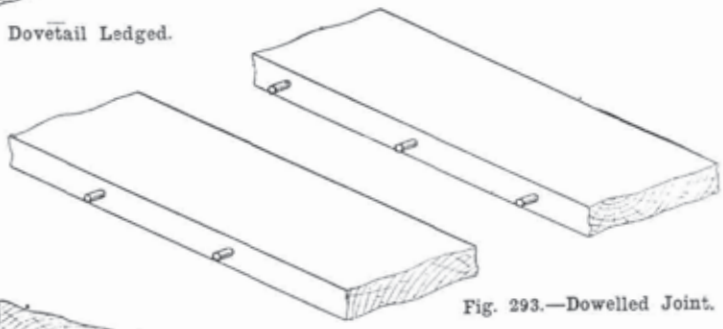
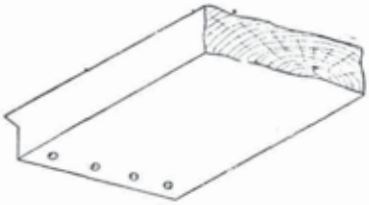


Fig. 293.—Dowelled Joint.



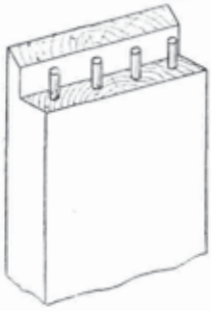


Fig. 296.—Dowelled Angle Joint.

Fig. 297.

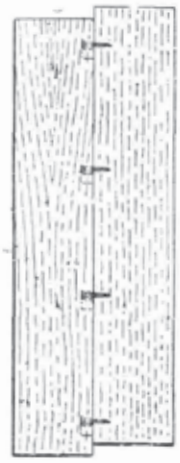


Fig. 298.

Fig. 299.

Fig. 297.—Screwed Joint Complete.

Fig. 298.—Screwed Joint, before Sliding into Position.

Fig. 299.—Edges of Boards to be Screw Jointed.

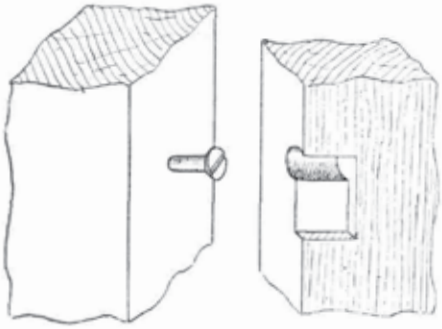


Fig. 300.—Sectional View of Screwed Joint.

to 300); the screw heads enter the holes bored for them, the edge is then slotted for about $\frac{3}{4}$ in. beyond the hole to allow the stem of the screw to pass along, the head projecting beyond the stem forms the key, and then the boards are merely slid together tightly, so forming a strong joint which can be taken apart easily.

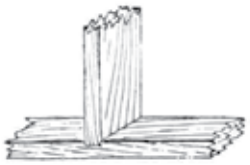


Fig. 301.—Housed Joint.

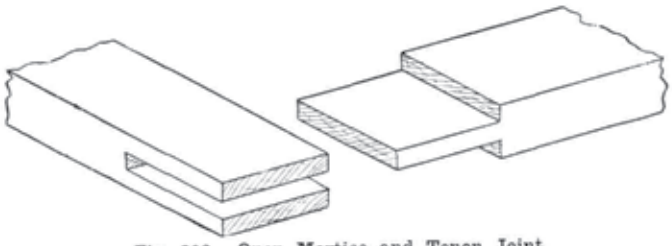


Fig. 302.—Open Mortise and Tenon Joint.

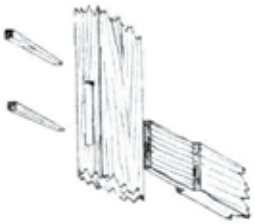


Fig. 303.—Tenon and Mortise Joint.

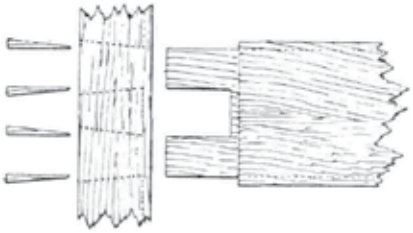
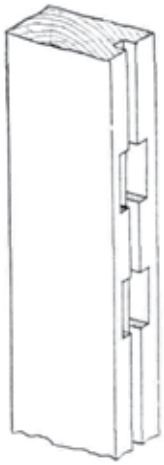


Fig. 304.—Pair of Single Tenons.



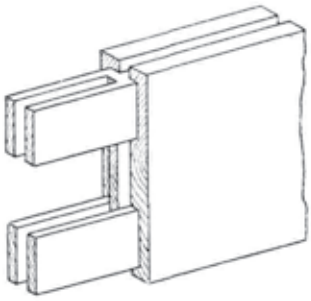


Fig. 305.—Double or Twin Tenons.

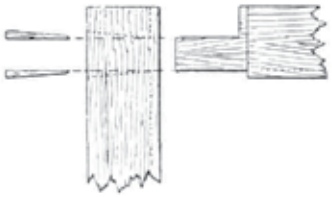
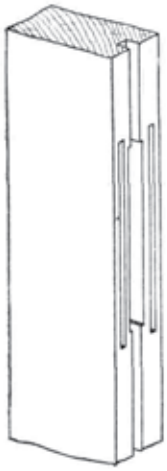


Fig. 307.—Haunched Tenon.



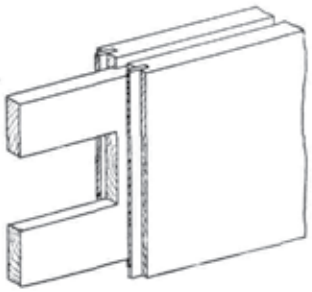


Fig. 306.—Pair of Single Tenons with Grooves and Slip Feathers.

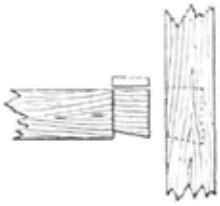


Fig. 308.—Dovetail Tenon.

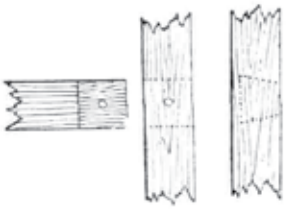


Fig. 309.—Pinned Tenon.

Fig. 310.—Foxtail Tenon.

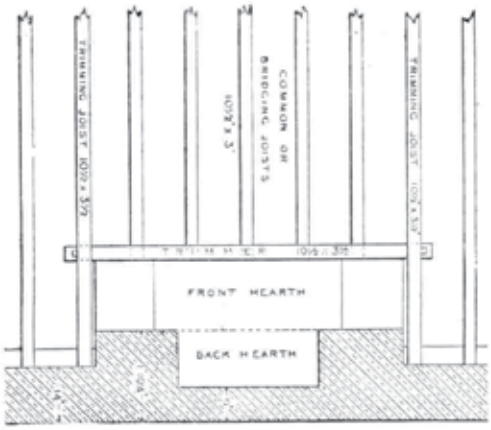


Fig. 320.—Plan of Trimming round Fireplace.

first-mentioned partition. The trimming joist is 11 in. by $3\frac{1}{2}$ in., and is placed 18 in. from the chimney-breast. The short trimmers are 11 in. by 3 in. and represented not as resting in the party wall, but as being supported on iron corbels built in the wall. Fig. 316 shows, to the left, an isometric view of the tusked and keyed joint to the trimming round chimney-breast; to the right, it shows a sectional isometric view through joint of trimmer and tailing joist. It also represents the kind of joint that

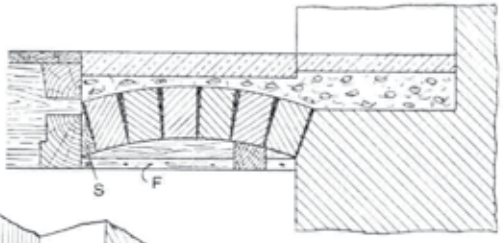


Fig. 321.—Cross Section through Coach Head Arch, Trimmer, Hearth, etc.

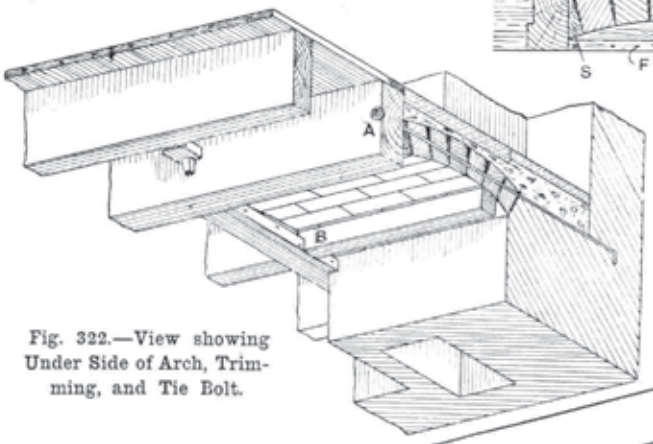


Fig. 322.—View showing Under Side of Arch, Trimming, and Tie Bolt.

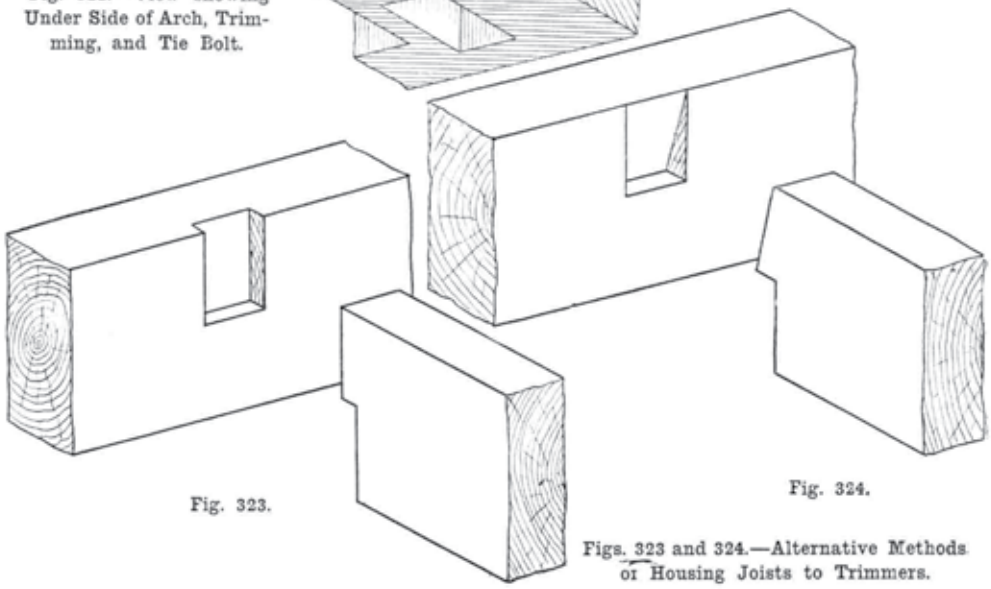


Fig. 323.

Fig. 324.

Figs. 323 and 324.—Alternative Methods of Housing Joists to Trimmers.

would be used to connect the staircase trimmer and joists shown in well. Fig. 317 (p. 70) gives a view of the herringbone strutting (2 in. by 1½ in.), four rows of which are indicated on the plan. The joists going from back to front are required to be

Fig. 325.—Plan of Binder or Double Floor.

34 ft. 9 in. long; therefore all, or the greater part, would have to be formed of two lengths and halved on the middle bearing; alternative methods of doing this are shown by Figs. 318 and 319.

parallel with the chimney-breast, and the trimmers which carry the joists are against the sides of the breasts. Fig. 320 is a reverse case, there being only one trimmer, which is parallel to the breast, but two trimming joists, these being at right angles to

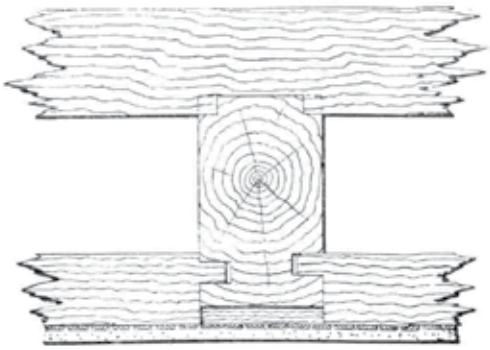


Fig. 327.—Section through Binder showing Bridging Joists Cogged, and Alternative Methods of Connection with Ceiling Joists.

it. Fig. 321 is a section through the trimmer, hearth, coach head brick arch, etc., shown in plan at Fig. 320. s (Fig. 321) is a feathered-edge piece of board (a springing piece) nailed to the trimmer for the arch to

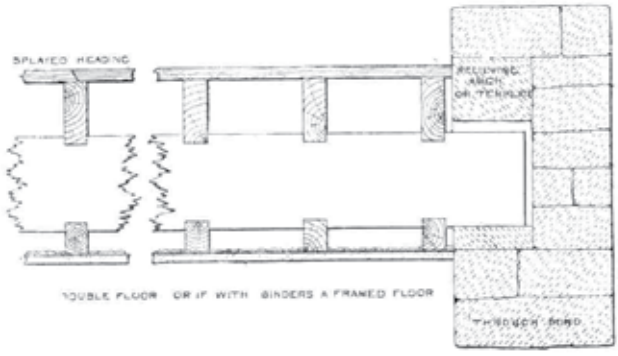


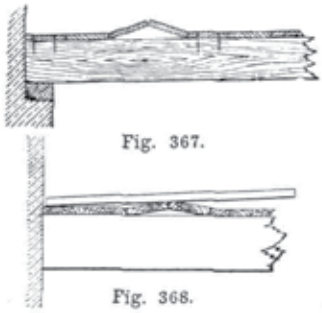
Fig. 326.—Section through Joists, showing Side of Binder supported by Wall.

Trimming Round Openings.

In projections where fireplaces and flues (usually known as chimney breasts) occur in walls it is necessary to trim round them, so that the nearest timber in front shall be at least 18 in. distant, whilst that at the sides may be only an inch or so. In the plan (Fig. 315) the trimming joist runs

butt against; F is a fillet nailed to the trimming joists so as to support the piece of scantling to which the laths are nailed. This construction is clearly shown at B (Fig. 322). When a trimmer has to support an arch, to prevent any likelihood of the arch forcing it back, one or two iron bolts are inserted, one end being bedded and

the reason that red deal battens are, as a rule, kept under cover; orders can be executed and despatched without the necessary seasoning that white deal requires.



Figs. 367 and 368.—Laying Folded Floors.

Red deal is more easily manufactured than white. It is to a certain degree softer and not so tough in the reed as spruce.

Direction of Grain in Floor-Boards.—If a specification does not insist on any particular position of the grain of the wood, it will be complied with by either of the examples shown in Figs. 365 and 366. If the grain is intended to show "annual rings parallel with the edges," words to that effect should be inserted in the specification, or it should be stated that "all boards are to be cut radially from the tree." No doubt the plank shown in Fig. 366 would be less liable to warp than that shown in Fig. 365;

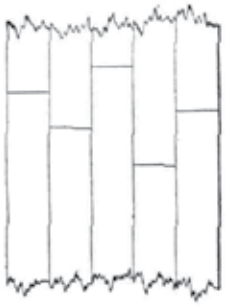


Fig. 370.—Floor with Joints broken at 3-ft. Intervals.

but to obtain all like this would mean picking over a very large parcel of boards in order to get the quantity required, and it may be looked upon as impracticable.

Laying Floor-Boards.

Folded Floor.—"Floors to be laid folding with the joints broken" means that the heading joints of the boards are not

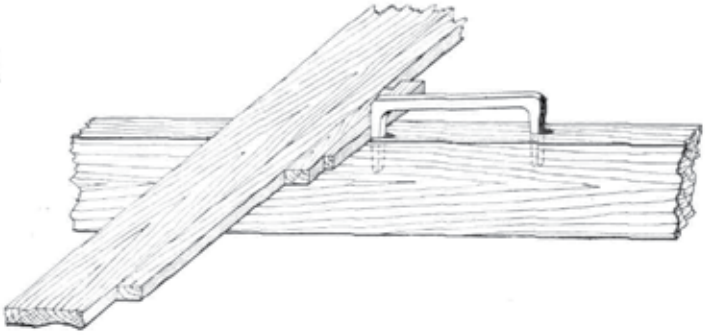


Fig. 369.—Cramping Floor-Boards with Dog and Folding Wedges.

to be in line when laid, but are to be crossed in as long lengths as possible from joist to joist. The system of laying the boards *with a succession of joints in line* causes unevenness when the boards shrink, and weakens the floor. The term "laid folding" is an old one, and was applied when mechanical means were not available for bringing the joints tightly together. In the absence of a floor cramp the boards *may be laid with fairly tight joints* by jumping them in, as shown in Fig. 367. The first board next the wall is laid and nailed in its place; then other boards (say five), to make a width of about 3 ft., are

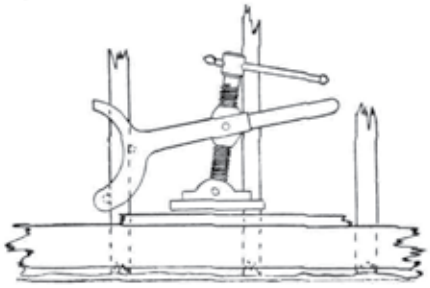


Fig. 371.—Ordinary Pattern Floor Cramp.

laid down. The final position of the fifth board having been ascertained, the fifth board is nailed down ¼ in. inside the line it takes when only hand tight. The four other boards are then jumped in and nailed.

A board placed over the loose boards, as seen in Fig. 368, will be found of assistance in getting the floor-boards down to the joists, but there will still be some difficulty

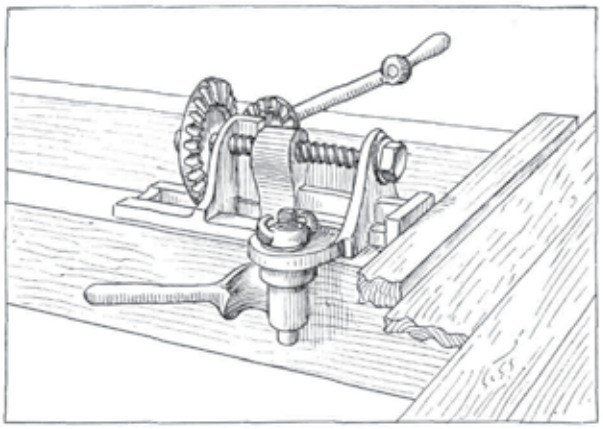


Fig. 372.—Improved Form of Floor Cramp.

unless the four boards are kept loose—that is, none of the intermediate boards between the first and sixth must be nailed until all of them are tight home. Another simple method of cramping is shown in

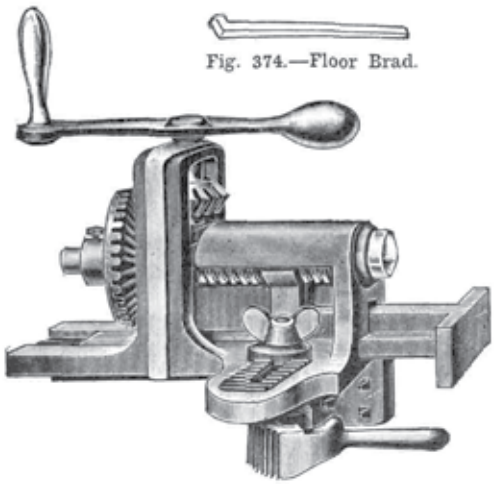


Fig. 374.—Floor Brad.

Fig. 373.—Another Improved Floor Cramp.

Fig. 369. An iron timber dog (Fig. 47, p. 11) is driven into the top edge of the joist, allowing about 3 in. from the edge of the floor-board. A piece of rough timber 2 in. thick is then laid next the board, and a pair of hardwood folding wedges is driven between the timber and the dog until the joints of the board are close;

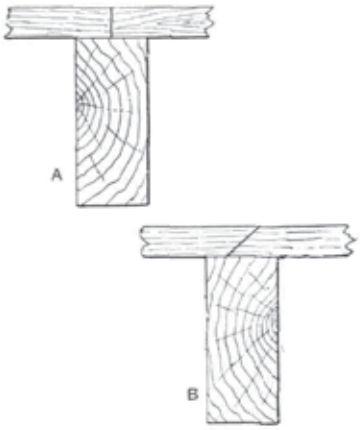


Fig. 375.—Butt and Splayed Heading Joints.

then the boards are nailed, the dog is removed, and more boards laid in the same manner. Both the methods above mentioned are usually adopted for the commoner kinds of work only.

Laying Floor-Boards with Aid of Cramp.—Floors laid with the heading joints crossed, as in Fig. 370, need a special cramp to bring up the joints; three kinds of cramps are shown by Figs. 371 to 373, but a variety is available. For instance, batten-width tongued and grooved common Baltic flooring would be laid in the following manner. The joists would be tried over and brought to a level. A batten, or line of battens, would be laid down next the wall to line true at the outer edge, and then be nailed to the joists. The remaining rows are laid two or three at the time with the tongues inserted, then cramped into place, nailed, and the next lot of battens applied. If the battens are already tongued, they can be laid either way, as the block, or saving piece, between the cramp and batten can be grooved to clear the tongue. Figs. 371 and 372 show the modes of using floor cramps. When the floor has been finished so far that there is not sufficient room for the cramp, the remaining

battens can be wedged in from the wall, or forced together by using a piece of quartering as a lever.

Floor Brads.

Nails used in flooring are called floor brads (Fig. 374), and they are driven through

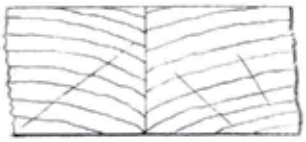


Fig. 376.—Straight Floor Joint.

Fig. 377.—Rebated Floor Joint.

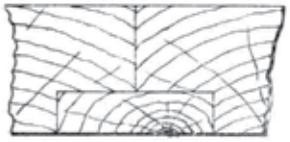


Fig. 378.—Rebated and Filleted Joint.

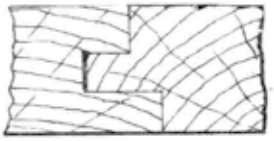


Fig. 379.—Rebated, Grooved and Tongued Joint for Secret Nailing.

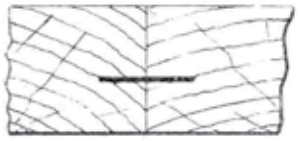


Fig. 380.—Iron Tongue Joint.

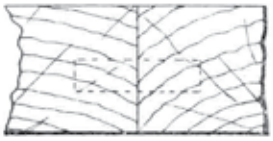


Fig. 381.—Dowelled Floor Joint.

the floor-boards into the joists, two at each passing, about 1 in. from the edge.

Joints for Floor-Boards.

Heading Joints.—The points of contact between the ends of two floor-boards are called heading joints (Fig. 375). A (Fig. 375) shows the section of a butt heading joint, but slightly less simple than the splayed heading joint shown in section by B (Fig. 375). These joints should always be arranged to occur over a joist, and in floors laid with the aid of a cramp, contiguous boards should have their heading joints on different joists—that is, should break joint. The actual joint is made in different ways. In common floors the boards simply butt up against each other A (Fig. 375); in better work the heading joints are splayed B (Fig. 375). Even with plain headings it is usual slightly to undercut the ends so as to present as close a surface joint as possible. Sometimes the heading joints are grooved and tongued in a similar fashion to the longitudinal joints described below. In very expensive work the ends of the boards are cut into a series of sharp, salient and re-entering notches, whose ridges are parallel to the surface of the floor. These notches fit one another, and form a tight joint. Such joints are sometimes used in oak floors; they are extremely troublesome and expensive to make, and the point nearest the surface of the floor is very liable to break away even in hard wood.

Edge Joints.—The ordinary straight joint for the longitudinal edges of floor-boards is shown in section by Fig. 376; the rebated joint (Fig. 377) is another common method, a joint requiring more work being the rebated and filleted (Fig. 378). The rebated, grooved, and tongued joint (Fig. 379) is useful for secret nailing. The joint shown in Fig. 380 has an iron tongue, and Fig. 381 shows the dowelled joint. The ploughed and cross-tongued joint with slip feather (Fig. 260, p. 62) is also used. In all floors which are ceiled underneath, means should be taken to prevent dust or particles of any kind from falling between the boards. Any accumulation of organic matter on the upper surfaces of the plaster is certain to decompose. The ceiling being, moreover, always more or less porous, these particles gradually work their way to the under surface, and produce a stained appearance, which no amount of whitewashing or scraping will remove. The usual method of preventing this is to form a ploughed and tongued floor. Each board is grooved on each edge, and thin slips, or tongues, either of wood or of galvanised iron, are then inserted (see Figs. 260 and 380). If of iron, the tongue should be galvanised. The tongue should

be fixed nearer to the lower edge of the board than to the upper, so that as much wear as possible can be had out of the floor before the tongue is exposed. Another method of attaining the same object is known as rebating and filleting (see Fig. 378); a rebate is cut on the lower edge of each board, and a fillet of oak or some other hard wood fixed in the space thus formed. For superior work, a dowelled floor (Fig. 381) has the advantage of showing no nails on the surface; the boards are pinned together between the joists with oak dowels, and nailed obliquely on one edge only. Dowelled boards should not be more than 3 in. wide, and not less than 1¼ in. thick when finished. The "Pavodilos" joint is as shown by Fig. 382, a slightly modified form being that shown by Fig. 383, which, although the second key is lost, may possibly be preferred on account of the danger, when nailing down the flooring jointed as in Fig. 382, of damaging the feather-edge of the board that is being fixed.

Double-boarded Floor.

An upper layer of thin oak boards is sometimes fixed over a rough deal floor for the sake of appearance, and also in some cases to obtain an almost impervious surface. A floor of this kind, wax-polished and well laid, is much to be commended for the ease with which it can be cleaned, and for its non-absorbent nature.

Sound-proof Floors.

One method of preventing the sound from one room being audible in another room immediately below is to nail fillets to the joists, and on these nail a layer of rough boards, and to fill in on the top of these boards a stratum of lime-and-hair mortar. Slag felt, a preparation of slag wool, which is a material produced by blowing off waste steam into the slag of iron furnaces, is also used for this purpose. In the case of the slag felt the process is as follows: On the under side of the joists, fillets are nailed to wooden blocks 1 in. thick, and to these fillets the lathing for the plaster ceiling is affixed. The slag wool (known as "pugging") is then laid on the upper surface of the laths, and is felted by a patent process, this process of felting removing entirely the property which the slag wool possesses of emitting sulphuretted hydrogen, and also reducing the weight of the material. Slag material, being fireproof, is to be preferred to sawdust and other combustible materials sometimes

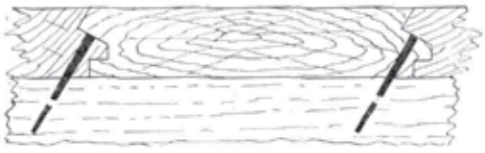


Fig. 382.

Fig. 383.

Figs. 382 and 383.—"Pavodilos" Joint in Flooring.

used. Fig. 384 shows the section of part of a common floor, showing 9-in. by 3-in. joists, and 1½-in. boarding with a rebated heading joint. In addition, "pugging" and a lath-and-plaster ceiling are shown. The object of the pugging is to reduce the transmission of sound. The fillets for supporting the pugging need not be of the shape indicated in Fig. 384. Another means of attaining the desired end is to nail strips of felt on the upper edges of the joists, under the floor-boards. By this means the connection between the joists and boarding is broken. This arrangement creates some difficulty in fixing the boards, which can be overcome by nailing a lath along the top of the felt.

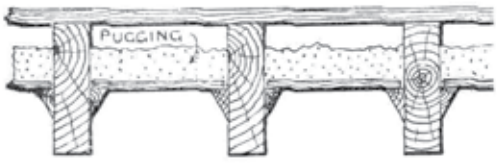


Fig. 384.—Section of Sound-proof Floor with Pugging.

Fireproof Wooden Floors.

Protected Wooden Floors.—One of the simplest and most economical methods of constructing a fire-resisting floor is to protect an ordinary wooden floor with slabs of asbestic plaster or of slag wool (silicate