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SAFETY PAMPHLET No. 8

FENCING

AND

OTHER SAFETY PRECAUTIONS

FOR

WOOD-WORKING MACHINERY

ISSUED BY THE HOME OFFICE

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The Home Office Industrial Museum, 97, Horseferry Road, Westminster, contains a wide range of health and safety exhibits including numerous wood-working machinery safeguards.

See page 3 of the cover of this pamphlet.

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FENCING

AND

OTHER SAFETY PRECAUTIONS

FOR

WOOD-WORKING MACHINERY.

The long list of accidents (including many fatalities) which are reported year by year as being due to wood-working machinery, affords ample evidence of the need for special precautions, and for a specially high standard of fencing in connection with these machines.

Certain precautions have been made compulsory by the Wood-Working Machinery Regulations, 1922,* which came into force on January 1st, 1923, and this pamphlet has been prepared with the object of assisting occupiers of works in which such machinery is used, by supplying information as to available guards, and suggesting methods of working which will minimise the risk of accidents.

Other safety pamphlets have been issued dealing with the safeguarding of transmission machinery, the protection of hoists, the use of chains, the use of abrasive wheels, belt-mounting and fire-protection.† In the following pages attention is concentrated on the dangers peculiar to wood-working machines.

GENERAL SAFETY PRECAUTIONS.

Selection and Instruction of Machine Operatives.—Occupiers are reminded that the installation of necessary safeguards will not by itself infallibly prevent every accident. Operatives require careful and expert instruction in the use both of their machines and of the safeguards provided, and also in the safer methods of working.‡ In assigning men to machines regard should be had to their personal characteristics. Slow and clumsy men should not be put to high-speed tools, nor should reckless men be allowed to work at a circular saw, for example. Youthful inexperience is undesirable at dangerous machines. Much depends upon choosing foremen endowed with caution and an intelligent regard for accident prevention.

Care of Plant.—Tools which are kept sharp and true, straight and in balance, are safer and more efficient than neglected ones.

Maintenance of Safeguards.—There are advantages in making safety appliances conspicuous, e.g., they may be painted a bright red colour.

* See Appendix I.

† See page 2 of the cover of this pamphlet.

‡ Required by Regulation No. 9.

It is essential that they should be maintained in good order, and that their use and proper adjustment should be enforced by adequate supervision.*

Easy Manipulation of Safeguards.—The parts of guards which may have to be adjusted should be provided with fastenings easily loosened and tightened by hand, such as butterfly nuts, wing nuts, thumb nuts, handwheels, handles, &c., and care should be taken not to use square or hexagon nuts and bolts which require spanners and such tools. It cannot be expected that guards will be kept in proper adjustment if unnecessary difficulty and trouble are involved. (See Fig. 1, a, b, c, d.)

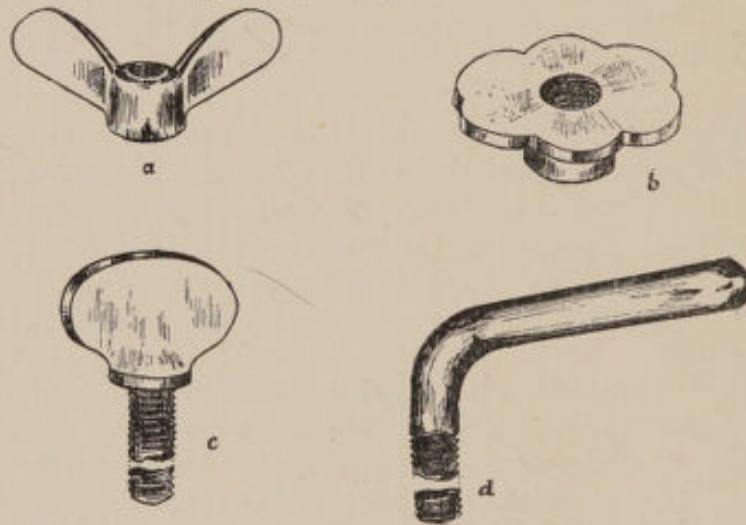


FIG. 1.—Hand Grips.

It is also a mistake to **nail** guard barriers in place when they could be **screwed** or **bolted**, or **hinged** or fastened to supports by **cleats** or **hooks and eyes**. When such barriers have to be removed for occasional access to the parts guarded, difficulty in taking them down means trouble in putting them back, with the result that the guards are thrown aside.

Seals can be set on barriers which might otherwise be displaced without authority.

Warning Notices.—Notices affixed at each machine assist the management in some works in securing constant use of the safeguards provided. Phrases such as the following are employed:—

“This machine must never be used unless the guard provided is in its place and properly adjusted.”

“This machine is only to be used by persons expressly authorised by the manager.”

“If the machinist considers the guards available are not suitable for any particular job, he must report to the foreman before starting the machine.”

“Employees disregarding these instructions are liable to instant dismissal.”

* See Regulation No. 21.

Secure Foothold.—This is particularly needed beside such machines as the larger circular saws and planers, for when pressing the wood up to the machine the machinist's hands are near the cutters, and overbalancing in such circumstances has given rise to many accidents.

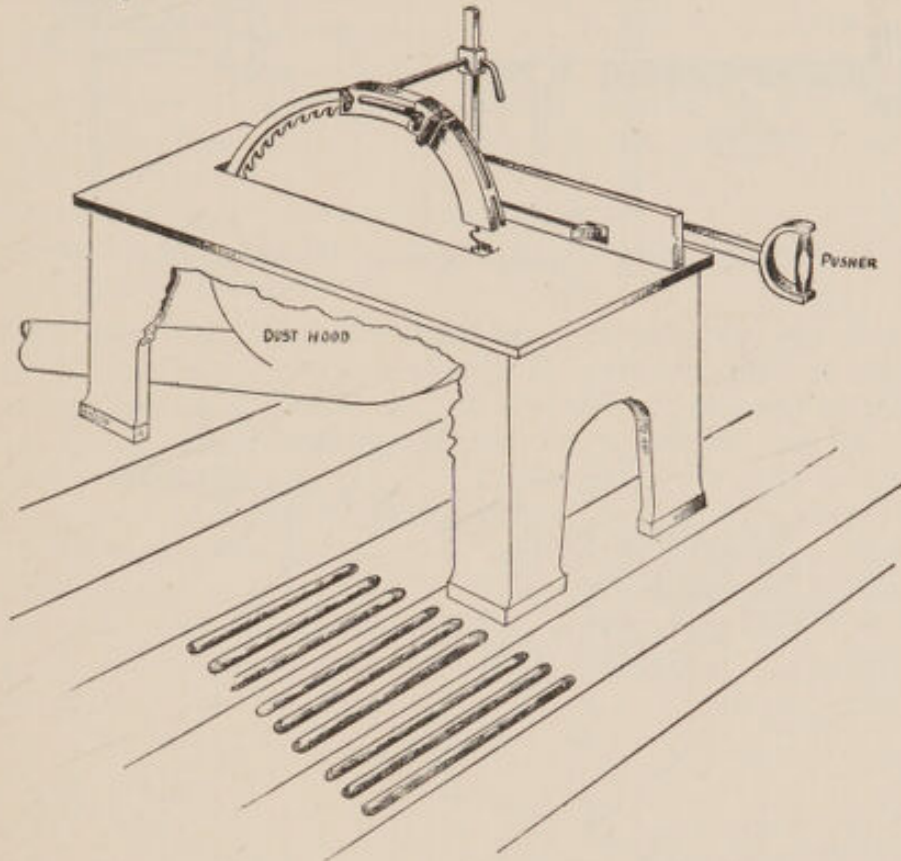


FIG. 2.—Grooves for Slippery Flooring.

Brick, stone or concreted floors should be roughened from time to time and not allowed to become slippery.* Wooden floors may have laths nailed down at intervals or suitable grooves may be cut in the floor boards, but thick battens liable to trip a person approaching the machine should be avoided. It is also undesirable to have loose grids, which may rock or slip.

Machine-starting Gear.—Efficient "striking gear" should be fitted to all power-driven machines,† in order that they may be stopped easily in an emergency or when not required. Power, as well as wear and tear, is saved, in addition to diminishing risk of accident.

The striking gear should be fitted with a device for maintaining the machine strictly in one condition or the other. The power should be definitely "on" or "off." Many injuries have been inflicted by machinery unexpectedly set in motion by a belt "creeping" from the "loose" to the "fast" pulley.

* See Regulation No. 4.

† Required by Regulation No. 1.

Figs. 3A, 3B and 4 show some of the simpler forms of belt lever locks. Of these the "dead-centre" type shown in Fig. 4 is the most reliable.

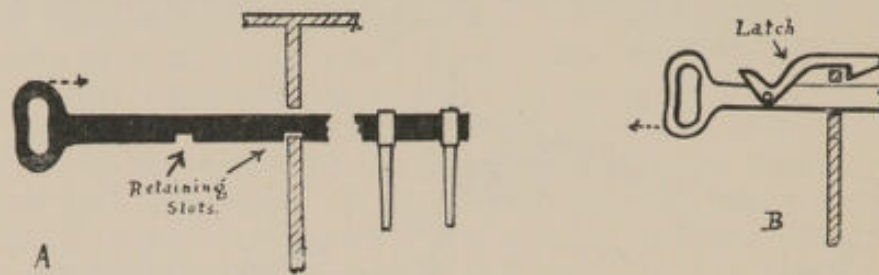


FIG. 3 A. and B.—Simple Catches for Starting-Gear.

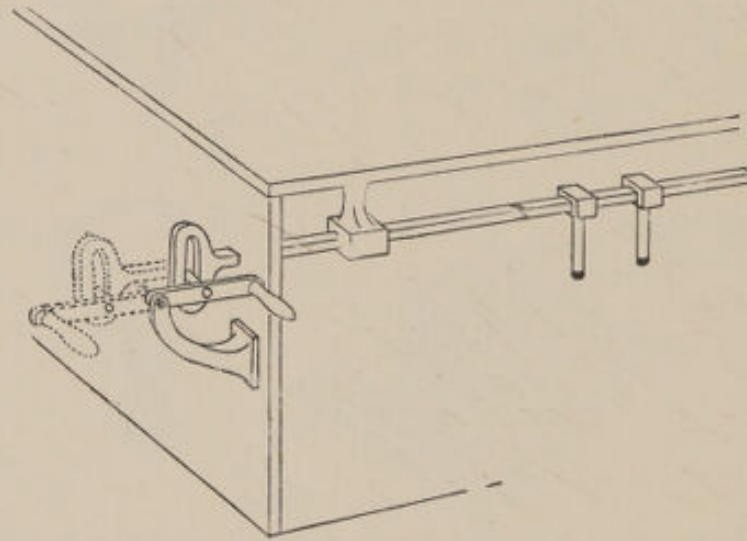


FIG. 4.

Illumination.—The great importance of good illumination is not always fully realised. **Light is a tool which adds to the efficiency of every other tool.** Ill-lit workplaces result in poor work and lessened output; they cause eye-strain to the operatives, reducing their general efficiency and their value to their industry. Where such dangerous machines as woodworking tools are not furnished with good lighting, there is a further drawback in greatly increased risk of accident. When deciding where machinery shall be fixed a prime consideration should be the availability of adequate daylight;* and when new buildings are being designed, the advantages of securing top light, if possible, should be borne in mind.

Much improvement can often be effected in dark rooms by such simple expedients as the use of limewash or white paint on all walls and ceilings, and the regular cleansing of windows and light-globes.

* Required by Regulation No. 5.

It is essential that the means of **artificial illumination** should be placed at a sufficient height, or be suitably shaded, to prevent glare in the eyes of any person working on the premises.* High lights for general illumination and well-shaded lights directed upon special points form a good combination for factory purposes. By this system the strongest light can readily be directed to points where it is most required.

Care should be taken that shadows (including the shadow of the operative himself) are not cast upon the machine or upon the work.

Flickering lights should not be tolerated.

Fuller information is contained in Welfare Pamphlet No. 7 on "Lighting in Factories and Workshops."†

Size and Suitability of Premises.—Businesses are not infrequently handicapped unnecessarily by overcrowded‡ or otherwise unsuitable premises which add to the risk of accident and hamper production. Wood-working is too often carried on in "temporary" sheds in which quite inadequate provision is made for the removal of waste material. Dry and level§ ground should be selected for the site of such temporary mills, and protection|| during winter months can be given by curtains of tarpaulin in cases where more permanent walling is not available. The sketch, Fig. 5, shows a method successfully employed at mobile workshops during the war.

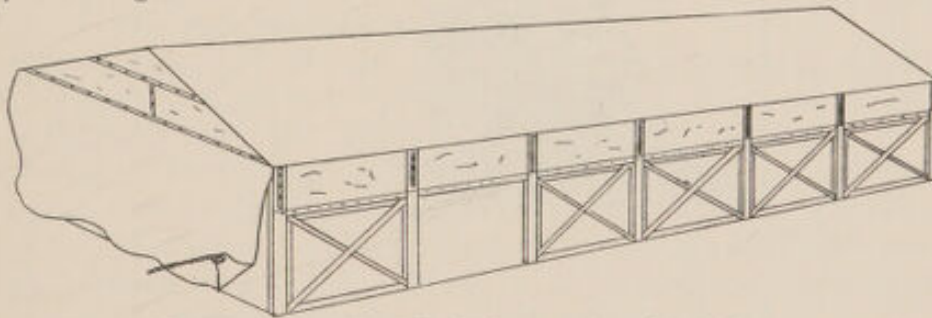


FIG. 5.—Portable Workshop, 30 feet by 65 feet.

Roof covered by corrugated iron or tarpaulin. 3 feet of oiled cotton or tracing linen whole length of shed and at ends, to give light.

Tarpaulin panels, all movable, 8 feet high by 10 feet wide, at each bay.

Millgearing.—In a number of old sawmills, heavy shafting, pulleys and belting may be found in a cramped cellar below the mill; owing to their obscure situation they are apt to be overlooked, and often no attempt is made to safeguard them. Yet

* Required by Regulation No. 6.

† Price 4d., obtainable in the manner indicated on the cover of this pamphlet. See also Third Report of Departmental Committee on Lighting, 1922. Cmd. 1686. Price 9d. Obtainable in the same manner indicated on the cover of this pamphlet; and also Technical Pamphlet No. 1, December, 1919, issued by the British Industrial Safety First Association, Savoy Street, W.C.

‡ See Regulation No. 3.

§ Required by Regulation No. 4.

|| See Regulation No. 8.

labourers, the oiler and belt attendant must go into these cellars from time to time to bag-up sawdust and so forth. They do this at great peril, and far too many fatalities have resulted from such conditions. Shafting and millgearing in such a situation must be protected in the most complete detail. See Safety Pamphlet No. 1.*

The more modern practice is to "cut and cover," that is to say, to instal shafting and pulleys in trenches covered by plates or loose lengths of board. Sawdust and chips are excluded from these trenches, and oiling is done (it should not be attempted when the machinery is running) by lifting single boards over the bearings. Oil pipes from the bearings up to the floor level have not the vogue which they merit, both as a safety and a labour-saving device. (See Fig. 6.)

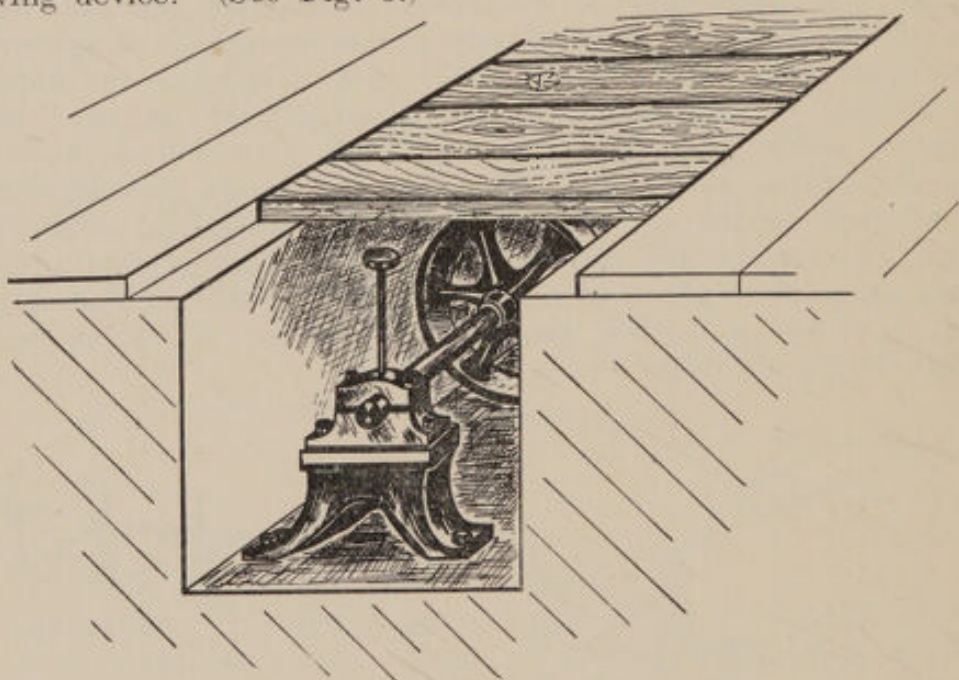


FIG. 6.—Shallow Trench System for Shafting.

Belt Mounting.—Many accidents occur from the handling of belts on running pulleys. Precautions against accidents of this kind are indicated in Safety Pamphlet No. 12.*

The remarks and illustrations which follow relate to Safety Devices, classified separately, for:—

Circular Saws.

Band Saws.

Planing Machines (Jointers or "Buzz-planers").

Feed-rollers and gearing of Planing and Moulding Machines (Thicknesses, Panel-planers, 3 and 4 Side Planers and Moulders).

Spindle Moulders (Wood-shapers).

Mortising Machines (Chain and Chisel).

* See page 2 of the cover of this pamphlet.

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saw (that is to say, a saw whose thickness tapers-off away from the centre) an inclined plank is employed by some sawyers which has the effect of sloping the table top in the other direction, that is to say, from front to back, and not from side to side. For box boards the back is higher than the front, and the sawyer pushes the block of wood up the slope.

Under-feed Saws.—In most types of circular saw the spindle runs below the table supporting the wood to be sawn, and the cutting is done by the

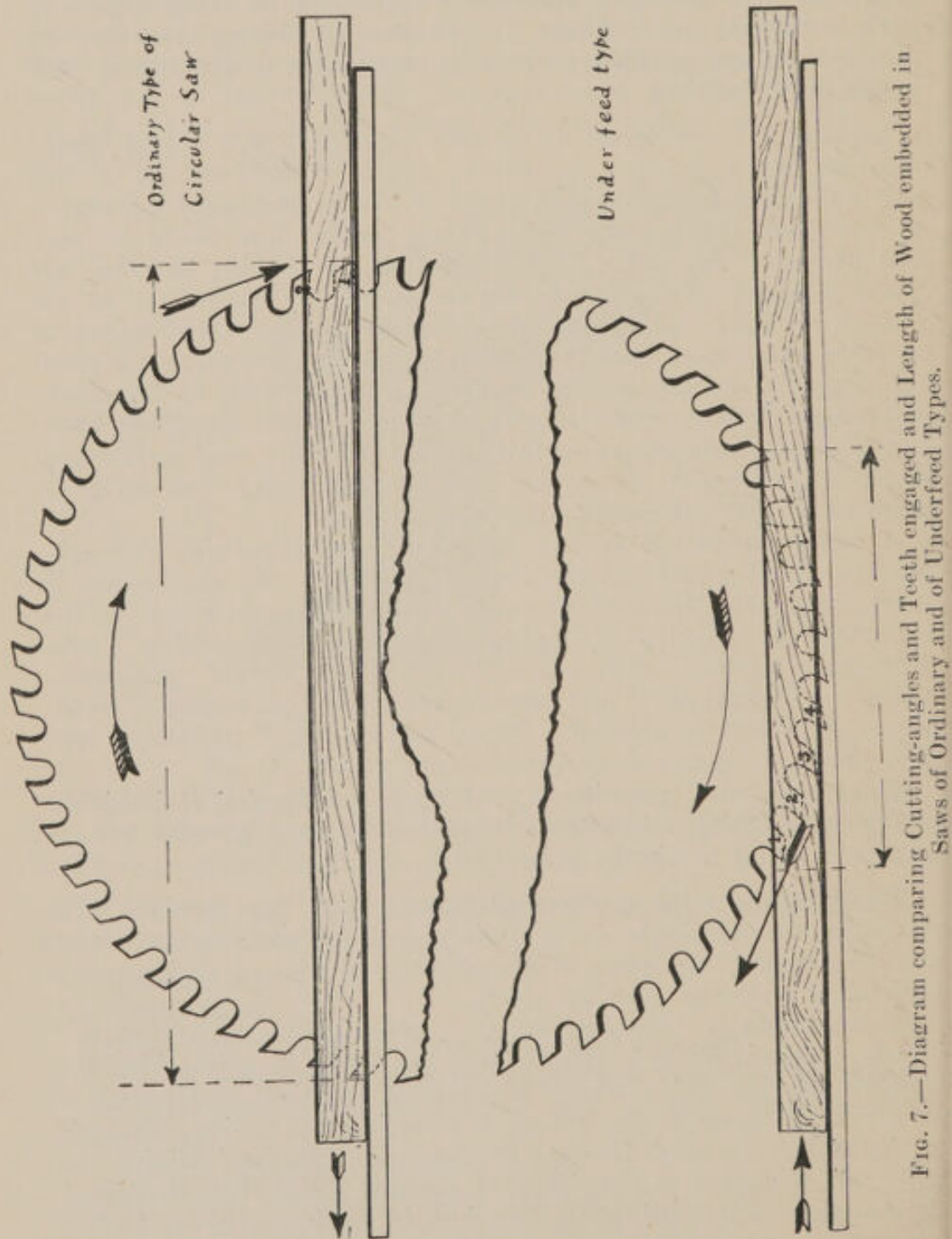


FIG. 7.—Diagram comparing Cutting-angles and Teeth engaged and Length of Wood embedded in Saws of Ordinary and of Underfeed Types.

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For the first sawing of tree trunks, **Racksaws**, that is to say, saws with **Travelling Tables**, are much used. Special home-made guarding for these is described later.

Clearly no one guard is equally applicable to every Circular Saw. It may happen, where a sawbench is used for a variety of purposes, or with a variety of saw-blades differing in diameter and thickness, that more than one safeguard must be provided. It is not reasonable to expect one single contrivance to be adaptable over a very wide range of sizes and conditions.

METHODS OF PROTECTING CIRCULAR SAWS.

Below the Bench.—Distressing accidents have been caused by contact with the part of a circular-saw blade which is underneath the table, and this part should be completely shrouded. Where an exhaust ventilation system is in use for removing dust and chips, the hood of the dust collector should enclose the underpart of the saw entirely. This is the best arrangement. Failing it, sheet-metal plates or aprons, hanging down from the underside of the table, should be fitted.* The common method of panelling the framework of the bench is unsatisfactory, as the panels are frequently found out of place, or large gaps are left between the top of the panels and the underside of the bench, or only the front of the bench is filled in, leaving danger points at the other three sides. Figs. 2, 8 and 19 show types of underbench protection.

Above the Bench.—The standard safeguard for circular saws consists primarily of (a) a "**RIVING KNIFE**," "parting-knife," "splitter" or "spreader"*; (b) some sort of cover over the "crown" of the saw; and (c) a front cover easily and rapidly adjustable to the thickness of the work. Fig. 8 is typical.

Riving knives are thin blades of steel placed at the back of the saw, their main function being to keep the cut open and thus prevent the wood being sawn from closing on the saw. Should the wood seize on the saw it is apt to be projected backwards with great force, endangering the life of any one working the saw or who happens to be in the line of flight. Quite heavy timbers have been flung considerable distances in this way, and have broken through substantial partitions. The riving knife is wedge-shaped in section, and its greatest thickness should be very slightly more than the thickness of the saw teeth, say, 10 per cent. wider. This is enough to keep the saw-cut open, with-

* Required by Regulation No. 10.

out increasing the effort needed to feed the wood up to the saw. The riving knife should be **curved** to the form of the back part of the saw. **Straight** riving knives, whether vertical or inclined, are unsatisfactory, for they leave a gap between themselves and the saw-blade, where hands may be badly cut, and where rinds, knots and loose ends of wood may be caught up in the teeth of

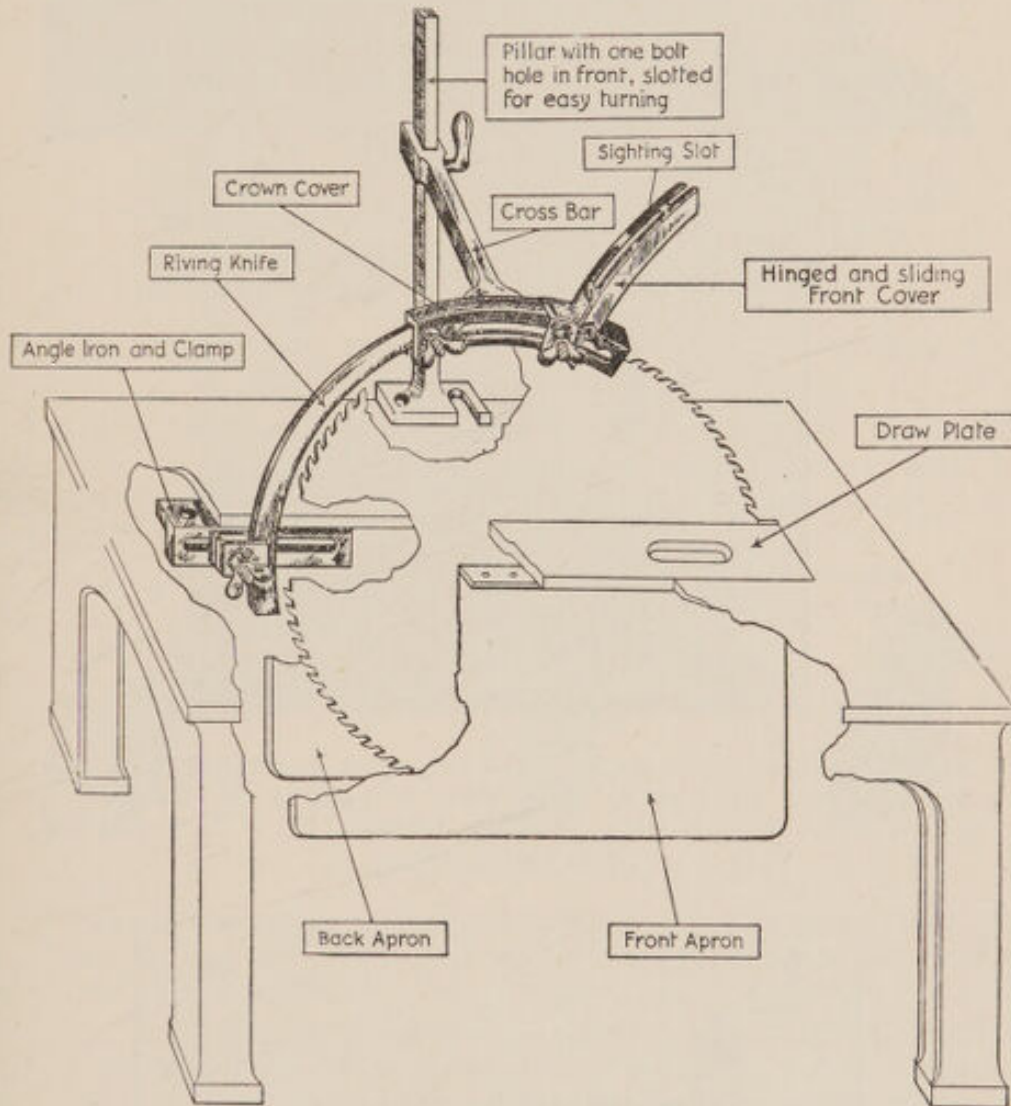


FIG. 8.

the saw and thrown in the face of the sawyer. Moreover, they are less efficient in their function of keeping open the saw-cut, for they fail to enter the cut, at once, at the point (usually the upper edge of the plank) where the sawn timber first begins to leave the saw. Riving knives, curved to the saw, and closely set, say, within $\frac{1}{2}$ -inch of the saw-teeth, have none of these disadvantages.

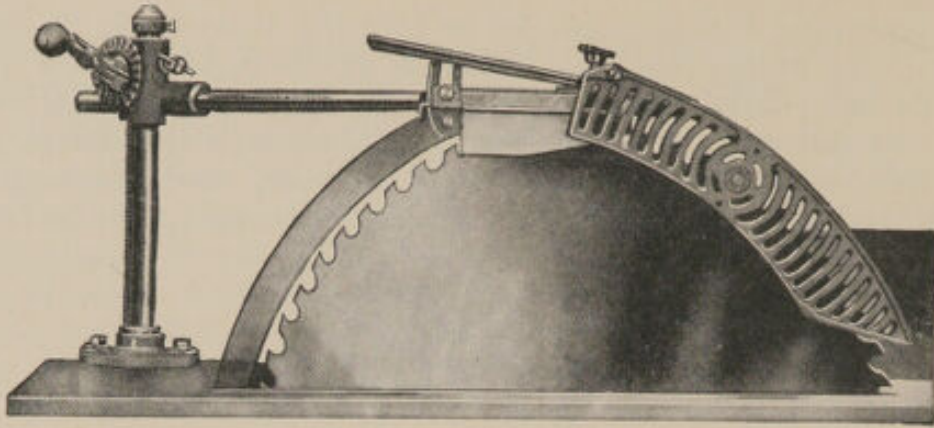


FIG. 9.—Circular Saw Guard. (Messrs. M. Glover & Co., Leeds.)

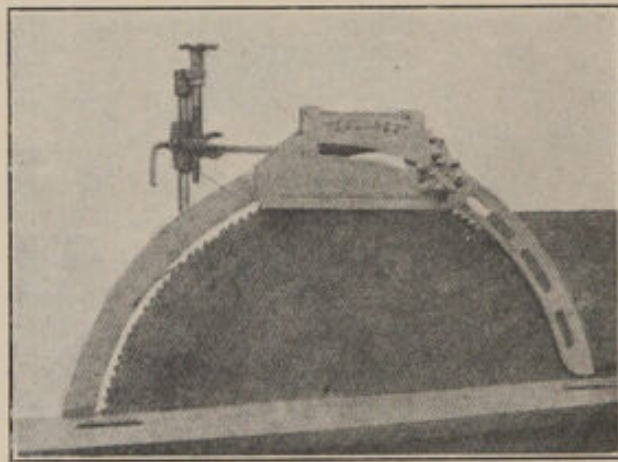


FIG. 10.—Circular Saw Guard. The Guard is shown fully extended. Adjustment of the front shield is made by turning the hand-wheel, which moves a pinion over a rack. (Messrs. W. & L. Cole, Ltd., Mile End, London.)

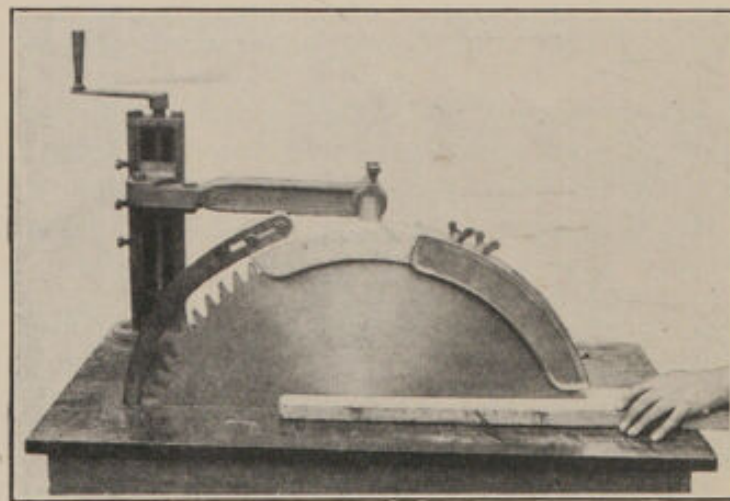


FIG. 11.—Circular Saw Guard. (Messrs. Wm. Cook & Sons, Glasgow.)

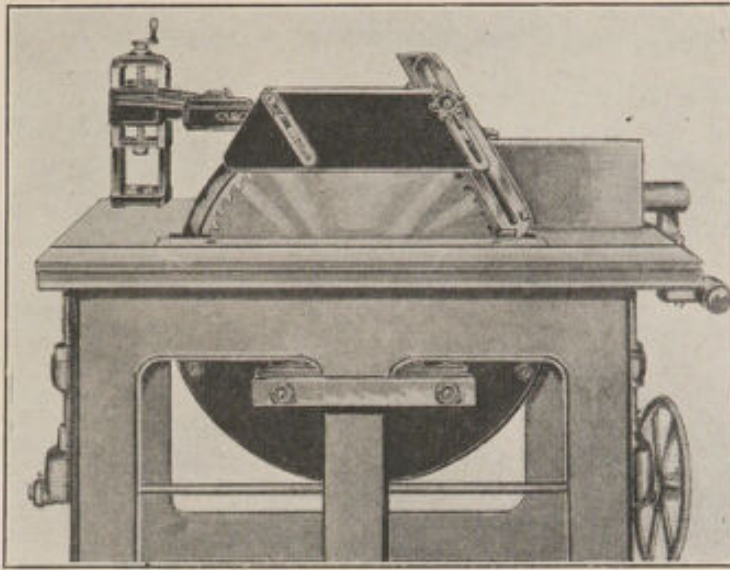


FIG. 11A.—“Climax” Circular Saw Guard. (Messrs. C. D. Monninger, Ltd., 59, Farringdon Road, London, E.C.2.)

A third variety of riving knife, roughly triangular in shape, Fig. 12 C, having the sharpened edge curved to the saw, and the opposite edge straight, is also used. This type can be supported

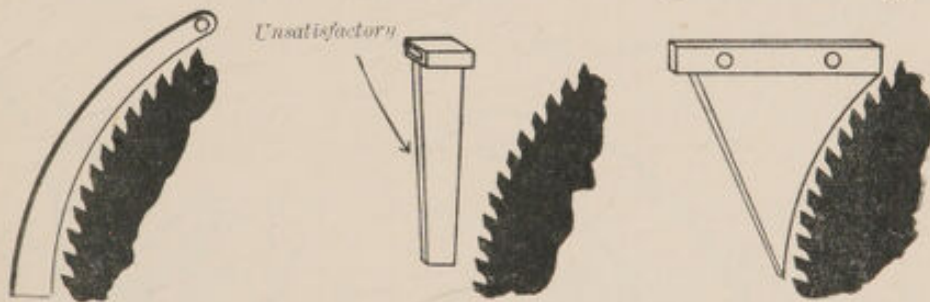


FIG. 12, A, B, and C.—Riving Knives.

with reasonable rigidity from the bench or suspended from an overhead fitting without requiring a fastening below the bench. It confers as much safety as the more usual pattern of curved riving knife, but has this drawback in the eyes of some sawyers, that it renders more difficult the trick of sawing “round” instead of “straight” in order to correct a tendency in some timber to curve.

These three sorts of riving knives are shown in Fig. 12, A, B and C.

Riving knives should be firmly supported, preferably by fastenings both above and below the bench.

Exceptions are the “triangular” type of riving knife just described, and “Stub” riving knives used for rack-saws and for very small saws, which are mentioned later (pages 15, 31 and 37). The fastenings should be carefully designed to allow of adequate,

exact and rapid adjustment. Fastenings should be hand operated and should not necessitate the use of a spanner.

Underbench fittings should provide a tight grip and allow for following up the wear of the saw, and if saws of different diameters are used in the same bench the range of adjustment should be sufficient for all sizes of saw used. To allow of such adjustment the use of some sort of slot is usual. Various patterns are shown in Figs. 13A, 13B, 14, 15, 16, 17, 18, 19 and 20.

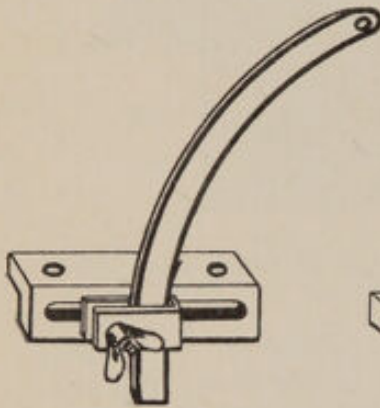


FIG. 13A.—Riving Knife Support.

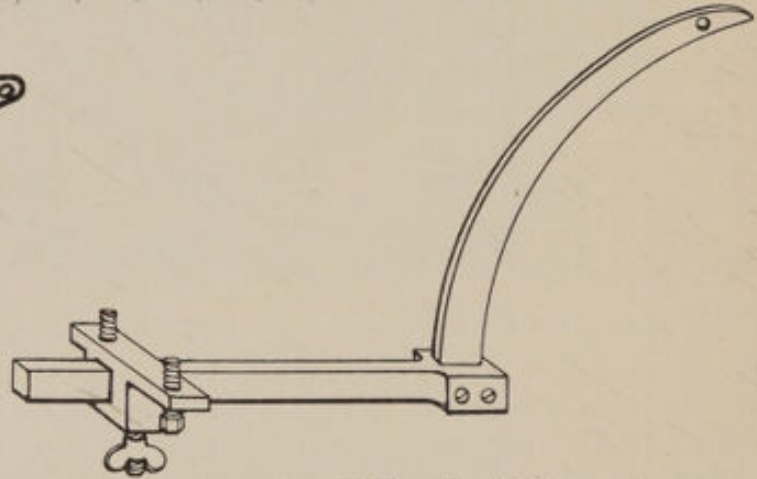


FIG. 13B.—Riving Knife Support.

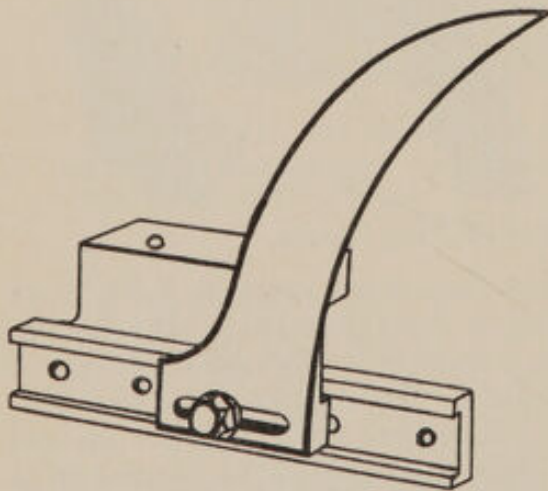


FIG. 14.—Riving Knife Support.
(Messrs. Wilson Bros., Leeds.)

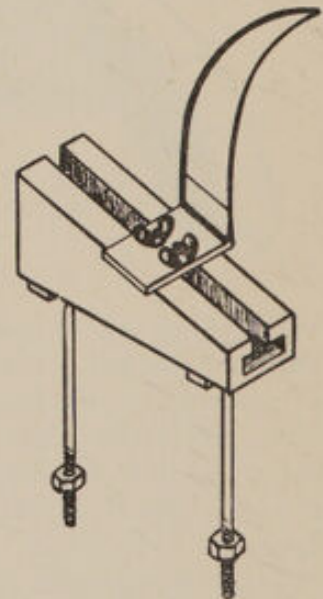
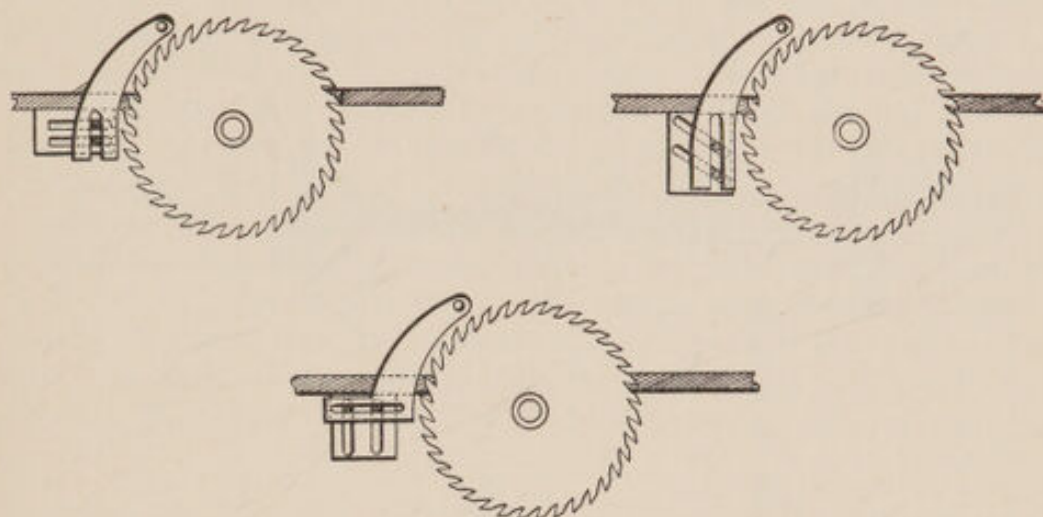


FIG. 15.—Riving Knife Support.
(Mr. B. Henderson, Inverness.)

Riving knives should not be fixed to the bench by a single screw engaging in one of a series of holes tapped into the edge of the bench at the saw-slot. As these holes can only occur at intervals, the riving knife is not kept in close adjustment to the saw, when it decreases in diameter due to wear.

Reliance cannot be placed upon the mere wedging of the lower end of the riving knife into the saw-slot. The use of a pin projecting at each face of the riving knife and bedded into semi-circular grooves in the bench on each side of the saw-slot is also totally unsuitable. These methods do not give secure fastening, and the result, if the riving knives are placed close to the saw, is that any tendency of the wood to bind draws the riving knife



FIGS. 16, 17 and 18.—Riving Knife Supports.

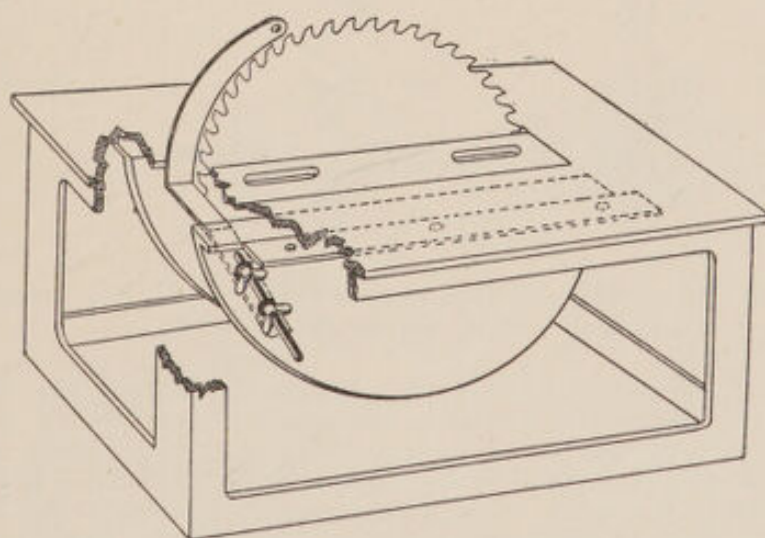
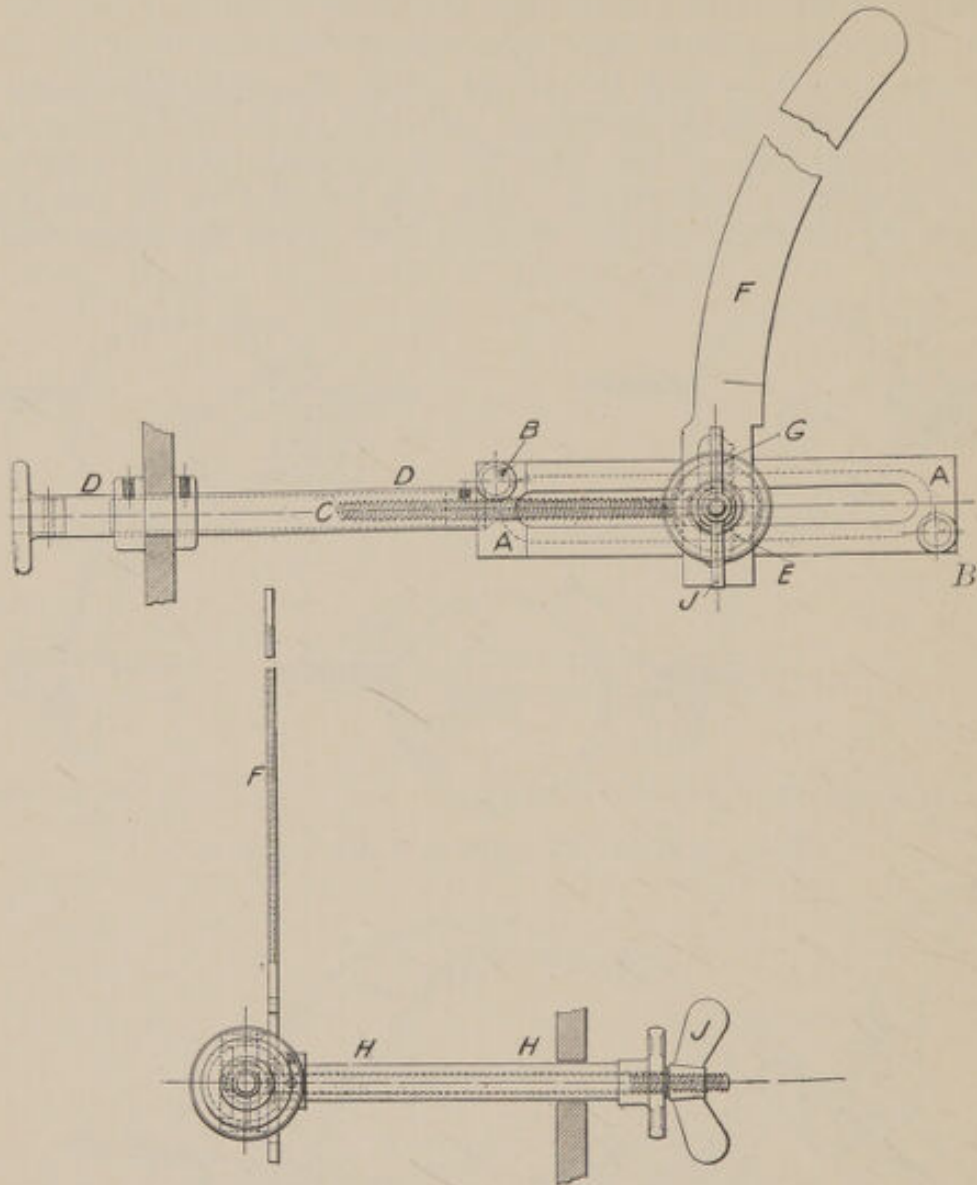


FIG. 19.—Riving Knife Support and Underbench Guard (Mr. W. T. Smith, Wray, Lancs.). (The crown and front of saw also require guards—not shown.)

upon the saw. This destroys the points of the teeth and the saw has to be resharpened. In the alternative the riving knife has to be set so far from the saw that it ceases to confer protection.



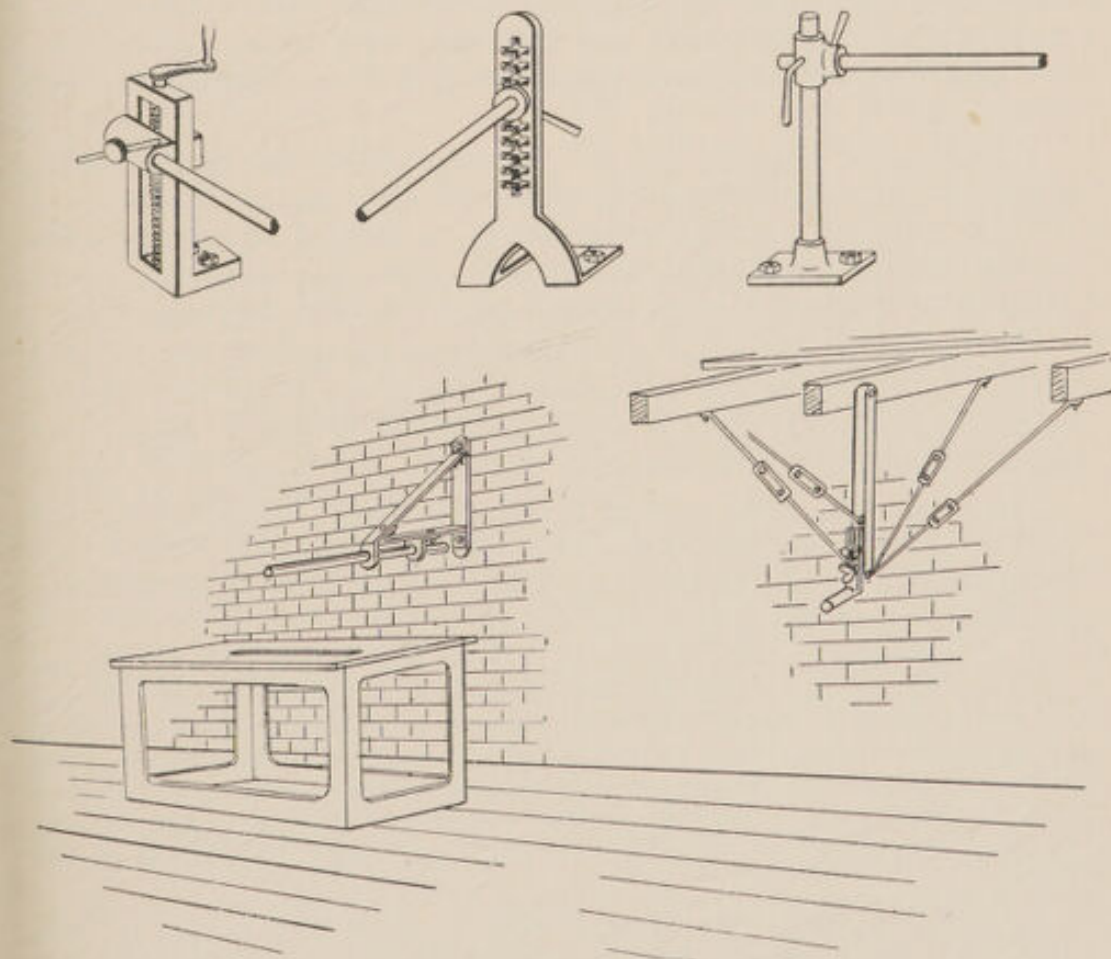
FIGS. 20, A and B.—Adjustable Riving Knife for Circular Saw (designed and used in H.M. Arsenal, Woolwich).

The knife *F* is carried between close-fitting lugs in a holder *E*, which can travel backwards and forwards through a slotted bar *A A*, firmly bolted at *B B* to a web under the saw-bench. (In the absence of a web an angle iron could be bolted to the bench.) This slotted bar is so placed as to secure that the knife is in alignment with the saw. The holder is fastened to a screw *C* moving in a hollow spindle *D D*, which terminates in a hand-wheel at the back of the bench. A nut (through which the screw attached to the holder is threaded) is attached to the spindle, so that when the hand-wheel is turned, the screw, and consequently the holder, is moved in a horizontal direction either towards or away from the saw. Accurate adjustment of the knife in relation to the saw can thus be made horizontally very easily and quickly.

Easy means of adjustment in a vertical direction are also provided. In a slot in the shank of the riving knife there is a rack *G* which gears into a small pinion. This pinion is actuated by a hollow spindle *H H*

terminating in a hand-wheel at the front of the bench. After the adjustments are made, the fly-nut J at the end of the spindle is screwed up tightly so as to hold the riving knife rigidly in position.

For the **Crown of the Saw** (by which is meant the top part of the saw, about one-sixth of its total circumference) a great variety of hoods and covers are available. Many of these are cumbersome and far larger than necessary. Clumsy appliances create a good deal of prejudice against the use of guards, and the greatest care should be taken to adopt only efficient types of guards, compact and neatly fitting. An inverted "U," somewhat curved and with the sides deep enough to cover the teeth of the top part of the saw, is sufficient for the crown of the saw. If the cover is made deeper it prevents the saw from cutting to its full height above the table, when required. The crown cover may be supported over the saw in many ways. The commonest method is to attach a pillar to the top of the bench at a convenient part, usually at the back of the table in the middle or at one end. The pillar supports an arm which carries the crown cover across the bench. Provision is invariably made for some degree of vertical



FIGS. 21, 22, 23, 24 and 25.—Guard Supports.

adjustment at the pillar, by a screw, or a slot or a sliding socket or other similar means.

The crown cover may also be supported by a bracket from a wall, or suspended from a beam overhead, or even in some cases (very small saws only) it may be carried by the riving knife.

Types of support for crown cover are shown in Figs. 21, 22, 23, 24 and 25.

It is convenient to incorporate some simple device (such as the slotted bolt-hole shown at the base of pillar in Fig. 8) which will allow the whole guard to be swung round clear of the saw for such occasions as sharpening or changing saws, without disturbing the adjustments in which the parts of the saw guard have been set. Thus, in Fig. 8, the pin attaching the upper end of the riving knife to the crown cover is withdrawn and the two bolts holding down the base of the pillar are slackened for access to the teeth of the saw. The loosening of the second pin, which holds the riving knife below the bench, allows its withdrawal, where necessary, when the whole saw-blade becomes accessible.

A number of the hoods of sawguards on the market are pivoted, and swing up as the approaching wood lifts them. The drawback of such appliances is not that they fail to give protection, but that they are apt to be cumbrous and to impede the full use of the saw.

Other hoods may be set to a height above the bench corresponding with the thickness of the wood to be sawn. But even if a quick-threaded screw is employed the continual adjustment adds to the trouble of working the bench, and in practice the maintenance of the guard at its correct height is often neglected.

The simplest and most efficient system for general use is that shown in Fig. 8, where the crown cover is not large, is set more or less permanently, and is supplemented by a sliding front cover quickly adjusted to the different thicknesses of wood to be sawn.

Covers for the **front part of a Circular Saw**, like covers for the crown, are best of inverted "U" section. It is important that due provision should be made for a *view of the saw*. This is easily attained by cutting a long slot in the guard.

If a *very* narrow strip has to be cut from a thin board it may be necessary to set the vertical guide (usually known in the trade as the "fence") too close to the rear face of the saw, to permit the front cover (if flanged on both sides) to be pulled down close to the board. The difficulty can be met, should it arise, by making the front guard in two portions, separately adjustable, so that the one flange rests on the top of the "fence" whilst the other can be drawn down to the top of the plank.

A well-designed front cover should be such that it can be set, and held, by a rapidly-operated hand-gripped screw, so that its lower edge is at any desired height above the saw-bench and just

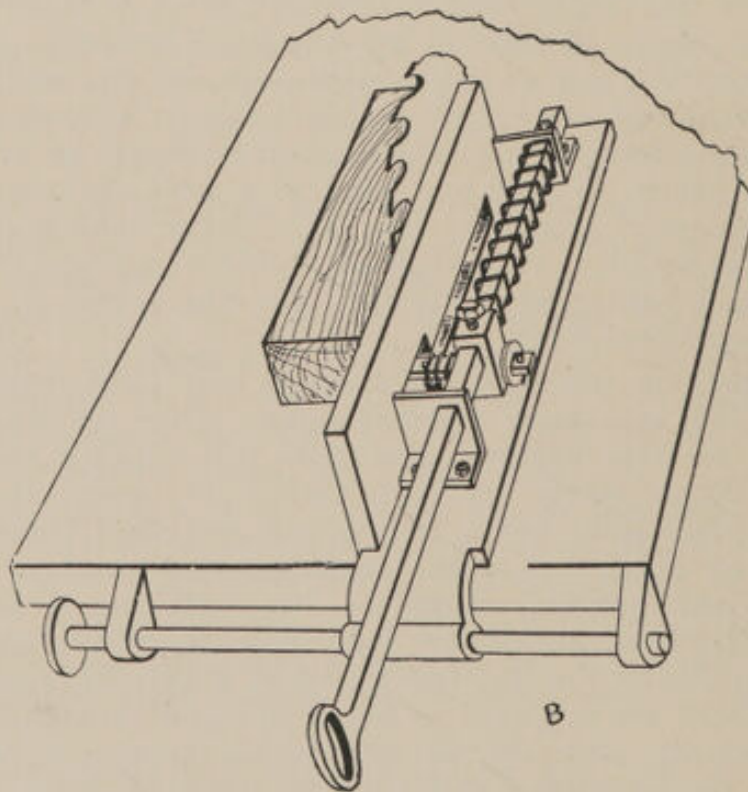
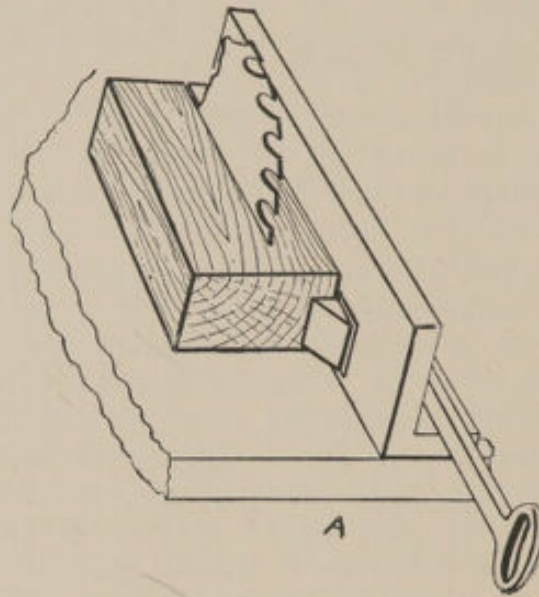
clear of the timber being sawn, from the thinnest board to a block almost as thick as the height of the saw above the table.

Extra convenience is arrived at by also fitting a hinge to the front cover so that the lower part of it may be turned back temporarily if, for example, it is desired to cut one deep block of timber during a run of cutting thinner boards. It is a somewhat quicker operation to turn back the hinged part than to loosen the holding screw, slide up the front cover to a new position and retighten. *See also fig. 10.*

A great proportion of the accidents happening at the front of the saw would undoubtedly not occur if suitable front covers, as described above, were fitted and kept in proper adjustment at all times. Most of these accidents happen when the sawyer's hand slips for some reason; he may overbalance owing to an inequality, or obstacle, or slipperiness at his standing place; the wood being sawn may cant over or kick, and so bring his hand into contact with the saw teeth; a piece of rind or a splinter may give way or a softer or a thinner part of the wood being sawn may cause the teeth of the saw to emerge somewhat earlier than expected. In all these cases a slipping hand has a good chance of being intercepted by the lower edge of the guard if it has been fixed as close down as possible to the wood being sawn. It is the inch or two of saw-teeth exposed just above the wood being sawn which gives rise to the majority of hand injuries.

Another danger remains to be considered, namely, the risk of being cut by the saw as it passes through the last few inches of the timber being cut. A "pusher" is the remedy here. It may take the form of a push-stick which should be available at every saw-bench, to keep one hand at a safer distance from the teeth of the saw. Compare Fig. 85. Better than a push-stick, however, is a sliding cleat such as is shown in Figs. 26 and 28, or a linkwork pusher, as in Fig. 27. *See also on page 27 a description of mechanical feeds.*

For repetition work, in which speed may have pecuniary importance, it is sometimes urged as an excuse for not fitting guards necessary for safe working, that they will entail a reduction in output. Where safety and high output are incompatible, safety has the prior claim, but a well-thought-out guard should involve little or no hindrance to the manufacturing process, and may even increase output, owing to the confidence it engenders. These pushers improve output, for instead of slowing up the feeding action during the last few inches of a cut, as is usual when the saw-teeth are expected to begin to come through the wood, the sawyer can push the last few inches through more quickly, secure in the knowledge that when he has hold of the pusher he is not in peril from the saw-teeth he is expecting to emerge from the block.



FIGS. 26, A and B.—“ Pusher ” for Circular Saw
(the saw needs a guard also—not shown).

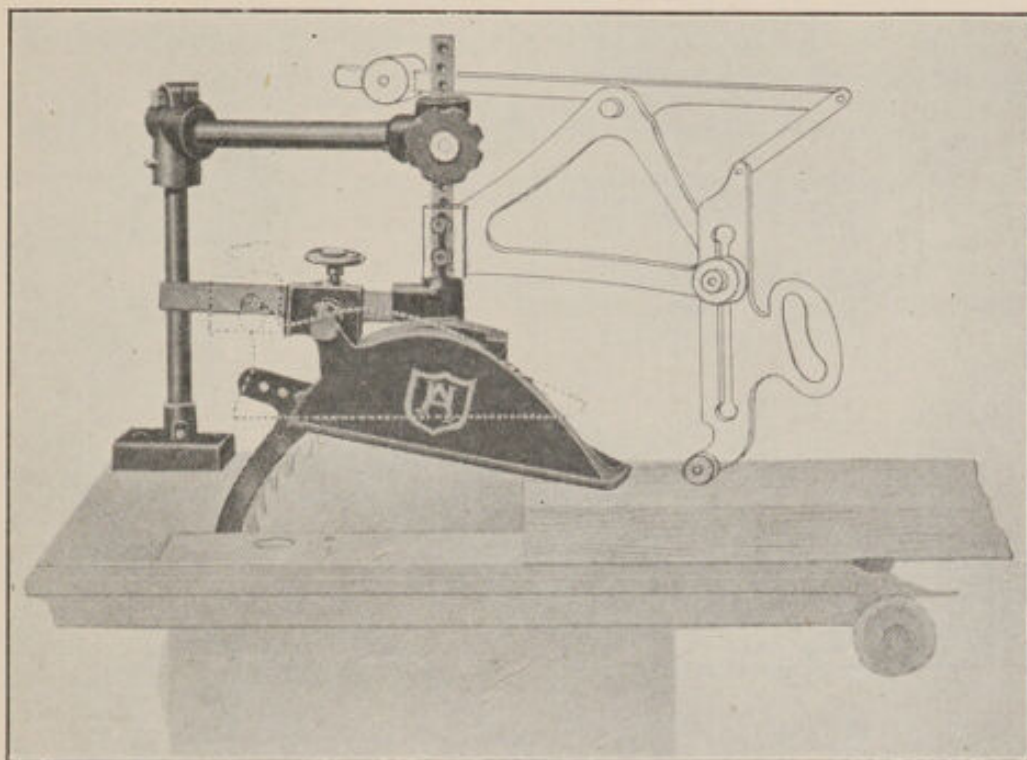


FIG. 27.—Pusher for Circular Saw.
(Messrs. Aublet, Homer and Co., London.)

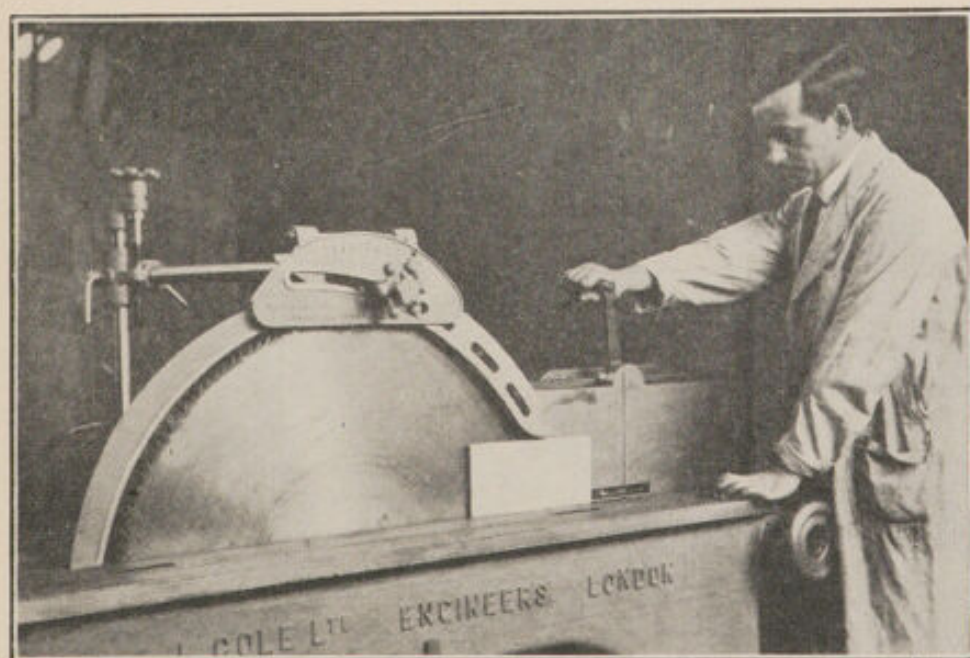


FIG. 28.—“Puller” for Circular Saw. This fitting is attached to the “fence” by two screws. Drawing back the handle impels the wood forward to finish the cut. (Messrs. W. & L. Cole, Ltd., Mile End, London.)

Push-blocks, as shown in Fig. 55 under the heading of planing machines, or the kinds shown in Figs. 29 to 30A, might advantageously be used much more frequently by sawyers.

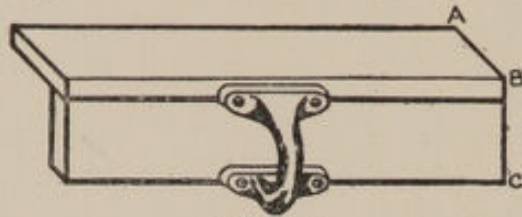
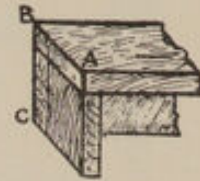


FIG. 29.

SHOWING BLOCKED
END AT A.B.C.

Note guard strip to protect
thumb and cleat to propel block.

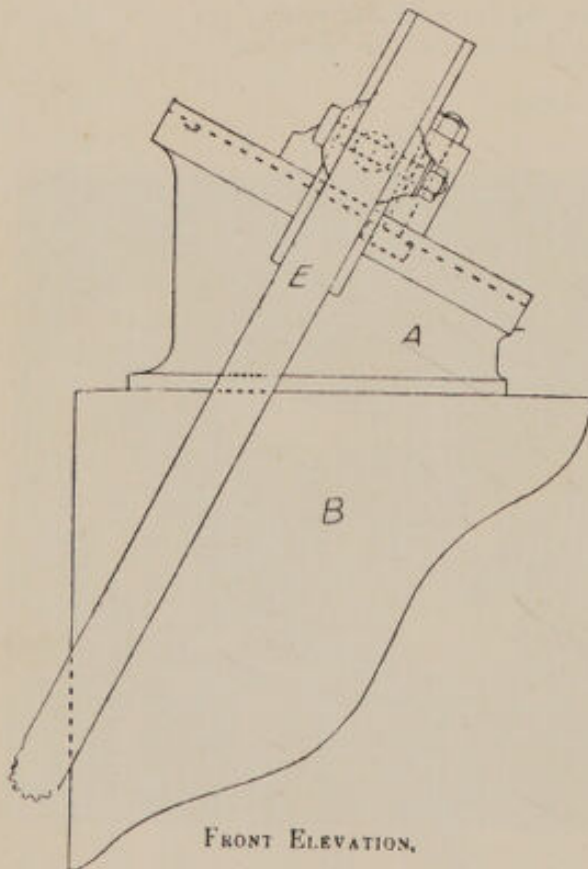


FIG. 30.

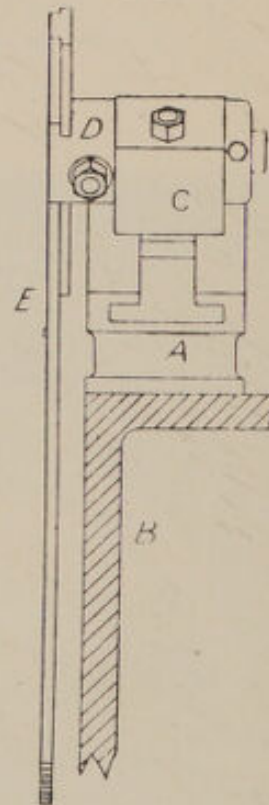


FIG. 30A.

(FIGS. 29, 30 and 30A.—Push Blocks. (See also remarks on pages 46 and 61.)



FRONT ELEVATION.



END ELEVATION.

FIG. 31.—Safety Device to Prevent Wood jumping Back from Circular Saws.

The wood passes forward under a swinging rod E, notched at its lower end. The rod is set with a slope in the direction of the feed and so

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When timber closes on the saw, it is usually on the teeth at the back, that is to say, at a moment when the saw-cut is rather longer than the full width of the saw. Occasionally, however, the wood pinches earlier, before the cut has reached the riving knife, which is consequently unable to prevent the projection of the wood. The action in this case, although dangerous, is fortunately not usually so violent as it is when the teeth of the saw at the back are firmly gripped by the jammed wood. Non-return devices such as those shown in Figs. 31, 32 and 33, have their value in such cases.

Mechanical (or "automatic") feed systems are coming into more extensive use for repetition work, as in boxmaking. These chain or reciprocating feeds have the advantage from the safety point of view of keeping the attendant at a safer distance from the saw. Figs. 34, 35, 36 and 37 show mechanical feeds by different makers.

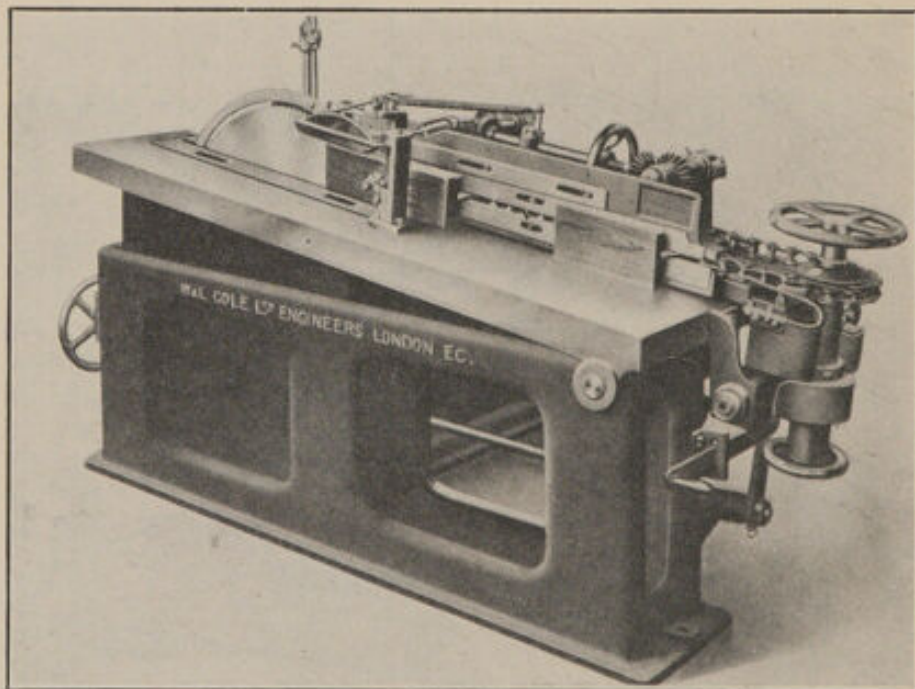


FIG. 34.—Mechanical Feed. (Messrs. W. & L. Cole, Ltd., Mile End, London.)

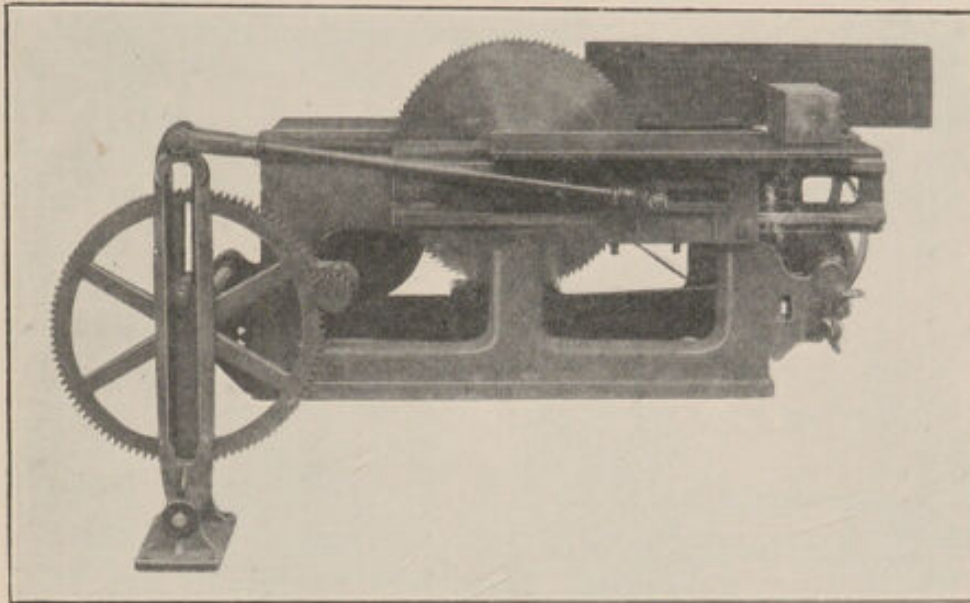


FIG. 35.—Mechanical Feed. The necessary guards for saw and gearing, etc., are not shown. (Messrs. A. Sheldon & Sons, Wells.)



FIG. 36.—Mechanical Feed. The necessary guards for saw and gearing, etc., are not shown. (Messrs. A. Ransome & Co., Ltd., Newark; Bisset's Patent.)

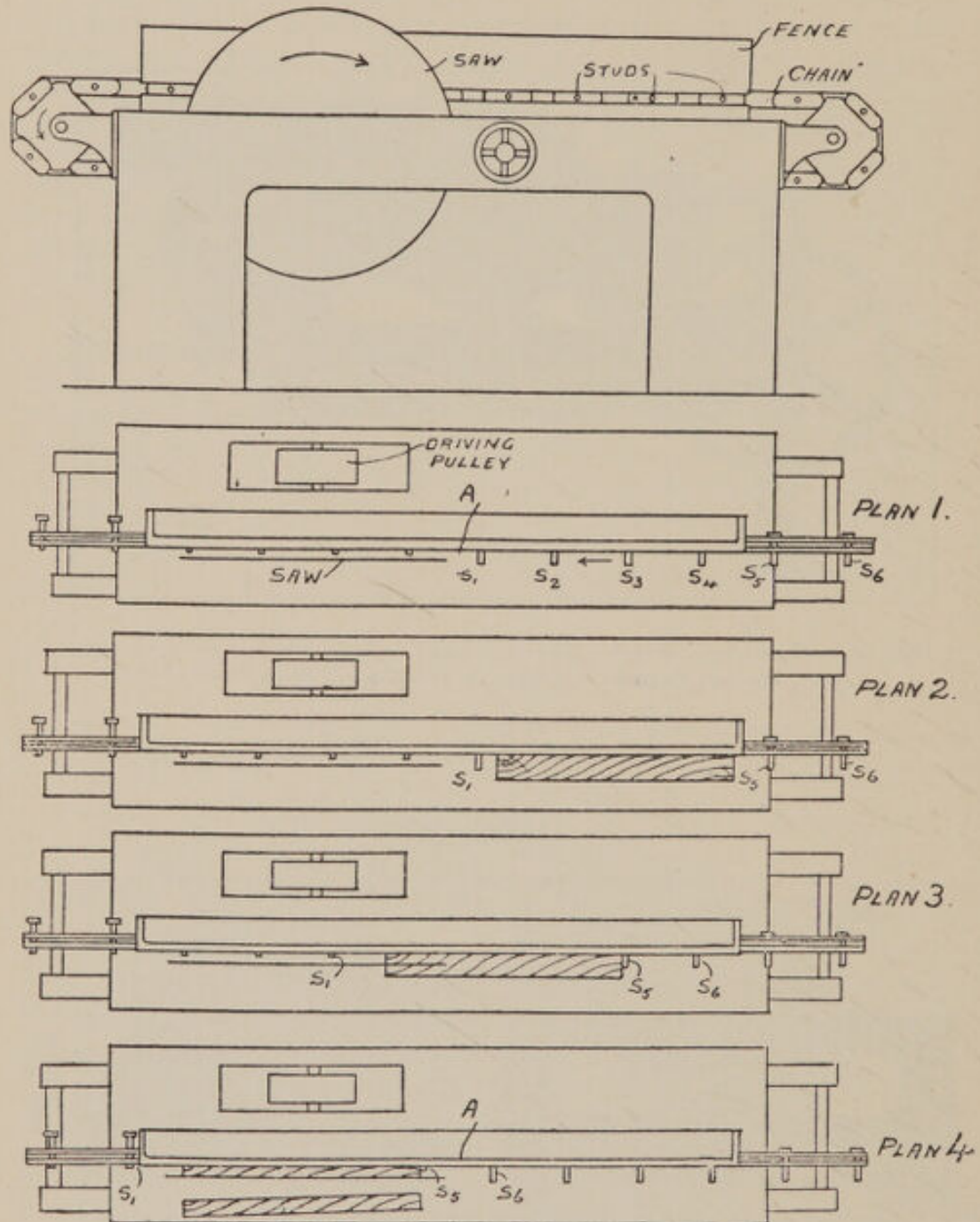


FIG. 37.—Mechanical Feed: Atkinson's Patent Stud-feed for Circular Saws.

The above diagrams show an elevation and four plans to illustrate the working of the studs.

A power-driven vertical feed-roll attachment is sometimes fitted to saw benches, and this, too, tends to keep the sawyer at a safer distance from the blade. The chain and sprocket gear or toothed wheels driving the feed-roll should be enclosed. (Compare also the notes on p. 40, bandsaws," Fig. 50, and on p. 48, "planers.")

SAFEGUARDING FOR SPECIAL VARIETIES OF CIRCULAR SAWS.

Cross-cutting Saws.—Unless the saw-bench is reserved solely for this operation, the protection for the saw already described (riving knife, crown cover and front cover) should be provided, and it will serve with equal efficiency for cross-cutting.

Where no "ripping" (cutting along the grain and not across it) is ever done at all at the bench or it is specially contrived for a

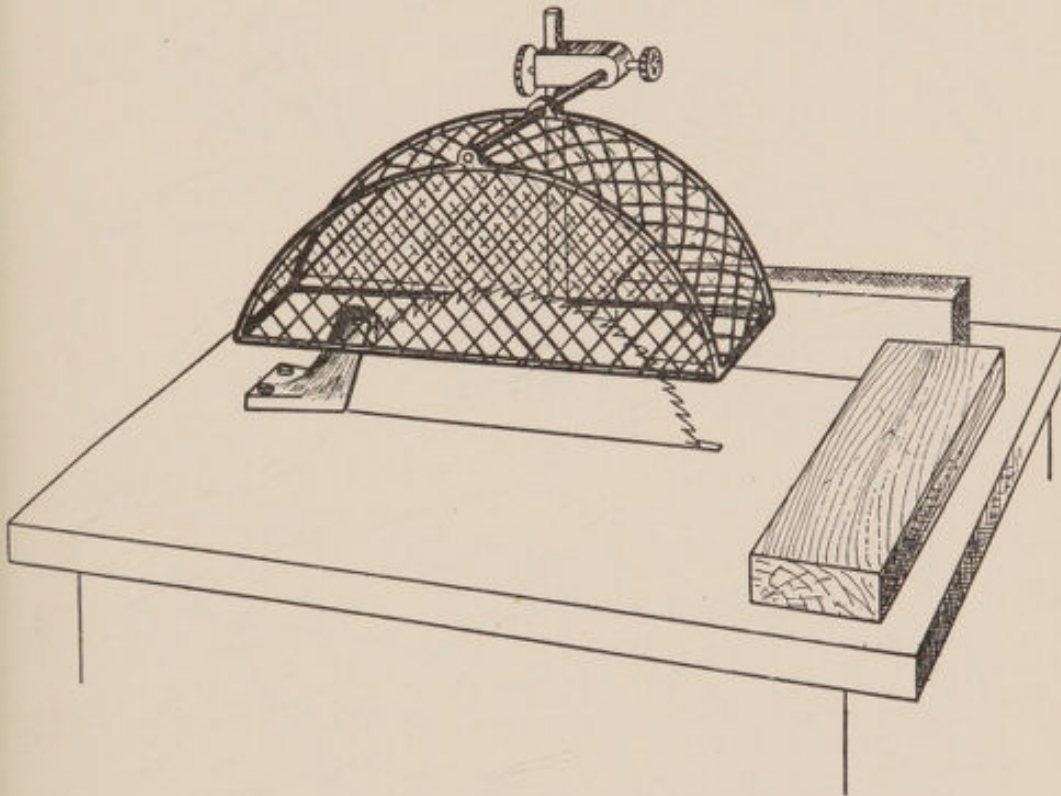


FIG. 38.—Hood and Deflecting Piece.
(For cross-cutting only.)

limited range of work (cutting off to lengths or the like) a plain hood, extending well to the front, may be sufficient protection, if it entirely covers all but the front edge of the saw actually cutting. Sloping pieces should also be fitted at the back of the saw to deflect the cut pieces of wood. See Fig. 38.

"Chariots" or Slides are particularly useful for cross-cutting, although their use is not restricted to this process, for they can be used for ripping and "rabbeting" in many cases. Although chariots do not protect a circular saw, they may remove a very large part of the danger by keeping the hands away from the saw-blade. It is regrettable that the slide-feed principle is not used nearly so extensively as it might be, for in addition to conferring extra safety it is an economical method of working and increases output. A number of saw benches are specially designed to carry sliding tables, but it is not sufficiently widely realised

that the ordinary push bench can be fitted very easily with a "home made" traveller, which can be placed in position on the bench, or removed again in a few moments. In all cases "chariots" need to be fitted with a stop, to prevent contact between the saw teeth and the framework of the chariot.

FIGS. 39 A, B and C.—"Home made" "Chariots" for Cross-cutting.

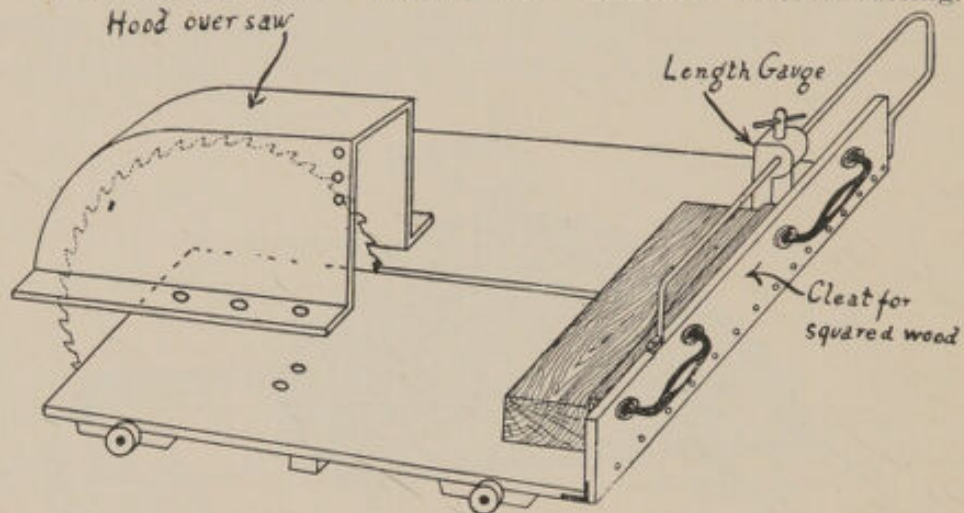


FIG. 39 A.

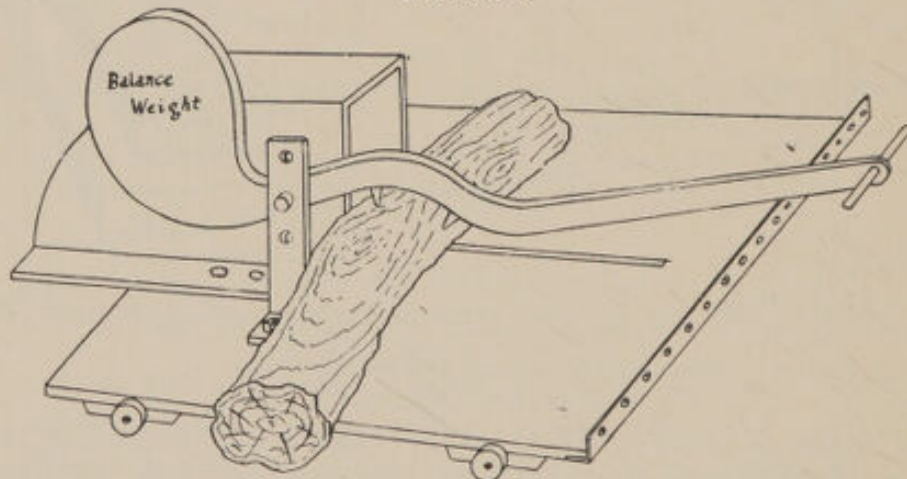


FIG. 39 B.—Spiked Gripper for Firewood, etc.

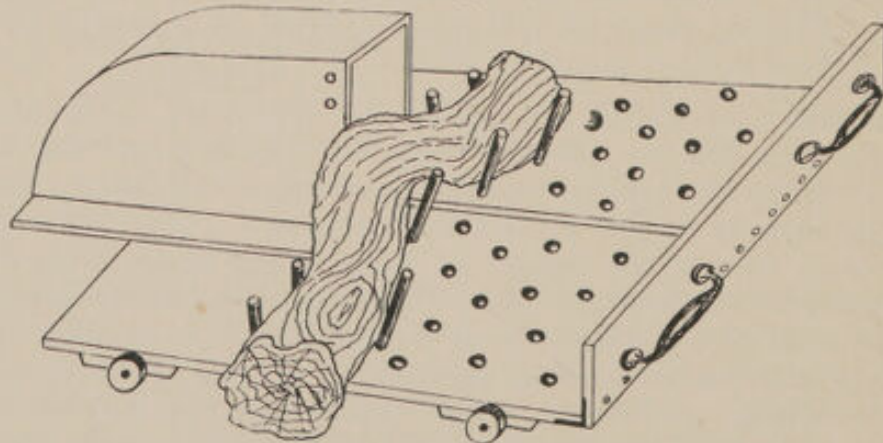


FIG. 39 C.—Sloping Pins.

FIGS. 39 D and E.—Rails for Cross-cutting "Chariots."

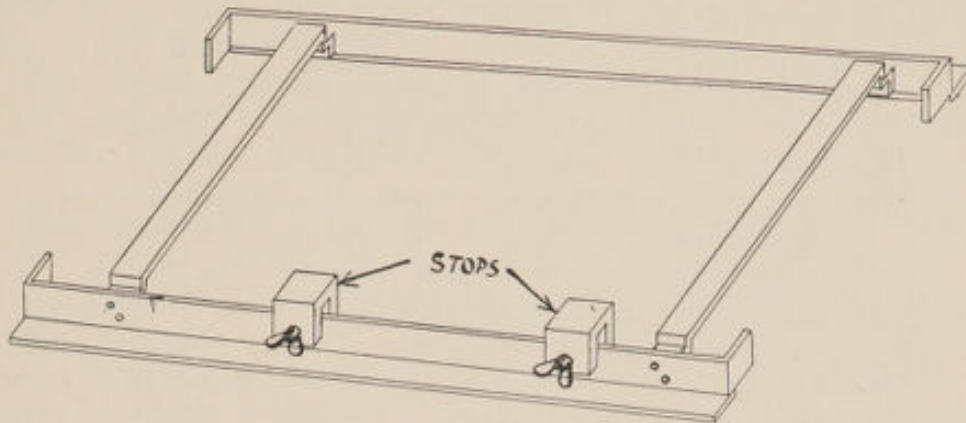


FIG. 39 D.—Angle Iron Frame to Fit on Bench Top.

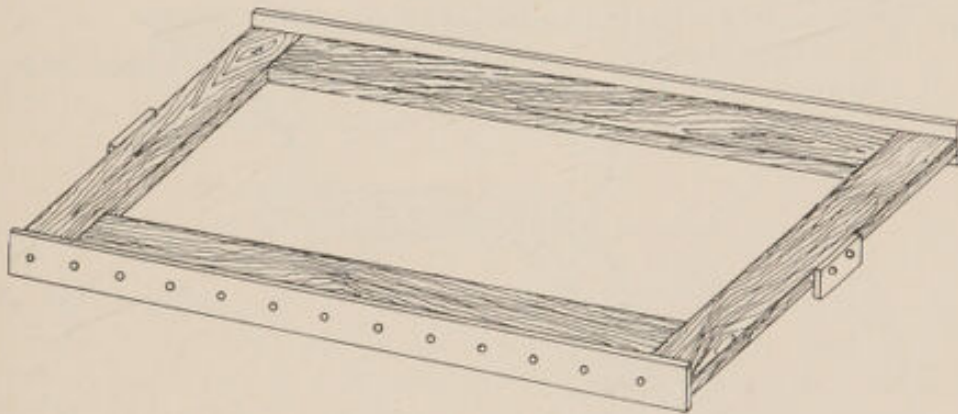


FIG. 39 E.—Wood Frame, Metal Rails.

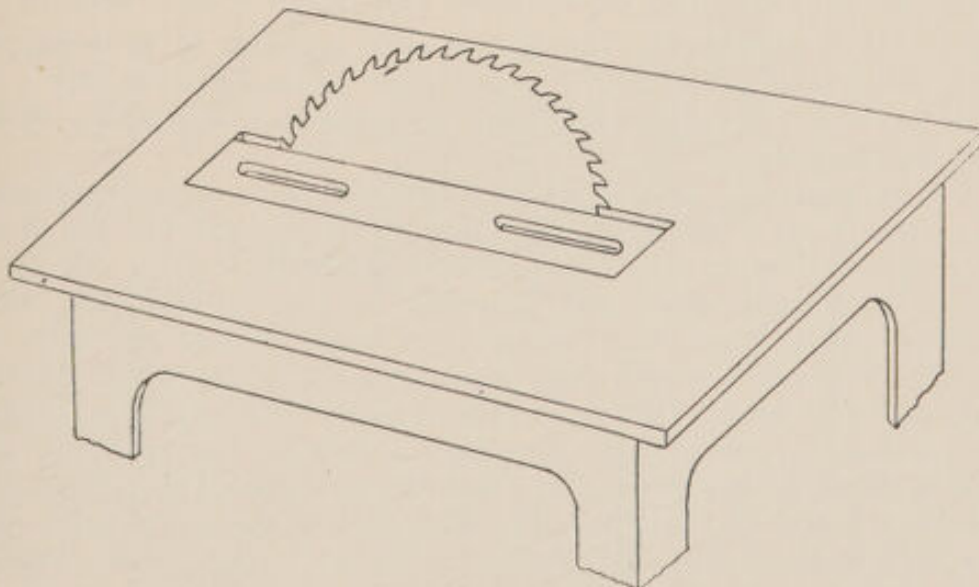


FIG. 39 F.—Bench-top for above frames.

The tiny wheels on which the slide is mounted require to be guided by a groove, or a raised rail, or an angle iron, or by lateral wheels, bearing against the edges of the saw table, or in some such manner, in order to secure that the travel of the slide is exactly in line with the saw. Handgrips must be provided at the back of the slide, in a position which makes it impossible for the hands, when holding them, to come into contact with the saw teeth. Work rests adapted to the work to be done must be fitted to the slide. "Vees," such as the pins shown in Fig. 39 C, are useful for holding round pieces. Provision should be made for bringing the two sides of the "vees" closer together (shown by alternative holes for the pins in Fig. 39 C) in order to accommodate a wider range of diameters. For squared timber a vertical plate or cleat can be used. Rectangular blocks of wood placed in front of this cleat reduce the necessary travel of the slide and accommodate the most advanced point of the saw whilst the upper edge of the cut is being completed.

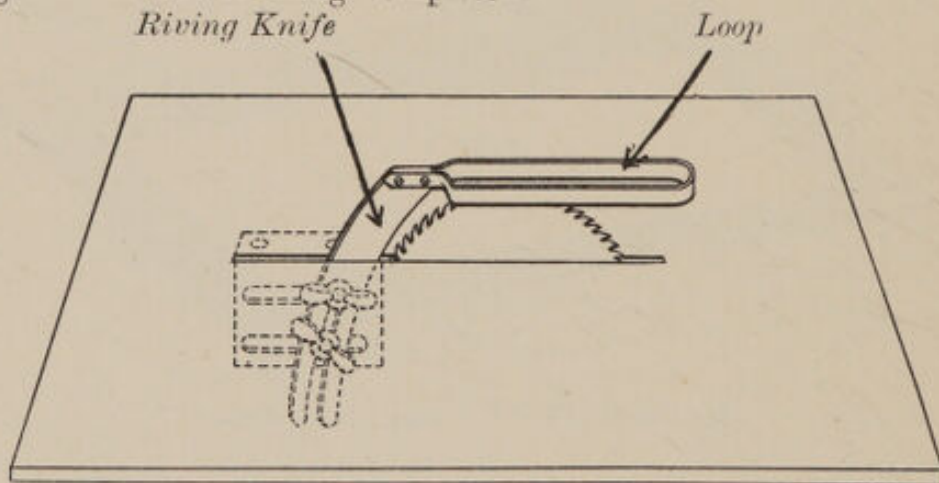


FIG. 40.—Guard for very small Circular Saws—below 6 inches diameter.

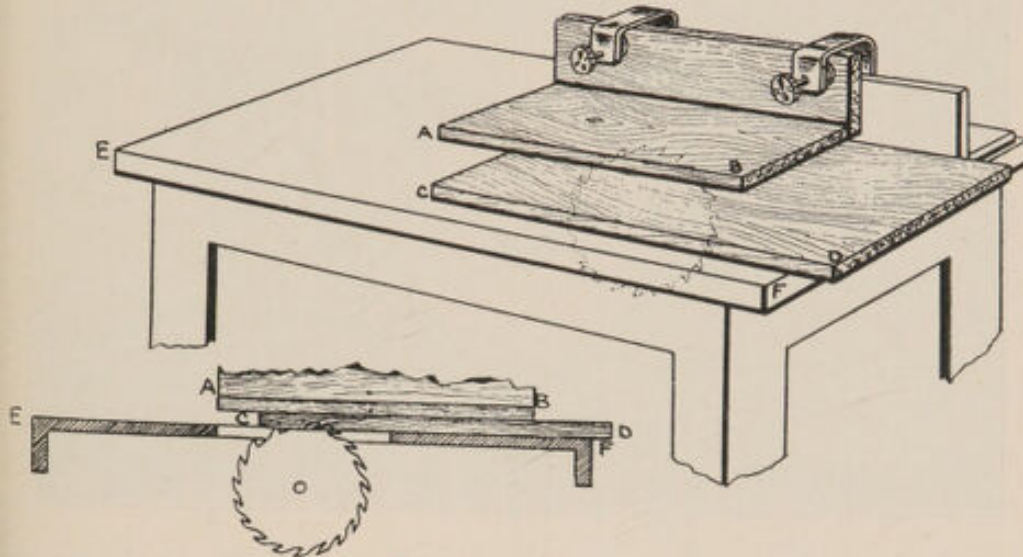
For mitre cutting the top of the slide requires to be equipped with a vertical plate which can be set at suitable angles. In some cases work holders, to clamp the material firmly to the slide, may be needed.

Where a slide is used at a bench reserved for cross-cutting only, and relying on a hood for guarding, the supports for the hood may be attached to the slide and so move with it (Fig. 39 A).

For **very small saws**, say 6 inches or less in diameter, with perhaps hardly more than an inch of height above the table, a hood of standard pattern may prove too cumbrous when delicate work is being done. For such saws a small riving knife supported only below the bench, and carrying a cover for the crown of the saw in the form of two parallel wires or bars of small size (Fig. 40), has been found very useful. The wire part of the guard must project well to the front. By having it double, a view of the line of the saw is secured.

In place of the wires or bars a piece of plate glass in a frame has been used, but the sawdust is apt to obscure the glass on the underside.

Simple "home-made" guards for **rebating** and for **tenon-cutting** on a circular saw are shown in Figs. 41 A, B and C. Two short lengths of board fastened together at a right angle as shown are clamped to the vertical guide at a suitable height to cover the saw blade, but to allow the wood being "rabbited" to slide along the table over the saw and under the guard.



FIGS. 41 A and B.—"Home-made" Angle Piece for Rebating.

For **tenon-cutting** the wooden "angle" is clamped to the edge of the bench to form a second vertical guide. The wood to be tenoned is then passed between the two uprights, and accidental contact of the hand with the circular saw is rendered unlikely.

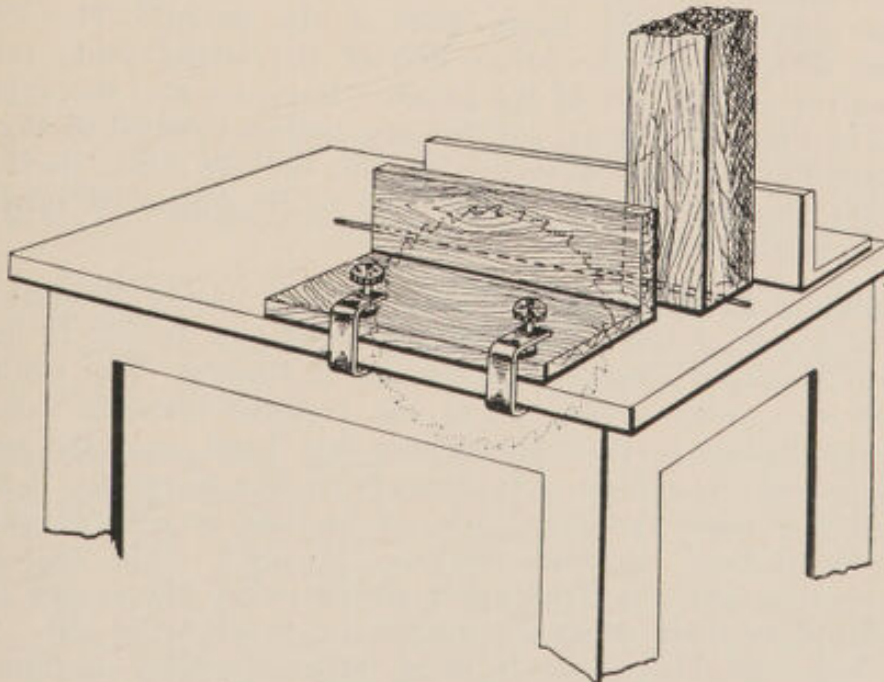


FIG. 41 C.—"Home-made" Angle Piece for Tenon-cutting.

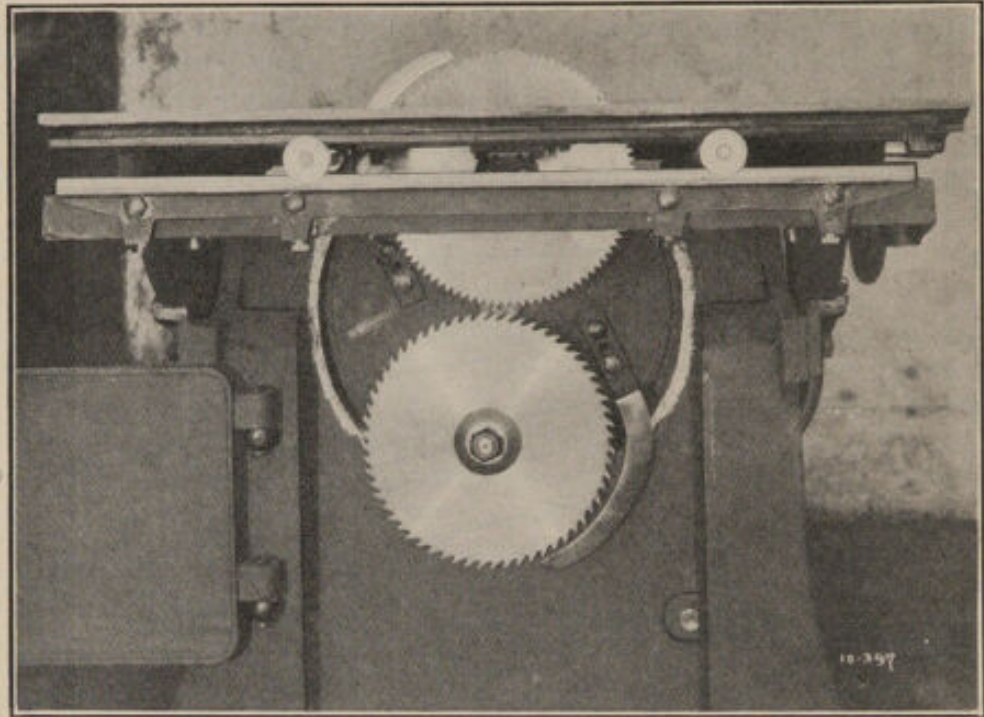


FIG. 42.—Method of Attachment of Riving Knives for Double Dimension (2-Spindle) Saw. Guard for front and crown of saw is not shown. (Messrs. Thomas White & Sons, Ltd., Laighpark, Paisley.)

The guards for “**rise and fall**” benches need to be supported independently of the saw table. Overhead or wall brackets (Figs. 24 and 25), or a pillar attached to the floor or to a part of the frame of the saw bench other than the table, can be used for the support of the upper part of the guard. The slotted bracket which grips the lower end of the riving knife can be attached to a fixed part of the bench. Compare also the supports shown in Figs. 40 and 45, and the arrangement shown in Fig. 42.

Where the table top is stationary, but the saw blade itself rises and falls through it, the guards need to be supported upon the brackets of the saw spindle.

Pendulum Saws are used for cross-cutting timber of substantial size, or a pile of boards, and as the wood has usually to be cut up into standard lengths, the process is simple. The timber is pushed up against a stop set at the required distance from the saw; the handle is then grasped by one hand, and the saw is drawn across the timber. As there is no line to cut to, it is not necessary to view the saw blade, which can be covered entirely by a metal hood in three sections (Fig. 43). The two lower portions slide into the fixed upper portion when the curved lifting lugs fitted to their edges encounter the wood to be cut. Thus the whole saw blade may be kept either sheathed or buried in the wood.

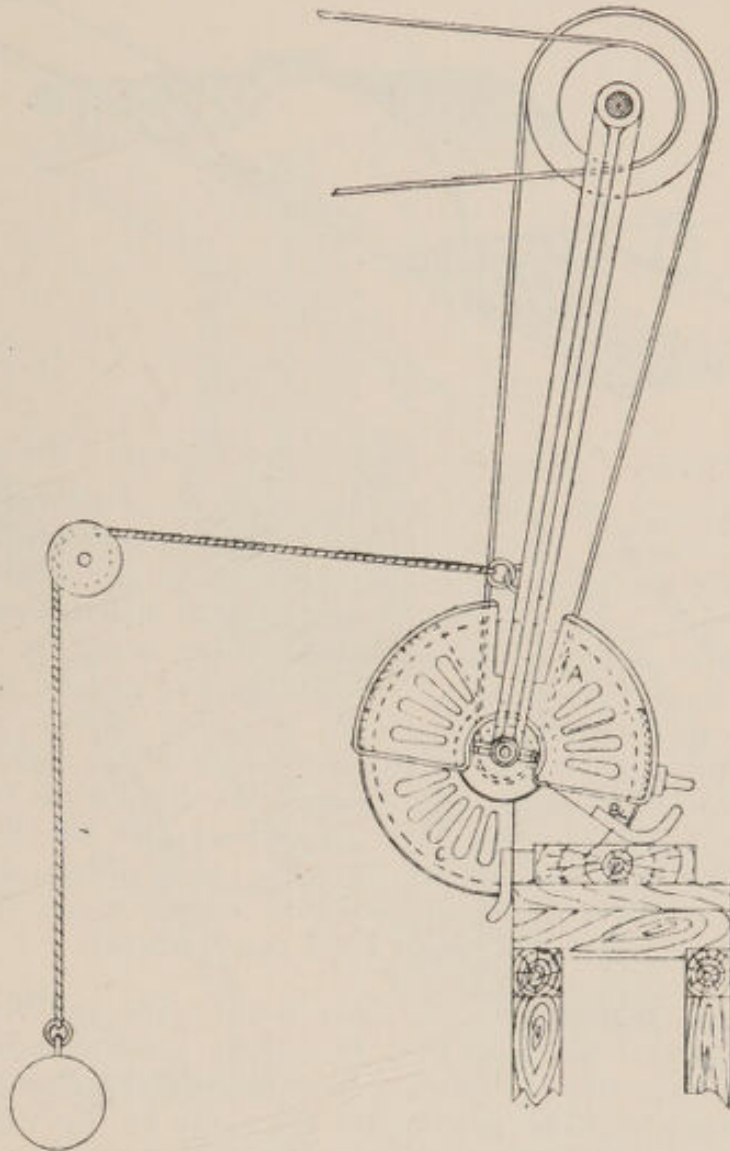


FIG. 43.—Guard for "Pendulum" Saw. ("Fleck" System.)

The hood is in three parts, A, B, C, of which the upper part A is fixed, and the two lower parts B and C open only when the actual cutting is being done

It is necessary to limit the swing of the arm of the pendulum by suitable stops or by a short chain, otherwise the saw may be pulled out unexpectedly far in front of the table and inflict severe injury on the attendant.

Multiple Saws and Gang Saws can be protected individually by the methods already described, but in some cases the safeguarding can be simplified, for example by including all the saws under one hood if the spaces between them are very restricted. Thus Fig. 44 shows a roller-feed gang saw used for ripping boards into a number of strips. Saws and feed roller are all shrouded by the one hood, and both the front and the back parts of the saw blades are fitted with a non-return device.

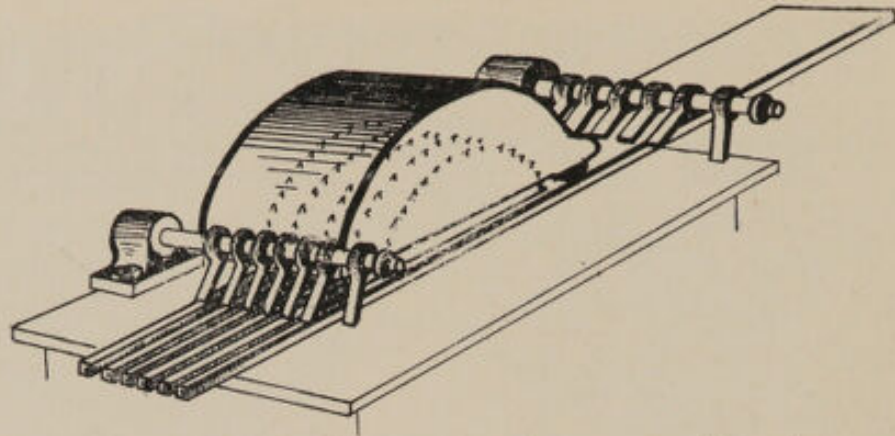


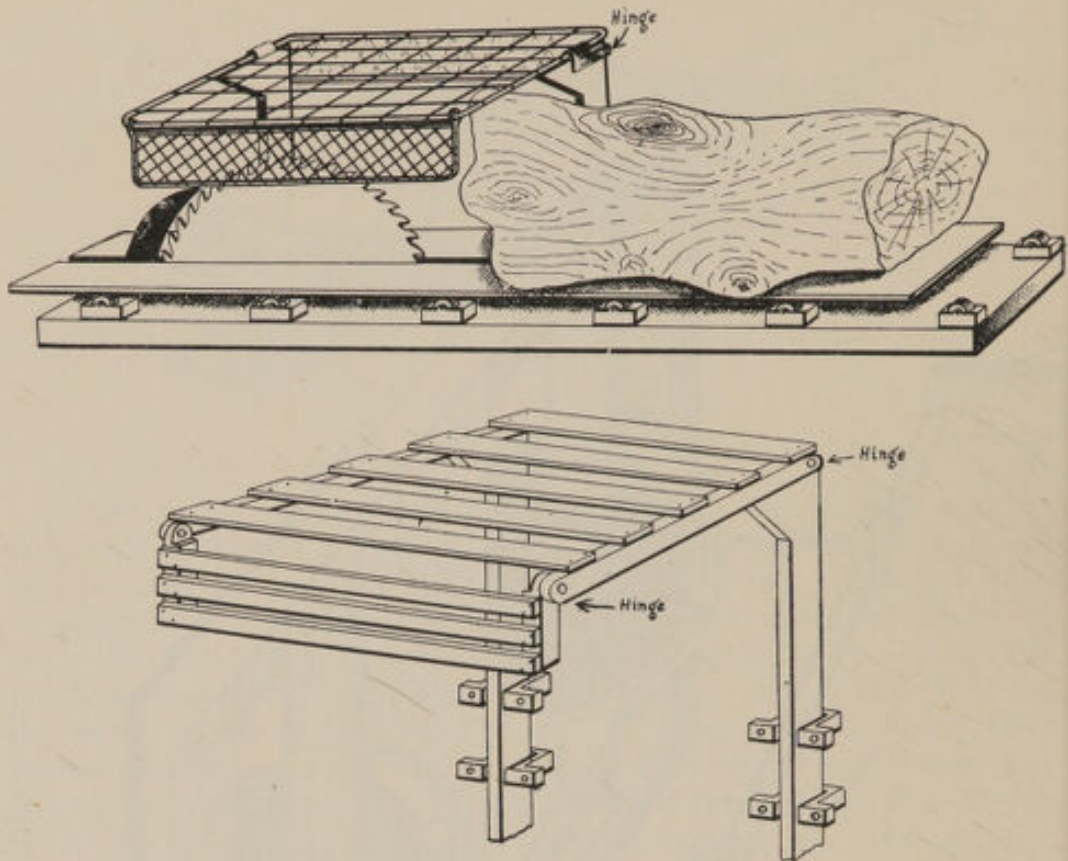
FIG. 44.—“Gang-saw” Hood and “Non-return” Device.

When two or more saws are fitted on one spindle and used at frequently-changed distances apart, the ordinary form of guard can be used by fitting a bar extending across and above the saws to support it, lateral adjustments to accommodate variations in the distances between the saw blades being made by sliding the guard-holders along this bar. A similar bar can be fitted below the table to carry the lower ends of riving knives, where easy lateral adjustment is needed and the design of the bench does not already provide clamping arrangements for the knives (Fig. 45).

Double-bladed cross-cut saws (equalisers and the like) require safeguarding as already described under cross-cutting, usually with separate protection for each saw blade, except where they are set so close together that a single hood can be fitted

For **Rack Benches** or log saws fitted with travelling tables, safeguarding as shown in Fig. 46 confers a considerable measure of protection without hindering sawing operations. A tree trunk of very large butt can pass under the cover for the crown of the saw, because this is at a height several inches above the top of the saw, a concession which can be permitted when a side flap, hinged if desired, has been fitted at the edge of the top cover. This guard should be of generous dimensions, and be at least as wide as the travelling table. It is well to make it of strong material, such as expanded metal or strong lattice work, which will not obscure light and sight. A **riving knife** must also be fitted at the back of the saw. Owing to the frequency with which the blades of rack saws are entirely buried in the timber, the full riving knife required for ordinary saw benches would often have to be removed. A “**Stub**” pattern of riving knife must, therefore, be resorted to. This should be very slightly thicker than the saw teeth, and it should be of considerable width at the lower end, by which it is fastened below the table, gradually tapering off to a point at its upper end. It is only by this width that a suitable stiffness can be obtained, unless the blade is unduly short. (See Figs. 14 and 15.)

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FIGS. 46 A and B.—Rack Saw guarded by "Stub" Riving Knife and Hinged "Bridge" Frame.

BAND SAWS.

The saw, as a rule, runs over two (or three) light spoked wheels in the near proximity of the operative. The saw blade may break or come off and inflict serious injury, and accidents may also arise by contact with the revolving spokes of the wheels or with the saw. It is consequently essential that the saw blade and the wheels should be well protected. Fortunately it is easy entirely to cover with wire netting, wood or sheet metal (plain or perforated), the whole of the wheels and all of the blade except the part actually cutting.* The covers are usually hinged or readily detachable for convenience in dismantling the saw. Stout wire netting or expanded metal, or some sort of perforated sheeting, is better as material for fencing the upper wheel (or pulley) than solid sheet fencing, as it is undesirable to obscure light and sight at head level.

The part of the blade just above the work should always be guarded to prevent the operative's head being cut. A light piece of wood or metal (slotted if a view of the part of the saw blade just above the cut is desired) can be attached to the guide (*see*

* Required by Regulation No. 12.

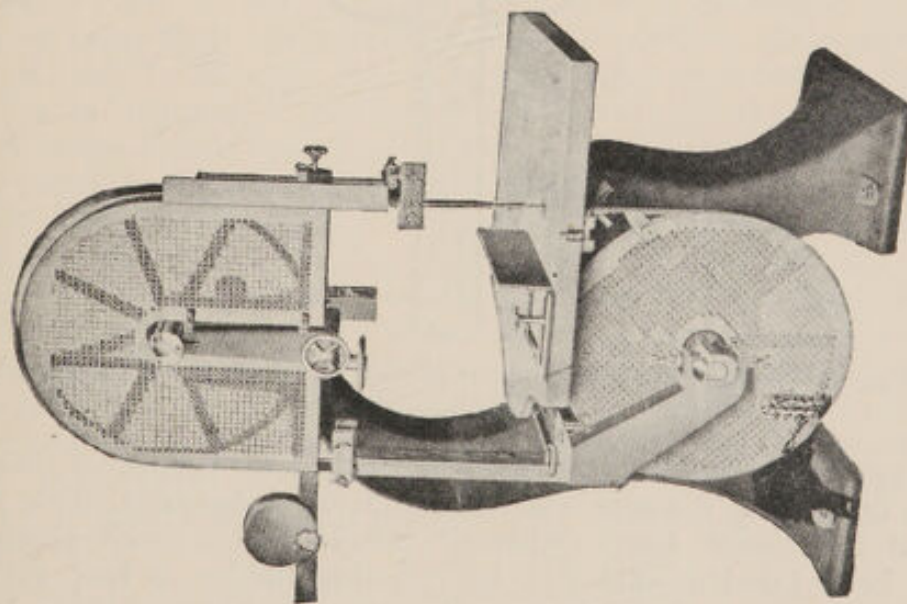


FIG. 47.
(Messrs. Haighs (Oldham), Ltd.)

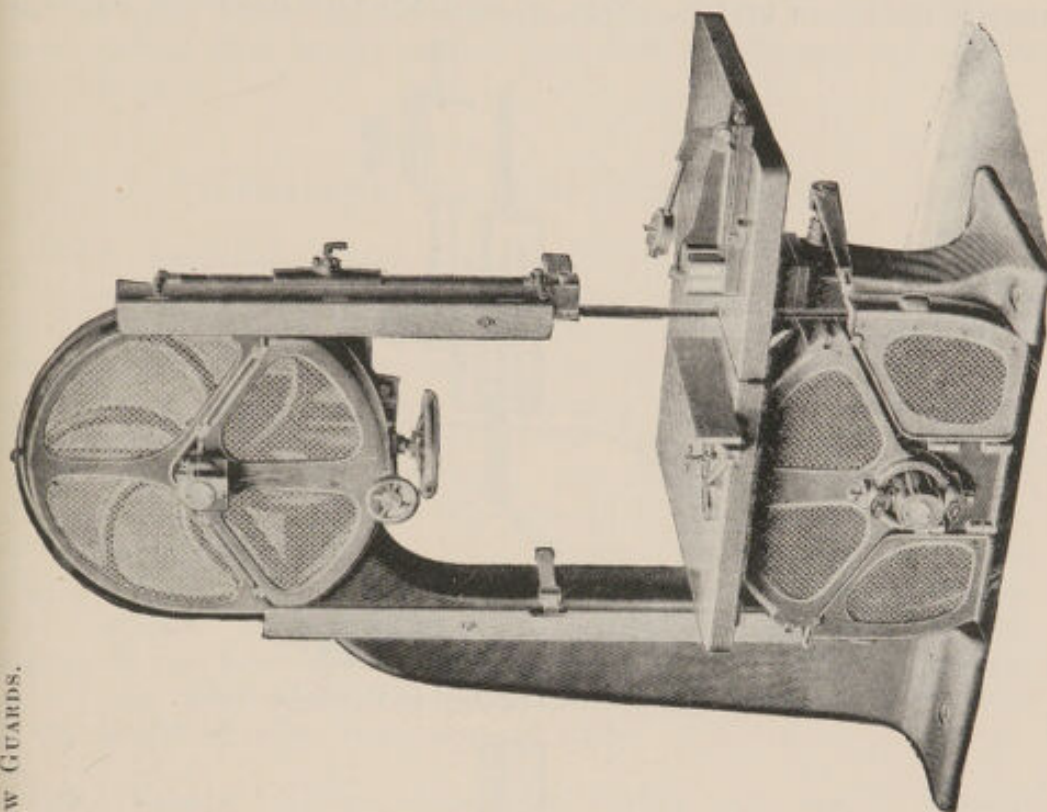


FIG. 48.
(Messrs. Guilliet, Sons & Co., Auxerre and London.)

Fig. 49). This saves the necessity for separate adjustment of the guard, because raising the guide to accommodate thicker work carries the guard up too. Figs. 47 and 48 show band saw fencing.

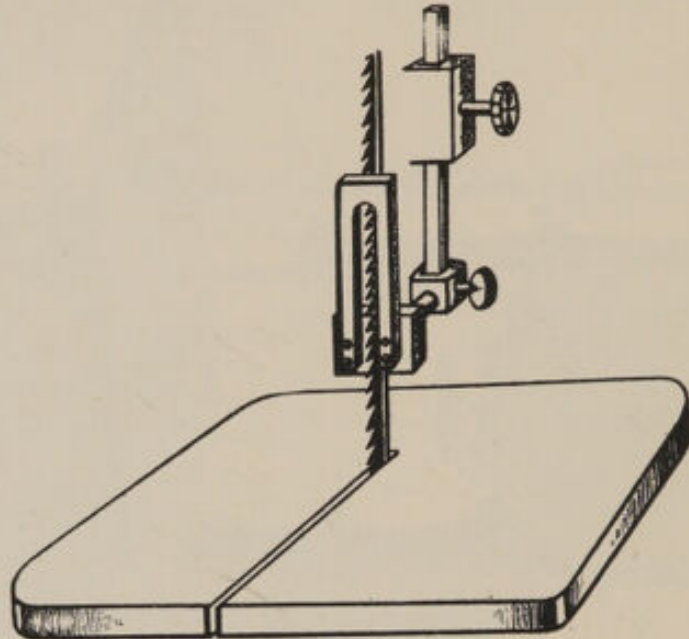


FIG. 49.—Light Guard attached to Bandsaw Guide.

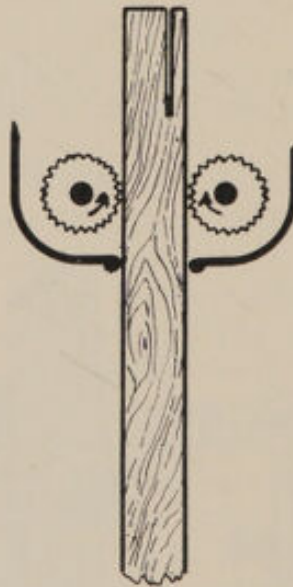


FIG. 50.—Diagram, showing, in Plan, Shield for Fluted Feed Rolls of Large Bandsaws.

Very large band saws, whether vertical or horizontal, are not free from these dangers which, in fact, are intensified, for a heavy band may work havoc when it breaks unless stout protection has been fitted around it. As travelling tables or feed rolls are necessary for leading the wood to the saw blade, there is less risk of contact with the blade just above the work than with the ordinary size of band saw. When feed rolls are used it is

necessary to fit them with shields in order that hands may not be crushed between the fluted rolls and the timber. Fig. 50 indicates the sort of shield which is required, and the same danger is mentioned later in the case of feed rolls for planing and moulding machines.

OVERHAND PLANING MACHINES.

These machines, known also as "Surfacers," "Jointers," or "Buzz Planers," are very dangerous owing to the necessity for handling the material quite close to the cutters, and have been responsible for many severe injuries to the hand. As a consequence of a knot or other irregularity catching in the cutters, the wood being planed is apt to be thrown suddenly backward out of the grip of the machinist, and his hand then falls upon the part of the cutter recently covered by the wood. Or again, when the rear end of the wood is passing over the knives the fingers slip as they are following it. In the first case described, if a "square" cutter block is in use, it is likely that all the fingers of the leading hand will be cut off at once, whilst in the second case the ends of the first and fourth fingers or the thumb of the following hand more usually suffer.

The "square" cutter block*—the earlier type used in planers is a rectangular block of square section, provided with two or four longitudinal slots by which thick knives are bolted on.

A "circular," "safety" or "cylindrical"† cutter block is now obtainable from all the leading makers of such machinery. This block is completely cylindrical except for shallow clearances in front of each knife edge, and it is fitted with two, three or four thin knives, inserted in slots and held by screws, or attached by curved cover blocks (*see* Fig. 51 A, B, C, D, E). The knives being so much thinner can be made of finer steel and be sold more cheaply than the blades for square blocks. Again, the grinding is more expeditious when the knives have to be resharpened. It is also claimed for circular blocks that they do smoother work and do it more rapidly. *Circular* blocks can be obtained either with the knives arranged spirally, or to give a straight shear in the usual way. In some of the earlier patterns clearances in front of the knives were faulty, and the block was apt to clog up with chips. Accordingly it is well for buyers of circular blocks to satisfy themselves that the pattern they select is free from this defect.

* Forbidden since 1st March, 1924, by Regulation No. 13.

† Required by Regulation No. 13. The similar block for spindle-moulders is mentioned on page 51, Fig. 65.

CIRCULAR CUTTER BLOCKS FOR WOOD PLANERS.



FIG. 51 A.—Skew Block (2-Cutter). (Messrs. Thomas Robinson & Son, Ltd., Rochdale.)

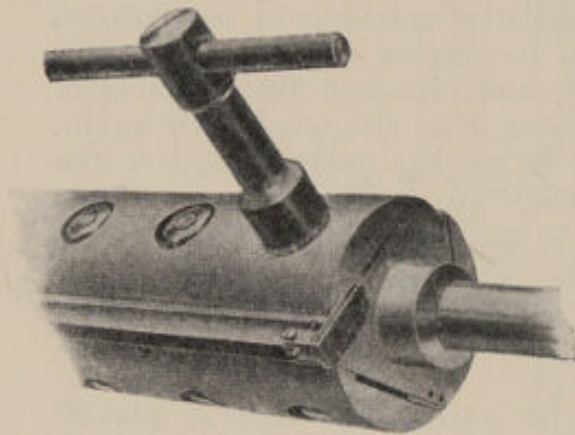


FIG. 51 B.—3-Cutter Block. (Messrs. C. D. Monninger, Ltd., Clerkenwell.)

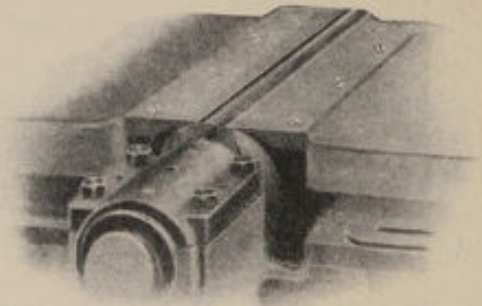


FIG. 51 C.—Close-set Steel Lips to Planer Table fitted with Circular Block.



FIG. 51 D.—Segmented Circular Block with Moulding Irons fitted. (Messrs. Wilson Bros., Leeds.)



FIG. 51 E.—2-Cutter Circular Block. Note the "back irons." (Messrs. A. Ransome & Co., Ltd., Newark-on-Trent.)



FIGS. 52 C and 52 D.—Typical Injuries.
By Square Block. By Circular Block.
(Messrs. M. Glover & Co., Leeds.)

Removing the chips by pneumatic suction systems, mentioned later on (Figs. 90-96), assists the machine and is of considerable advantage.

As there is far less space between the lips* of the table and the block with the circular than with the square type, it is evident that the character of the injury inflicted is likely to be considerably less distressing with the circular block. This is found to be so

FIGS. 52 A, B.—Overhand Planer Accidents.

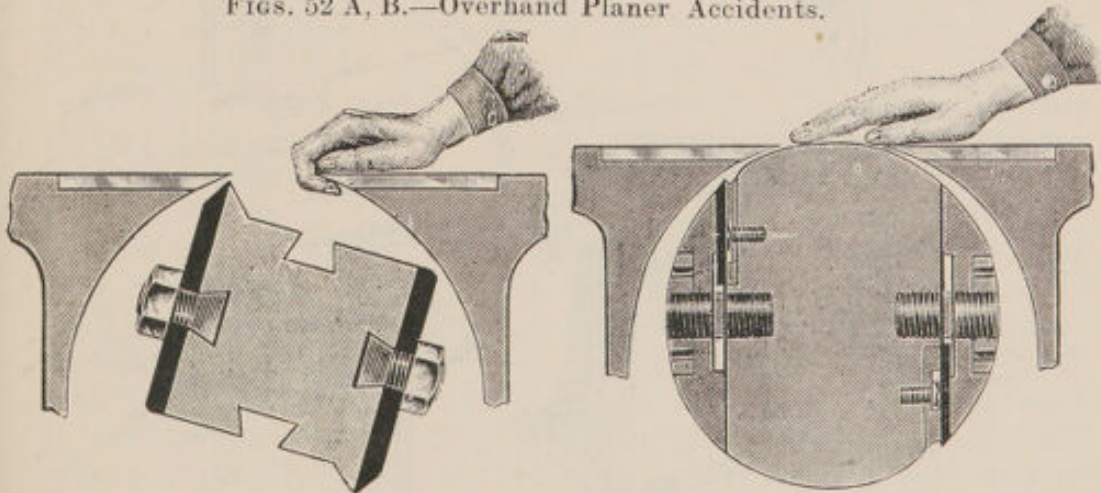


FIG. 52.—How the Injury Arises.

* It is an advantage to fit STEEL lips to planer tables, in order to keep the gap as narrow as possible and to lessen the risk of pieces of the edge breaking off, leaving the width of gap irregular. (See Fig. 51 C.)

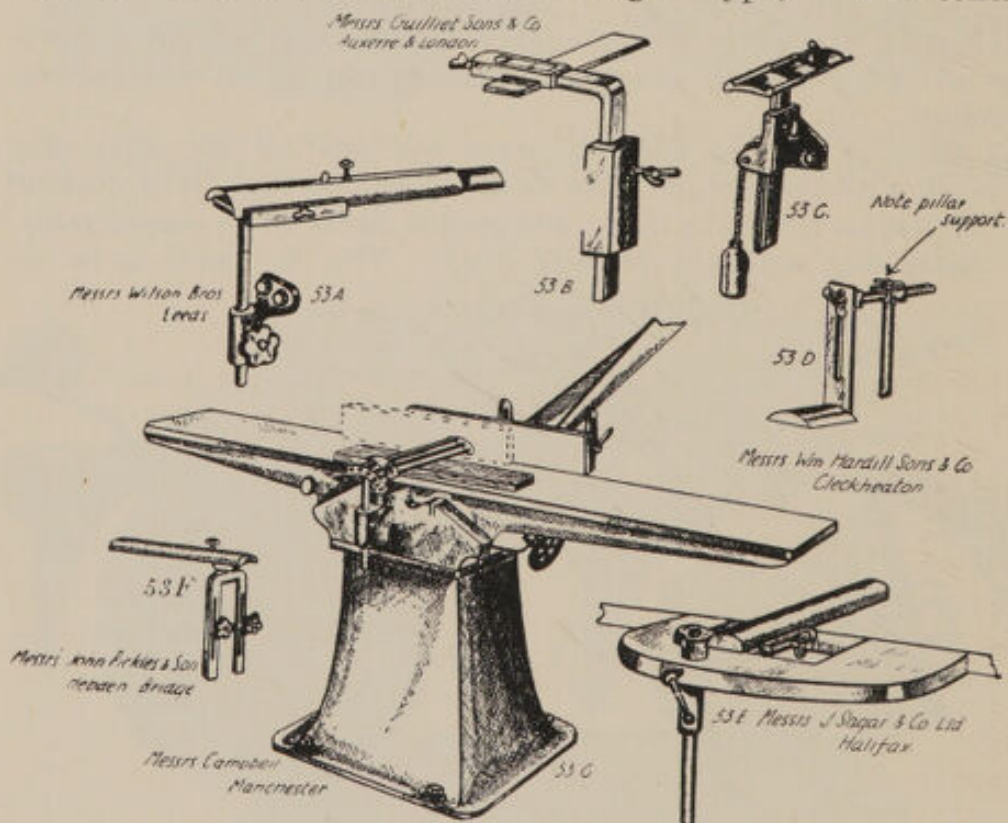
in practice. The circular cutter block does not "refuse" at a knot so readily as the square block does, so that accidents are less frequent with it. The damage done by circular blocks does not often involve loss of bones, and is usually confined to the removal of "sixpences" of flesh from the tips of the fingers.

It is sometimes urged against the circular block that it cannot be used for rebating or moulding—tasks possibly better undertaken by circular saws, vertical spindle moulders, or three or four-cutter moulding machines. To meet this, certain makers have special arrangements in their circular cutter blocks by which a part of the cylinder can be removed when it is desired to use the moulding irons.

Figs. 52 A, B, C, D, show respectively sections of square and round blocks and the typical injuries inflicted by them.

There is also a mongrel cutter block which has two curved and two flat surfaces. It is decidedly more dangerous than a true cylindrical block, and is not suitable for use on an overhand planer.*

Although the circular cutter block does not cause so many accidents nor such severe ones as the square block, the risk is not by any means negligible, and it is still necessary to use a guard with it. This should be of the "bridge" type,† which consists



FIGS. 53 A, B, C, D, E, F and G.—"Bridge" Guards for Overhand Planers.

* Forbidden since 1st March, 1924, by Regulation No. 13.

† Required by Regulation No. 15.

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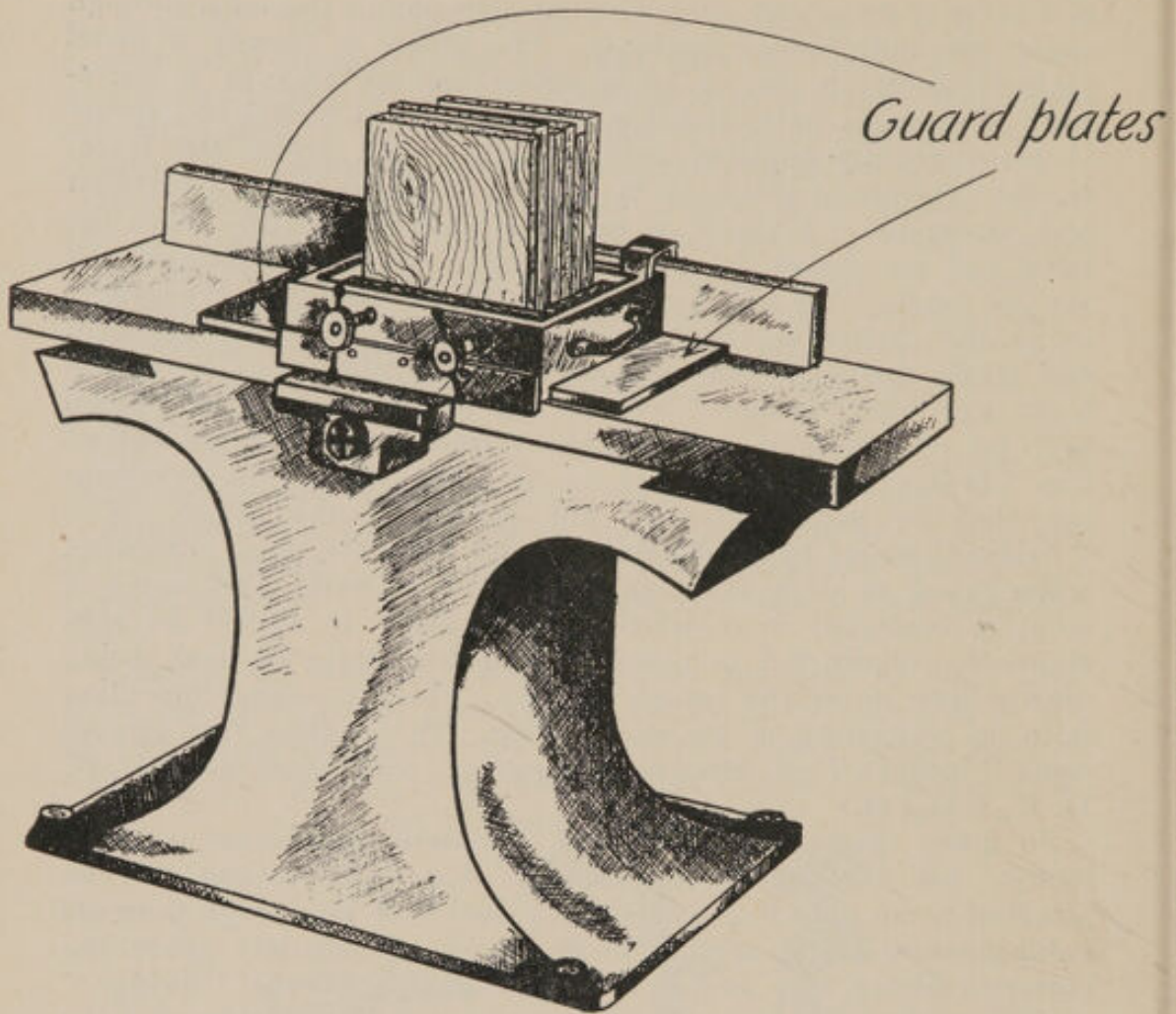


FIG. 54.—Sliding Clamp, fitted with Guard Plates for Use when Machining Ends on an Overhand Planer.

idea is useful only for edging or for such work as planing the ends of bars or boards (comparatively a rare process), in which case the "bridge" guard cannot be used, owing to the depth of the material. If work of this description is done regularly a special clamp with extended guard plate attached (as shown in Fig. 54) should be used.

Push-blocks or Holders furnished with good handgrips are very useful appliances at overhand planing machines and should always be available. They are particularly required for holding short or thin pieces.* The under surface should have a suitable cleat or overlapping piece at the back, or should be studded with short spikes, such as the tips of tacks, or be covered with very coarse emery paper in order to engage with the work.

* See Regulation No. 14.

For some kinds of repetition work a push-block provided with a clamping arrangement may well be used. Figs. 55 A, B, C, and D show several sorts of push-block. Fig. 56 illustrates a sliding pusher for small pieces.

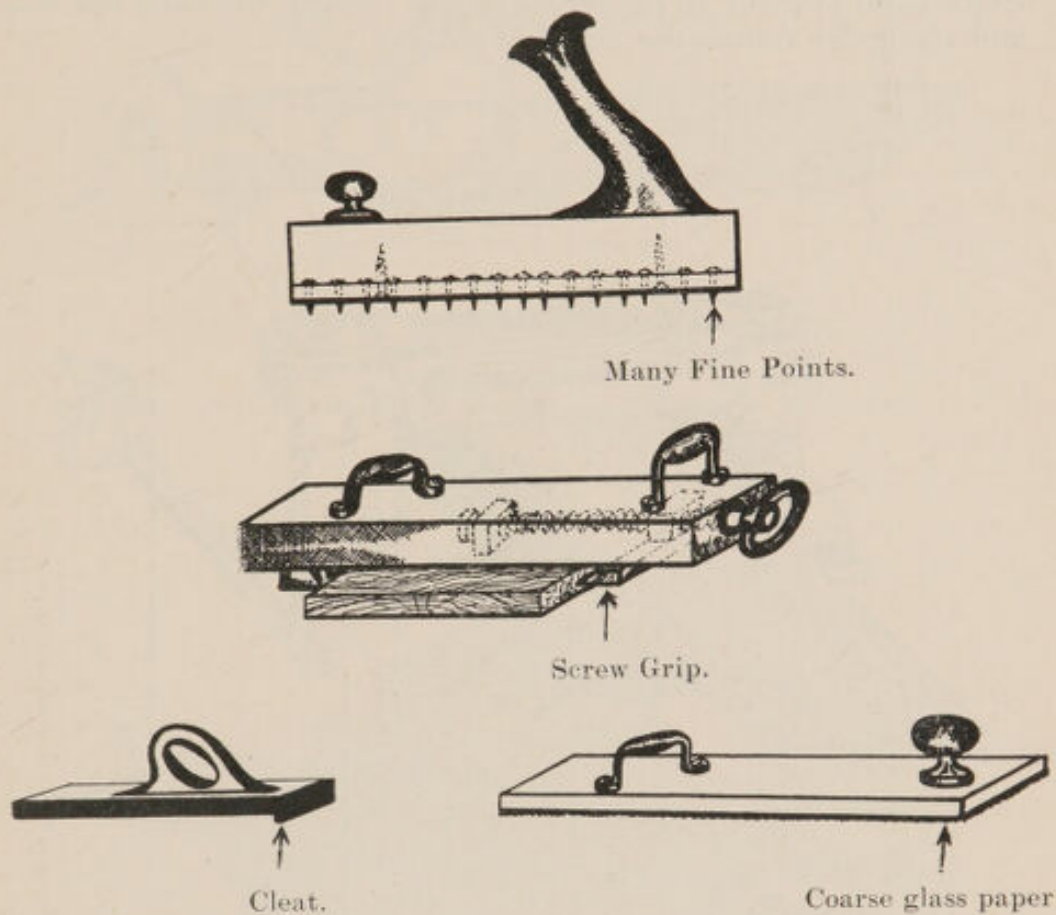


FIG. 55 A, B, C and D.—Push-Blocks for Use at Overhand Planer.
Note Hand Grips set at comfortable Angles.

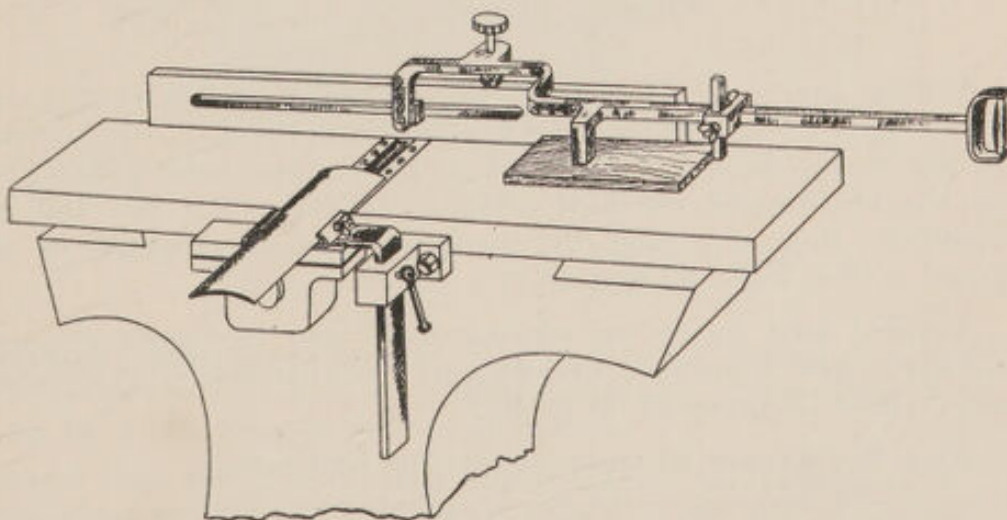


FIG. 56.—Sliding Pusher for Small Pieces at Overhand Planer.

Feed Rollers.—Horizontal, mechanically-driven fluted rollers are used for feeding various planing, moulding and sand-papering machines, such as "thicknessers," "panel-planers," "surfacers," "three-siders" and "four-side planers." The operative's hand is liable to be drawn in and crushed between the wood and the roller unless the latter is covered.*

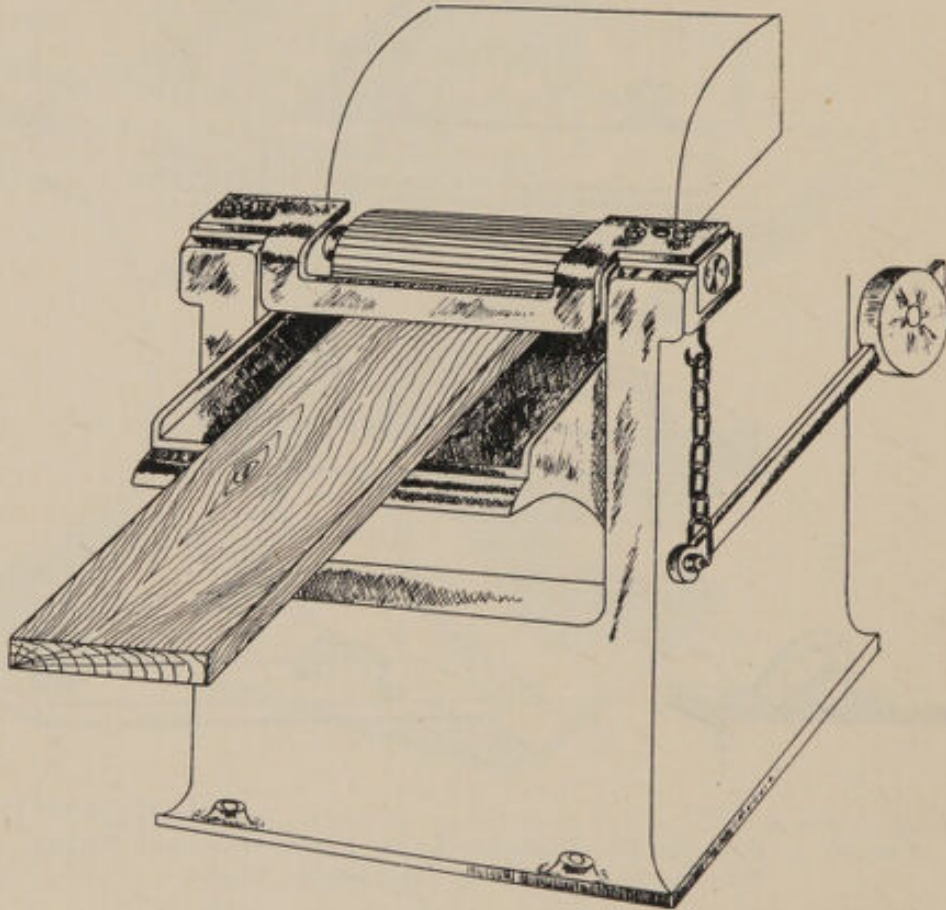


FIG. 57.—Planer Feed Roll Guards. Attached to the front top roller bearing and so obviating adjustment.

Where the feed roller is allowed considerable vertical movement (against springs or weights) to accommodate irregularities in the wood, there is an advantage in mounting the guard plate on the bearings of the feed roller so that the two rise and fall together, thus obviating the necessity for adjustments of the guard. (See Figs. 57 and 58.)

Vertical feed rollers on circular saws and bandsaws are used similarly, and occasion a like danger. Similar guarding is applicable. (See Diagram 50 on p. 40.)

Figs. 57, 58 and 59 show guards for feed rollers.

* See Regulation No. 16.

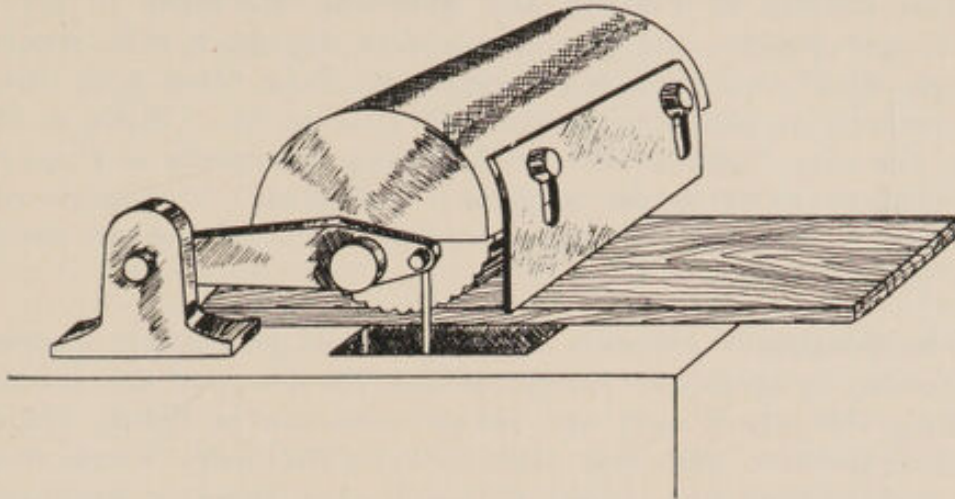


FIG. 58.—Guard Plate attached to Hood over Planer Feed Roll.

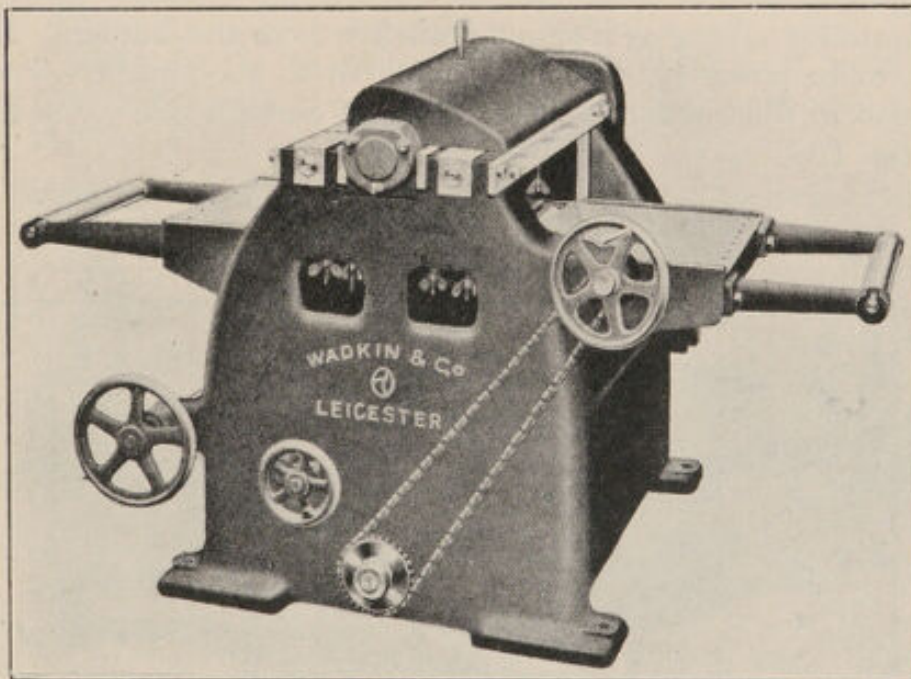


FIG. 59.—Guards for Cutter and Feed Roller of Planer.
(Messrs. Wadkin & Co., Leicester.)

Lightning Planer.—There is a light type of **planer** in which short boards are smoothed by a **fixed** plane-iron, over which they are fed by a revolving rubber-covered drum.

Danger does not arise in this machine from the planing blade, but the feed roller should be fitted with a hood, the lower edge of which should just be clear of the work.

The **Cutters of Planing and Moulding Machines** in general (overhand planers and spindle-moulders are dealt with specially on pp. 41-47 and 51-62 respectively) should be fitted with plating to prevent accidental contact with the cutters. With a little care the curved plates used for deflecting the stream of chips can be adapted to serve this purpose. Better still, the hoods of a pneumatic chip collector can be placed in a position to envelop the cutters closely.

The **Gearing** of all such machines should be entirely enclosed, preferably by gear cases incorporated in the design of the machine. Failing this, sheet metal or wooden cases can be fitted. This is more expensive and less satisfactory. Machinery users would do well to bear such points in mind when ordering machinery. Complete gear casing is important, not only for preventing accidents (and it is essential for that purpose), but also for the benefit of the machinery itself, and for keeping power bills low. Machinery, the gear of which is constantly being strained by the clogging action of wood debris, cannot be expected to remain accurate for so long as it would do if free from this burden. Moreover more power is, of course, required to run machinery when clogged in this manner. An example of encased gearing is shown in Fig. 60.

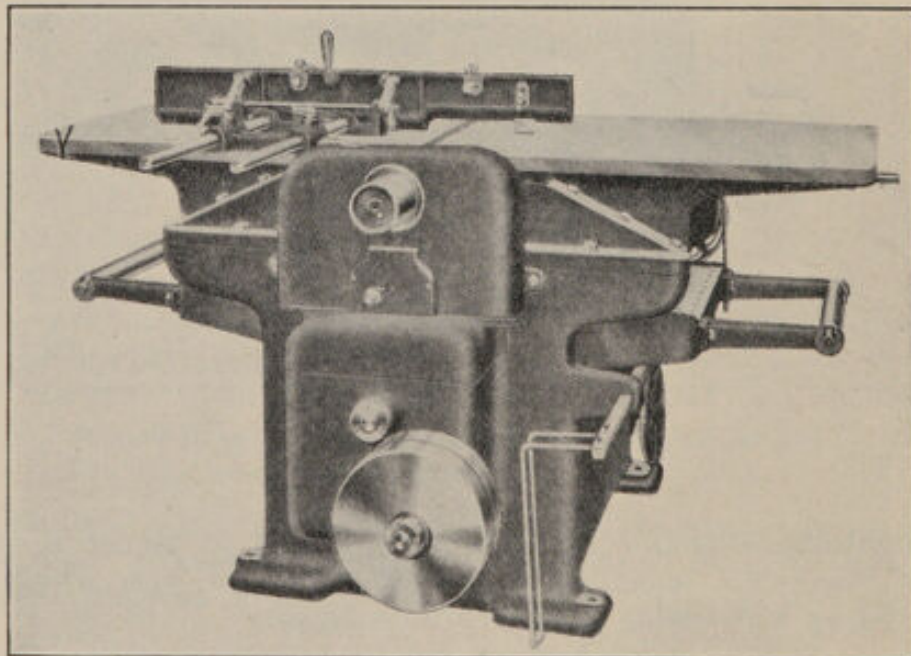


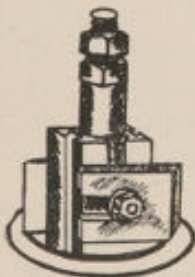
FIG. 60.—Example of Encased Gear-wheels on Wood-Planing Machine.
(Messrs. Wadkin & Co., Leicester.)

SPINDLE MOULDERS.

The vertical spindle-moulder or shaping machine is one of the most dangerous tools in common use. It causes a large number of accidents yearly, and a considerable proportion of these result in the loss of several fingers. As with circular saws and overhand planers the reason lies mainly in the operative's hands being constantly in close proximity to rapidly moving edge tools. The fingers come into contact with the cutters, especially when the work is violently torn from the machinist's grasp in consequence of some irregularity catching in the cutters. The fatal accidents are caused by cutters breaking off or coming loose, and being hurled away with great velocity, due to the centrifugal force developed by their exceptionally high speed, one to seven thousand revolutions per minute. It is therefore of prime importance that suitable safeguards should be chosen for each operation* and that cutters should be set with scrupulous care.

Three types of Cutter-block are used on these machines. A **Square Block** provided with longitudinal slots to take the bolts by which cutters are attached is commonly used in the building trade for heavy joinery mouldings (Fig. 62). For some jobs it is possible to use the much safer **cylindrical block**, such as Fig. 65. (Compare with cylindrical blocks for overhand planers, pp. 40 and 43.)

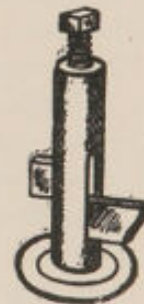
Square block.



Collar spindle.



French spindle.



FIGS. 62, 63 and 64.—Types of Spindle-Moulder Cutter-Blocks.

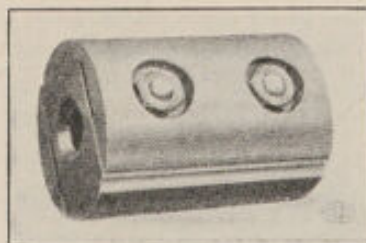


FIG. 65.—Cylindrical or "Safety" Cutter Block for Spindle Moulder.
(Messrs. J. Sagar & Co., Ltd., Halifax.)

* See Regulation No. 17.

The **Collar Spindle** is used for lighter work. It consists of a screwed spindle carrying upper and lower grooved collars or washers between which the cutters are gripped. Smaller washers are used as packing pieces between the collars and the lock nuts. The sides of the cutters and the grooves in the collars may be serrated to lessen the risk of the knives flying. Cutters can be changed quickly (Fig. 63).

The **French Spindle** is used particularly in the cabinet and chairmaking trades for curved and straight work of greatly varying character. It consists of a cylinder slotted for several inches of its length and penetrated from the top by a long setscrew. Cutters can be changed very rapidly by slackening the setscrew and slipping the new knife and its balance piece into the slot (Fig. 64).

The same machine may use more than one of these types of block, and it may be employed for long runs of one moulding or to give a particular shape to only one piece of wood.* To meet these varying conditions guards of widely different design are available, but it **cannot be expected that any one of them could prove universally suitable for every description of work.**

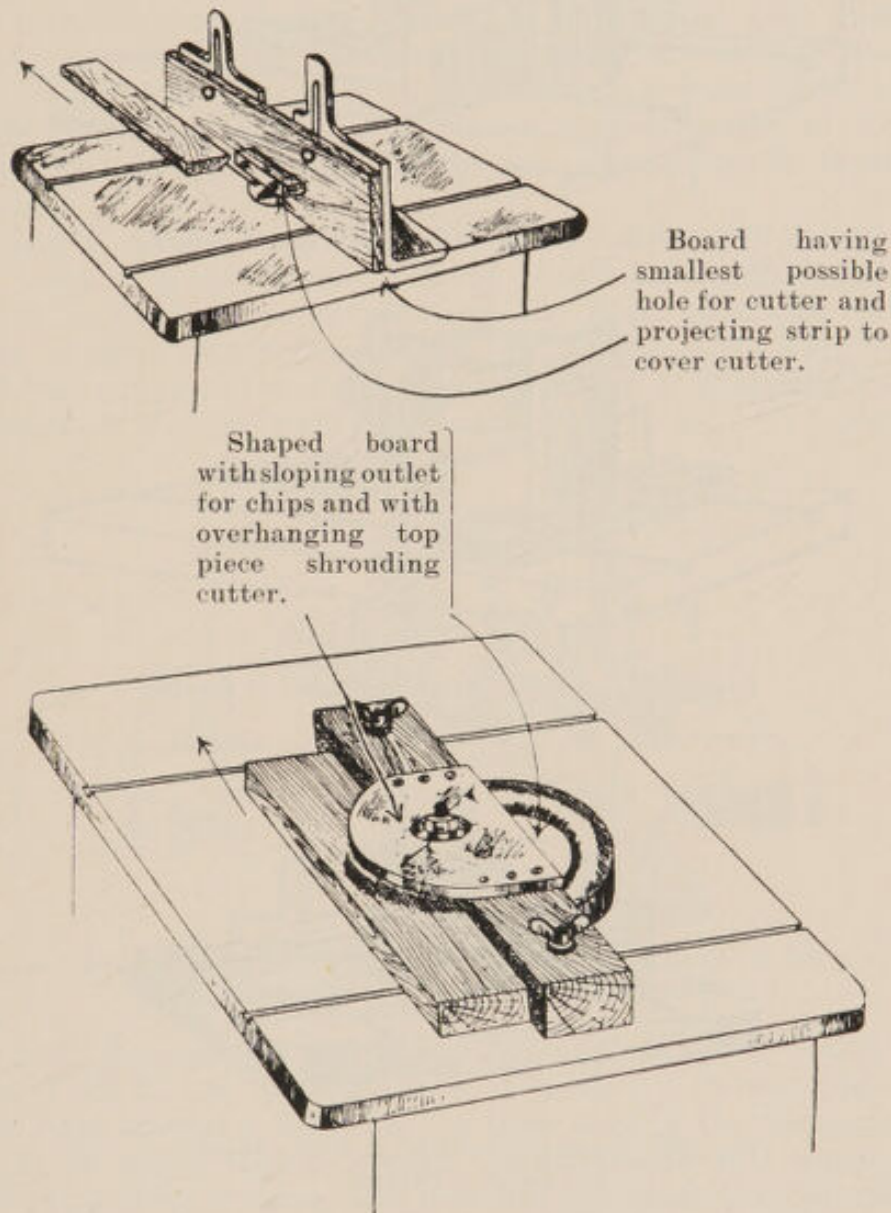
For **straight work** on a spindle-moulder (this will include most of the work done in the building trade **with the square block**) the vertical guide (often called the "*fence*") along which the work is passed in front of the cutters simplifies the safeguarding arrangements. The gap in the guide through which the cutters pass can sometimes be made very much smaller by placing a special board in front of the guide, the board containing a hole no larger than necessary to allow the particular cutter in use to do its work. If the cutter is a small one and near the table it may be possible to guard it by a simple block of wood attached to the board described, projecting beyond the cutter but allowing the work to pass under. (See Fig. 66.)

In general, however, for straight work a shield is required to cover the gap, leaving only space enough for the passage of the work, between itself and the guide. This shield must be capable of vertical adjustment and also of adjustment to and from the face of the guide. Where a moulding is being cut on the edge of a flat board, this shield is set closer to the guide and slightly raised above the table so that the board can be slid in under the lower edge of the shield. (See Figs. 68 A and B.)

To carry the shield it is usual to provide some sort of upright which can be screwed (perhaps through a slotted foot, allowing adjustments in a horizontal plane) to grooves or holes tapped in

* The "**Penny Job**" (pre-war price) meant that the machinist had to take the cutter out of his machine, select from his stock a different blade, set and balance it in the spindle and then mould the piece of wood brought to him by his customer, the small cabinet-maker, all for one penny. To be popular in these conditions, a guard must be very quickly adjustable.

the table. Sometimes the upright is attached to the table by a clamp, as in Fig. 75. Where a clear table is particularly desirable it is an advantage to *suspend* the guard from the ceiling or from a wall bracket. (Compare Figs. 24, 25, 72 and 76.) An additional convenience is a *hinge* in the supporting arm for the shield, so that it can be turned back for such purposes as cutter changing.



FIGS. 66 and 67.—“Home-made” Spindle-Moulder Guards for Use with Saws or other Tools Close to the Table.

A shield of this sort supported as described can be used for work in which the vertical guide is absent, although for *variety* work other types of guard are available, which have advantages in some circumstances.

The principle of passing the work between a shield and the guide is also used in combination with a device for putting spring

FIGS. 68 A and B.—Spindle-Moulder Guard.
(Messrs. J. Sagar & Co., Ltd., Halifax.)

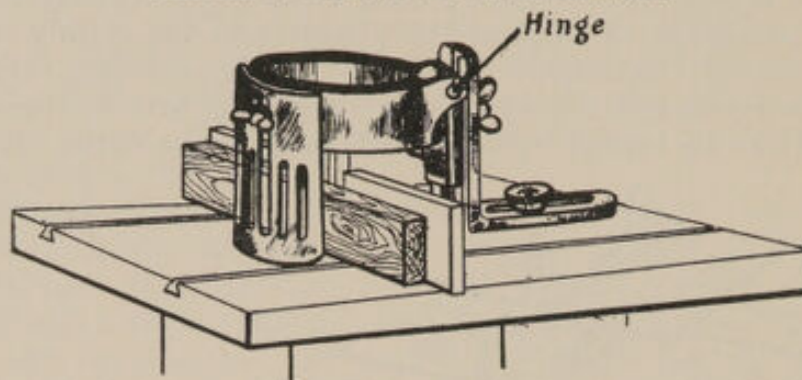


FIG. 68 A.—Set for Moulding Face of Board.

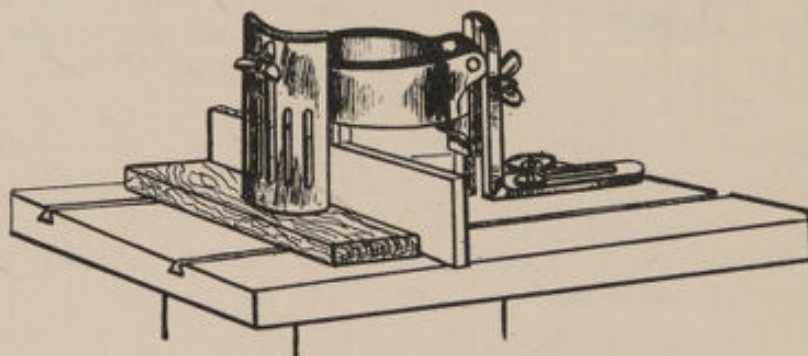


FIG. 68 B.—Set for Moulding Edge of Board.

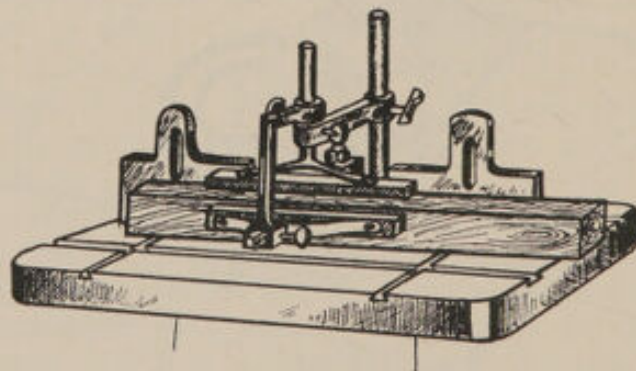


FIG. 69.—Spring Guard for Spindle Moulder.
(Shaw's Patent.)

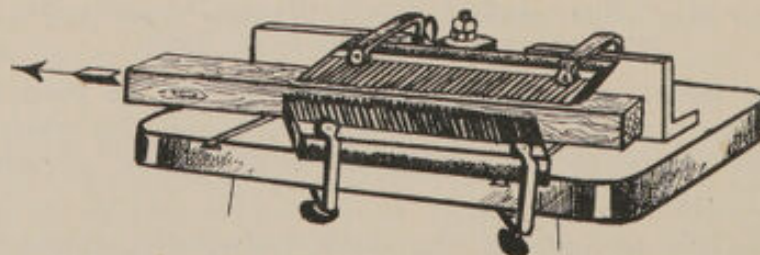


FIG. 70.—“Home-made” Wooden Comb Spring Guard for Spindle Moulder.

pressure on the work, in order to hold it firmly up to the cutters. The thin strips of steel ordinarily employed (*see* Fig. 71) for this purpose do not confer upon the operative protection which is much needed, and they should only be used in conjunction with a guard as in the special case described later on this page. One variety of the pressure shield appliance is illustrated in Fig. 69, and it will be seen that blocks of wood of convenient size, supported by bow springs, press upon the top and also the side of the wood being machined. These spring blocks act as a shield to the cutters. A home-made appliance of a similar kind is shown in Fig. 70. Here the spring shield is simply two slotted boards resembling combs.

There is danger from the cutter on the other side of the guide, and a box or a simple curved shield should be placed there, unless (which is much more satisfactory) the hood of a chip-collecting plant envelops the cutters behind the guide. (*See* Fig. 97.)

Mention may be made of a **special method of operating** a spindle engaged on *straight* work. This is shown in Fig. 71. The wood

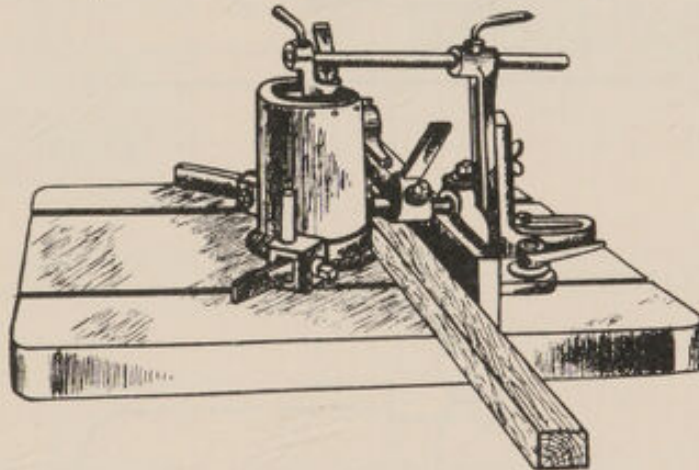


FIG. 71.—Special Method of Working Spindle Moulder.
(Messrs. R. Slinger & Son, Preston.)

is passed between the cutter and the vertical guide, which in this case is all in one piece and not in halves. "Striking-in" (that is to say, cutting a moulding on parts only of the timber and not along its whole length) cannot be done with this arrangement, and, as the wood must pass between the fixed vertical guide and the spindle, it would not be practicable if there were any variation in the thickness of the wood being machined. Apart from these drawbacks, this method has the advantage that safeguarding is simple, for a shield can be placed almost entirely around the cutters, as shown.

It is a mistake to suppose the circular guide known in the trade as a "*ring fence*" is a safeguard, or that it can be relied upon to prevent accidents. It is no more than a guide, and the protection it confers, if any, is negligible.

For **curved work**, whether this circular guide is used or not, a guard is necessary. The defect of the shield described on p. 53 as suitable for straight work is that it covers only a portion of the circumference, and a more complete hood of the *bell* or *cage* type is required for curved work. This needs to be capable of

FIGS. 72 and 73.—“Cage” Type Guards for Spindle Moulders.

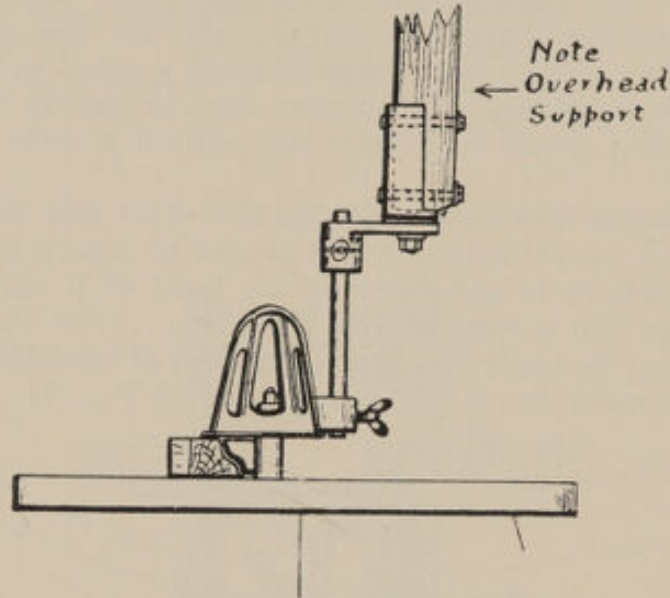


FIG. 72.

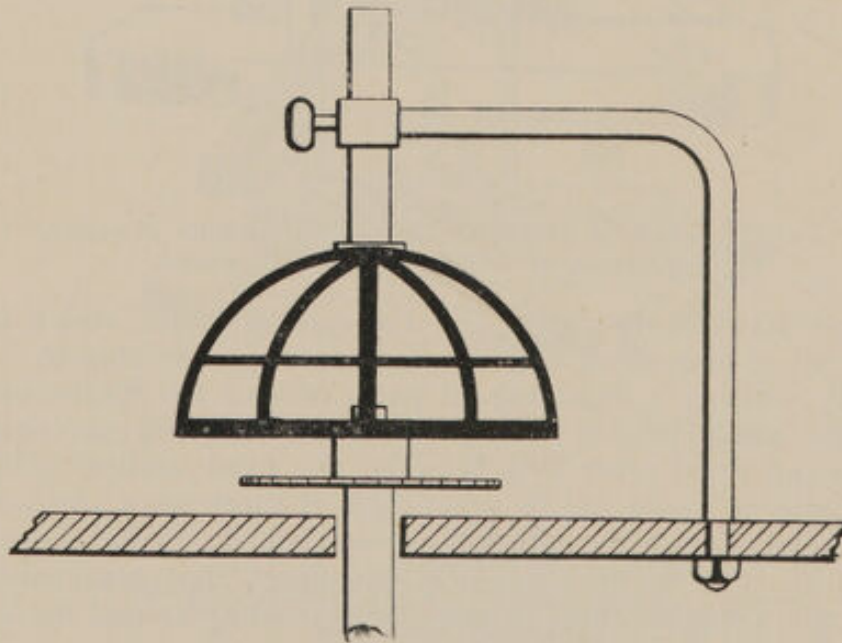


FIG. 73.

vertical and also horizontal adjustment. As in the case of straight work, it can be supported from a pillar, bolted or clamped (*see* Fig. 75) to the table, or can be suspended from the ceiling or

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On "collar" and on "French" spindles for **variety work** such as occurs in cabinet-making, two other types of guards are favoured. (This work is largely on curved material, but partly also on straight pieces, and often covers all the edges outside and inside of a frame.)

The one is essentially a curved **band** of metal or netting rapidly adjustable in height and across the table. Examples of it are shown in Figs. 77, 78 and 79. One pattern has a screw for

"BAND"-TYPE GUARDS FOR SPINDLE MOULDERS.

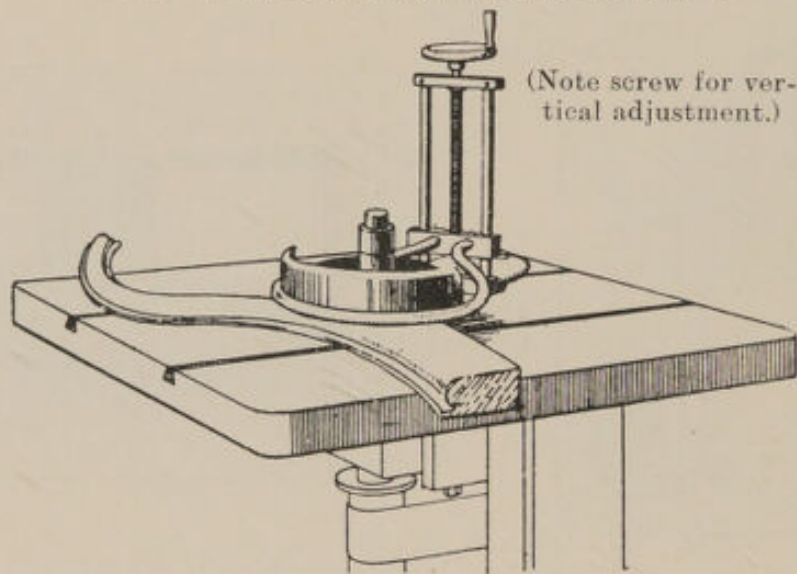


FIG. 77. (Penn-Farrell Patent.) (Mr. Brewer, London.)

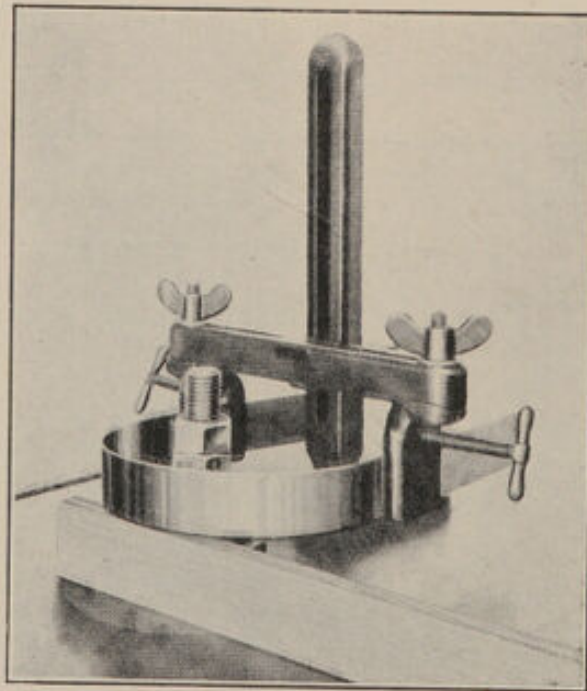


FIG. 78. (Messrs. Taylor & Co., Driffield; Glass' Patent.)

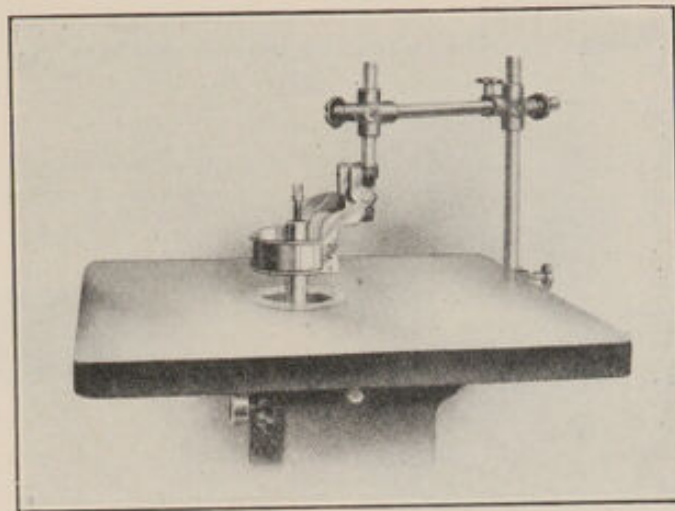


FIG. 79. (Messrs. Aublet, Homer & Co., London.)

vertical adjustment, and the upper edge of the band is turned inwards to deflect the chips away from the face of the operative. In another, the band is a steel spring provided with adjustable clips by which its curvature can be altered.

The other consists of a **wheel**, a pulley or a "**crinoline**" attached

FIGS. 80, 81, 82 and 83.—Spindle Moulder Guards: Revolving Type.

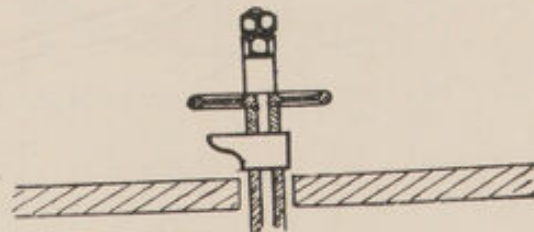
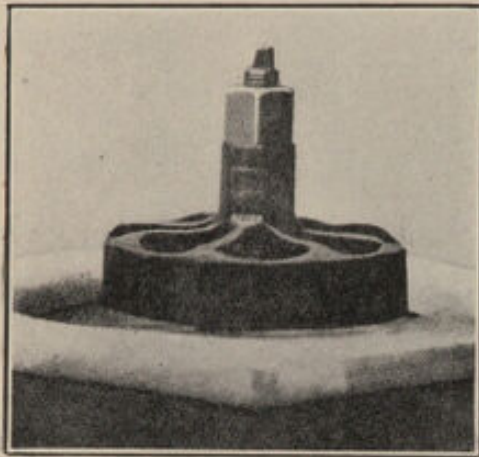


FIG. 80.



Fig. 81.

"WHEEL"-TYPE GUARDS FOR SPINDLE MOULDERS.



FIGS. 82 A and 82 B. (Messrs. Robt. Douglas, Glasgow, and John McDowall & Sons, Johnstone.)

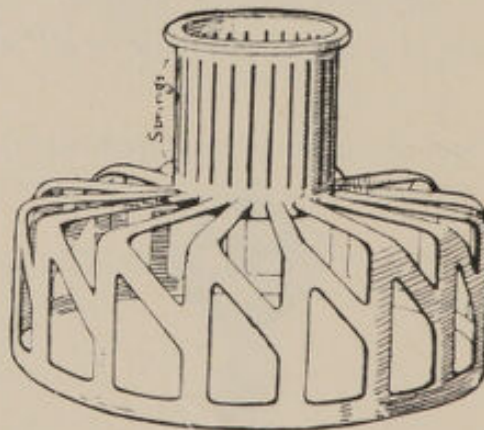


FIG. 83A.—"Money" Patent. (Mr. Brewer, London.)

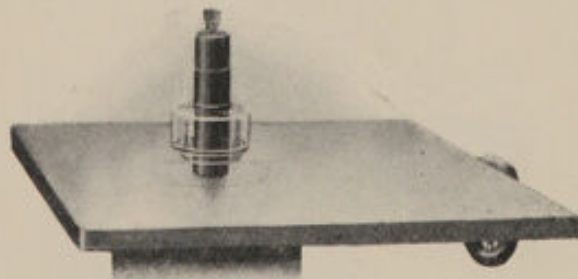


FIG. 83B.—"French" Spindle Revolving with Guard attached. (Mr. Clarence Brewer, London; Money's Patent.)

to the spindle and revolving with it. This gives a clear table. The guard projects beyond the cutters, and is slightly above them. A series of the guards of different diameters may be required in cases where the cutters employed vary much in size. Certain patterns of this kind of guard are secured to the spindle under the nuts holding down the cutters, but one make has a spring shank and can be slipped on and off the (*French*) spindle with great ease and rapidity.

Instances have occurred in which this type of guard has caught and retained a flying cutter, a feat which can hardly be expected from the other types described (except the bell guards mentioned under "curved work"), but it cannot be relied upon to give this protection on all occasions. Figs. 80, 81, 82 A, B, and 83 A, B, show various revolving guards.

For "variety work" on a spindle moulder, **jigs or work-holders**,* **push-sticks**† and **push-blocks** are much needed, for the work will be in short lengths or be thin or curved pieces, on most occasions. A *push-block* similar to those used with overhand planers and circular saws (see Figs. 29, 30 and 55) is suitable for some jobs.

The simplest form of *push-stick* is a rod with a spike at the lower end; more elaborate kinds are provided with a handle and possibly also with a shoulder piece. There is advantage in these additions, for the risk of being cut, should the push-stick slip, is lessened. (Fig. 85, page 61.)

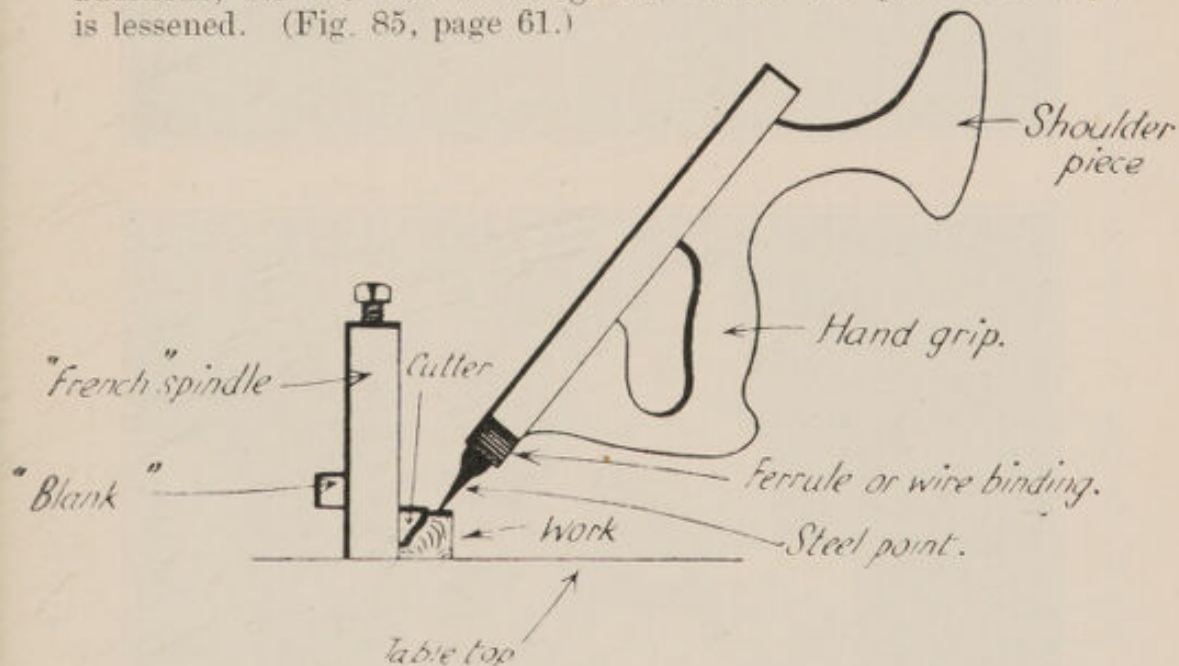


FIG. 85.—Bethnal Green Type of Push Stick for Use at Spindle Moulder.

Jigs and Work Holders.

Spring clips on the principle of a pair of tongs; *screwed clamps*; or blocks of wood suitably *recessed* to grip small pieces; *jigs* pro-

* Required by Regulation No. 18.

† Required by Regulation No. 19.

vided with a pair of centres as on a lathe; and other *work-holding* devices can be utilised for many operations which would otherwise be highly dangerous. It is most reprehensible to attempt, for example, to chamfer a moulding on a tiny square of wood no more than an inch long and $\frac{1}{4}$ inch thick, holding it in the fingers—or possibly assisted by the point of a push-stick—when a work-holder might be put into the danger space instead of a man's hand. (See Figs. 84 A and B.)

SPINDLE MOULDER JIGS USED AT LANG PROPELLER WORKS, WEYBRIDGE.



FIG. 84A.

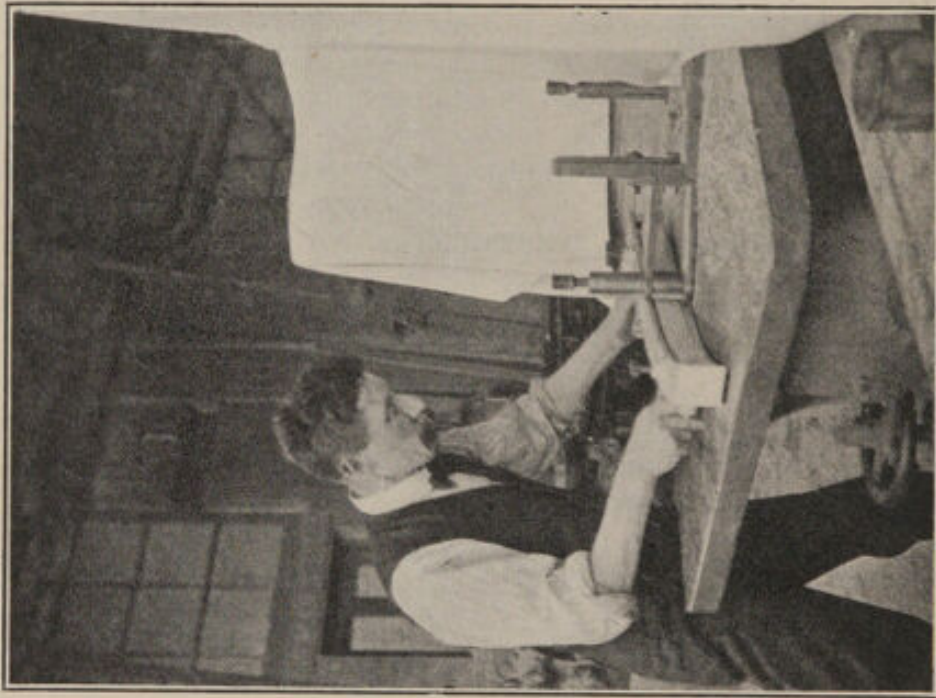


FIG. 84B.

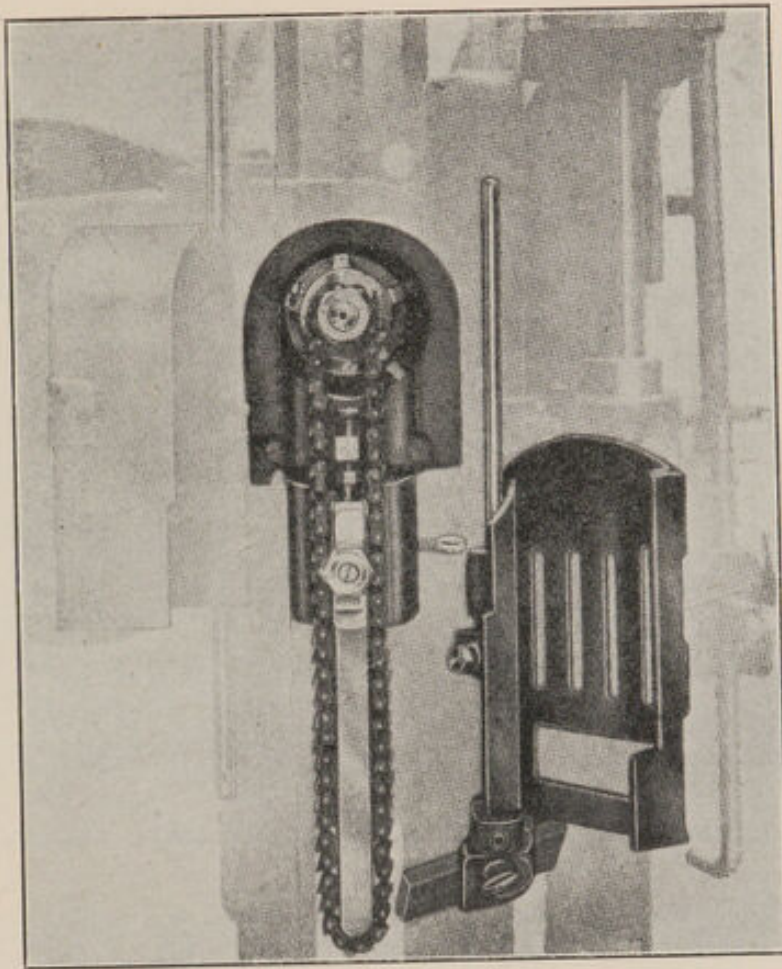


FIG. 86A.—Guard swung clear to give access to chain.
(Mr. A. Cooksley, London.)

MORTISING MACHINES.

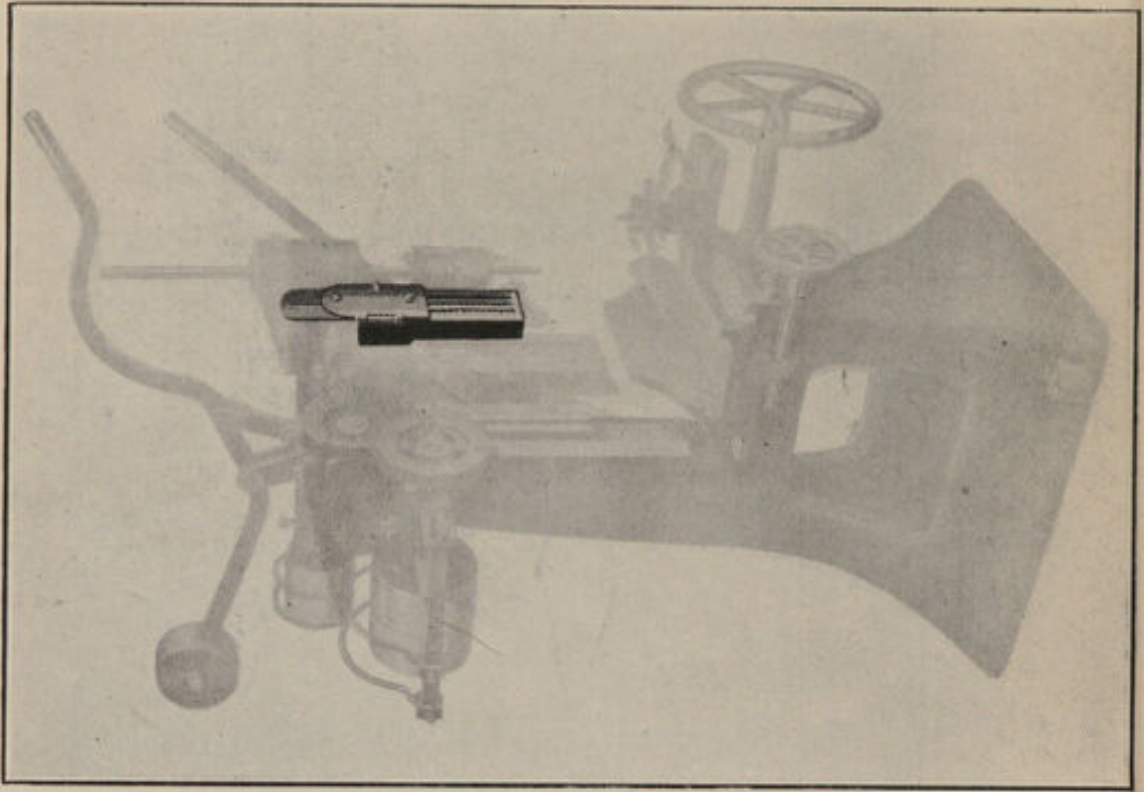
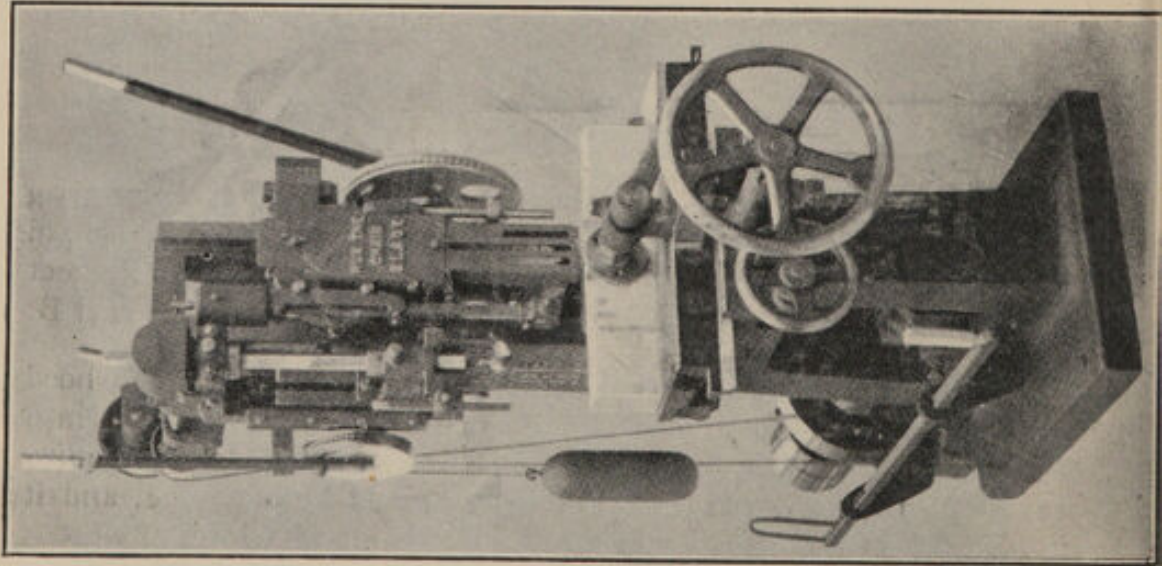
Severe wounds have occasionally been caused by mortising chisels and chains, and it is important that these tools should be enclosed completely* by a sliding guard of netting, of sheet metal, or of rods as shown in Figs. 86 A, B and C, and 87 A and B.

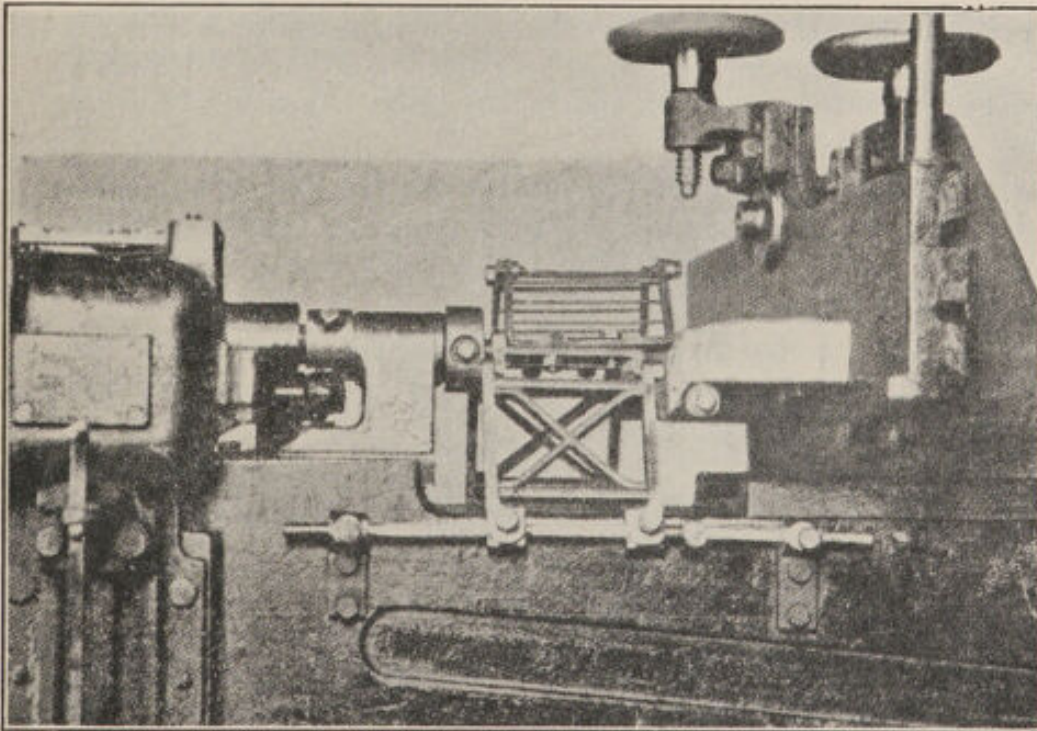
The guard can be arranged neatly to telescope within the hood over the upper part of the chain when the cutters descend into the wood. The *sides* of the chain, as well as the *front*, require covering with the guard. Sight holes should be adequate, and it is an advantage to paint the inside of the guard white.

* Required by Regulation No. 20, so far as chain mortising machines are concerned.

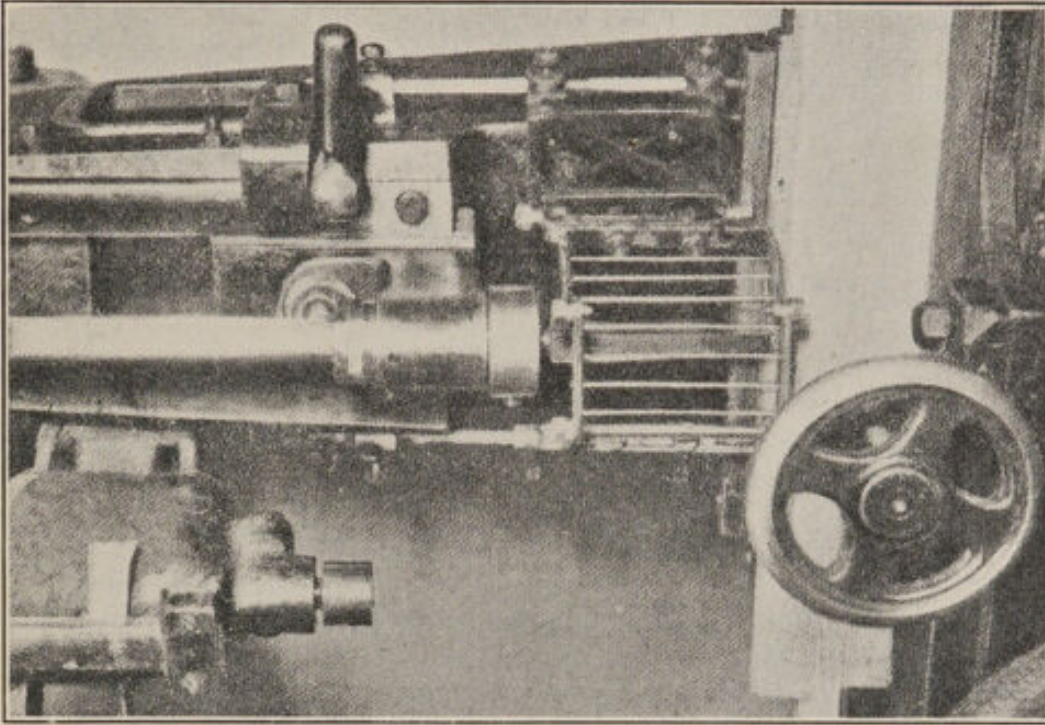
GUARDS FOR CHAIN MORTISERS.

The front and sides of the cutters of the chain mortiser are covered by a piece of sheet metal through which the chain descends to the work.





Side Elevation.



Front View of Guard.

Figs. 87A and 87B.—The Guard can slide upon the rods at sides of machine. Ordinarily it rests upon the timber which is being mortised, but collars are provided on the side rods by which the Guard can be set at a fixed height. (Messrs. Austins (East Ham and Ilford) Ltd., Ilford.)

VERTICAL FRAME SAWS.

The gearing should be enclosed. The belts, pulleys, cranks and the like also need to be provided with adequate protection. Boarding, sheet metal, strong netting or palisade work may be the material, but a rail or two is insufficient alone.

HORIZONTAL FRAME SAWS

require similar safeguarding, and in addition the connecting rod and the heavy cranked wheel which drives it should be securely fenced in.

EXHAUST VENTILATION

or pneumatic dust-removal systems have many advantages in wood-working establishments.

They lessen the fire risk and render the likelihood of a dust explosion more remote.

They save the labour of shovelling and sweeping up wood débris by delivering chips and dust at a central collecting point, where the refuse may conveniently be bagged up, or where it may be used to produce power, either being burned in a boiler or in a suction gas producer.

They diminish the risk of accidents caused by flying chips, and by keeping the air clearer enable the worker better to see (and so to avoid) the danger points. The discomfort caused by a constant bombardment of face and clothing by particles of wood thrown off by machines harasses workers and makes them less fitted to avoid danger.

They help to maintain vitality and to prevent injury to health from inhaling dust, by keeping the air supply free from fragments of wood and earth. The irritation and eczema set up by certain woods is also avoided.

They prevent contact with cutters to this extent—that the collecting hoods must necessarily shroud a good portion of the danger area.

Some firms consider that they receive a better return on their outlay for dust-removal plant than on the capital otherwise laid out in their business.

General information on the important subject "Ventilation of Factories and Workshops" is contained in a Home Office pamphlet so entitled,* but the special problems of removing dust such as that made in wood-working are beyond its scope. The installation of

* Price 6d. Obtainable in the manner indicated on the cover of this pamphlet.

suitable appliances should be entrusted to competent ventilating engineers, most of whom are prepared to guarantee that their work will secure satisfactory results.

In judging between competitive estimates for any particular piece of work, points which should receive consideration are :—

- (1) The relative amounts of horse-power required to operate the rival installations—an important consideration, as the power expended in driving the plant is an annual charge;
- (2) The thickness of the piping employed (the life of the job will depend largely on this);
- (3) The facilities provided for keeping the pipes clear; and
- (4) The surplus accommodation in the piping, etc., available in the event of extension of plant.

The lowest tender is not necessarily the cheapest.

Figs. 88 to 92 show fans, cyclones, piping and general arrangements, etc.

Figs. 93 to 100 show pneumatic collectors applied to different wood-working tools.

A point which should be borne in mind when designing hoods for collecting chips from tenoning machines, planers and spindle-moulders is that the material employed should be strong enough to be able to retain flying cutters, which come off with great force when they break or work loose.

Sand-papering machines should not be worked without a dust-collecting apparatus, for in addition to the fine-wood flour, which it is objectionable to breathe, tiny particles of the abrasive are also cast into the air, and these particles are highly injurious when inhaled.

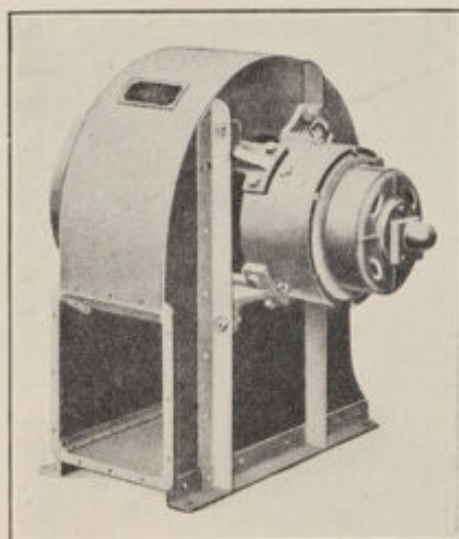


FIG. 88.—Fan, with direct coupled electric motor for removal of wood dust and chips. (Messrs. Keith, Blackman & Co., Ltd., London.)

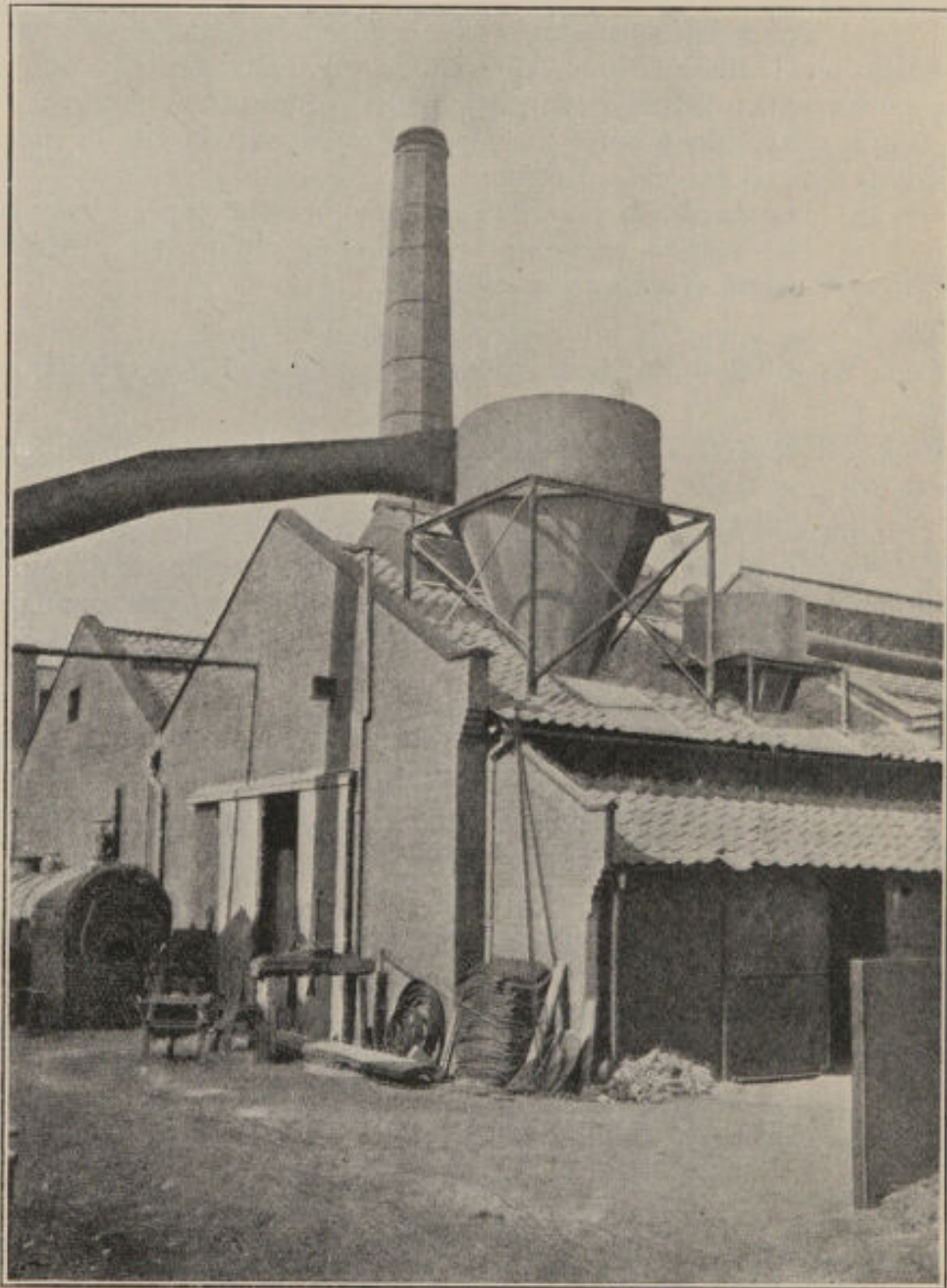


FIG. 89A.—Cyclone Dust Collectors at Boiler House.
(Messrs. A. Ransome & Co., Ltd., Newark-on-Trent.)

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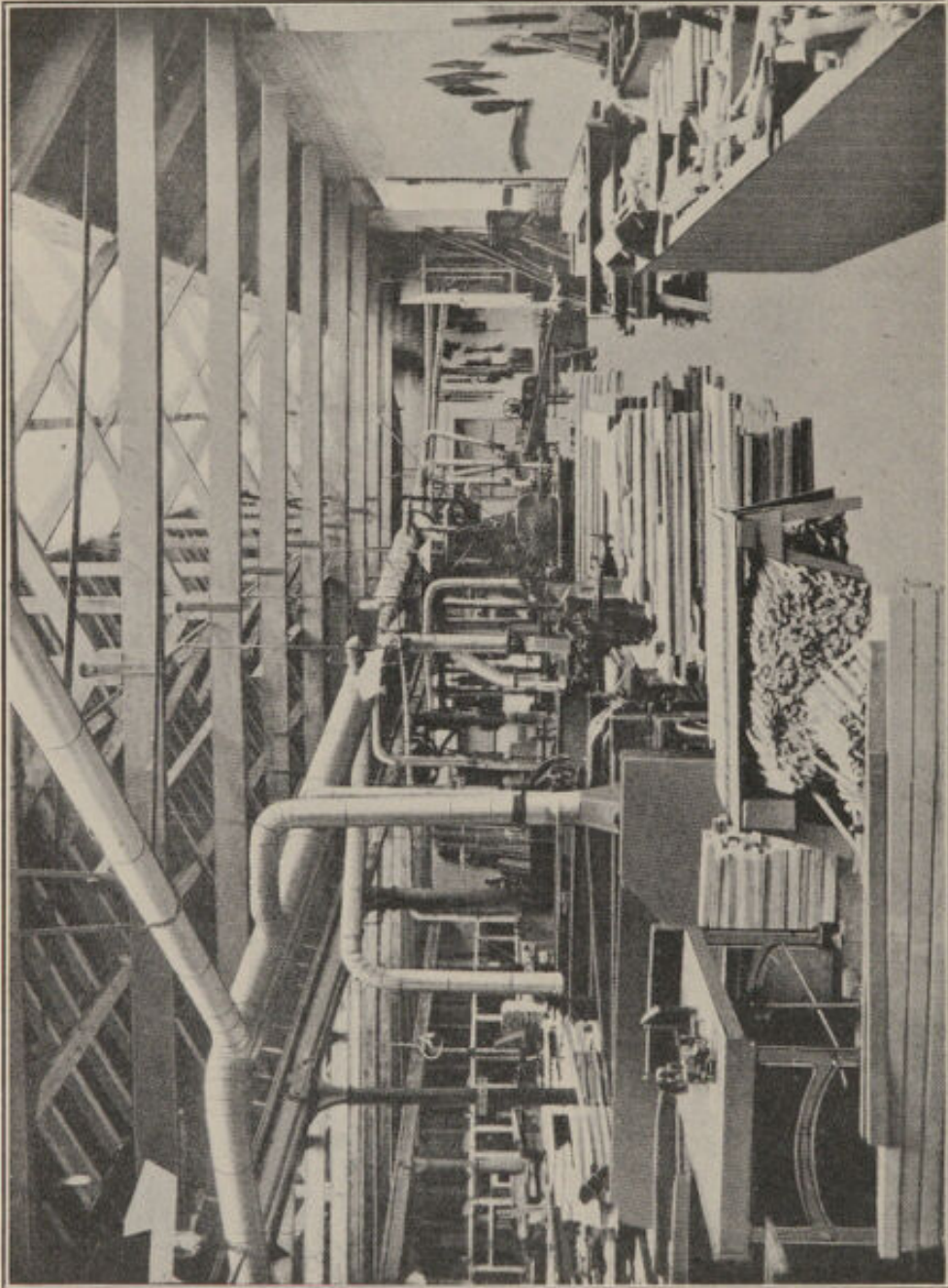


Fig. 90.—General View of Hoods and Ducts for removal of dust and chips.
(Messrs. A. Ransome & Co., Ltd., Newark-on-Trent.)

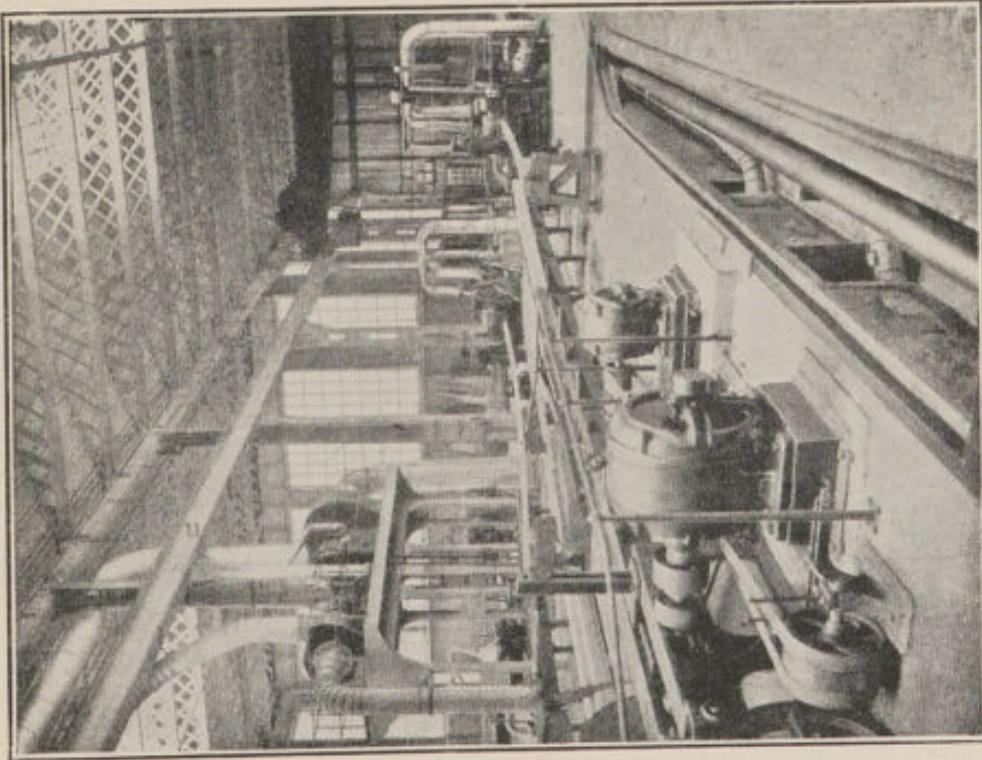


FIG. 91.—General View of a Pneumatic Installation, showing fans and piping above and below ground. Trench cover and belt guards not shown. (Messrs. Sturtevant Engineering Co., Ltd., London.)

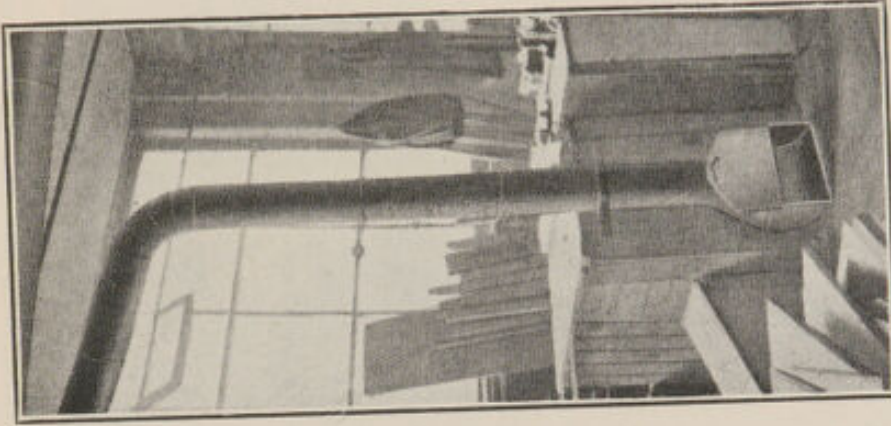


FIG. 92.—"Sweep-up." Note that aperture is vertical and not horizontal. This is intended to exclude hammers, spanners, oil cans, etc., which might otherwise be carried into the fan. (Messrs. Matthews & Yates, Ltd., Swinton, Manchester.)

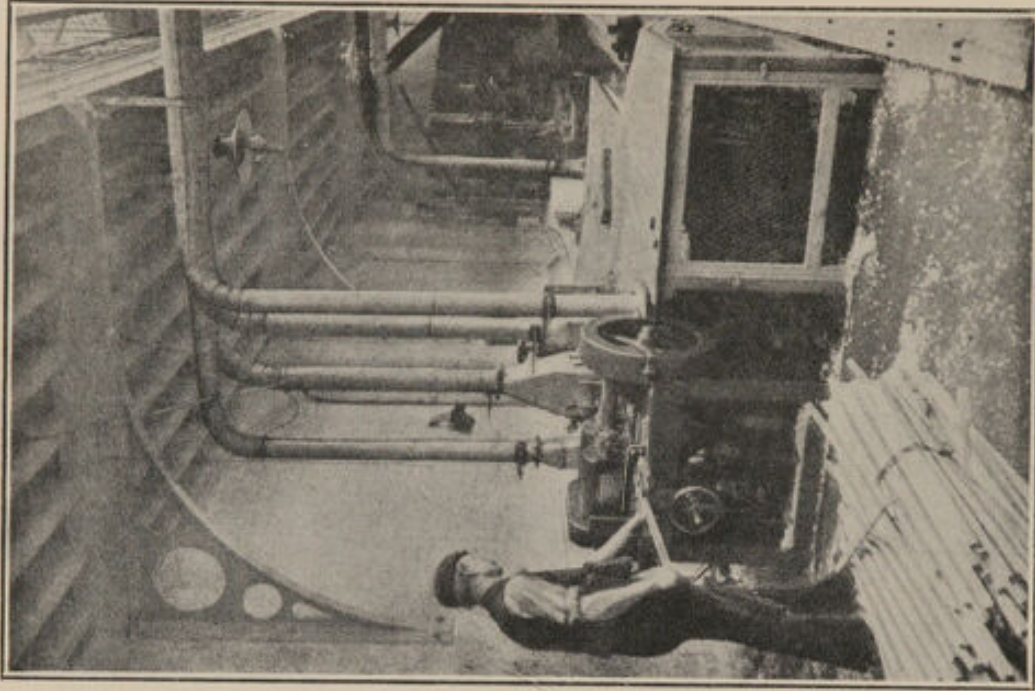


FIG. 94.—Exhaust applied to Wood Planer, showing Hoods and Branch Pipes. (Messrs. Sturtevant Engineering Co., Ltd., London.)

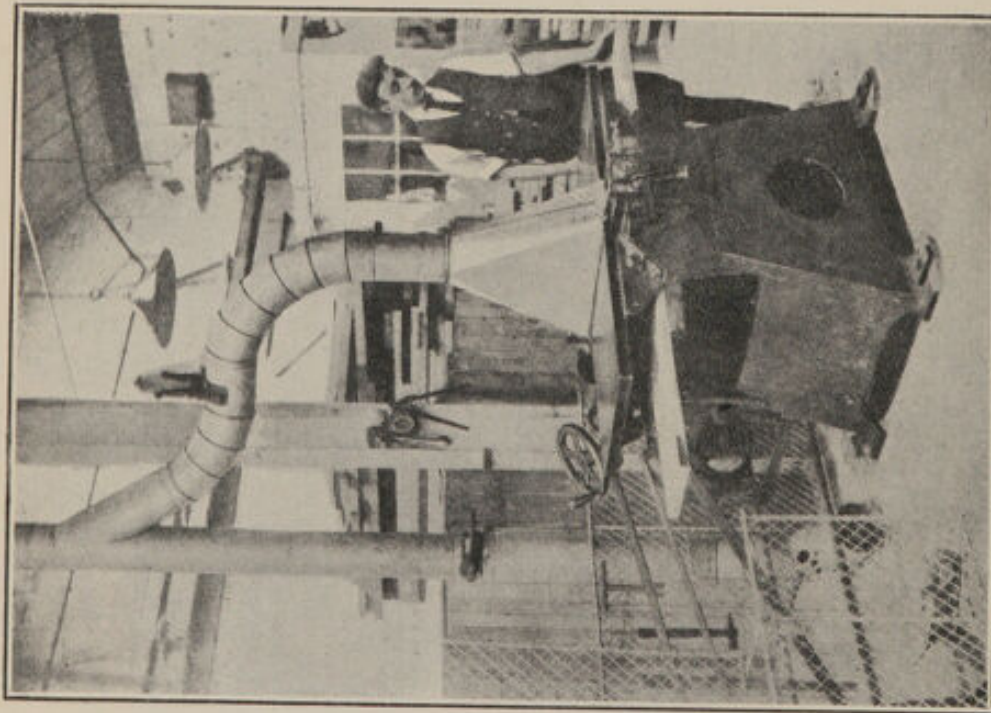


FIG. 93.—Collecting Shavings from Planing and Thicknessing Machine, with Lower Table and Upper Hood in use, the Lower Hood being disconnected. (Messrs. Sturtevant Engineering Co., Ltd., London.)

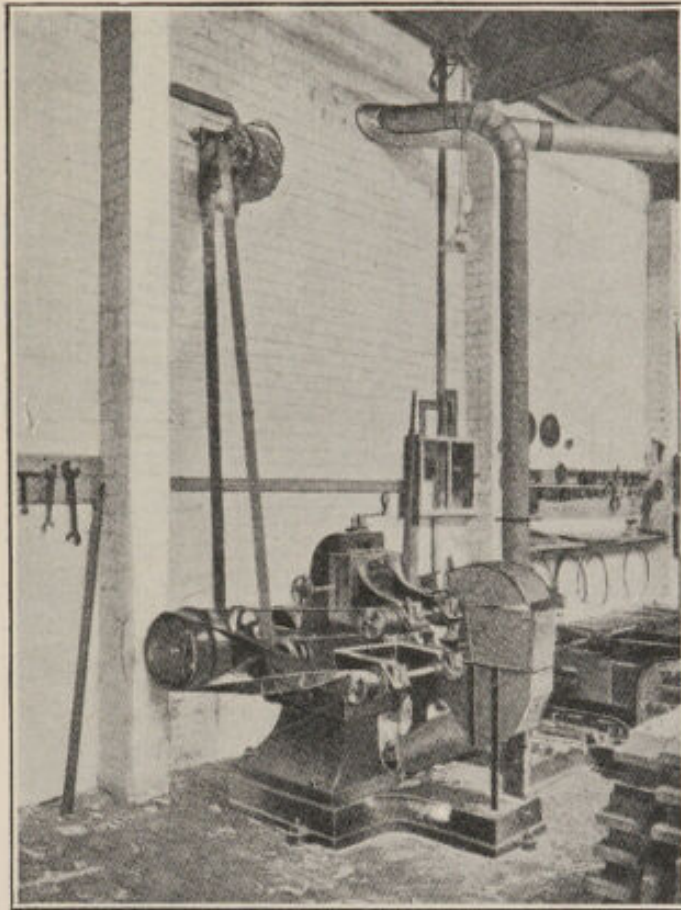


FIG. 95.—Exhausting Wood Chips from Tenoning Machine. The sections of the Hood are hinged to permit of ready access to Cutters. Guard for belts not shown. (Messrs. Sturtevant Engineering Co., Ltd., London.)

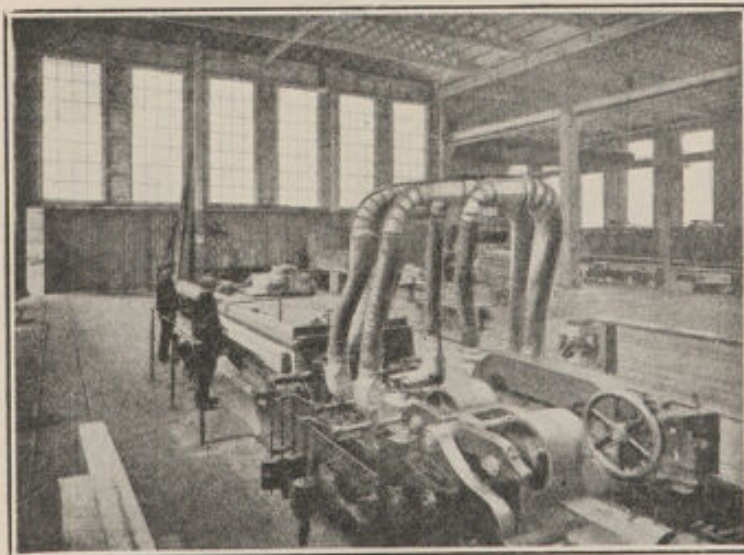


FIG. 96.—Six-cutter Wood-planer equipped with apparatus for removing wood refuse. (Messrs. Sturtevant Engineering Co., Ltd., London.)

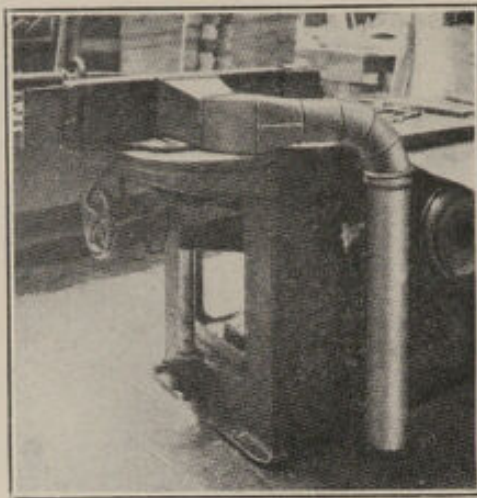


FIG. 97.—Hood and Pipe for removing Dust and Chips from Spindle Moulder.
(Messrs. Matthews & Yates, Ltd., Swinton, Manchester.)

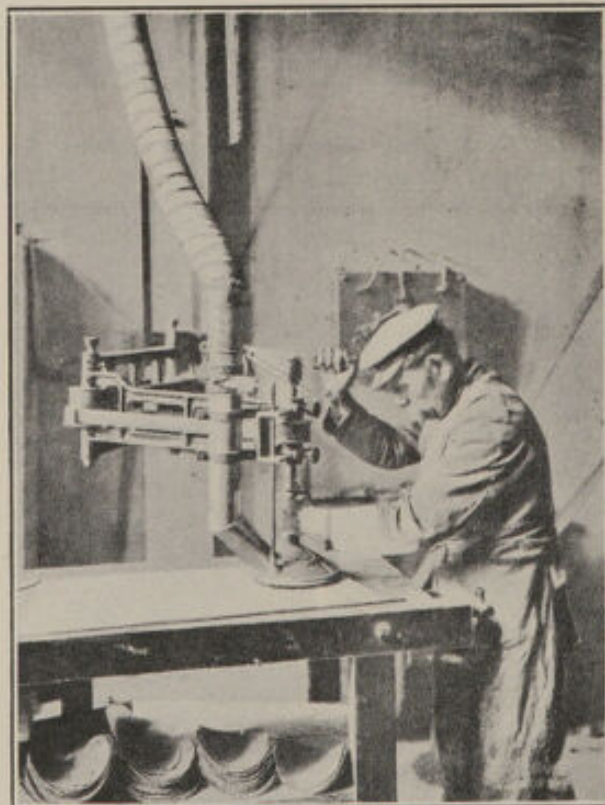


FIG. 98.—Flexible Piping for removal of Dust made by small horizontal sanding disc, which is movable over a wide surface. (Messrs. Sturtevant Engineering Co., Ltd., London.)

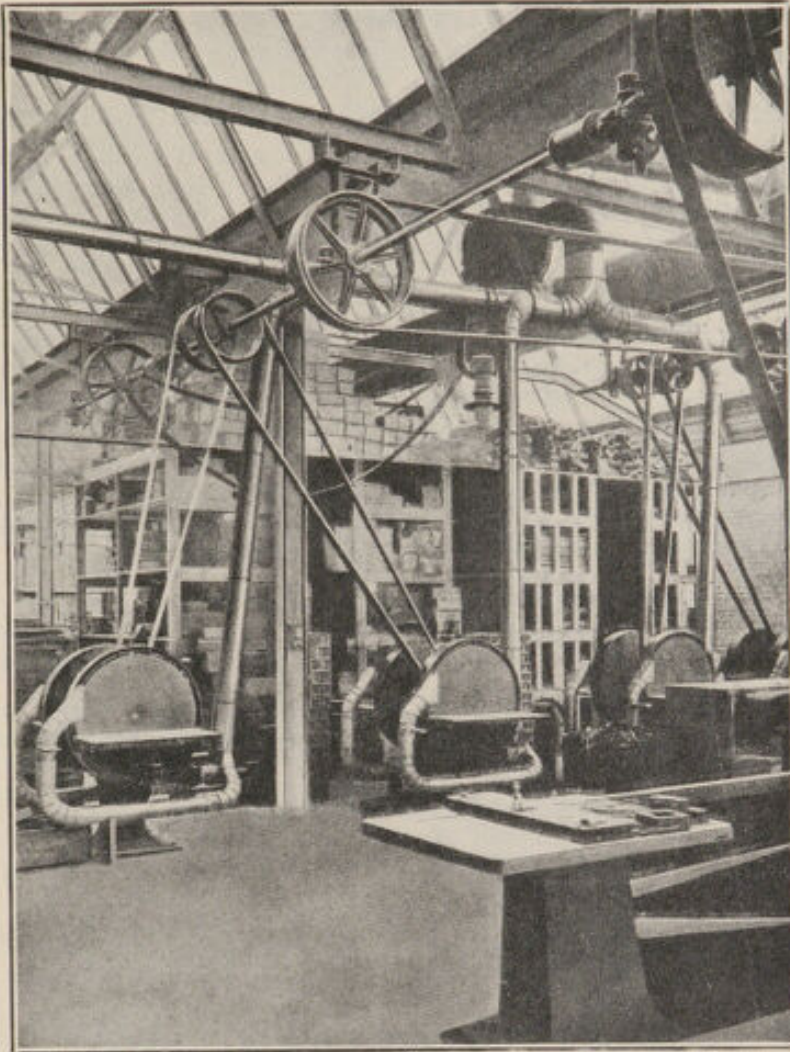


FIG. 99.—Dust-Exhausting System at Sanding Discs. (Messrs. W. E. Browning & Co., Leytonstone.)

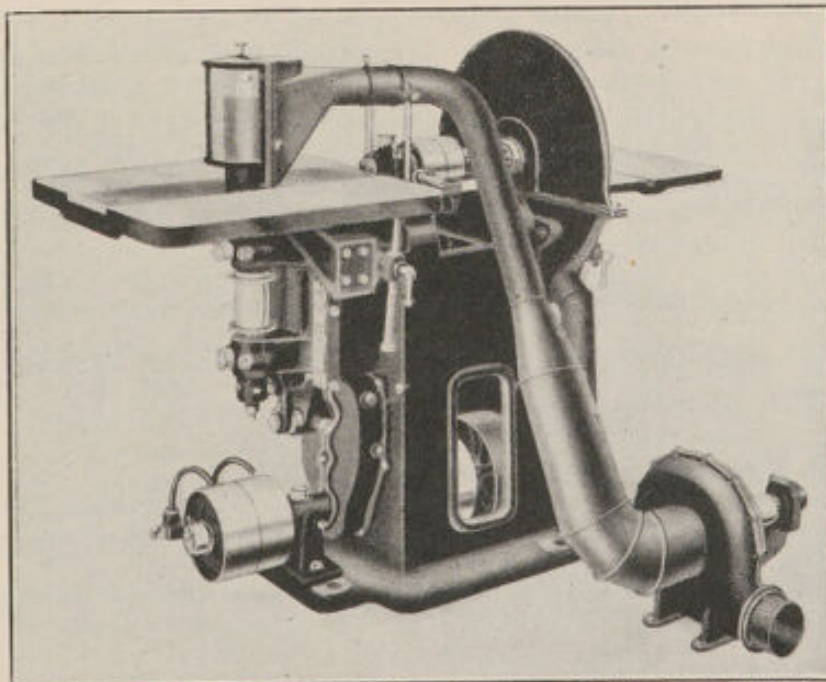


FIG. 100.—Exhaust applied to combined Disc and Vertical Bobbin Sander. (Messrs. Wadkin & Co., Leicester.)

APPENDIX.

THE WOODWORKING MACHINERY REGULATIONS.*

In pursuance of Section 79 of the Factory and Workshop Act, 1901, I hereby make the following Regulations and direct that they shall apply to all factories or parts thereof and to any place to which the provisions of the said Section are applied by the said Act in which any woodworking machinery is used.

Provided that if the Chief Inspector of Factories is satisfied in respect of any factory or other place to which these Regulations apply that, owing to the special conditions of the work or otherwise, any of the requirements of the Regulations can be suspended or relaxed without danger to the persons employed therein, he may by certificate in writing authorise such suspension or relaxation for such period and on such conditions as he may think fit. Any such certificate may be revoked at any time.

These Regulations† may be cited as the Woodworking Machinery Regulations, 1922, and shall come into force on 1st January, 1923.

‡Definitions.

In these Regulations—

"*Woodworking machine*" means a *circular saw, plain band saw, planing machine, vertical spindle moulding machine or chain mortising machine operating on wood.*

"*Circular saw*" means a circular saw working in a bench (including a rack bench) for the purpose of ripping, deep-cutting or cross-cutting, but does not include a swing saw or other saw which is moved towards the wood.

"*Plain band saw*" means a band saw, other than a log saw or band re-sawing machine, the cutting portion of which runs in a vertical direction.

"*Planing machine*" includes a machine for overhand planing or for thicknessing or for both operations.

* * * *

"*Underground room*" means a room any part of which is so situate that half or more than half the whole height thereof measured from the floor to the ceiling is below the surface of the footway of the adjoining street or of the ground adjoining or nearest to the room.

"*Gauge*" means the Imperial Standard Wire Gauge.

Duties.

It shall be the duty of the occupier to observe Part I of these Regulations.

It shall be the duty of all persons employed to observe Part II of these Regulations.

* St. R. & O., 1922, No. 1196, and 1927, No. 207.

† These Regulations, as amended by the Woodworking Machinery (Amendment) Regulation, 1927 (*see* footnote on the next page), may now be cited as the Woodworking Machinery Regulations.

‡ Terms to which defined meanings are given are printed throughout in italics.

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(ii) The knife shall be maintained as close as practicable to the saw, having regard to the nature of the work being done at the time, and at the level of the bench table the distance between the front edge of the knife and teeth of the saw shall not exceed half an inch.

(iii) For a saw of a diameter of less than 24 inches, the knife shall extend upwards from the bench table to within one inch of the top of the saw, and for a saw of a diameter of 24 inches or over shall extend upwards from the bench table to a height of at least nine inches.

(c) The top of the saw shall be covered by a strong and easily adjustable guard, with a flange at the side of the saw farthest from the fence. The guard shall be kept so adjusted that the said flange shall extend below the roots of the teeth of the saw. The guard shall extend from the top of the riving knife to a point as low as practicable at the cutting edge of the saw.

(11) A suitable push-stick shall be kept available for use at the bench of every circular saw which is fed by hand, to enable the work to be carried on without unnecessary risk.

(12) Every plain band saw shall be guarded as follows:—

(a) Both sides of the bottom pulley shall be completely encased by sheet metal or other suitable material.

(b) The front of the top pulley shall be covered with sheet metal or other suitable material.

(c) All portions of the blade shall be enclosed or otherwise securely guarded, except the portion of the blade between the bench table and the top guide.

(13) After 1st March, 1924, no planing machine, which is not mechanically fed, shall be used for overhand planing unless it is fitted with a cylindrical cutter block.

(14) No planing machine, which is not mechanically fed, shall be used for planing overhand any piece of wood less than twelve inches in length unless a safe holder is used for such piece of wood. Provided that this regulation shall not apply to the operation of planing the edges of flat pieces of wood, nor to a planing machine which is fitted with a cylindrical cutter block.

(15) Every planing machine used for overhand planing shall be provided with a "bridge" guard capable of covering the full length and breadth of the cutting slot in the bench, and so constructed as to be easily adjusted both in a vertical and horizontal direction.

(16) The feed roller of every planing machine used for thicknessing, except the combined machine for overhand planing and thicknessing, shall be provided with an efficient guard.

(17) The cutter of every vertical spindle moulding machine shall when practicable be provided with the most efficient guard having regard to the nature of the work which is being performed.

(18) For such work as cannot be performed with an efficient guard for the cutter, the wood being moulded at a vertical spindle moulding machine, shall, if practicable, be held in a jig or holder of such construction as to reduce as far as possible the risk of accident to the worker.

(19) A suitable "spike" or push-stick shall be kept available for use at the bench of every vertical spindle moulding machine.

(20) The chain of every chain mortising machine shall be provided with a guard which shall enclose the cutters as far as practicable.

(21) The guards and other appliances required by these Regulations shall be maintained in an efficient state and shall be constantly kept in position while the machinery is in motion, except when, owing to the nature of the work being done, the use of the guards or appliances is rendered impracticable. The guards shall be so adjusted as to enable the work to be carried on without unnecessary risk.

(22) Regulations 10, 12, 15 and 16 shall not apply to any *woodworking machine* in respect of which it can be shown that other safeguards are provided and maintained which render the machine equally safe as it would be if guarded in the manner prescribed by these Regulations.

Part II.—Duties of Persons Employed.

(23) Every person employed on a *woodworking machine* shall

(i) use and maintain in proper adjustment the guards provided in accordance with these Regulations;

(ii) use the "spikes" or push-sticks and holders provided in compliance with Regulations 11, 14, 18 and 19;

except when, owing to the nature of the work being done, the use of the guards or appliances is rendered impracticable.

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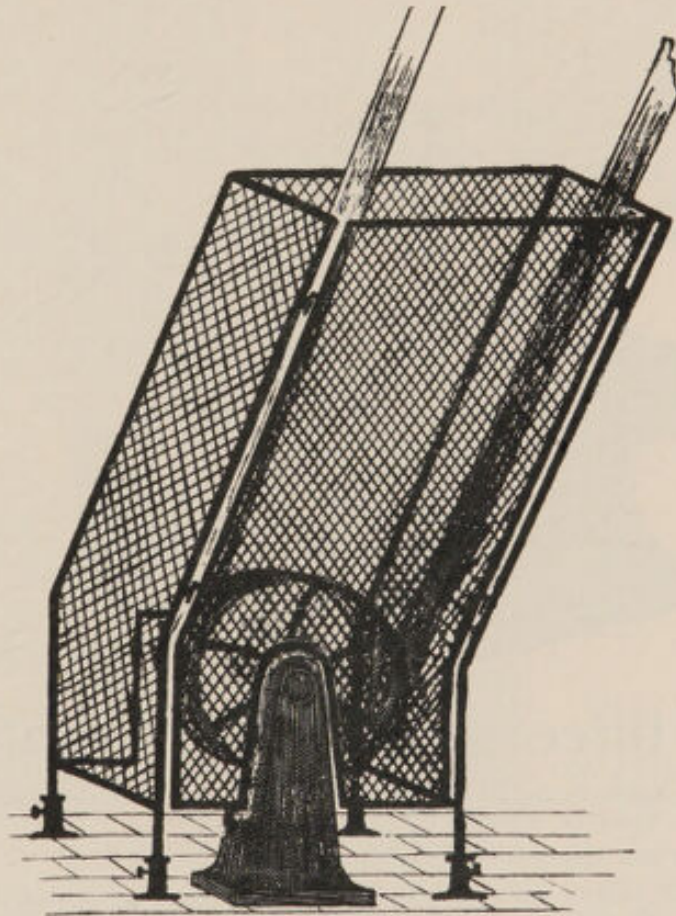
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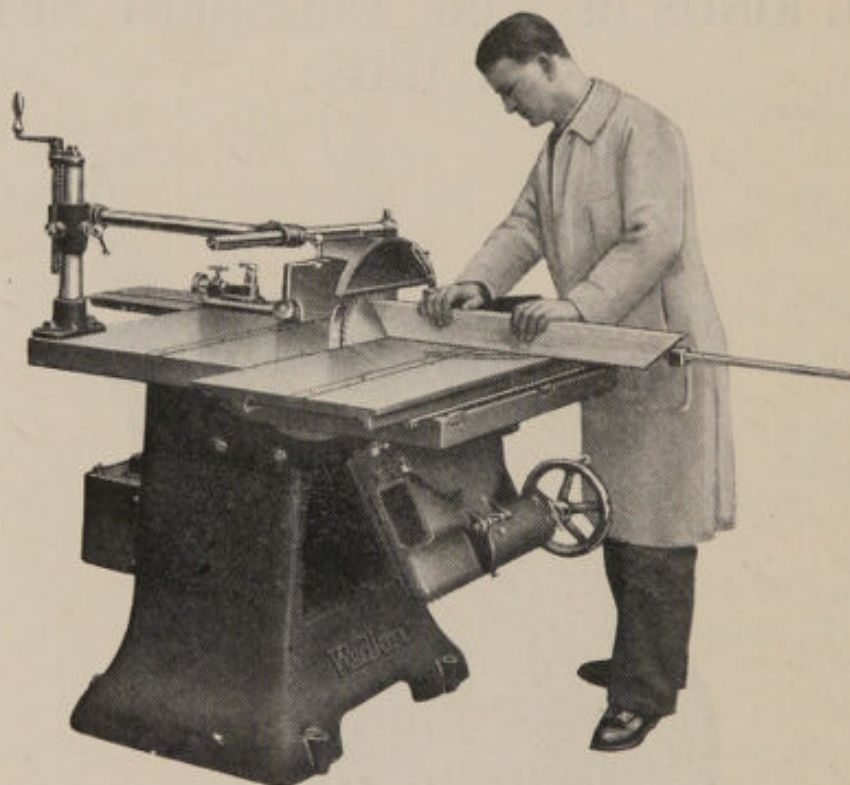
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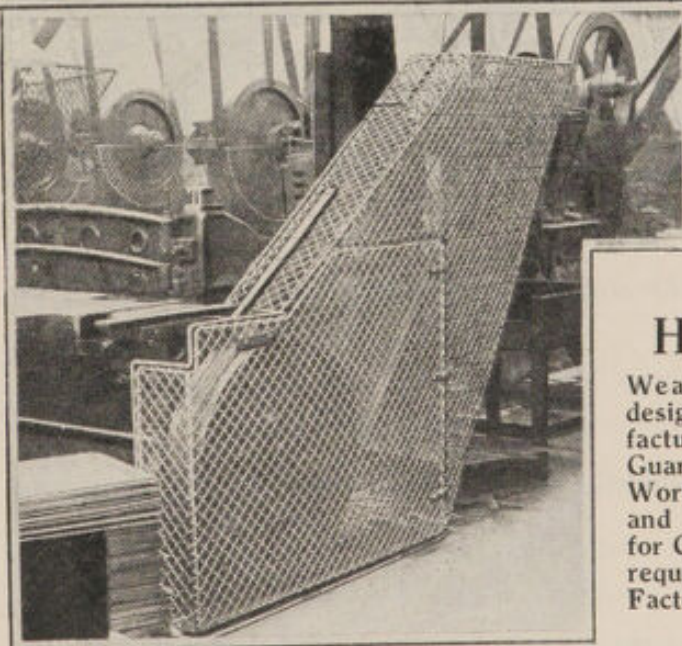
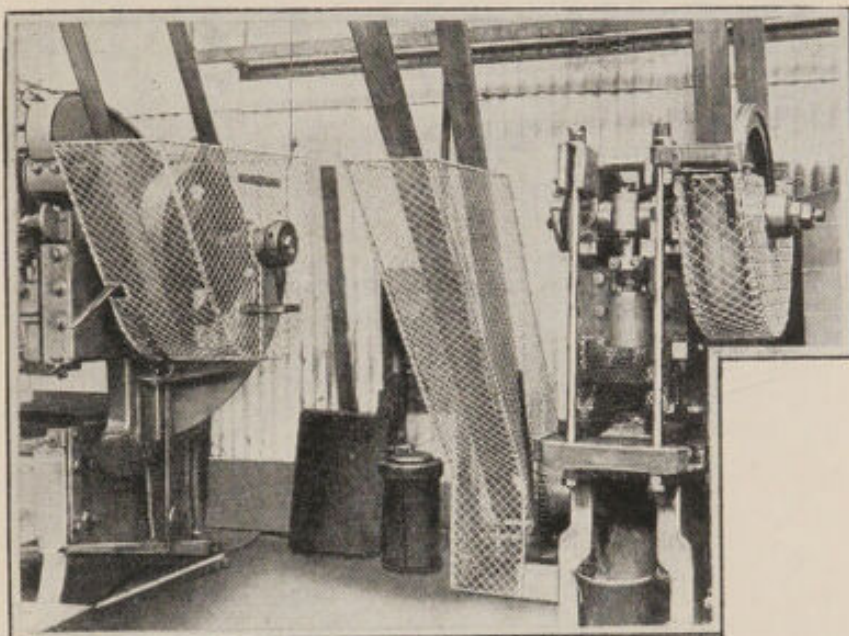
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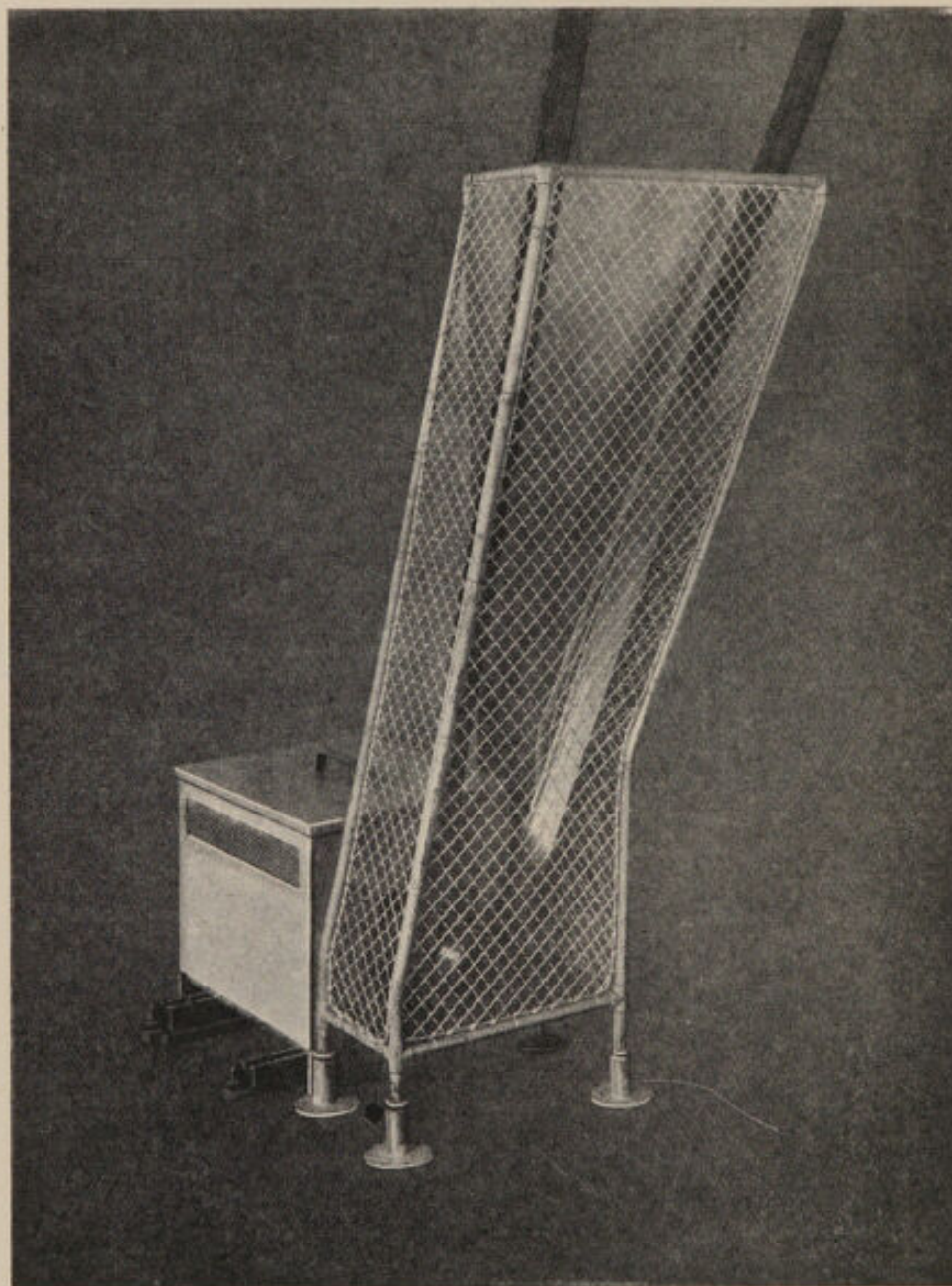
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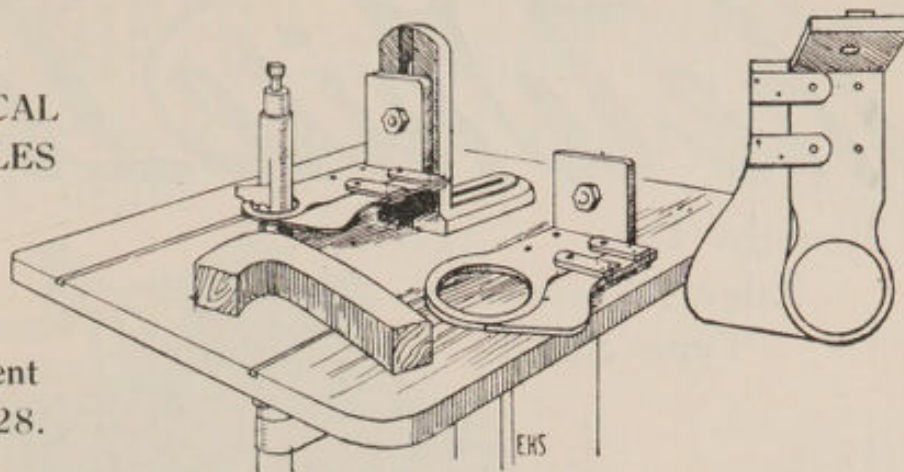
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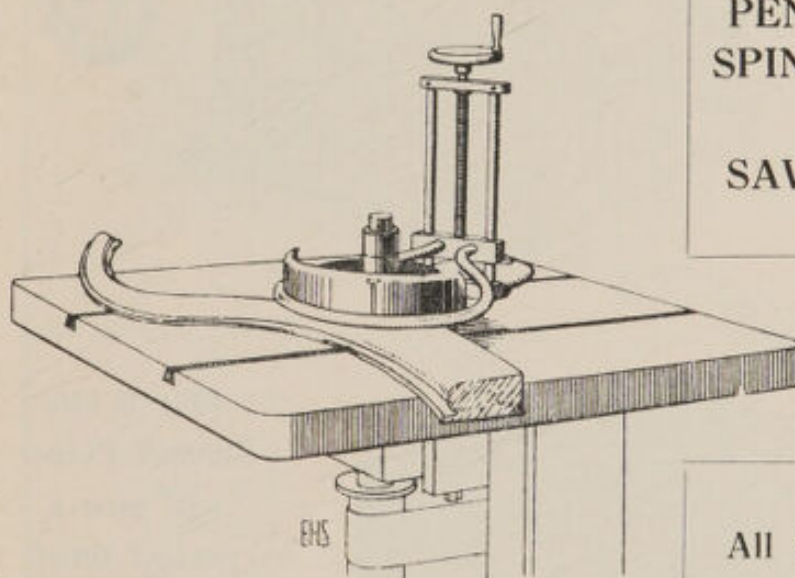
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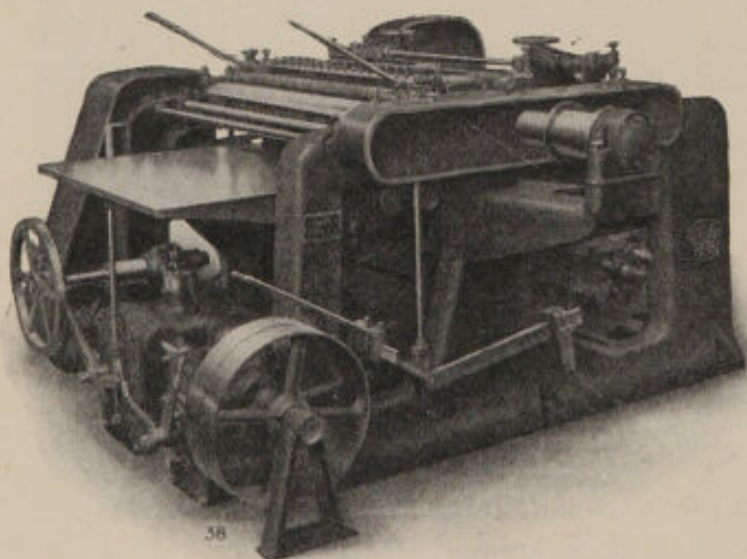
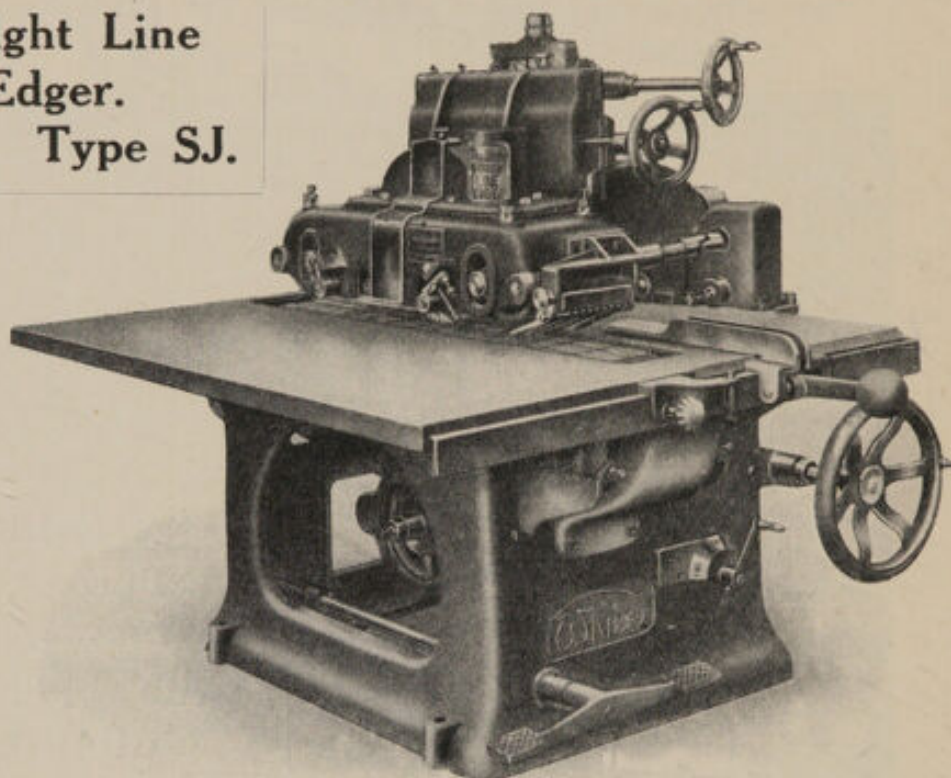
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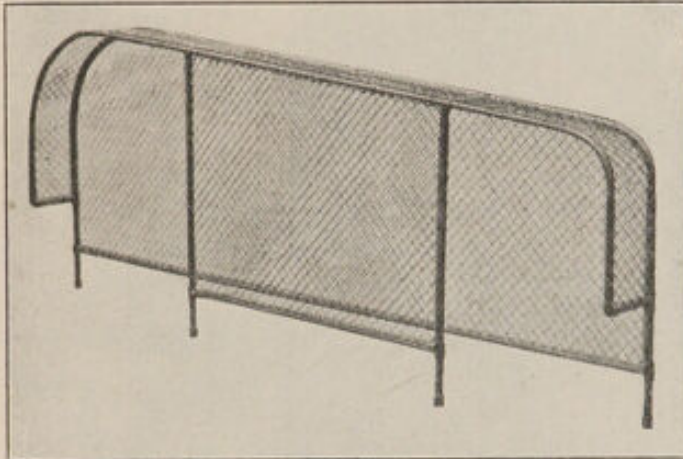
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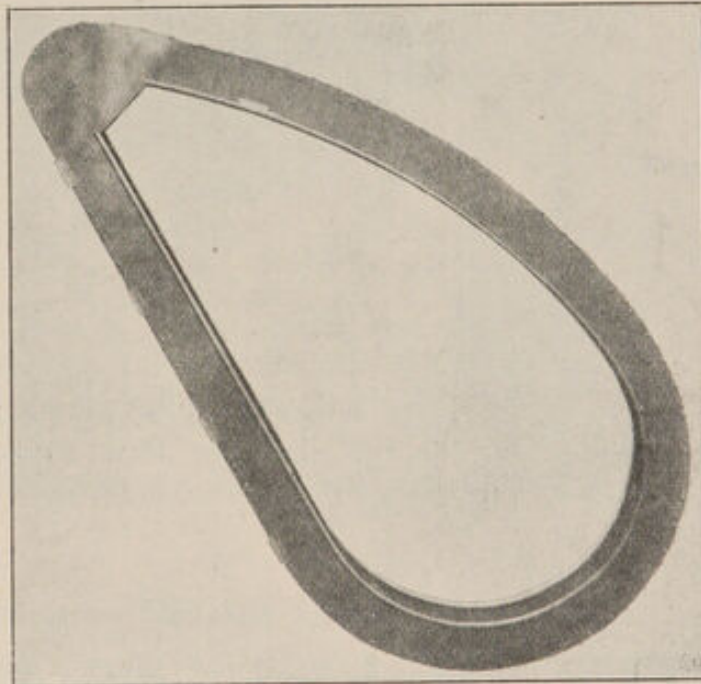


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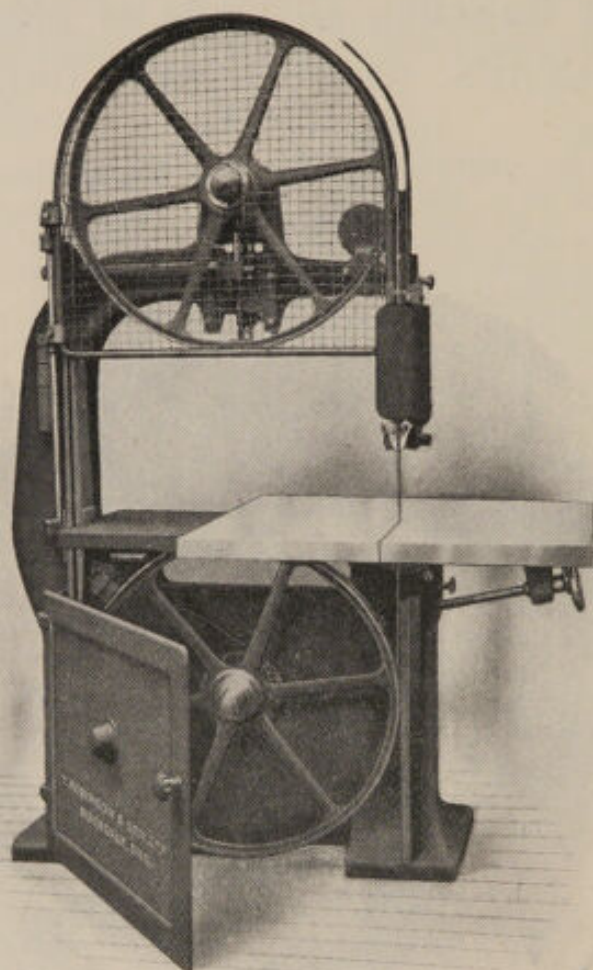
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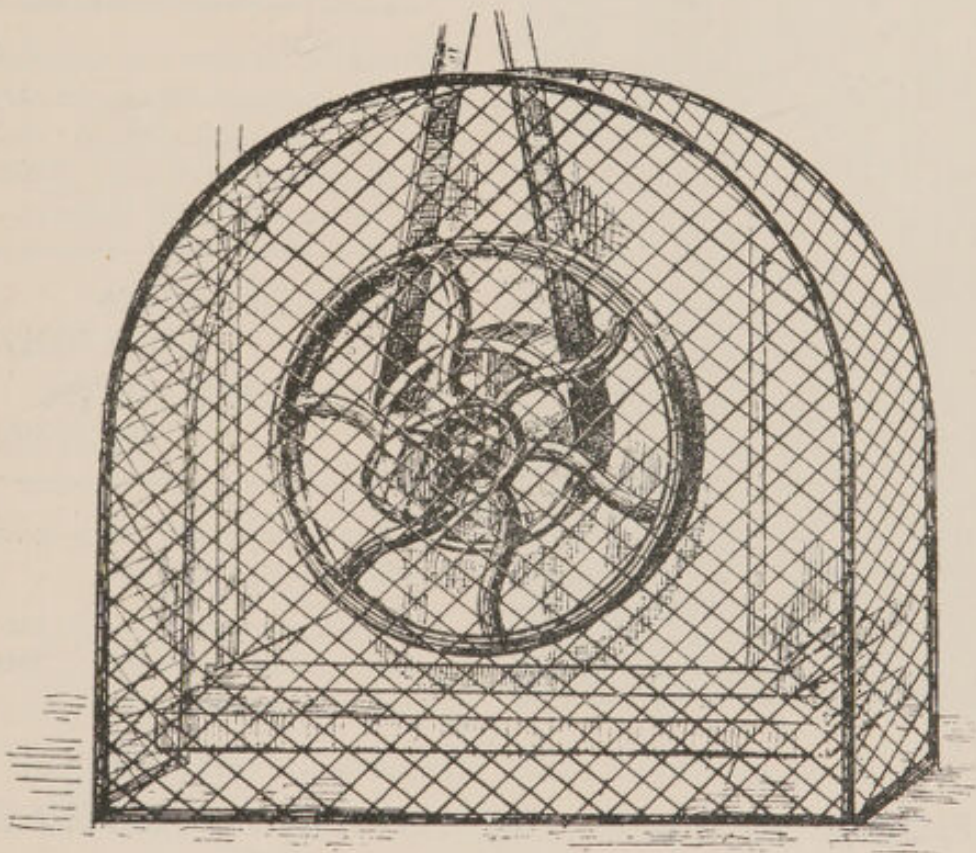
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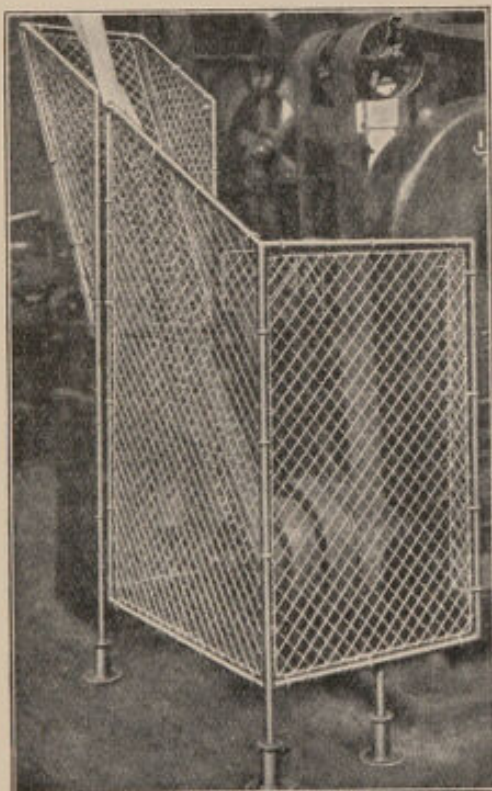
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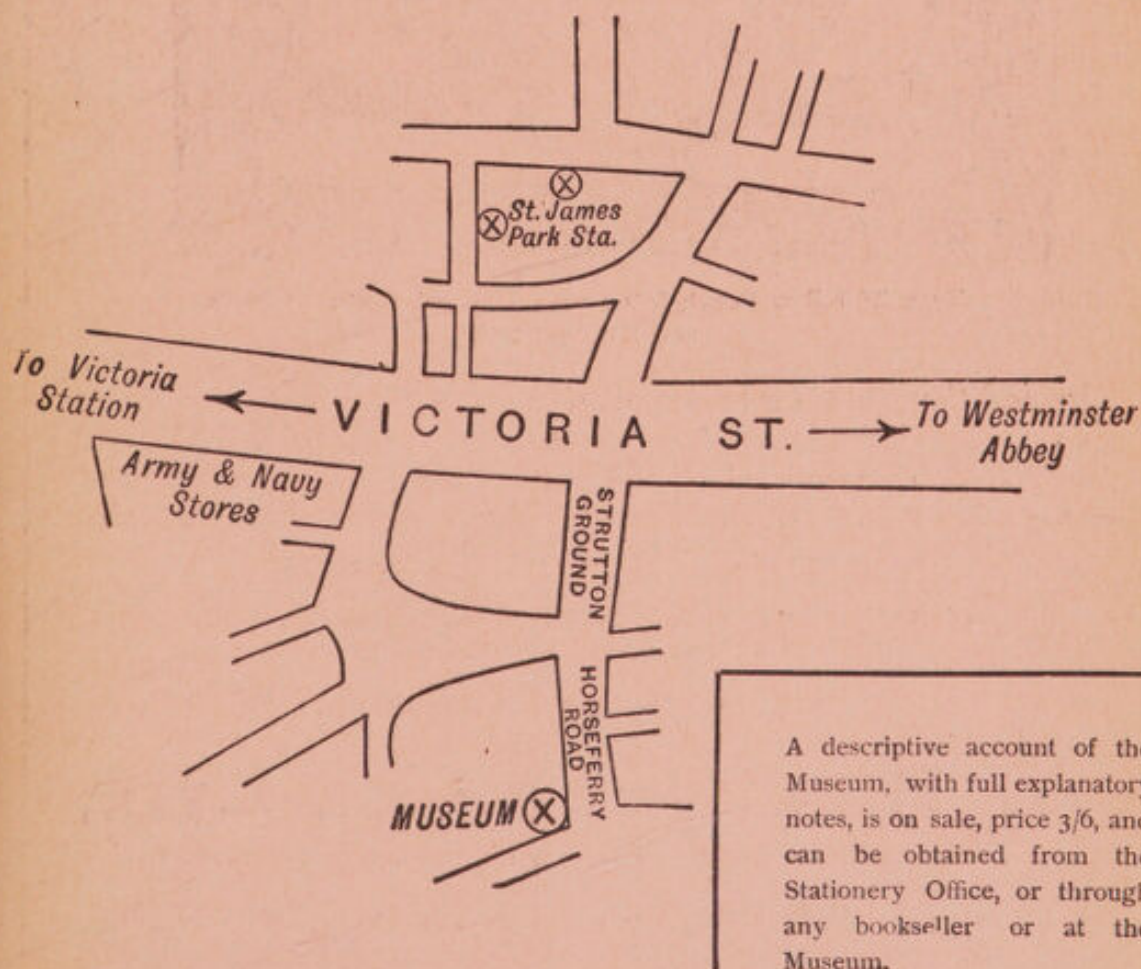
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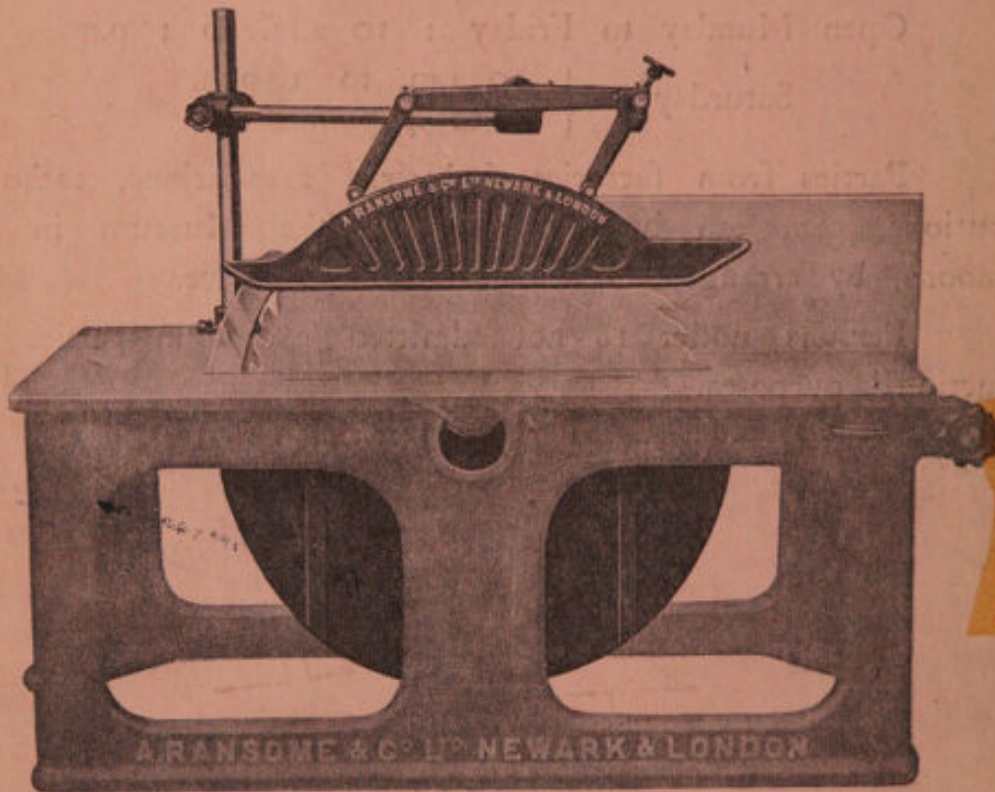
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