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SAFETY CODE SERIES

SAFETY CODE
FOR POWER PRESSES AND
FOOT AND HAND PRESSES

NATIONAL SAFETY COUNCIL, SPONSOR

—
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American Engineering Standards Committee



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SAFETY CODE FOR POWER PRESSES AND FOOT AND HAND PRESSES

INTRODUCTION

This Code was formulated and revised according to the procedure of the American Engineering Standards Committee, under the sponsorship of the National Safety Council, by the following committee:

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1. The use of power presses and foot and hand presses for stamping and forming pieces of metal and other material has grown so rapidly, and the loss of hands or fingers on these presses as commonly operated is so frequent, that this hazard has become one of the most serious mechanical problems in accident prevention. Different factors that make the problem difficult are the wide variety of operations and operating conditions—variations as to size, speed, and type of the press; size, thickness, and kind of pieces to be worked; construction of dies; required accuracy of the finished work; skill of operators; length of the run, etc. Under these varying conditions a wide variety of guards and feeding methods has been devised.

2. This Code is one of a number of safety codes on various subjects which have been or are being formulated under the general auspices of the American Engineering Standards Committee. One purpose of the Code is to serve as a guide to State authorities. The Code itself is printed on pages 2 to 9, inclusive, of this publication, and it includes such requirements as may properly be enforced by a State industrial commission or labor department. These requirements are necessarily brief and general because of the varying conditions mentioned above. It, therefore, has seemed advisable to include an appendix on pages 11 to 20 presenting additional information that is not a part of the Code but which contains illustrated descriptions and discussions of press hazards and of the methods that have been used to overcome them. The photographs will be loaned on request to State or other authorities desiring to reproduce this Code.

3. When adopted for State use, the references to other national codes in section 3 should be changed so as to refer to the corresponding regulations of the State itself.

4. The Code is also intended for use directly by concerns operating presses. When so used the distinction between "mandatory" and "advisory" items (see par. 20, sec. 2) largely disappears. The entire Code may be adopted by any manufacturing concern as a standard to be followed by its superintendents, foreman, designers, mechanics, and operators.

5. While very different problems are encountered in large and small shops, and on large and small presses, a definite line can not be drawn between them and therefore they are not treated separately in this Code. For most of the sections of the Code illustrations will be found in the appendix showing the application of the various safeguarding methods to both large and small presses and to short as well as long runs.

6. It is realized that there are many hazards in shops where presses are used and that not all of these hazards are related to press operation. These nonpress hazards are important but they can not logically be covered in this Code. They are or will be dealt with in other codes.

SECTION 1. SCOPE AND PURPOSE

Rule 10. Scope.

These requirements apply to all power presses, foot presses, and hand presses, by which are meant machines fitted with rams (plungers) and dies for the purpose of blanking, trimming, drawing, punch-

ing, or stamping material, also including plate shears and plate punches but not including bulldozers, hot-metal presses, hammers, bending presses or brakes, power screw or fitting presses, air presses, and hydraulic presses, which are either covered by other codes or require special treatment.

Rule 11. Interpretations and exceptions.

The purpose of this Code is to provide reasonable safety for life, limb, and health. In cases of practical difficulty or unnecessary hardship, the enforcing officers or body may grant exceptions from the literal requirements of this Code or permit the use of other devices or methods, but only when it is clearly evident that equivalent protection is thereby secured.

NOTE.—To secure the uniform application of this Code enforcing officers are urged, before rendering decisions on disputed points, to consult the committee which formulated it—the Committee on Safety Code for Presses, in care of American Engineering Standards Committee, 29 West Thirty-ninth Street, New York, or National Safety Council, 108 East Ohio Street, Chicago.

SECTION 2. DEFINITIONS

Rule 20.

The word “shall” is to be understood as mandatory and the word “should” as advisory.

Rule 21.

The word “approved” means approved by the authority having jurisdiction.

Rule 22.

The word “ram” means the moving part of the press which is sometimes called plunger, slide, gate, or mandrel.

Rule 23.

The word “knockout” covers any mechanical device for removing material, sometimes called kickout or ejector.

Rule 24.

“Manual feeding” is placing material under the ram by hand or by hand tools.

Rule 25.

“Semiautomatic feeding” is placing material under the ram by some mechanical device, which device requires the attention of an operator at each stroke of the ram.

Rule 26.

“Automatic feeding” is placing material under the ram by a mechanically actuated device that does not require the attention of an operator at each stroke of the ram.

Rule 27.

A “gate guard” is one that completely incloses the point of operation before the operating clutch can become engaged.

Rule 28.

A “sweep guard” is one that moves across the point of operation after the operating clutch has become engaged.

SECTION 3. REFERENCES TO OTHER CODES

Rule 30.

This Code is supplemented by the following codes:
 Safety Code for Mechanical Power Transmission Apparatus.

NOTE.—Copies may be obtained from the American Society of Mechanical Engineers, 29 West Thirty-ninth Street, New York City.

National Electrical Safety Code.

NOTE.—Copies may be obtained from Superintendent of Documents, Government Printing Office, Washington, D. C.

National Electrical (Fire) Code.

NOTE.—Copies may be obtained from National Board of Fire Underwriters, 76 William Street, New York City.

Safety Code for Walkway Surfaces.

NOTE.—This code is now in preparation, but tentative draft may be obtained from the American Engineering Standards Committee, 29 West Thirty-ninth Street, New York City.

Code of Lighting Factories, Mills, and Other Work Places.

NOTE.—Copies may be obtained from Superintendent of Documents, Government Printing Office, Washington, D. C.

Safety Code for the Protection of the Heads and Eyes of Industrial Workers.

NOTE.—Copies may be obtained from Superintendent of Documents, Government Printing Office, Washington, D. C.

SECTION 10. GENERAL HAZARDS

Rule 100. Press foundation.

Every press shall be placed on a substantial foundation, floor, or other support, and shall be securely fastened or anchored in place.

Rule 101. Working space and aisles.

Presses shall be so located as to give (*a*) enough clearance between machines so that the movement of one operator will not interfere with the work of another; (*b*) ample room for cleaning machines and handling the work, including material and scrap; (*c*) aisles of sufficient width to permit the free movement of employees bringing and removing material. Surrounding floors and flooring shall be kept in good condition, free from obstructions and grease.

Rule 102. Lighting.

Presses should be so located, with respect to sources of both natural and artificial light, that light of sufficient intensity will fall on the work; direct or reflected glare and shadows, including moving shadows, should be avoided.

NOTE.—For specific requirements see Code of Lighting Factories, Mills, and Other Work Places.

Rule 103. Means of disconnecting power.

Every power press shall be provided with means for disconnecting all power from the press and from the pulley on press. Acceptable methods are:

(a) Individual motor drive; if the switch or starter is so constructed and located that the motor may be accidentally started, provisions shall be made to permit locking or latching in off position.

(b) Tight and loose pulleys on countershaft, with belt shifter which can be locked or latched in off position.

(c) Belt perch or idler pulleys to facilitate throwing belts off and on the drive pulley.

(d) Clutch on drive pulley, with clutch handle that can be locked or latched in off position.

Large presses should, if possible (as, for example, friction-clutch presses), have some provision for stopping press instantly at any point of the stroke.

Rule 104. Belt, pulley, gear, and shaft guards.

All belts, pulleys, gears, and shafts shall be guarded. Removable sections, preferably hinged, shall be provided in such guards where necessary, so that the press can be turned by hand.

NOTE.—For specific requirements see Safety Code for Mechanical Power-Transmission Apparatus.

Rule 105. Switches and other electrical apparatus.

All switches and other electrical apparatus shall be guarded.

NOTE.—For specific requirements see National Electrical Safety Code and National Electrical (Fire) Code.

Rule 106. Feeding mechanisms.

All gears and feed rolls on press feeding mechanisms shall be guarded.

NOTE.—For specific requirements see Safety Code for Mechanical Power-Transmission Apparatus.

Rule 107. Protection against flying particles.

A shield, goggles, or other means of protection should be provided if the nature of the operation and the kind of material are such as to cause an appreciable hazard from flying particles.

NOTE.—For specific requirements see Safety Code for the Protection of the Heads and Eyes of Industrial Workers.

SECTION 11. SAFEGUARDING PRESS HAZARDS AT POINT OF OPERATION

Rule 110. Safeguarding classification.

One or more means of safeguarding the press hazards at the point of operation shall be provided and used on every press, depending upon the method of feeding, and in accordance with the following:

Method of feeding press	Safeguarding required
I. Automatic feed..... Automatic roll feed. Automatic push or pull feed. Automatic plunger feed.	Inclosure of ram (see rule 111), or limitation of ram stroke (see rule 112), or gate guard (see rule 113).
II. Semiautomatic feed..... Chute feed. Slide feed. Sliding dies. Dial feed. Revolving dies.	Inclosure of ram (see rule 111), or limitation of ram stroke (see rule 112), or gate guard (see rule 113).
III. Manual feed.....	Inclosure of ram (see rule 111), or limitation of ram stroke (see rule 112), or gate guard (see rule 113), or two-hand tripping device (see rule 113), or sweep guard (see rule 113), or special hand tools (see rule 114).

Rule 111. Inclosure of ram.

Opening between bottom of inclosure and work or working surface shall not exceed $\frac{3}{8}$ inch. The top of the inclosure shall extend at least as high as the upper limit of travel of the ram. There shall be no dangerous shear points between the guard and any moving part. Openings in the guard shall not exceed $\frac{1}{2}$ inch if within 4 inches of any danger point; if farther away than 4 inches, openings shall not exceed 2 inches square or 1 inch wide.

NOTE.—If the inclosure is very close to the die, it is recommended that openings do not exceed $\frac{3}{8}$ inch.

Rule 112. Limitation of ram stroke.

If press is safeguarded by limiting the ram stroke, the stroke of the ram shall be such that the clearance between the ram and die or stripper shall not exceed $\frac{3}{8}$ inch.

Rule 113. Gate guards, two-hand tripping devices, sweep guards.

If press is safeguarded by gate guard, or two-hand tripping device, or sweep guard, such guards and devices shall conform to the following specifications:

(a) Every such device shall be simple and reliable in construction, application, and adjustment. It shall be permanently attached by means of cap screw or through bolts to the press frame. It shall not offer any accident hazard of itself. It shall be designed and constructed to minimize the possibility of removing or misusing essential parts and to facilitate inspection of them.

(b) The device shall be so designed and constructed that it would be extremely difficult for the operator to place or permit his hand to remain within the danger zone while the ram is approaching the lower limit of its down stroke.

(c) Two-hand tripping devices should be so arranged as to prevent tying, wedging, or otherwise securing one handle or button and operating the press with the other hand only, except by use of a key in possession of foreman.

(d) On slow acting presses the device shall be arranged so as not to permit the operator placing his hand in the danger zone after the press has been tripped and while the ram is still descending.

(e) Openings in gate and sweep guards shall not be greater than specified in rule 111.

(f) Unless the device is directly connected to the ram (for example, a sweep guard), a nonrepeat attachment shall be provided, by which the treadle or operating lever is disconnected after each stroke and a positive stop is introduced to stop the press. The nonrepeat attachment shall not be dependent upon the action of any spring, except a compression spring operating in or on a closely fitting barrel or rod and so wound that the space between coils is less than the diameter of the wire. Such nonrepeat attachment, however, is not required for a gate guard so constructed as to assure its being in place to offer full protection if the press should repeat from riding the treadle or breakage of the latch return spring.

NOTE.—A nonrepeat attachment may be so arranged that it can be rendered inoperative in case continuous operation is desired, provided that for such operation the press shall otherwise be safeguarded as specified in rule 110.

Sweep guards which are attached to the ram and which move downward so that the operator's hand might be caught between gate and lower die are not recommended.

If nonrepeat attachments are provided on some of the presses in a department, they should preferably be provided on all the presses so that there will be less likelihood of confusion and, therefore, of accident when operators are changed from one machine to another.

Two hand-tripping devices constitute a serious hazard if it is easy to tie down or wedge one lever or button so the press can be operated with one hand only. Press operators must be given careful supervision by foremen or others in positions of authority to insure the proper use of such devices.

Rule 114. Special hand tools.

Hand tools for placing and removing material shall be such as to permit easy handling of material without the operator placing his hand in the danger zone. Such tools are accepted in lieu of a guard, only where the use of the tools is strictly enforced by the employer.

SECTION 12. OTHER PRESS GUARDS

Rule 120. Treadle guard.

On every foot-operated power press a substantial guard shall be placed over the treadle to prevent accidental tripping, or an equally effective special design of treadle shall be used. For treadles other than long bars extending across the machine the openings in such guards shall not be more than twice the width of the foot.

Rule 121. Latch on hand lever.

Hand-operated power presses, especially if of large size, should be equipped with a spring latch on the lever to prevent accidental or premature tripping.

Rule 122. Interlocking device.

Each hand-operated power press, if tended by more than one man, should have an interlocking lever or similar device controlled by the helper to prevent accidental or premature tripping.

SECTION 13. MAKING AND SETTING DIES**Rule 130. Design and construction.**

Newly constructed dies shall be designed and constructed so as to involve the least possible hazard to the press operator. They should be cut away so that unnecessary crushing hazards will not exist. They should be so arranged that the operator will assume a natural position and do his work in the safest possible manner. Dies shall be so designed and constructed as to provide or permit safeguarding as required in section 11. The die setter should be held responsible for procuring and installing, when he sets the dies for any operation, an effective guard or safe feeding arrangement suitable to the operation.

SECTION 14. OPERATING RULES**Rule 140. Inspection and maintenance.**

Regular inspections shall be made to insure proper condition of all bolts and screws which might become loosened by vibration; of all treadle attachments, treadle and clutch springs, and all parts of clutch. Oil should not be allowed to collect in excessive quantities because of the possibility of gumming and causing the clutch or pulley to stick and repeat.

Rule 141. Die setting.

In setting dies (except on large presses which can not be turned by hand) the source of power shall be disconnected from the press and the press shall be turned by hand until proper alignment of the dies is assured.

Rule 142. Instruction of operators.

Before starting to work on a press, and before starting to work on any materially different operation, the press operator should be carefully instructed in the hazards of the machine and of the particular operation and in the safe method of work.

Rule 143. Rules for operators.

The foreman of the press department should enforce the following rules:

(a) Do not operate your machine unless the press and all safety devices are in perfect working order. If anything is wrong, stop work and notify the foreman.

(b) Always use the safety devices and guards provided for your protection.

(c) If you think that any device on your press interferes with production, consult the foreman and try to devise some better guard. For most operations some method can be found that is both safe and efficient.

(d) If automatic or semiautomatic attachments or special tools are provided for feeding, always use them and never place your hand under the ram.

(e) It is easier and quicker to feed stock from the level of the press table.

(f) If material sticks in the die, remove it with a stick, not with fingers. If this happens frequently, notify foreman, who will have the attachment or die adjusted.

(g) Do not wear gloves if there is danger of fingers being caught under the ram or in feed rolls.

(h) Grasp material by the sides, if possible, rather than by top and bottom.

(i) Do not let your hand or head be caught between top of guard and any projection on ram.

(j) Keep your hair short or wear a cap.

(k) Inspect clutch mechanism at beginning of each shift and operate press without work a few times to make sure that brake band is working properly. This is especially important on Monday morning or after any shutdown, and after oiling.

(l) If clutch begins to click, have it inspected.

(m) Never distract attention of another press operator—you might cause him to lose a finger.

(n) Pay strict attention to your work at all times.

(The remainder of this pamphlet is not a part of the Power Press Code. It is merely a discussion of the Code, including illustrated descriptions of press hazards and methods for overcoming them, the paragraphs being numbered 200 to 250 and followed by Figures 1 to 63.)

APPENDIX

A.—POWER-PRESS HAZARDS

Paragraph 200. Classification by causes.

Most press accidents occur at the operating point or dies. The following table summarizes the results of a careful study of 147 power-press accidents, the reports of which were sufficiently detailed to make accurate classification possible. Sixty-one of these were taken from the records of the Aetna Life Insurance Company and 86 from the records of the Wisconsin Industrial Commission. The table clearly shows the general trend of press accidents although the number of cases is too small to include all minor causes. The tabular form of the first part of the classification is based on the fact that, for an operator to be injured at the operating point, there must be a combination of two causes—there must be some reason for him to place his hand between the dies, and there must be some reason for the ram to come down at that time.

(a) ACCIDENTS TO FINGERS OF OPERATOR AT OPERATING POINT

Cause	Ram came down because of—			Total
	Normal operation	Accidental tripping	Defect of machine	
Normal feeding or removing material.....	72	20	21	113
Removing material that stuck.....	7	5	2	14
Cleaning or oiling.....	1	1	—	2
Slipping, stumbling, horseplay, etc.....	2	1	—	3
Total.....	82	27	23	132

(b) ACCIDENTS DURING OPERATION BUT NOT AT OPERATING POINT

Caught between moving part and frame or bed.....	6
Adjusting machines without throwing off power.....	4
End of punch broke and struck eye.....	3
Miscellaneous:	
Adjusting machine, accidentally threw on power.....	1
Injured heel on treadle and developed infection.....	1
Total.....	15
Grand total.....	147

In six of these cases the operator reached around the side of a stationary or movable guard.

In five cases the press was equipped with a two-hand device which was out of order or not effective.

In four other cases there was a mechanical guard which failed to operate.

In four cases the operator failed to use the chute feed.

In one case he took the guard off.

In one case he failed to use the hand tool provided.

In one case he left his finger on the sliding die, the ram being unguarded.

The files from which these power-press accidents were taken also disclosed 4 accidents on foot presses—3 during normal operation and 1 resulting from horseplay.

Par. 201. Normal operation.

The large proportion of accidents listed under “normal operation” shows clearly that most of them occur on unguarded or imperfectly guarded presses, due to an error or lack of coordination on the part of the operator, such as—

- (a) Tripping too soon.
- (b) Riding the treadle.
- (c) Failing to remove fingers soon enough.
- (d) Reaching in to adjust material after tripping.
- (e) Wearing gloves.

To operate an unguarded press usually requires accurate coordination of the movement of hands and feet and this in turn requires that the mental condition of the operator be of a high standard. Anything that interferes with such coordination, whether internal or external, is likely to cause an accident.

Par. 202. Accidental tripping.

The table shows that another important cause of accidents is accidental depression of the treadle, as by—

- (a) A falling object.
- (b) Being struck by truck or other moving object.
- (c) A person other than the operator stumbling onto it.
- (d) Operator being bumped into by another person or an object.

Par. 203. Defects of machine.

As indicated by the table, a considerable number of accidents result from genuine repeating or dropping back of the press, caused by a defect or deficiency in the machine, such as—

- (a) Pulley “seizing” or “freezing” on shaft.
- (b) Drifting because of poor braking (brake becoming loose or brake bolt shearing off).
- (c) Dog breaking.
- (d) Latch return spring breaking or coming loose.
- (e) Pitman breaking, allowing ram to drop.
- (f) Square-jawed clutch burring and sticking.

Par. 204. Die setting.

Another group of accidents consists of those occurring to die setters, while setting or adjusting dies, when fingers are caught by the unexpected descent of the ram, or when a splinter is thrown from the dies out of alignment.

Par. 205. Falling objects.

Die setters are sometimes injured by dropping a die on the hand or foot, by a scratch or bruise from hand tools, etc. These are often not reported as press accidents.

Par. 206. Miscellaneous.

A small percentage of press accidents result from other causes, such as—

- (a) Flying particles or pieces, from the material or the die, striking the operator's eye, face, or neck.
- (b) Operator or other person, or material, being caught between belt and pulley, or belt catching and pulling press over.
- (c) Shaft breaking, permitting pulley to fall.
- (d) Person or material being caught in gears.
- (e) Injury from electric power.
- (f) Knockout mechanism breaking, and falling bolt or other part injuring operator's foot.

B.—SAFEGUARDING PRESS HAZARDS AT POINT OF OPERATION

Par. 207. Safeguarding classification.

As specified in rule 110 of the Code, one or more means of safeguarding the press hazards at the point of operation shall be provided and used on every press, depending upon the method of feeding and in accordance with the following:

Method of feeding press	Safeguarding required
I. Automatic feed Automatic roll feed (see par. 213). Automatic push or pull feed (see par. 214). Automatic plunger feed (see par. 215). (See Figs. 2, 3, and 4.)	Inclosure of ram (see pars. 222-225), or limitation of ram stroke (see par. 226), or gate guard (see pars. 231-233).
II. Semiautomatic feed Chute feed (see par. 216). Slide feed (see par. 217). Sliding dies (see par. 218). Dial feed (see par. 219). Revolving dies (see par. 220). (See Figs. 32 to 43.)	Inclosure of ram (see pars. 222-225), or limitation of ram stroke (see par. 226), or gate guard (see pars. 231-233).
III. Manual feed (See Figs. 1 to 31.)	Inclosure of ram (see pars. 222-225), or limitation of ram stroke (see par. 226), or gate guard (see pars. 231-233), or two-hand tripping device (see par. 234-238), or sweep guard (see pars. 228-230), or special hand tools (see par. 227).

Par. 208. Automatic or semiautomatic feed preferable to manual feed.

Automatic or semiautomatic methods of feeding can usually be adapted for the majority of jobs that are now fed manually (except for certain blanking operations). Such methods eliminate all the hazards described in paragraphs 201, 202, and 203, and prevent accidents caused by inattention or other failure of the operator as well as those caused by mechanical defects. These methods also generally result in an increase in production and a decrease of spoilage. One or another of them should, therefore, be used wherever possible.

Par. 209. Long and short runs.

It is often assumed that automatic or semiautomatic feeding is practicable only in large establishments or on continuous runs. This is not the case. Some companies have found it possible to use auto-

matic or semiautomatic methods on all press operations, both long and short runs. There are doubtless still some cases where these inherently safe methods of feeding are impracticable and where an external guard is the only form of protection that can be applied, but such cases have been found to be much less numerous than was formerly supposed, and their number is constantly decreasing as experience with the other methods develops.

Par. 210. Not an afterthought.

These preferred methods of feeding are not something to be applied after the operation has been laid out and the dies made. They are an essential part of the operation itself. Therefore, they can not be successfully used except with the knowledge and cooperation of the die designers, die makers, and die setters, as well as of the operating executives. Feeding devices, knockouts, and guards must in general be attached to the die, or must be laid out to conform to the die; therefore, the die designer, maker, and setter should be held responsible for them and should have the element of safety constantly in mind during the designing, construction, and placing of the dies.

Par. 211. Suggestions for die designers, makers, and setters.

(a) Before starting to make a die determine what method of feeding is to be used to insure safe operation and lay out the die accordingly.

(b) Cut away all unnecessary metal, especially on front and sides. (See fig. 1.)

(c) Cut away front of upper die at 45° bevel to decrease danger and enable operator to see the work. (See fig. 1.)

(d) Construct and set dies so operator will hold stock by sides, not by top and bottom.

(e) If piece is to be cut or formed on one end only, arrange dies so the other end of the piece will project at the front and can thus be held safely by operator.

(f) It is advisable to tap heavy dies so that screw eyes may be inserted for convenience in lifting. In case of dies with pilot pins, the screw eyes should be placed in the lower die to prevent dies separating.

(g) A "soft punch and a hard die" tend to prevent chipping.

(h) Use guide pins to insure alignment of dies and reduce hazard of flying particles.

(i) On hand-fed blanking work make an inclosing guard to fit the die or adjust some guard already on hand for this purpose. On some small jobs this inclosure may be attached to the die or die block instead of to the machine. Generally the bottom of the inclosure can be attached to the stripper.

(j) Set the stripper or inclosure not more than $\frac{3}{8}$ inch above the lower die and have the top of the inclosure at least as high as the highest travel of the ram.

(k) Guard not only the front but both sides of the die, and the back if possible, so the operator will not be tempted to reach around under the ram if the material sticks.

(l) The lower die may be extended sidewise and backward by means of a plate to prevent reaching in. (See fig. 22.)

(*m*) When setting dies or making adjustments (except on large presses which can not be turned by hand) always disconnect the power first. Throw the belt off (unless a tight and loose pulley, or clutch on the drive shaft, is provided). The "safety stop" or pin provided on the clutch of the press is not sufficient to protect you in case the pulley should seize on the shaft.

(*n*) If you disconnect power by throwing a belt shifter, clutch lever, or electric switch, be sure to lock or block it in the open position.

(*o*) In running the press the first few times under power, it is good practice to place a steel shield in front of the dies in case the die should shift and a splinter be thrown out.

(*p*) Before you leave the machine make sure that the guard or the feeding apparatus is in first-class condition for safe, efficient operation. Remember the press operator is not a machinist and can not be expected to repair a broken, bent, or defective guard.

(*q*) Before leaving the press, tighten any loose screws or bolts and repair any other defects that you may observe in the press itself, or in the tripping mechanism.

(*r*) Always remember that a die is not a good die unless it is a safe die.

C.—AUTOMATIC AND SEMIAUTOMATIC FEEDS

Par. 212. Advantages.

Where automatic or semiautomatic feeding can be used, they have been found the most generally successful means of safeguarding the operation and in most cases they have also increased production or reduced cost. With these feeds it is unnecessary for the operator to place his hand under the ram during ordinary feeding. He may, however, be tempted to do so if a piece sticks, or he may do so accidentally. Therefore, it is necessary to provide a stick or pick with which to remove the material if necessary, and an inclosure to prevent putting a hand under the ram. With an automatic feed this inclosing guard may well be interlocked with the clutch lever. (See fig. 2.)

Par. 213. Automatic roll feeds—

Are often used on continuous operations of blanking from strips. The small gears on feed rolls should be inclosed, especially for women operators whose clothing or hair may get caught. The rolls themselves should be guarded although not so hazardous as the gears. For construction of gear and feed-roll guards see Safety Code for Mechanical Power-Transmission Apparatus. The ram should be inclosed. (See fig. 3.)

Par. 214. Automatic push or pull feeds—

Are similar to roll feeds in general but different in actual feeding mechanism. This feed is also used for blanking larger pieces. The ram should be inclosed.

Par. 215. Automatic plunger feed.

Another form of automatic feed is a magazine or chute in which blanks or partly formed pieces are placed and automatically fed one at a time by a mechanical plunger or other device which pushes them into place under the ram. (See fig. 4.) This method some-

times can not be used where accurate placing is required. For this as for other automatic feeds an inclosure of the ram is necessary.

Par. 216. Chute feed.

One of the most widely used semiautomatic methods of feeding consists of a horizontal or inclined chute in which each piece is placed by hand. The piece then slides or is pushed onto or into the lower die. As with the methods already described, it is necessary to inclose the ram. The safety of this method of feeding lies primarily in the fact that in regular operation the hand need never be placed under the ram, while for removing pieces of stock a pick is provided. Some of the many variations of this method which have been used successfully to meet various conditions are shown in Figures 5 to 10. Companies using feeds of this type have found that they practically eliminate accidents, increase production, and decrease costs; and can be adapted to many blanking or forming operations of small or moderate size.

Par. 217. Sliding feeds—

And other special mechanical feeds have been used to advantage in certain forming operations. (See figs. 11, 12, and 13.)

Par. 218. Sliding dies—

Are those which slide forward at each operation for safe feeding and then return to position under the ram for the downward stroke. The die may be slid forward and backward automatically, or by hand, or by a foot lever. The ram should be inclosed to eliminate danger to the operator. (See figs. 14, 15, and 16.)

Par. 219. Dial feeds—

Operate on the same principle as revolving dies, except that the dial simply carries the work into one fixed die. Inclosure of the ram is necessary.

Par. 220. Revolving dies—

Composed of two or more dies in one and automatically revolving with each stroke of the press, likewise permit safe feeding. Inclosure of the ram is necessary. (See figs. 17 to 21.)

Par. 221. Safety finger spring.

Automatic mechanisms sometimes introduce special hazards of their own which require attention.

D.—RAM INCLOSURES

Par. 222. Inclosing guards.

For most hand-set blanking work, and for some forming operations, complete protection can be provided by an inclosing guard with space between the guard and lower die sufficient to admit stock but not fingers—not exceeding $\frac{3}{8}$ -inch. Such guard is often attached to the stripper or to the die itself. To permit a view of the work the guard, or the front portion of it, is often made of wire mesh, wired with glass, or mica. (See figs. 22 to 34.)

Par. 223. The guard may be in telescopic form or in the form of a spring. As such guards must fit the size and shape of the die, it is essential that the die maker or die setter be made responsible for

procuring and setting up a proper guard for each new operation. One large user of such guards carries them in standard sizes, the opening through which the upper die passes varying by 1 inch.

Par. 224. For complete protection the guards should inclose the rear as well as the front and sides of the ram, or the lower die should be extended by means of a horizontal plate so as to prevent reaching in from the sides or rear. (See figs. 23 and 27.)

Par. 225. The operation of riveting ears to kettles can be made safe by inclosing the ram with a guard attached to the lower die or horn and assembling the kettle, ear, and rivets before placing in the press.

E.—LIMITATION OF RAM STROKE

Par. 226. Short stroke of ram.

A similar method, giving complete protection, is to use a press with short ram stroke or with length of stroke adjustable. The stroke can then be adjusted so there is not enough room for a finger to get under the ram.

F.—GATE GUARDS

Par. 227. Need for supervision; repeating.

Gate guards, in connection with the tripping mechanism, must be carefully maintained and supervised to prevent being thrown out of adjustment intentionally or unintentionally. They should be so constructed as to prevent reaching around, over, or under the guard. Most gate guards are preferable to sweep guards in one respect, because when the treadle or hand lever is operated the gate completely incloses the point of operation before the clutch can become engaged. When connected with the tripping mechanism only, however, they do not guard against accidents caused by repeating of the press, and an effective nonrepeat attachment should be used except as provided in rule 113e of the Code. (See pars. 239 to 243.)

Par. 228. Usual types.

Most gate guards are attached to the foot treadle. Some types expand upward or sideways instead of downward. The usual well-known types of gate guard are not illustrated here; special arrangements are shown in Figures 2, 35 to 38.

Par. 229. Hand trip.

Instead of being connected to the foot treadle, the gate guard may be pulled down by hand and at the last instant of travel may itself trip the press.

G.—TWO-HAND TRIPPING DEVICES

Par. 230. Adjustments.

As specified in rule 113c of the Code, two-hand operating attachments should be so arranged that it will be impossible to block, tie down, or hold down one button or handle. Adjustments to permit operating by one hand or by foot, when the nature of the operation requires, should be controlled by the foreman only.

Par. 231. Positive stop.

Some two-hand tripping devices introduce a positive stop or solid block below the ram, which is removed only when the hand levers are depressed, thus preventing accidents from repeating as well as from error of the operator. (See figs. 39, 40, and 41.)

Par. 232. Nonrepeat device needed with other types.

Most two-hand devices, however, are attached to the tripping mechanism and operate to trip the press or to release the foot treadle by which the press is tripped. These attachments offer no protection against genuine repeating of the press; therefore, an effective nonrepeat attachment (pars. 239 to 243) should always be used in connection with them. Most of the two-hand devices are well known and are therefore not illustrated here.

Par. 233. Use on large presses.

The electric and compressed-air types of two-hand attachment can be extended for large presses on which two or more men are employed, by placing four, six, or more buttons or valves in the electric circuit or air line, all of which must be operated simultaneously to operate the press.

Par. 234. Horn press.

A special variation of the attachments just described is the following: On a horn press where one hand is needed to hold the stock, a hand lever may be substituted for the foot treadle, thus keeping both hands out of danger.

H.—SWEEP GUARDS

Par. 235. Sweep guards attached to ram.

Figures 42 to 48 show various guards which swing or move across or in front of the die during the stroke of the press. The part which may strike the operator's hands should be covered with leather or rubber to soften the blow as much as possible. Guards of this type should be so arranged that the operator can not reach around or behind and get his hand into danger.

Par. 236. Attached to trip.

Sweep guards may be attached to the tripping mechanism. When so installed a nonrepeat attachment on the press is needed to give the same degree of protection as if the guard were attached to the ram (pars. 239 to 243).

Par. 237. Horn press.

For a horn press used for folding and grooving, a special guard has been devised, consisting of pieces on either side of the upper die which spread and push away the fingers when the ram descends. (See fig. 43.) Horn press operations may also be safeguarded by having the center portion of the upper die attached to the tripping mechanism, so that this portion comes down, ahead of the ram, and prevents the press being tripped if a finger is between the dies. The operation of such a device is similar to that of a gate guard (par. 228).

I.—HAND TOOLS

Par. 238. For hand feeding—

Without placing the hand under the ram, a variety of special tools have been developed and used successfully on operations where automatic feeds, or enclosing guards, are impracticable. Such tools include pushers, pickers, pliers, tweezers, forks, magnets, and suction disks. They furnish protection, provided they are always made use of by the operator; strict discipline is required to enforce their use. Therefore, because of the human element involved, they furnish less complete protection than the methods described in sections C, D and E; but with proper discipline they are safer than the methods described in sections G, H, and I. (See figs. 49 to 53.)

J.—NONREPEAT AND TREADLE-DISCONNECTING ATTACHMENTS

Par. 239. Purpose and function.

A nonrepeat attachment, as described in rule 113e of the Code and illustrated in Figs. 39, 40 and 41, removes the hazards of—

- (a) Operator riding treadle.
- (b) Pulley seizing on shaft.
- (c) Shaft drifting because of defective brake.
- (d) Breakage of latch return spring is not hazardous if spring is as described in rule 113e of the Code.

A nonrepeat attachment does not eliminate the hazard of the dog or other part of the mechanism breaking or wearing; this can be cared for only by regular inspection.

Par. 240. Where needed.

These devices are not required for safety where automatic or semi-automatic feeds, or inclosing guards, are used as described in paragraphs 212 to 226, inclusive, nor where safe methods of hand feeding are provided and rigidly enforced as outlined in paragraph 238. They are, perhaps, desirable, but not essential, with sweep guards or similar devices attached to the ram, as outlined in paragraph 235. It is, however, very desirable to provide an effective nonrepeat attachment and also a treadle guard, if the only other safeguard is a sweep or gate attached to the tripping mechanism (pars. 227 and 236) or a two-hand operating attachment not involving a positive stop (pars. 232 and 233).

Par. 241. Releasing brake.

To reduce wear on the brake and thus help to prevent repeating, a type of press in which the brake is released during each stroke is recommended.

Par. 242. Maintaining tension in brake band.

It is desirable to maintain constant tension in the brake band to reduce the likelihood of the press repeating or dropping back. This may be accomplished by introducing a strong spring at the brake-band connecting screw,

Par. 243. Ratchet to prevent dropping back.

Dropping back of the ram may be prevented by providing a ratchet wheel on the shaft with a dog or pawl so that shaft can revolve only in the forward direction.

K.—METHODS OF REMOVING MATERIAL**Par. 244. General.**

The safe removal of material, without placing the hand under the ram, is as necessary as the safe placing of it. In many types of automatic or semiautomatic feed the removal of material is taken care of automatically. In some cases the punchings fall through the lower die. In other cases the devices for placing material (such as special hand tools) also serve for removing it. In still other cases special schemes of removal are necessary.

Par. 245. Strippers—

Should always be used. On inclined presses these may be sufficient.

Par. 246. Knockouts.

Various types of automatic knockout, kickout, or ejector have been used, including mechanical devices and compressed-air jets, some of which are actuated automatically or by foot.

Par. 247. Knockout bolt guard.

On some types of press a guard to hold the knockout bolt (bumper stud) from being thrown onto the operator's feet, in case of breakage, is desirable. (See fig. 54.)

Par. 248. Reversing dies.

The danger of removing by hand can sometimes be eliminated by reversing the upper and lower dies and providing a knockout in the upper die. (See fig. 55.)

L.—QUALIFICATIONS OF OPERATORS

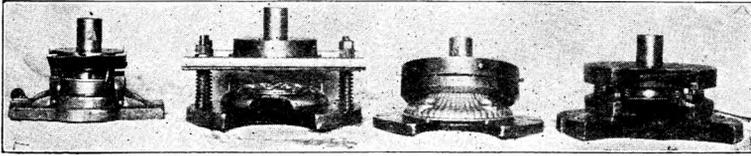
Par. 249. Workers should not be permitted on press operation if they are fatigued or otherwise unable to perform their work safely.

NOTE.—Men who change from day to night shifts become sleepy during their first night's work and therefore are not so alert as they are at other times. It has been practicable in some instances to place such men on less hazardous work during the first night.

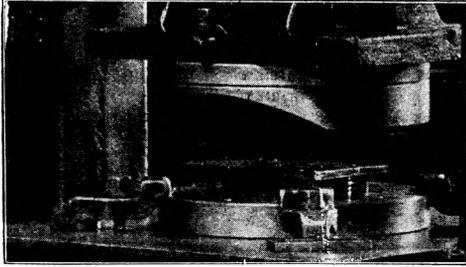
To reduce fatigue proper chairs for operators are recommended. Unless fool-proof feeding methods are used, the safe operation of a power press requires accurate coordination; operators who can not or do not attend to their work should not be tolerated.

M.—PRESS INSTALLATIONS

Par. 250. Bolting power presses direct to a concrete floor or foundation causes vibration of the floor and may cause breakage of the bolts. This may be avoided by fastening the press to timbers grouted into the concrete, or by placing a "gasket" of soft wood 1 or 2 inches thick, or of cork or lead, between the press and the concrete. In the latter case hardwood washers between bed plate of press and upper end of bolt will further decrease vibration.

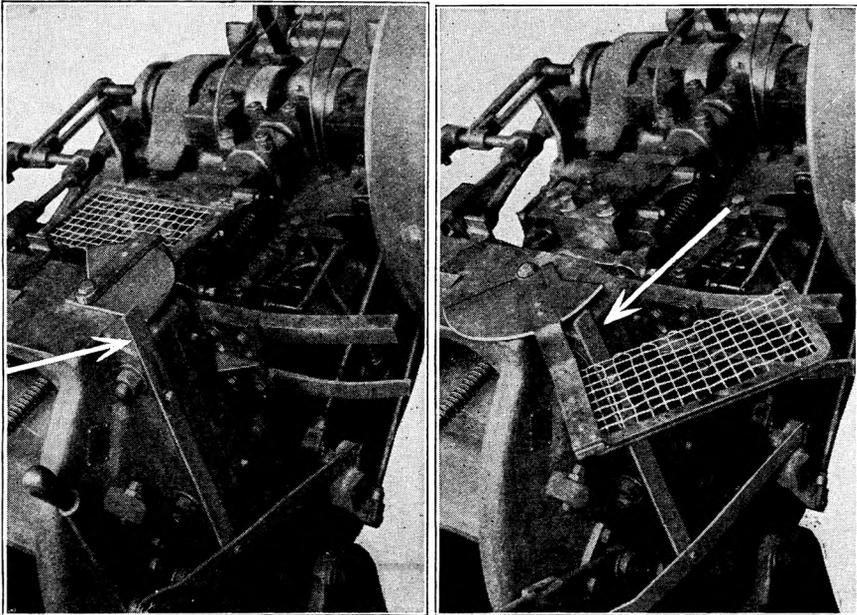


Courtesy Perfection Stove Co. and Aetna Life Ins. Co.



Courtesy Westinghouse Electric & Mfg. Co.

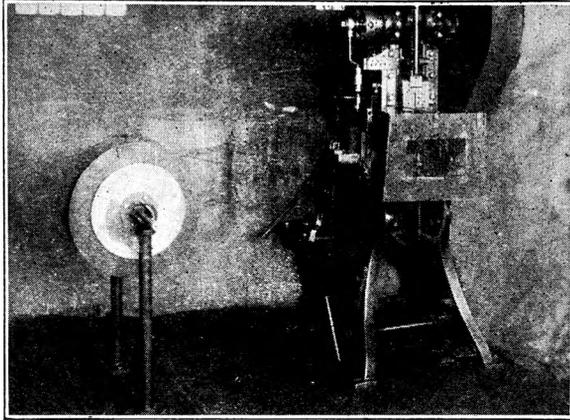
FIG. 1.—Dies and die holders cut away to decrease danger and to improve view of work. Special methods of guarding must also be provided. (Pars. 211 (b) and (c).)



Courtesy American Can Co.

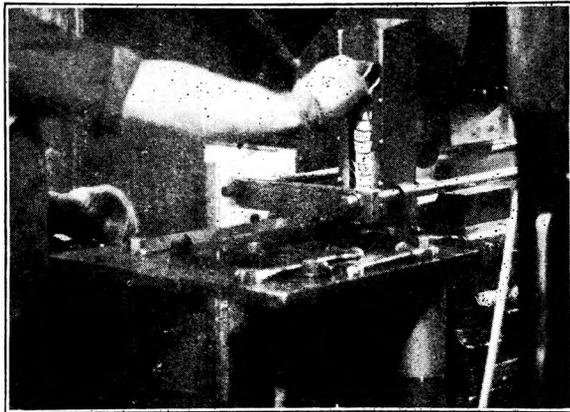
FIG. 2.—Automatic feed with gate guard. (Looking upward at front and side of press.) Material is fed from side, and press operates continuously. The bar indicated by arrow, attached to clutch lever, holds the gate guard in place in front of ram while foot treadle is in operating position. Second illustration shows machine stopped and guard open. Clutch lever can not be returned to operating position until guard has been closed. (Pars. 212 and 228.)

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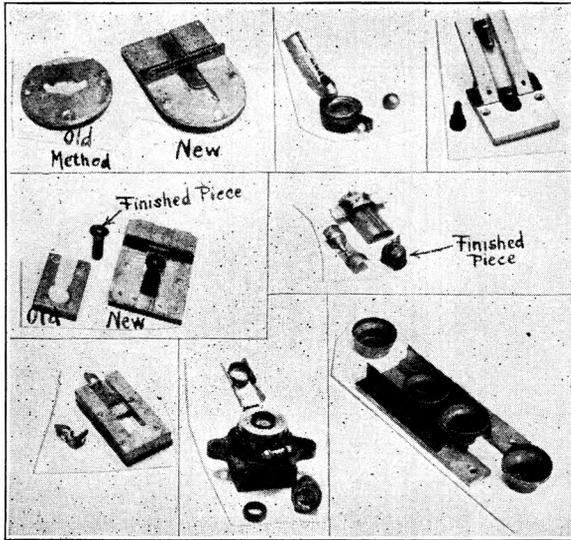
Courtesy Westinghouse Electric & Mfg. Co.

FIG. 3.—Automatic roll feed with ram inclosure. (Par. 213.)



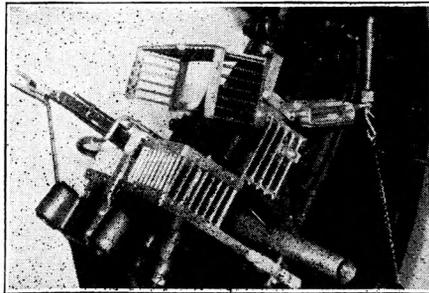
Courtesy Remy Electric Co., Division of General Motors Corp.

FIG. 4.—Automatic plunger feed. Piece at bottom of magazine is pushed onto die by plunger that is operated mechanically. Ram inclosure removed temporarily to show operation. (Par. 215.)



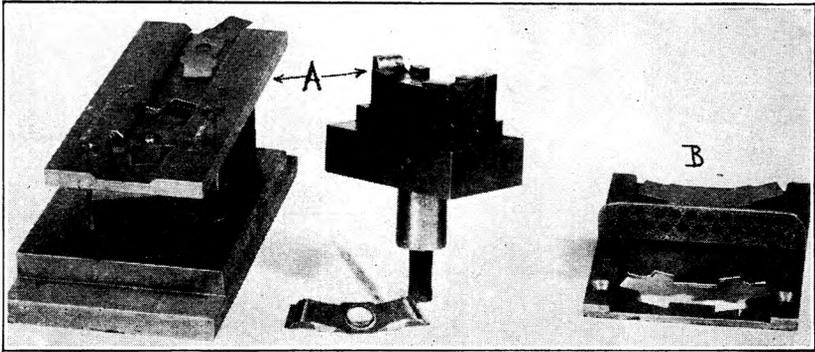
Courtesy Simmons Co.

FIG. 5.—Semiautomatic chute feed adapted to various irregular pieces. Formerly these pieces had to be set in die by hand. In some instances it has been necessary to reverse the punch and die. In many cases it is possible and advisable to attach chute to die. It often takes hours of experimenting with different angles of chute to get piece to locate itself properly. Complete protection is provided by adding ram inclosures. (Par. 216.)



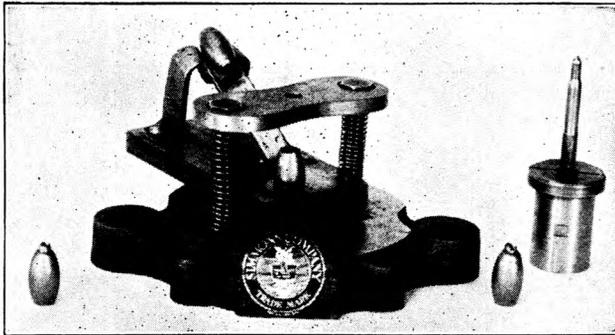
Courtesy American Can Co.

FIG. 6.—Semiautomatic chute feed, with ram inclosure made in two sections. Lower section secured firmly in position. Upper section so hinged that it can be raised when press is stopped. Press can not be operated when upper section is raised, and this section can not be raised while press is operating. Flywheel removed to show operation. (Par. 216.)



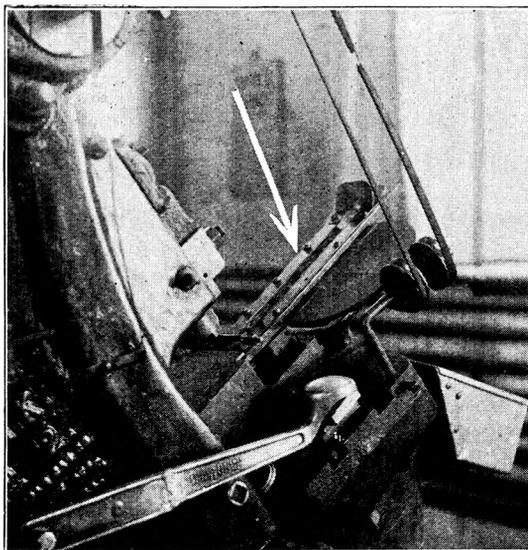
Courtesy Simmons Co.

FIG. 7.—Semiautomatic chute feed A permitting ram inclosure; used on inclined press. Formerly when piece was fed crosswise, as shown in B, it did not center itself in die. New method increased production and decreased spoilage. (Par. 216.)



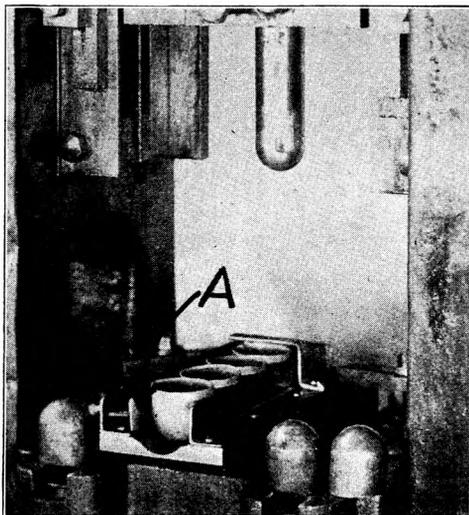
Courtesy Simmons Co.

FIG. 8.—Semiautomatic chute feed for piercing operation of barrel-shaped piece. Ram inclosure is provided. If set up on a straight press, the piece is ejected by compressed air; if set up on an inclined press, the piece will fall away by gravity. (Par. 216.)



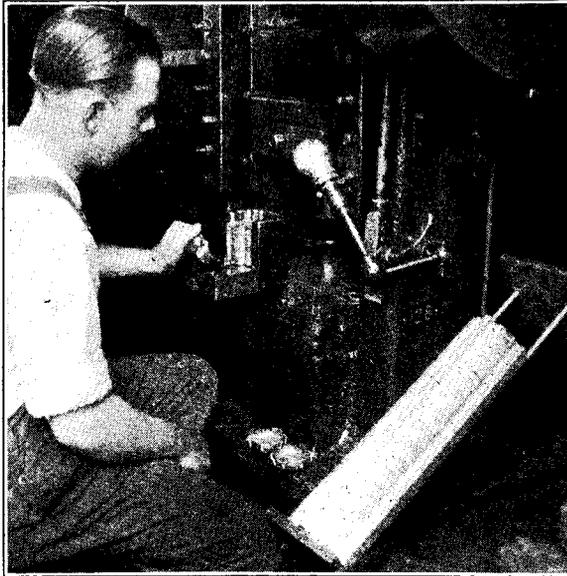
Courtesy Aluminum Goods Mfg. Co.

FIG. 9.—Semiautomatic chute feed. Pieces are so light that revolving dial has been installed under chute to help carry pieces into the die. Hand trip has been disconnected for this operation. Ram inclosure has been removed temporarily to show operation. (Par. 216.)



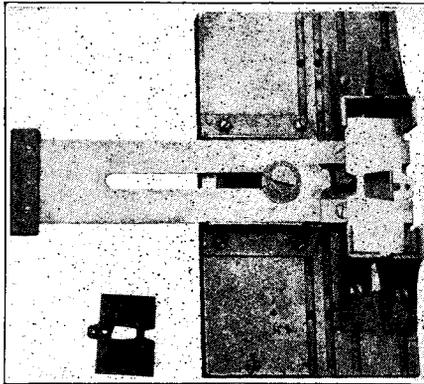
Courtesy Simmons Co.

FIG. 10.—Semiautomatic, horizontal chute feed. Vertical bar A, with springs behind it, put sufficient pressure on pieces to keep them from tipping over as they are pushed along, last piece on right dropping into die. Ram inclosure has been removed to show detail of operation. (Par. 216.)



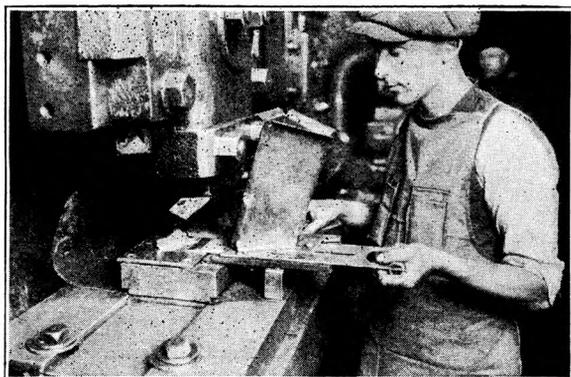
Courtesy Western Electric Co.

FIG. 11.—Semiautomatic slide feed. Lowest piece in magazine is pushed into die by hand-operated plunger. Ram inclosure has been removed temporarily to show detail of operation. (Par. 217.)



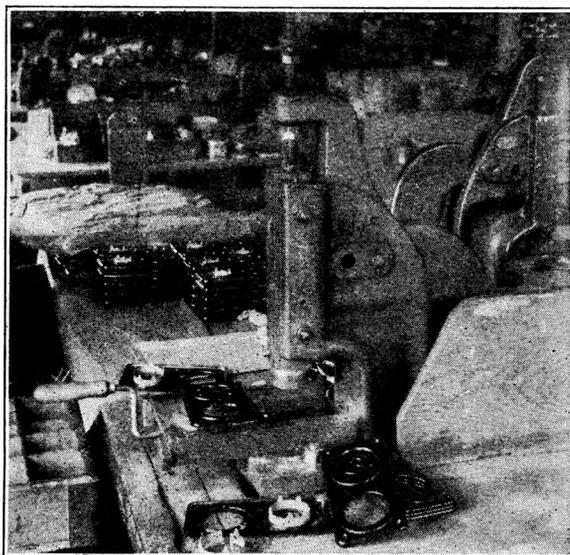
Courtesy Michigan Mutual Liability Co. and Weis Mfg. Co.

FIG. 12.—Looking down. Semiautomatic slide feed with hand-operated magazine that can be used interchangeably with various dies. Magazine is adjustable in that its size and shape may be varied to suit size and shape of various pieces, inasmuch as each corner of magazine can be positioned and fastened independently to base. Furthermore, bottom of magazine, through which blanks are pushed one at a time, can be raised for different thicknesses of stock. (Par. 217.)



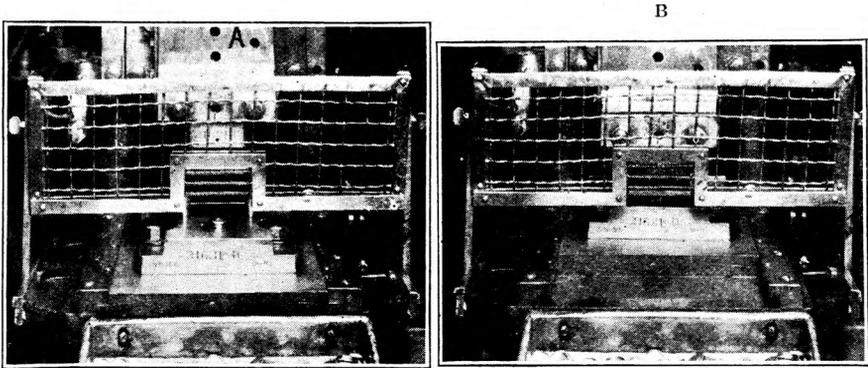
Courtesy Ford Motor Co.

FIG. 13.—Semiautomatic slide feed, consisting of magazine and hand-operated plunger. Ram inclosure removed temporarily to show detail of operation. (Par. 217.)



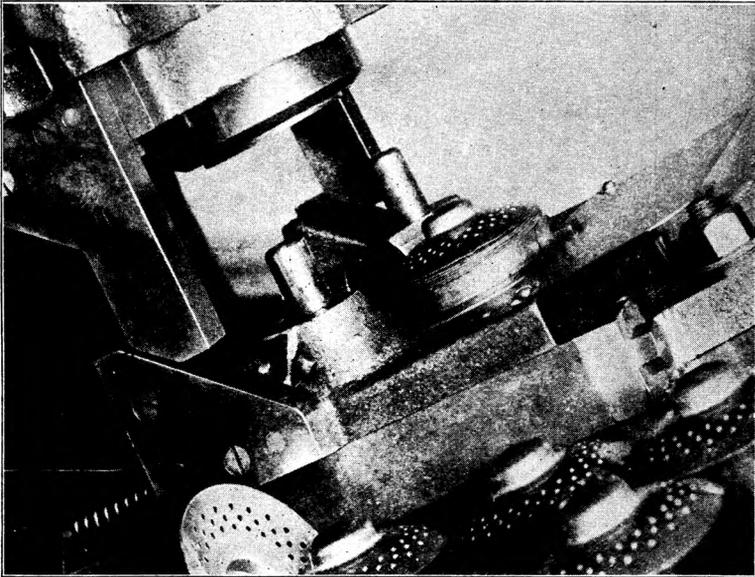
Courtesy Clum Mfg. Co.

FIG. 14.—Semiautomatic feed on kick press with hand-operated sliding die. Ram inclosure removed temporarily to show operation. This same arrangement is adapted for use on a great variety of power-press operations. Many of these jobs permit the installation of an interlocking lever to prevent the premature tripping of the press. (Par. 218.)



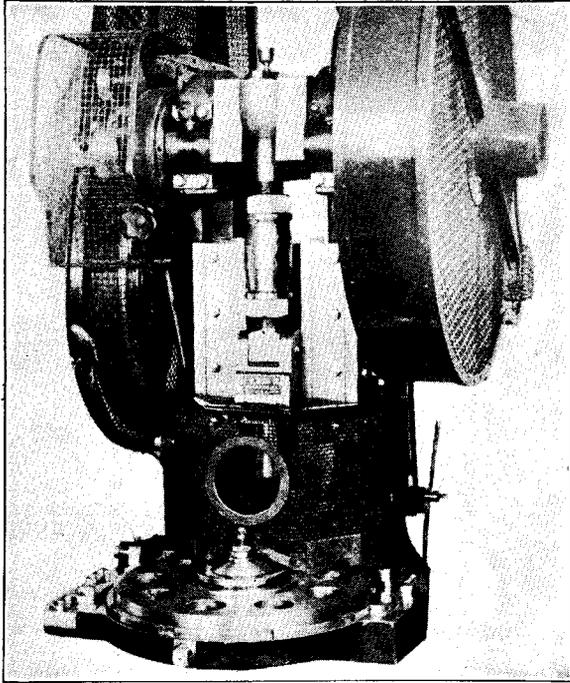
Courtesy Eastman Kodak Co.

FIG. 15.—Semiautomatic feed. Sliding die is operated mechanically by eccentric at rear of press. Work removed by air blast. Note ram inclosure. A shows die in out position for placing work in die; B shows die under ram. (Par. 218.)



Courtesy Cleveland Foundry Co. and Ætna Life Ins. Co.

FIG. 16.—Semiautomatic feed; sliding die actuated by inclined piece on side of ram. Pilot pins insure alignment. Ram inclosure removed temporarily to show operation. Spring at lower left pushes die toward operator as ram ascends. (Par 218.)



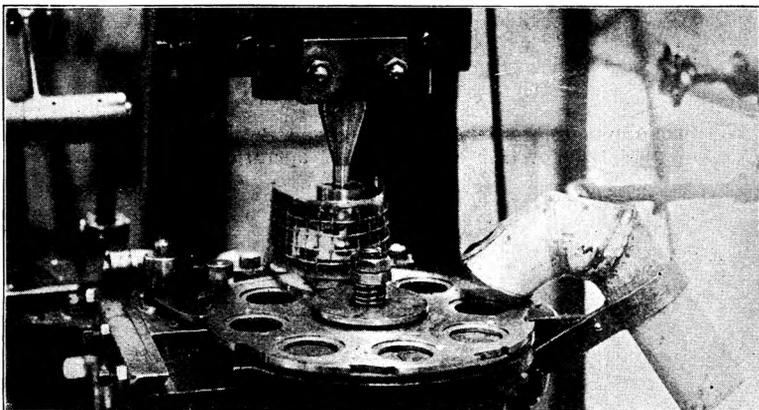
Courtesy Ætna Life Ins. Co.

FIG. 17.—Semiautomatic feed. Revolving die with ram inclosure. Inclosure has glass window for clear view of operation. (Par. 220.)



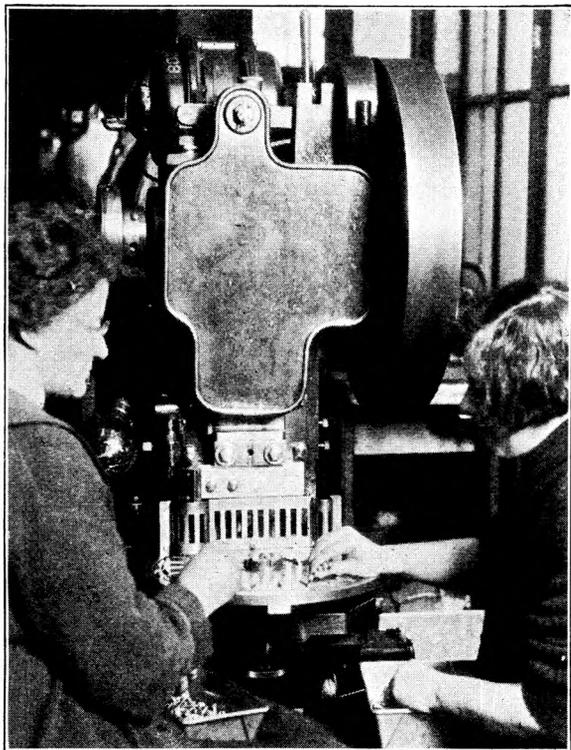
Courtesy Clum Mfg. Co.

FIG. 18.—Semiautomatic feed; revolving dies with ram inclosure. Presses operated hydraulically for assembly operations. Two or three girls work at each machine. (Par. 220.)



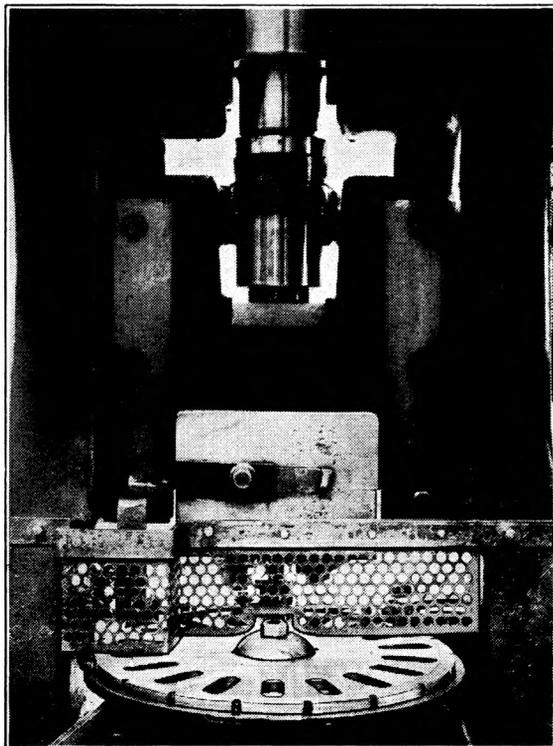
Courtesy Weis Manufacturing Co. and Michigan Mutual Liability Co.

FIG. 19.—Semiautomatic feed; revolving die with ram inclosure. Compressed-air jet from below blows finished pieces into curved pipe. (Par. 220.)



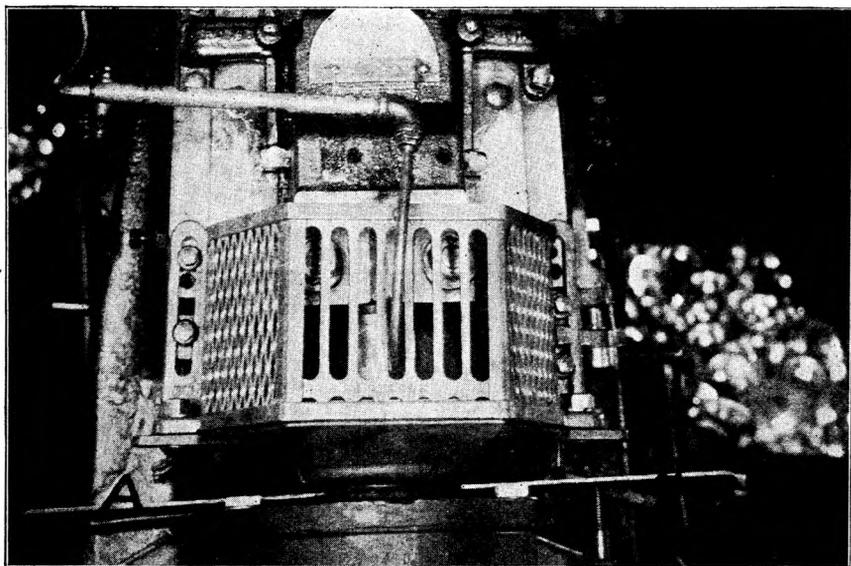
Courtesy Western Electric Co.

FIG. 20.—Semiautomatic feed; revolving die with ram inclosure. (Par. 220.)



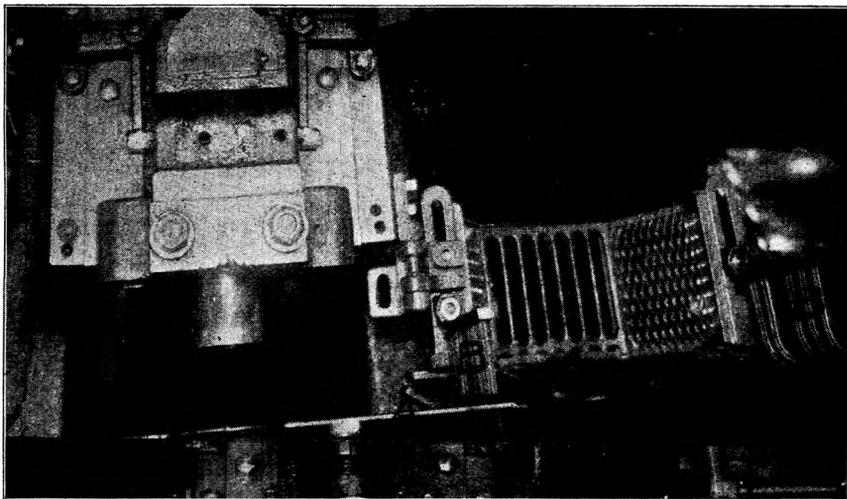
Courtesy American Pulley Co.

FIG. 21.—Semiautomatic feed; revolving die with ram inclosure. (Par. 220.)



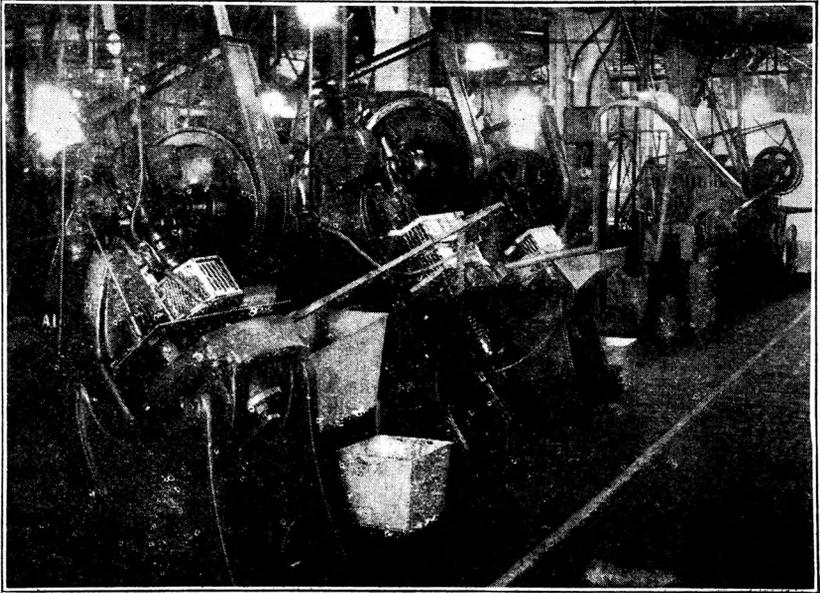
Courtesy American Can Co.

FIG. 22.—Power press with manual feed and ram inclosure. Standard sizes of inclosing guards are kept in stock to fit all operations with openings in bottom plate varying by 1 inch. The $\frac{1}{4}$ -inch plate marked A-A forms an extension of lower die. Guard is hinged at right, shown in Fig. 23. (Par. 222.)



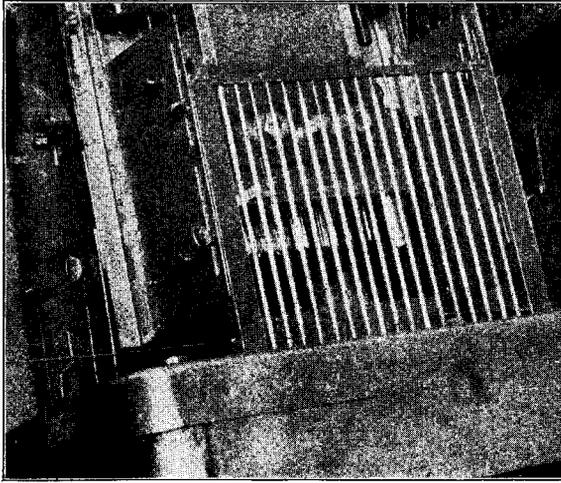
Courtesy American Can Co.

FIG. 23.—The same ram-inclosing guard as in Fig. 22 swung open for die setting. Note extensions B-B which, when guard is closed, extend backward and prevent reaching around behind the guard. (Pars. 222 and 224.)



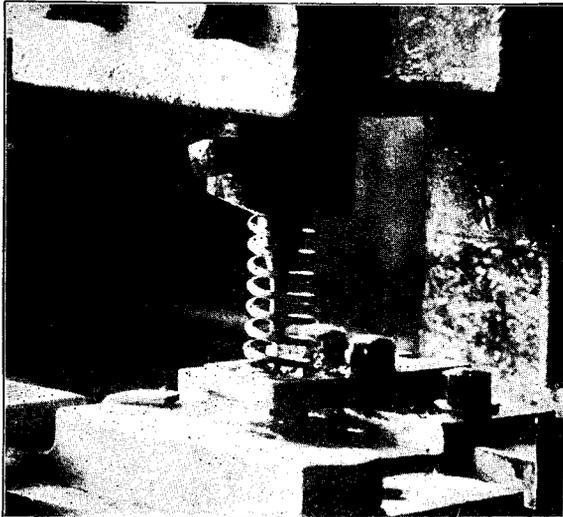
Courtesy American Can Co.

FIG. 24.—This line of seven presses is operated by two persons—one at press at left, other at press at extreme right. First press at left is fed by hand and pieces are transferred to succeeding presses by compressed air. Note ram inclosures, bumper stud guards, and treadle guards on all presses. Ram inclosures on second and third presses are shown in Fig. 6. (Par. 222.)



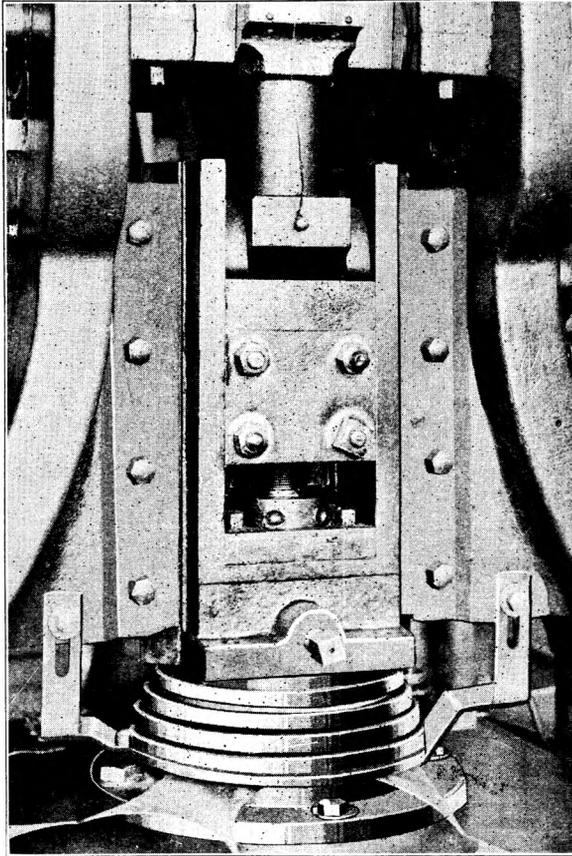
Courtesy General Electric Co.

FIG. 25.—Adjustable guard inclosing ram. Material is fed by hand from the side of the press. Side pieces and front of guard can be adjusted separately. (Par. 222.)



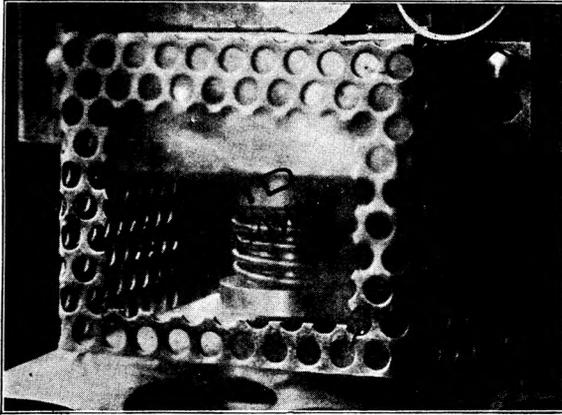
Courtesy Pierce-Arrow Motor Car Co. and Aetna Life Ins. Co.

FIG. 26.—Spring incloses punch above stripper on hand feed press. Space between coils must not be large enough to admit finger. (Par. 222.)



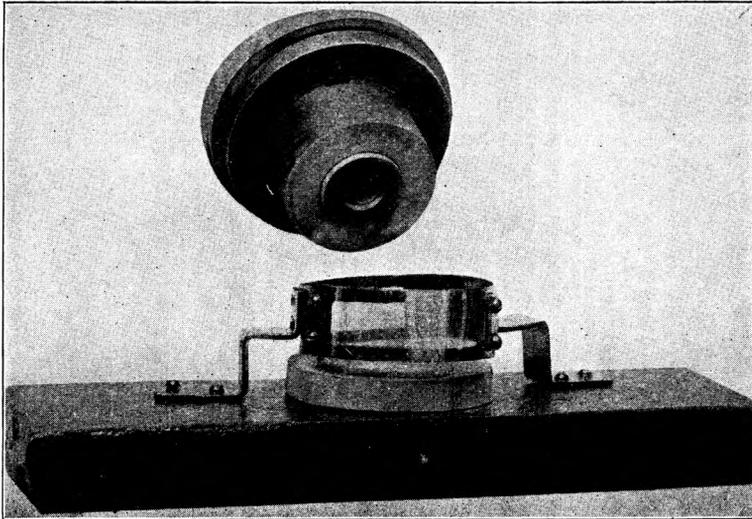
Courtesy American Can Co.

FIG. 27. Conical spring guard in open position (ram up) on hand-fed press. Spring telescopes when ram descends. Can not pinch fingers between coils. (Par. 222.)



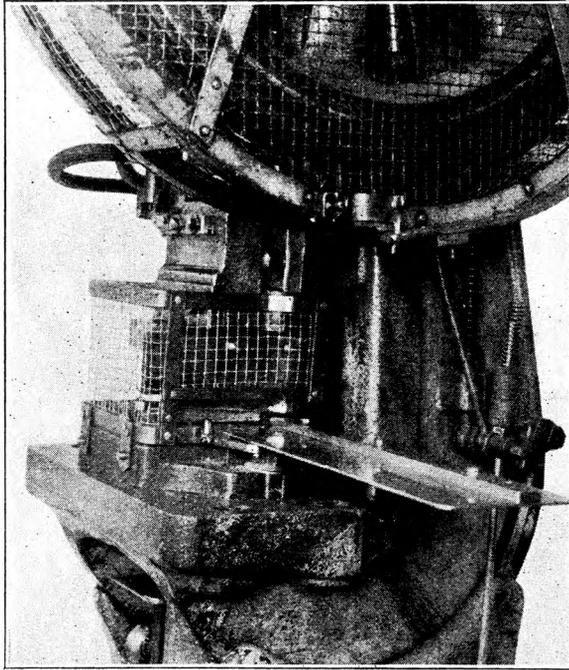
Courtesy Pierce-Arrow Motor Car Co. and Aetna Life Ins. Co.

FIG. 28.—Hand feed press. Ram inclosure with celluloid window in front. The spring acts as a knockout. (Par. 222.)



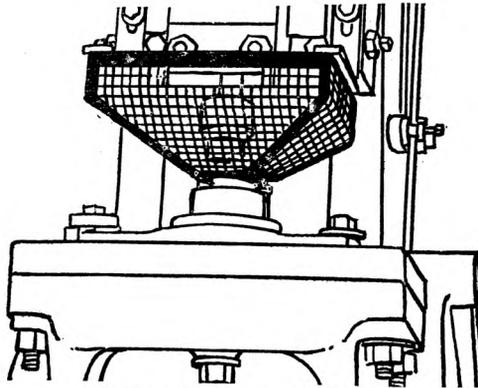
Courtesy General Electric Co.

FIG. 29.—Ram inclosure attached to die block, with mica windows. Stroke of ram must be limited so it will not form shear with top of guard. (Par. 222.)



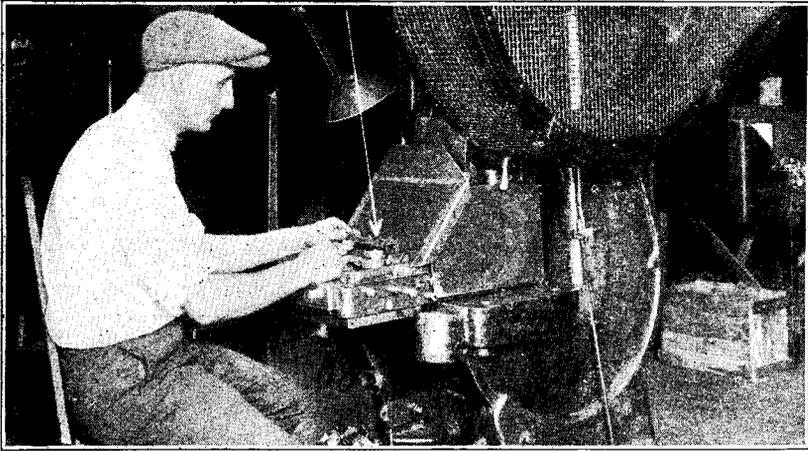
Courtesy J. L. Clark Mfg. Co.

FIG. 30.—Manual feed with ram inclosure used on blanking operation. Flat gauge at right extends working table and at same time speeds up production and decreases spoilage. (Par. 222.)



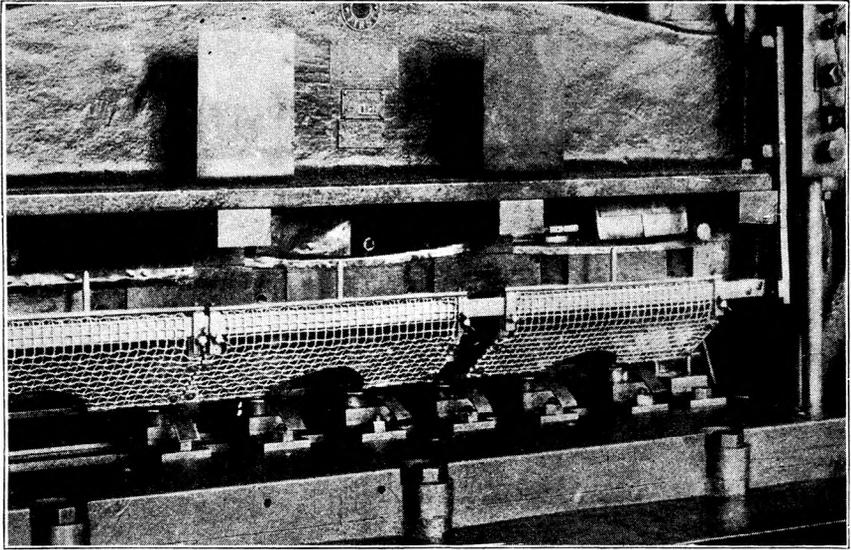
Courtesy Industrial Commission of Wisconsin.

FIG. 31.—Basket guard inclosing ram for hand-fed blanking operation. Opening at bottom is just large enough for ram to pass through. (Par. 222.)



Courtesy Clum Mfg. Co.

FIG. 32.—Hand feed forming die with ram inclosure. Operator drops flat piece in slot as shown; piece is formed into circle by horizontally moving ram actuated by bell crank; it then drops into keg underneath press. Similar devices are arranged on a great variety of small forming and piercing jobs. (Par. 222.)



Courtesy Westinghouse Electric & Mfg. Co.

FIG. 33.—Hand feed; guard inclosing rams on gang press. Guards may be adjusted along length of supporting rod. Enough space is left for feeding material, but not enough for fingers to be placed under plungers. (Par. 222.)

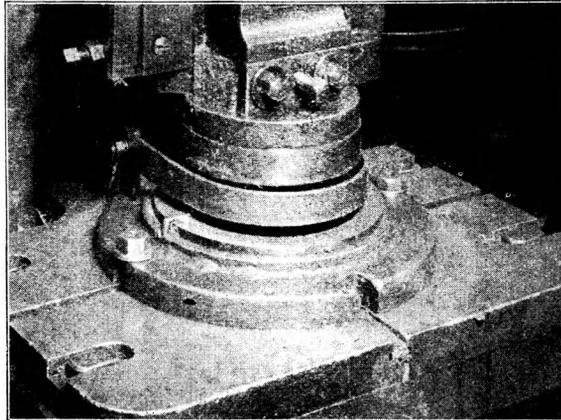
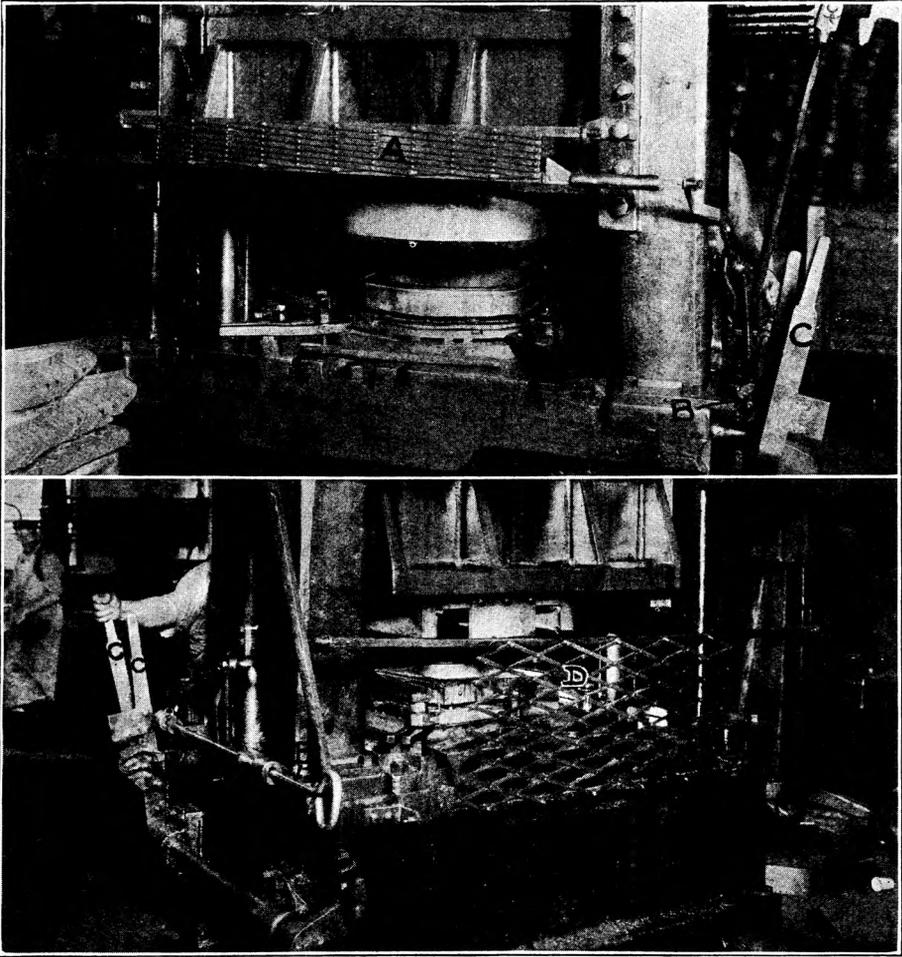
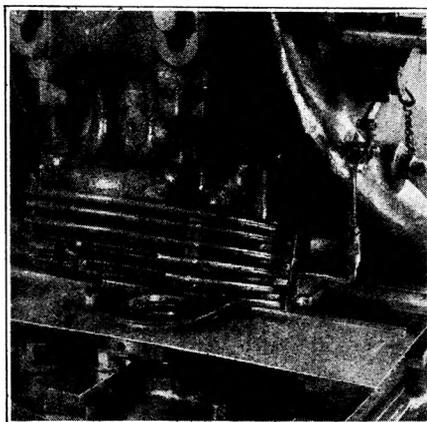


FIG. 34.—A simple ram inclosure made of flat iron on hand feed press. Should be used only where ram stroke is so limited that ram does not form shear with top of guard. (Par. 222.)



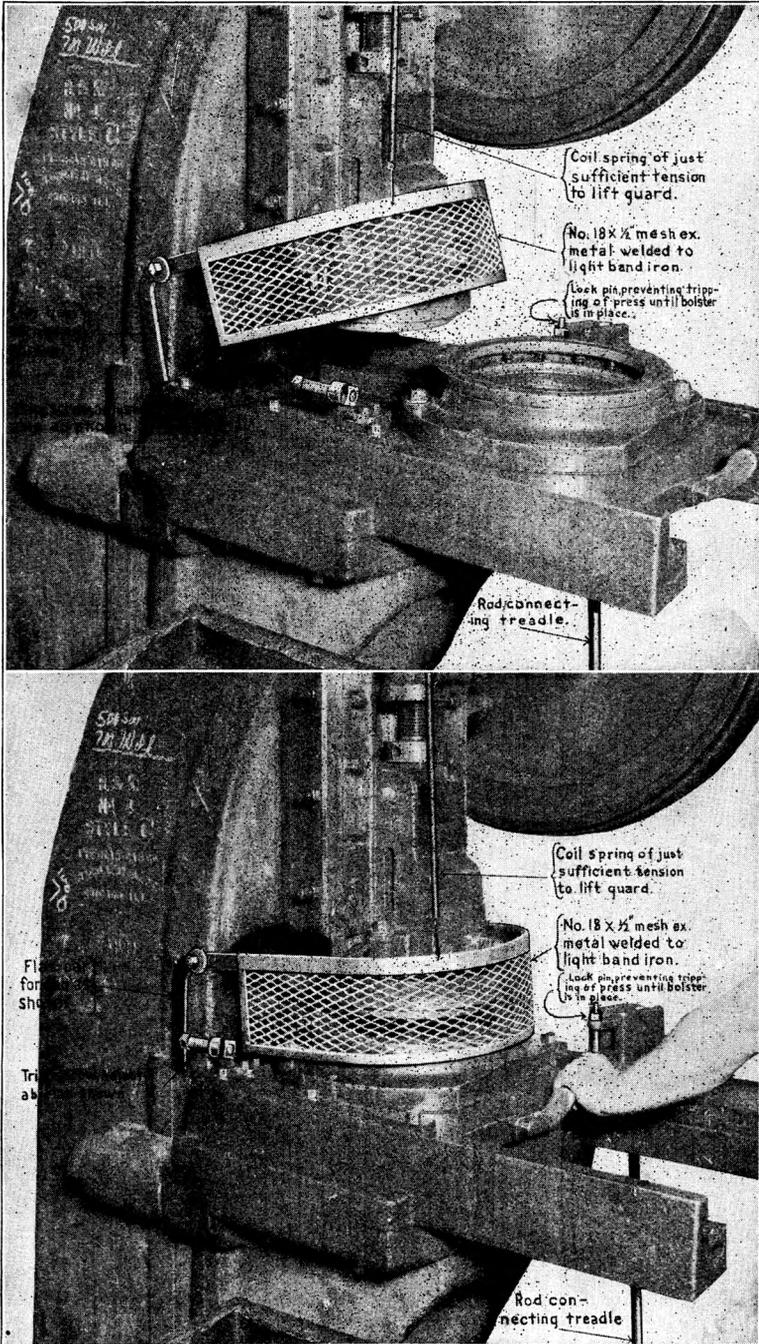
Courtesy Geuder, Paeschke & Frey Co.

FIG. 35.—Front and rear views of large hand feed press with gate guards. Gate A at front (fastened at top) is interlocked with gate D at rear (fastened at bottom). Closing one gate automatically closes the other. Man at rear must withdraw the interlocking bar B before press can be tripped by hand lever C. (Par. 228.)



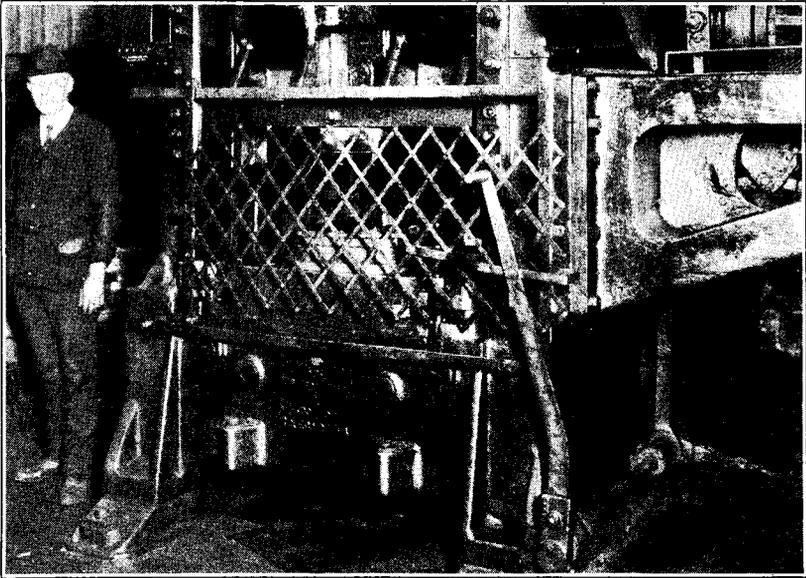
Courtesy American Can Co.

FIG. 36.—Manual feed with gate guard on blanking and drawing die. Gate is in up position. Depressing treadle first brings gate into down (closed) position; the clutch then becomes engaged and ram descends. (Par. 228.)



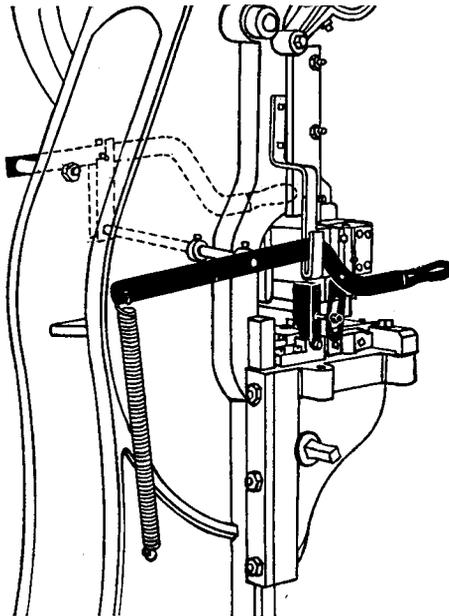
Courtesy American Can Co.

FIG. 37.—Hand-operated sliding die with gate guard around ram. Guard is brought down automatically when die is pushed in. Press can not be tripped until guard is down and die is in. (Par. 228.)



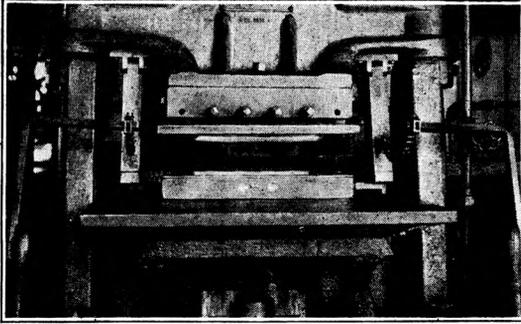
Courtesy Geuder, Paeschke & Frey Co.

FIG. 38.—Hand feed with gate guard both front and rear. Gate is collapsible, supported on rollers by horizontal guides, and is closed by operating lever. Gates are closed completely before friction clutch engages. (Par. 228.)



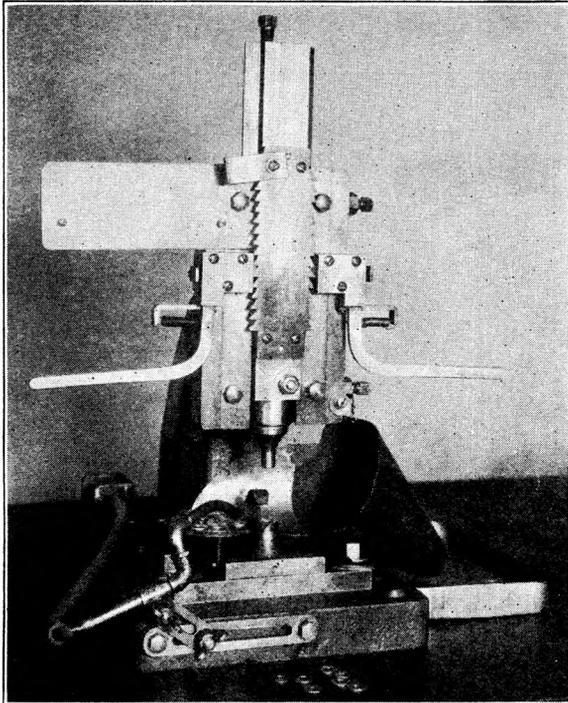
Courtesy National Enameling & Stamping Co.

FIG. 39.—Two-hand tripping device with positive stop. A solid steel block (shown in black below the left-hand lever) prevents the descent of the ram until it is tipped out of the way by depressing the left-hand lever. The right-hand lever is then depressed, tripping the press. No foot treadle. (Par. 231.)



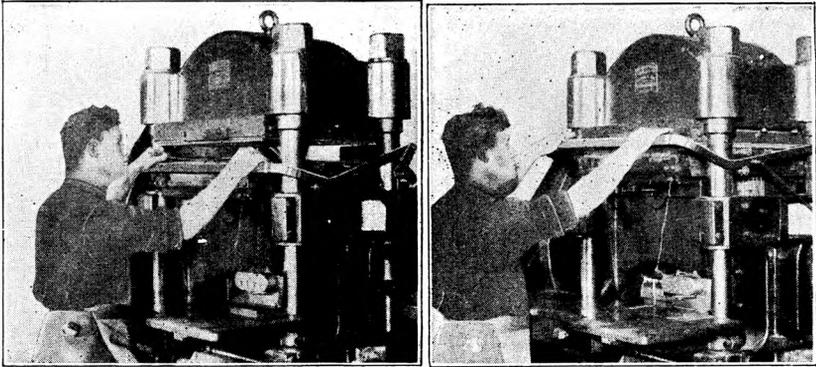
Courtesy E. I. du Pont de Nemours & Co.

FIG. 40.—Positive stop device for metal-embossing press. A swinging strut (or prop) is installed on each side of head. The press has a two-hand trip, and the struts, connected to the tripping mechanism, are swung out toward the horizontal when press is tripped. When operating levers are released and press regains dead center, struts again assume a vertical position and prevent press from repeating. (Par. 231.)



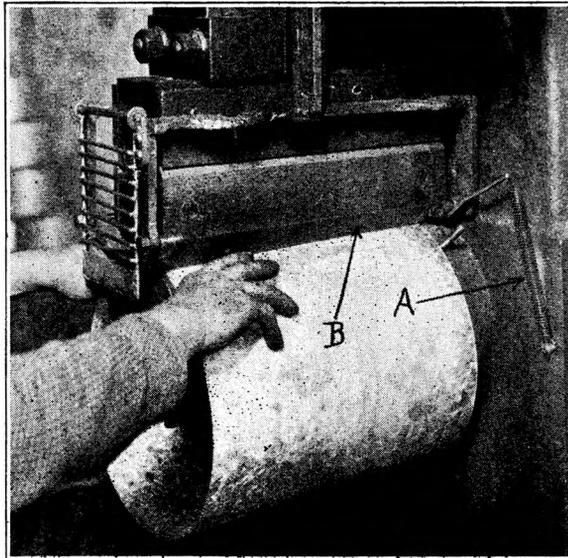
Courtesy Westinghouse Electric & Mfg. Co.

FIG. 41.—Hand-fed kick press with two-hand tripping device and air ejector. Before foot lever will operate the press, operator must use both hands to depress the two hand levers releasing the pins engaged in the rack on the front of the ram. (Par. 231.)



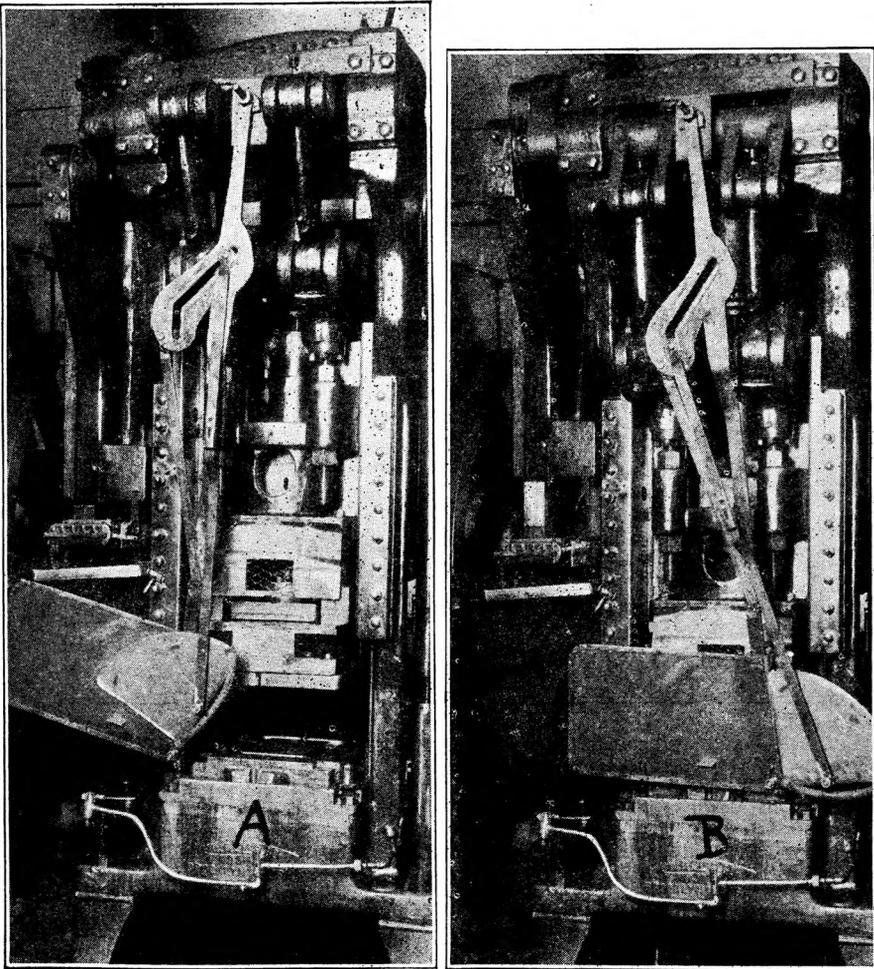
Courtesy American Can Co.

FIG. 42.—Hand feed embossing press with horizontal-bar sweep guard. The bar, which normally lies against lower platen, rises automatically with stroke of press and pushes hands out of danger. (Par. 235.)



Courtesy Geuder, Paeschke & Frey Co.

FIG. 43.—Sweep guard for horning press with ram inclosure at front. Guard is thin metal strip B on each side of press. When ram is up, spring A holds guard up under ram so operator can insert material in machine. Descending ram forces guard down and out, removing operator's hand from danger zone. (Par. 235.)



Courtesy Perfection Stove Co.

FIG. 44.—Hand feed with sweep guard operated by the ram. Note rubber bumper on edge of sweep. A shows guard open; B shows guard closed. (Par. 235.)

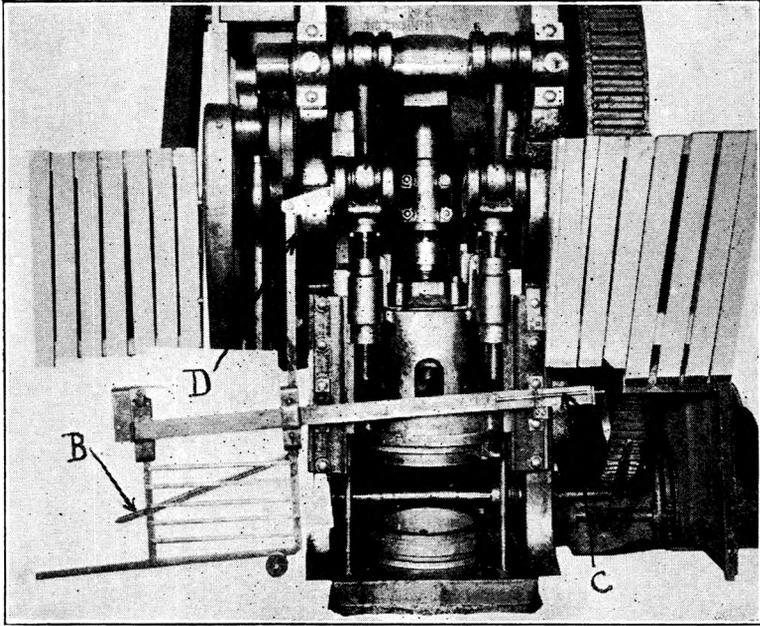
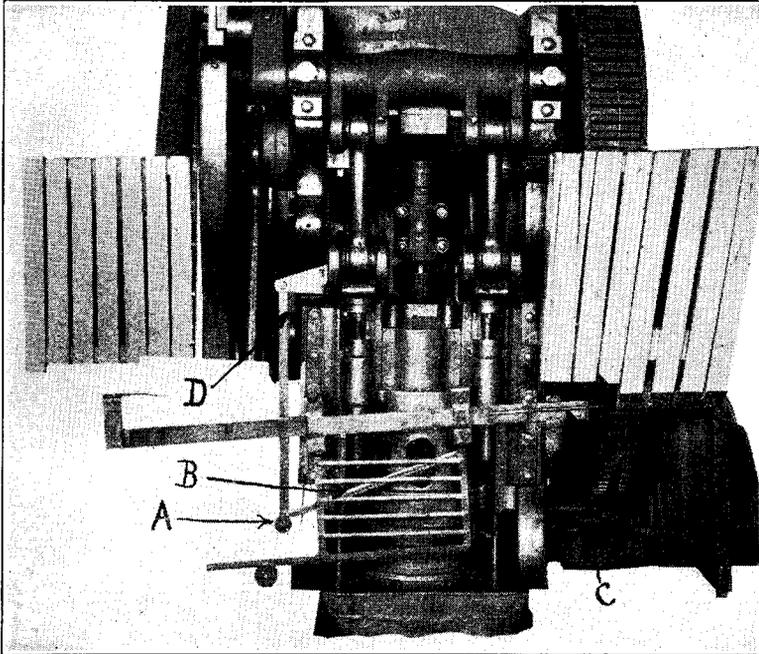


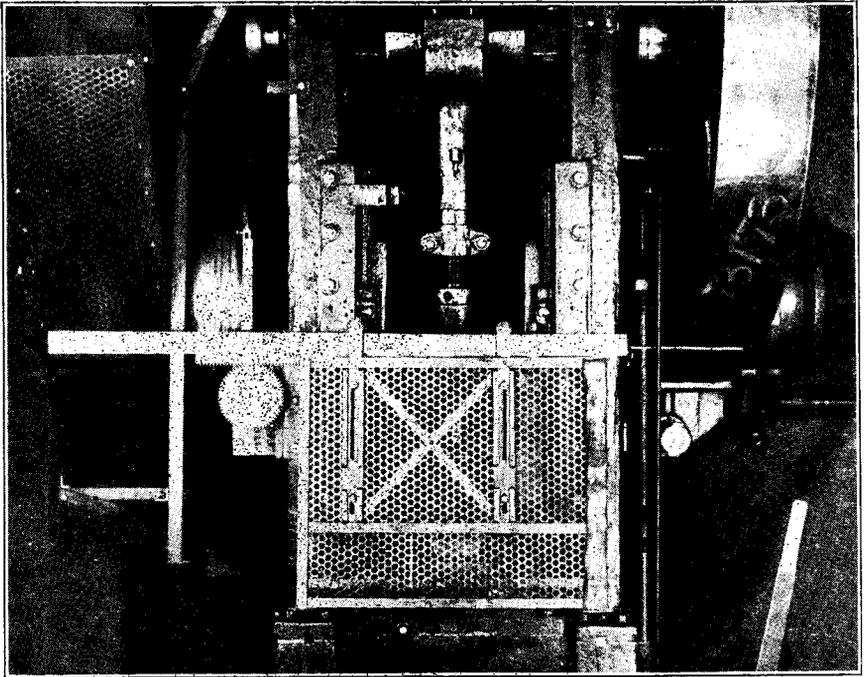
FIG. 45.—Hand feed toggle press with sliding sweep guard operated by roller A attached to bottom of arm connected to knuckle. When treadle is depressed, roller A travels in groove on top of rail B, pushing gate to right in front of die. Gate is closed when blank holder is within 4 inches of die and roller A drops below rail B. Gate hits push rod C and spring mechanism pushes gate back to its open position. This transpires before start of



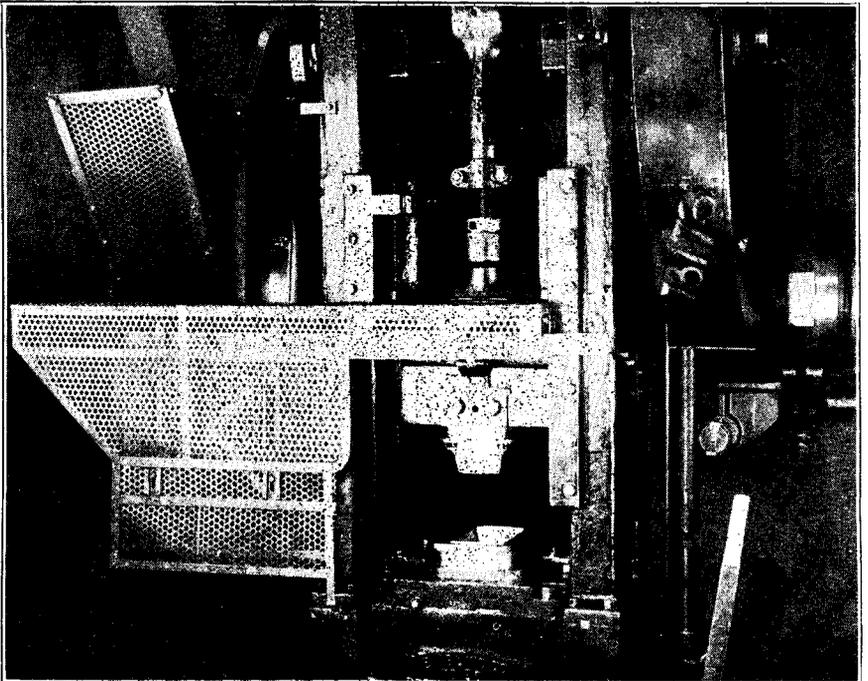
Courtesy National Enameling & Stamping Co.

upstroke and therefore gives operator access to die on all of upstroke and first three-quarters of down stroke, thereby eliminating all interference from guard. When gate is open the one-leaf spring D forces roller arm to left so that roller A is in proper position on top of rail B to repeat operation. This type of guard can be adapted for use on large presses up to 30 revolutions per minute. (Par. 235.)

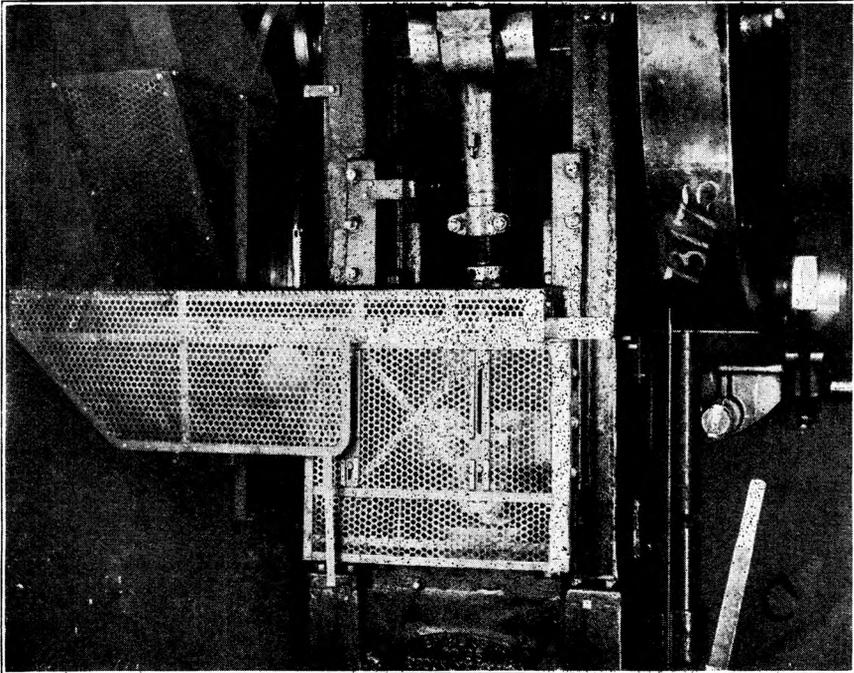
A



B

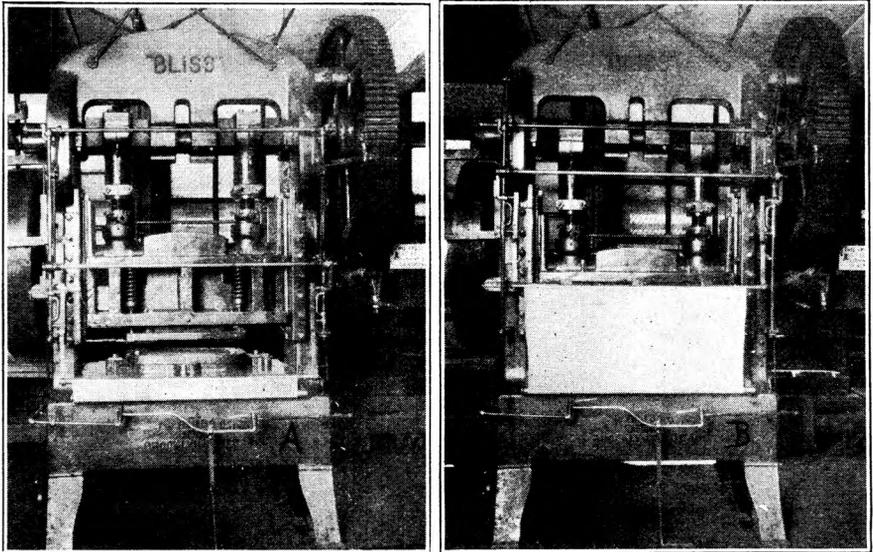


C



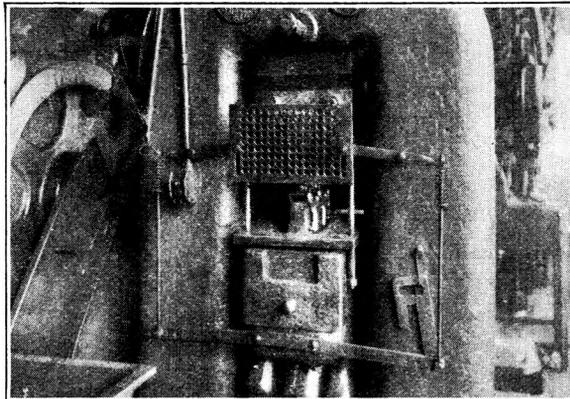
Courtesy Aluminum Goods Mfg. Co.

FIG. 46.—Manually fed press with horizontal sweep guard. A has stationary section of guard removed to show how rack and pinion actuate sliding section of guard. B shows complete guard with sliding section open; C shows sliding section closed. (Par. 235.)



Courtesy Perfection Stove Co.

FIG. 47.—Hand feed press with canvas roller-curtain sweep guard. A shows guard open for feeding press. When press is tripped canvas curtain unrolls upward as shown in B, sweeping operator's hands from danger zone. (Par. 235.)



Courtesy Ford Motor Co.

FIG. 48.—Hand feed press with sweep guard. Pieces are placed in lower die. When treadle is depressed lower die raises against upper die and guard moves down in front of danger zone. (Par. 235.)

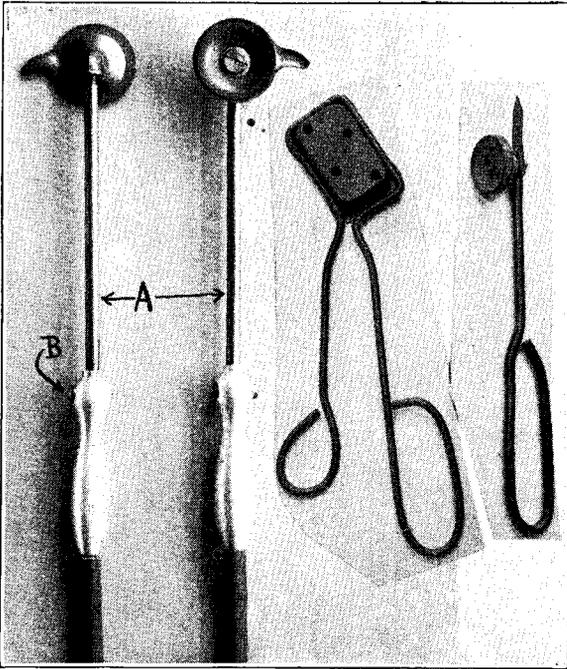
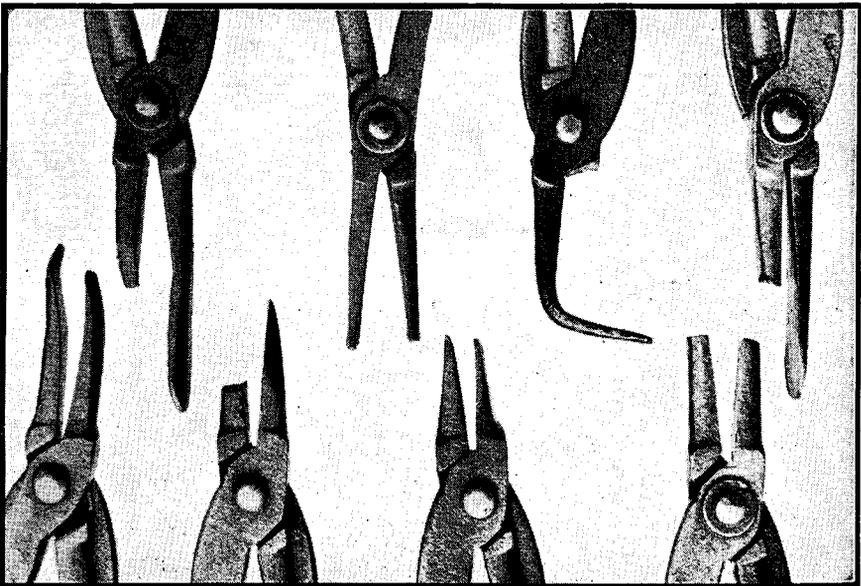
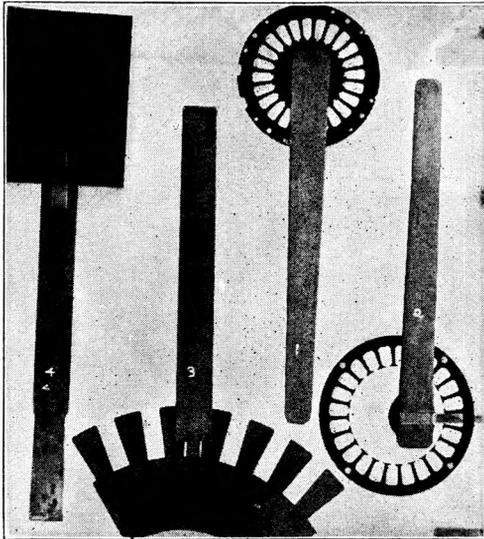
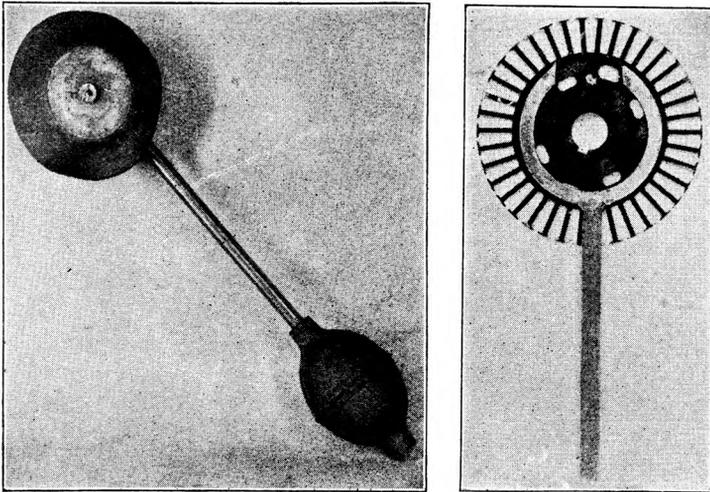


FIG. 49.—Special hand tools for feeding presses. Special hand tool A is connected to vacuum air line. Button on handle (B) controls flow of air. (Par. 238.)



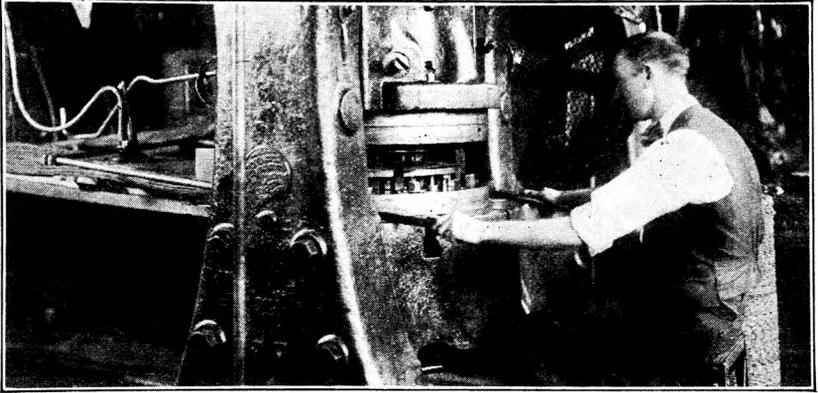
Courtesy General Electric Co.

FIG. 50.—Soft-nosed pliers, used for feeding presses, damaged in service. (Par. 238.)



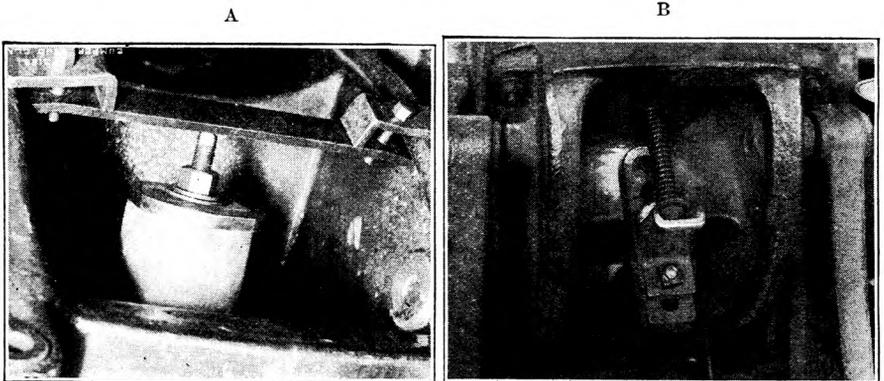
Courtesy Westinghouse Electric & Mfg. Co.

Fig. 52.—Suction disk (upper left), magnet (upper right), and other special hand tools for placing and removing material. (Par. 238.)



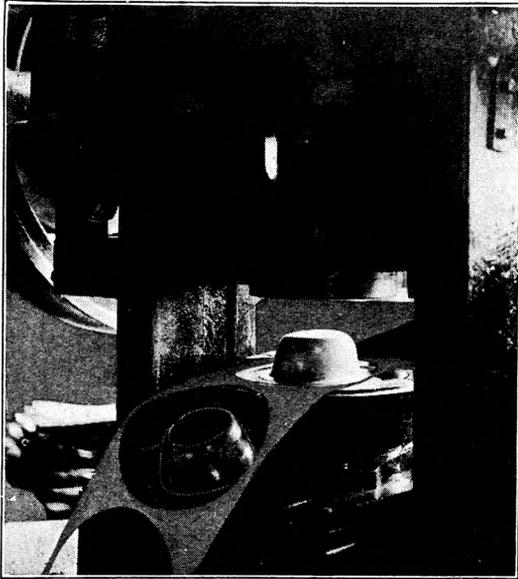
Courtesy Westinghouse Electric & Mfg. Co.

FIG. 53.—Hand feed with two-hand lifting device connected with vacuum air line used to pull sheet into die for first cut; for remaining cuts operator pulls stock by edges of sheet. Ram inclosure temporarily removed to show detail of operation. (Par. 238.)



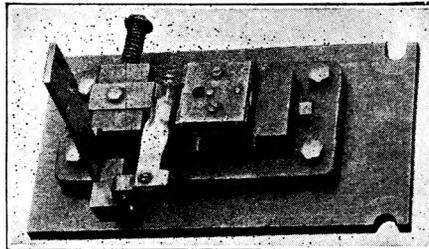
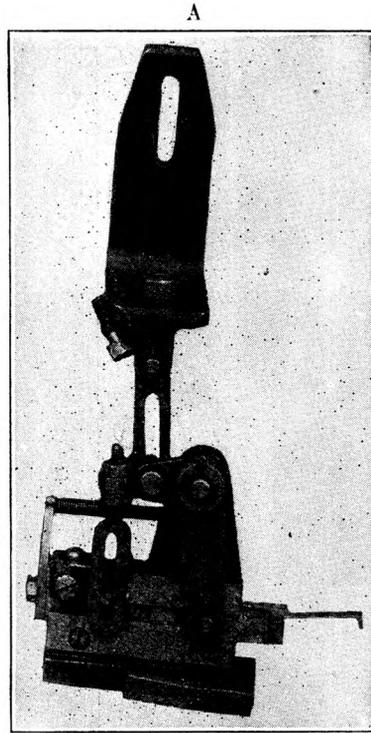
Courtesy American Can Co.

FIG. 54.—Bumper stud guards. Prevents stud and bumper from dropping on foot of operator in case stud comes loose or breaks; A for light work, B for heavy work. (Par. 247.)



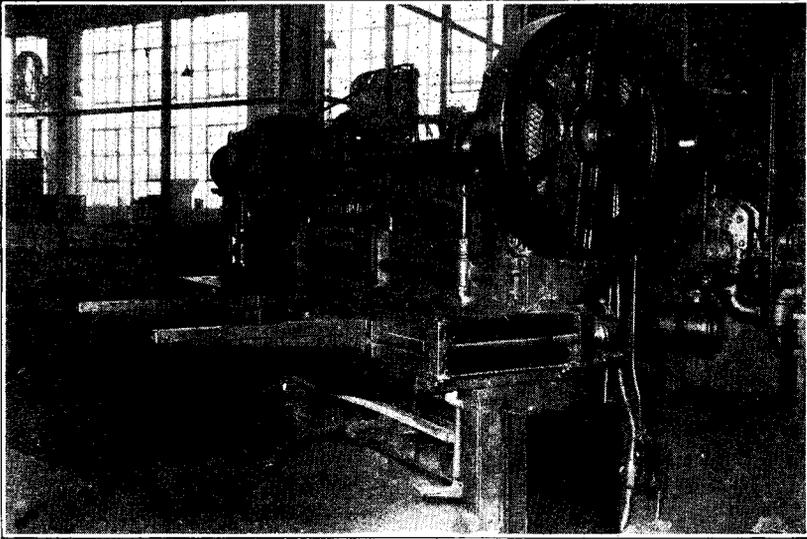
Courtesy Aluminum Goods Mfg. Co.

FIG. 55.—Hazard of pieces sticking in lower die eliminated, and production increased by reversing dies and providing knock-out for upper die. Ram inclosure removed temporarily to show operation. (Par. 248.)



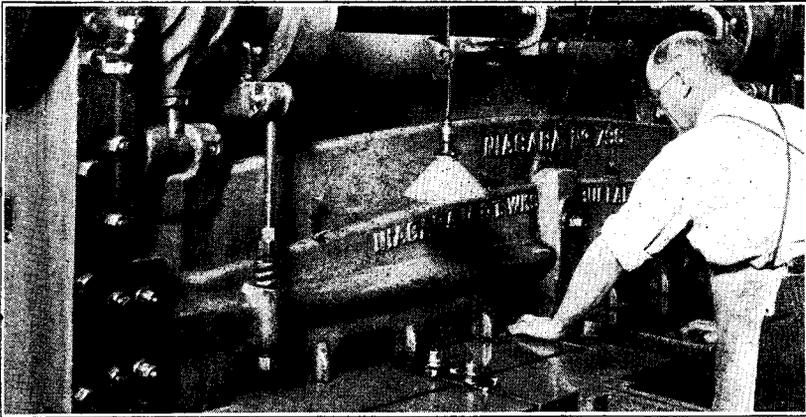
Courtesy Michigan Mutual Liability Co. and Weis Mfg. Co.

FIG. 56.—Mechanical finger. A link or wedge cam, tap bolted to ram, actuating a horizontal finger which reaches into press and pulls out piece (A) or pokes out piece (B). A little machine work, like drilling a half-inch hole, is necessary the first time attachment is used with any die. Ram of the press must be tapped for stud to attach connecting link or wedge cam. (Sec. K.)



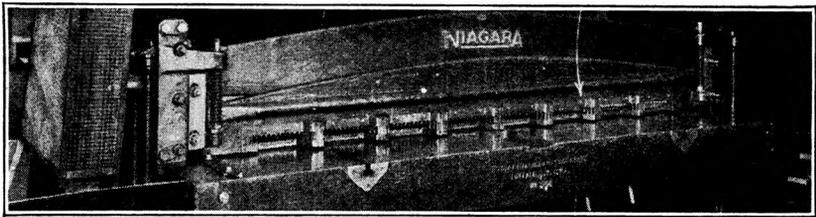
Courtesy Westinghouse Electric & Mfg. Co.

FIG. 57.—Square shear guard made of angle iron placed in front and independent of hold-down. Guard makes it possible to operate machine with one man and to discard circular cutter slitting process requiring two men. Shear cuts a much cleaner edge than slitter, thus eliminating many cuts and scratches. Cut pieces drop off and are piled automatically on trucks at rear. The remaining scrap is engaged by mechanically operated rollers at right of feed table and moved onto trucks placed there for that purpose. Note guard on rolls.



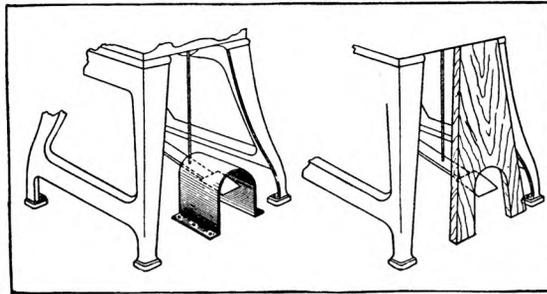
Courtesy National Cash Register Co.

FIG. 58.—Guard for square shear, applied to back of hold-down. Operator can work within $\frac{3}{8}$ inch of knife.



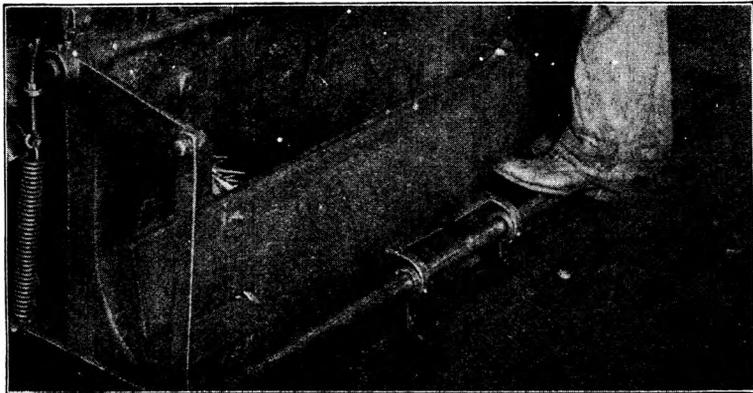
Courtesy Clum Manufacturing Co.

FIG. 59.—Well-guarded squaring shear. Guards carried back close to knife. Each section of guard has sufficient vertical movement through slotted bolt holes.



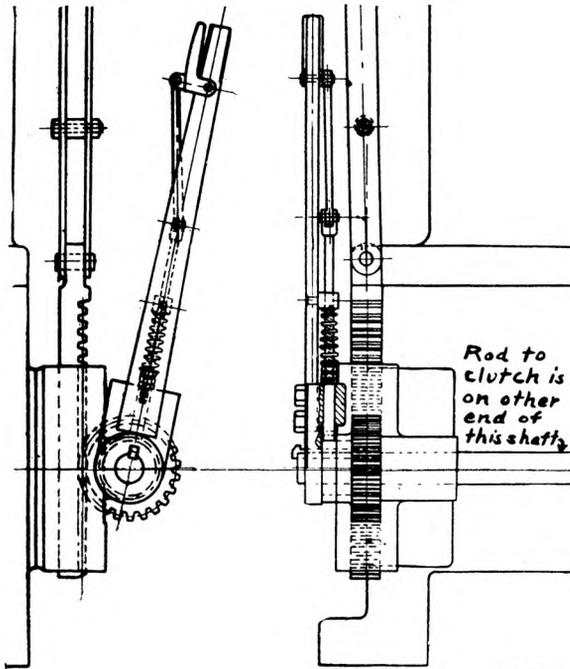
Courtesy Liberty Mutual Ins. Co. and David S. Beyer.

FIG. 60.—Treadle guards.



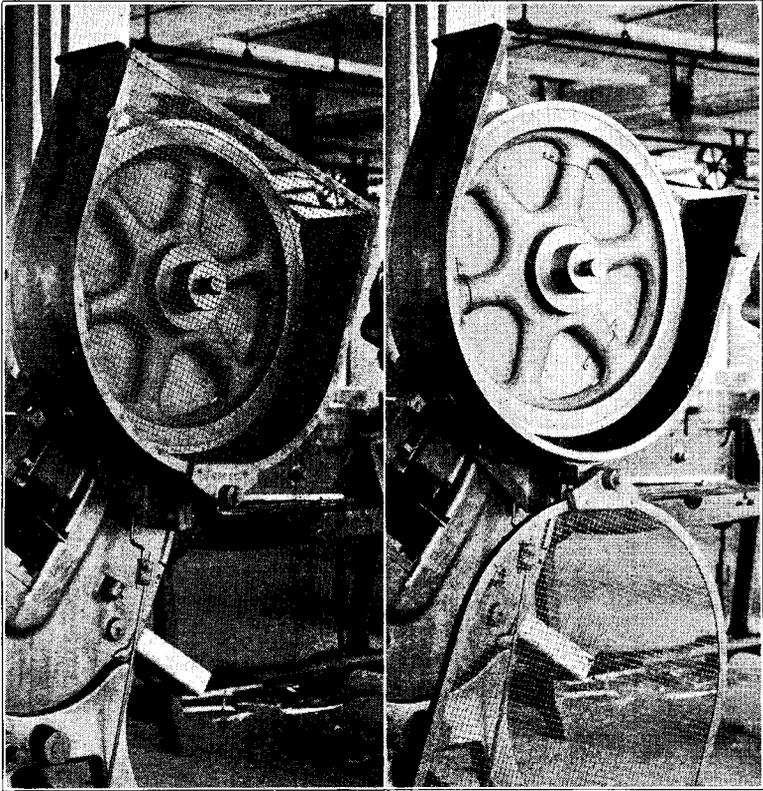
Courtesy International Harvester Co. and Aetna Life Ins. Co.

FIG. 61.—Device on treadle bar prevents bar being tripped by pressure at any other point. To trip, device must first be rotated on the bar by pressure at point A.



Courtesy E. W. Bliss Co.

Fig. 62.—Safety spring latch on hand lever.



Courtesy American Can Co.

FIG. 63.—Sheet-metal and wire-mesh guard furnishes protection on three sides. Guard is open on press side to permit easy access to latch, but sheet-metal disk is attached to pulley spokes to furnish protection. Swinging door gives access to outside of pulley.

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