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SAFETY PAMPHLET No. 5.

Fencing and Safety Precautions

FOR

COTTON SPINNING

AND

WEAVING MACHINERY.

PART II.

COTTON SPINNING AND DOUBLING PROCESSES.

ISSUED BY THE HOME OFFICE.

LONDON:
PRINTED AND PUBLISHED BY
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CONTENTS.

FENCING AND SAFETY PRECAUTIONS
FOR
COTTON SPINNING AND WEAVING MACHINERY.

PART II.—COTTON SPINNING AND DOUBLING PROCESSES.

This pamphlet deals with the cotton spinning and doubling section of the trade, and is the second of the series which is being issued to illustrate how the Cotton Trade Agreements* of 1911 and 1912 can best be carried out, and to show the best known types of guards for each dangerous part of the machinery.

Extracts from the Agreements, applicable to cotton spinning and doubling are given in Appendix II.

FENCING IN RELATION TO CLEANING MACHINERY IN MOTION.

The remarks made in the pamphlet dealing with the opening, blowing and card-room processes† have equal application to spinning and doubling. A large number of accidents result from cleaning machinery in motion, and as constant cleaning is necessary to secure a good quality of yarn, there is special need for the efficient protection of all dangerous parts. **Partial covers** (Fig. 1) only **increase the danger** by creating a trap between the guard and the cog teeth. **The fencing of all toothed wheels therefore should completely enclose the wheels.**

Another frequent cause of accidents to persons engaged in cleaning is the presence of projecting set-pins on the shaft collars and wheel bosses on machines (Fig. 2). Under the Agreements they are not to be allowed on new machinery and on existing machines they are to be replaced, where practicable, by grub-screws, save that those inside a box pulley may be regarded as being safe by position. **All other projecting set-screws must be protected.** A cheap and efficient guard is illustrated in Fig. 3.

* See Report on Conference between Employers, Operatives and Inspectors, concerning Fencing of Machinery, Prevention of Accidents, and Temperature in Cotton Spinning Mills, by G. Bellhouse, H.M. Superintending Inspector of Factories (price 3d,) and Report on Conferences between Employers, Operatives and Inspectors concerning Fencing of Machinery and other safeguards in Cotton Weaving Factories, by G. Bellhouse and J. Jackson, two of H.M. Superintending Inspectors of Factories (price 1d.) which can be purchased at the addresses on the cover of this pamphlet.

† Safety Pamphlet No. 4: Cotton Spinning and Weaving Machinery:—Part I. (to be obtained from H.M. Stationery Office at the addresses mentioned on the cover, price 1s.).

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TRANSMISSION MACHINERY AND HOISTS.

Pamphlets dealing with the Fencing and Safety Precautions for Transmission Machinery (Safety Pamphlet No. 1)* and with the Protection of Hoists (Safety Pamphlet No. 2)* have been already issued, and they should be consulted with respect to the safeguarding of " mill gearing " and hoists in cotton mills. The Agreements require heavy overhead main driving belts and ropes to be guarded underneath, but this does not apply to the belt driving a mule nor to the rope race in the engine house. It is not intended that these belts and ropes should be left unguarded. In case of mule belts an efficient guard at the back of the headstock (Fig. 22) affords protection for the belt also; as regards the rope race it is usual to fence the platform, giving access to the ropes, with strong posts and rails, and this is generally sufficient to protect the ropes also. The Agreements also require that metal fasteners are not to be used for overhead belts, unless the belt itself is fenced.

SPINNING MACHINERY.

Mules.—So far as the cotton trade is concerned the Agreement amplifies the Secretary of State's Regulations for Self-Acting Mules (Appendix I.) and details the improvements which experience has shown to be necessary in guarding backshaft scrolls, faller stops and draw band pulleys.

The Regulations require that the following parts of a Mule shall be securely fenced " as far as it is reasonably practicable " :—

(i) *Backshaft scrolls; carrier pulleys; draw band pulleys.*—The Agreement requires that " The guards for middle backshaft scrolls shall be fitted with flanges to protect the intake of the bands and the side of the scroll. The guards for the middle draw band and carrier pulleys shall be either fixed to the bottom creel board or be so fastened otherwise that they cannot readily be knocked aside. The side pieces of the guard shall be extended inwards far enough to completely guard the nip between the band and the scroll." In order to carry this into effect, a small Committee was appointed to draw up a Specification for these guards to embody the points agreed upon (*see* Appendix III.). Such specification was necessary owing to the serious accidents which occurred on mules that were considered to be " guarded." Many of the old guards only partly covered the scroll (Fig. 4), left the projecting gib-headed (or lip) key unprotected, and were easily displaced (Fig. 5). A large number of makers (Appendix IV.) have designed guards which comply with the Specification; which have been approved. Some of these are shown in Figs. 6 A, B, C, D, and 7 A, B, C.

The Regulations apply to all draw band pulleys whether below the scroll, in the mule gate, or on the frame ends. Those below

* Prices 3d. and 6d. respectively may be purchased through any Bookseller, or directly from H.M. Stationery Office at the addresses on the cover of this pamphlet.

the scroll are dealt with in the Specification referred to above. The draw band pulleys in the mule gate are now generally fixed flat on the floor as seen in Fig. 8, formerly they were often placed upright (Fig. 9). They are shown in these figures fitted with suitable guards. The bevel at the front of the guard in Fig. 8 diminishes the risk of the minder tripping over the guard when he is following the carriage on the outward run.

The Agreement specifies that the guard for the draw band pulleys on frame ends shall, on new machines, be extended at least half an inch beyond the end of the pulley—to protect the nip between the rope and the pulley. An old type of guard is shown in Fig. 10; a newer type, which complies with the Agreement in Fig. 11.

(ii) *Front and back carriage wheels.*—Types of satisfactory guards are shown in Figs. 12 A, B, C, D; that illustrated in Fig. 12 D covers the whole of the wheel and thus obviates the need for " picking " (Fig. 13). The risk of accident would be diminished if these wheels were made with a web between the spokes.

(iii) *Faller stops.*—The Agreement requires that the guard on new machines shall consist of a cover over the stop and the combined guard and faller stop (Fig. 14) is not to be deemed to satisfy this requirement; the danger from an unguarded stop is clearly illustrated in Fig. 15, and guards which comply with the Regulations and with the Agreement are shown in Figs. 16 A and B.

(iv) *Quadrant pinions.*—These have always been fenced, but on some mules the guards are left too short. Fig. 17 shows the pinion unguarded; Fig. 18 illustrates an extended guard, A, which covers these cogs so far as it is practicable to do so, but it is not possible to apply them to some of the older type of mules. Fig. 19 illustrates an efficient guard for the quadrant and pinion and one for the mule in Fig. 17 is shown in Fig 20.

(v) *Back of headstocks; including rim pulleys and taking-in scrolls* (Fig. 21).—The guards are usually made of beaded sheet iron, and so constructed that they can be readily fastened to the mule frame or entirely removed if extensive alterations or repairs are required. The back part of the guard is generally made to slide (Fig. 22) or is provided with doors by means of which access is obtained to make minor alterations to the gearing. The guard for the rim band pulley can be made by a semi-circular extension of the headstock guard—*see* C in Fig. 22—on some types of mules; on others a higher type of guard is required. The taking-in scrolls can be guarded either with separate sheet iron covers (Fig. 23) or by a lateral extension of the guard for the headstock, shown at A in Fig. 22.

(vi) *Rim band tightening pulleys*, other than plate wheels, connected with a self-acting mule erected after January 1st, 1906, are required by the Mule Spinning Regulations to be fenced or

to be by position or construction equally as safe as they would be if fenced. The unfenced wheel is shown in Fig. 24, a plated wheel in Fig. 25, but a much better type of guard is that illustrated in Fig. 26, the guard being extended along the traverse of the rope to protect the nip between it and the wheel. The openings in the face of the guard are left only large enough for the free passage of the rope and too small to allow a person's hand being drawn in.

There are other points of danger which are not covered by either the Regulations or by the Agreement and, as accidents are caused by neglect to provide safeguards for them, the following recommendations should be adopted :—

(*a*) *Faller wire brackets* if placed too near to each other set up a guillotine action when the mule changes over. Finger room (at least one inch) can easily be secured by seeing that the brackets are properly spaced on the faller rods. The bosses on these brackets should be made so long that it is impossible to place two brackets too near together.

(*b*) *The draft wheels and other cogs on the front of the mule.*—These wheels are inaccessible when the carriage is out, but not when it is in. Accidents usually occur owing to the operator slipping when piecing up. Guards sufficiently wide to prevent this should be fitted over the cogs as shown in Figs. 27, 28, 29.

(*c*) *The quadrant scroll* is generally guarded, but the guard is often left too short and does not cover the nip between the scroll and the band. A short guard is shown in Fig. 18 ; a complete one in Fig. 26.

(*d*) Many serious accidents have been caused by the accidental movement of the starting handle while some person was either cleaning or doing repairs between the carriage and the roller beam. This danger can to a large extent be obviated by a locking peg on the " stang " or setting-on rod. A suitable lock is shown in Fig. 30.

Ring and Throstle Frames.—The Agreement requires that :—

(i) *All cog wheels shall be securely fenced.*—This includes (*a*) the wheels in the headstock, (*b*) the draft wheels, and (*c*) those driving the lifting gear.

(*a*) On the older types of frames the guards for the headstock wheels were not carried low enough, leaving them easily accessible and causing frequent accidents to workers when wiping the frame ends. Efficient guards are now made by all the well-known makers, and are illustrated in Figs. 31, 32.

(*b*) The guards for draft wheels are often too short, so that they do not completely cover the cogs (Fig. 33). Complete covers, as illustrated in Figs 31 and 34, should be provided.

(*c*) The position of the lifting gear cogs varies with the make of frame and whether single or double tin rollers are used. They may be safe by position, but, if accessible, should be provided with complete covers.

(ii) *The outer end* (i.e., the end opposite the driving end) *of the frame should be filled in with metal plates.* An open end is shown in Fig. 35, and one fitted with plates in Fig. 36.

Tin Rollers.—No agreement was arrived at at the Conference on the question of the fencing of double tin rollers, but it is now the general practice to provide guards for them. When an accident does occur at these rollers it is always a serious one.

The guard, to be efficient, must run the whole length of the rollers and protect the nip on the ingathering side. If an inverted V-shaped guard is used, it must be fitted so that the ends of the V are not more than $\frac{3}{8}$ of an inch from the rollers (to allow free passage of the knots on the bands) and do not extend beyond the point where the leg of the V is at a tangent to the roller circle (*i.e.*, is at right angles with a line drawn through the centre of the roller to it). Various makes of guards have been put on the market, some of which are illustrated in Figs. 37 A, B, C.

The driving pulley and belt of ring and throstle frames are generally provided with a strong cast iron fender guard (Fig. 32) the panels of which should not be left open but should be filled in with sheet iron.

COTTON DOUBLING AND THREAD MAKING MACHINERY.

There has been no conference with this branch of the trade, but much of the machinery used in it is of similar construction to that used in other branches so that many of the above-noted safeguards can be applied.

The fencing of winding, reeling and gassing frames and other machinery used in subsidiary processes is dealt with in the third pamphlet of this series.

Doubling or twisting is done on flyer or ring frames and on twiners. Flyer and ring frames differ little as regards fencing from the frames used for spinning—there are of course no draft rollers and therefore no draft wheels to guard—but in other respects the recommendations already made and the safeguards required are the same.

Twiners, while resembling the cotton spinning mule, differ in construction. On a mule, the carriage, which carries the spindles on to which the cotton is spun, runs in and out, the creel containing the unspun yarn, is stationary. The twiner works in

exactly the opposite way. The fencing required is illustrated in the following figures :—

(1) Headstock cogs, Figs. 38 and 39.
(2) Rim band pulley, Fig. 40.
(3) Side rim pulley and driving belt, Fig. 41.
(4) Faller stops, Figs. 16 A and B.
(5) Carriage wheels, Figs. 12 A, B, C, D, and 42 and 43.
(6) Guard to twiner driving belt, Fig. 45.

An **inefficient** guard for the wheels on the twiner ends is illustrated in Fig. 44.

A variety of other machinery is used according to the class of yarn being made. These include *Polishing*, *Spooling* and *Balling* machines. The driving pulleys and belts on all require guarding, projecting set pins (which are numerous) should be guarded or made flush, the cog wheels at the driving end and the low shafting under spooling and balling machines require guarding on the lines already indicated for other machinery. (Figs. 2, 3, and 46.)

APPENDIX I.

REGULATIONS, DATED OCTOBER 17, 1905, MADE BY THE SECRETARY OF STATE, IN RESPECT OF THE PROCESS OF SPINNING BY SELF-ACTING MULES.

Whereas certain machinery used in the process of spinning in textile factories, and known as self-acting mules, has been certified, in pursuance of section 79 of the Factory and Workshop Act, 1901, to be dangerous to life and limb;

I hereby, in pursuance of the powers conferred on me by that Act, make the following Regulations, and direct that they shall apply to all factories or parts thereof in which the process of spinning by means of self-acting mules is carried on.

1. In these Regulations the term "Minder" means the person in charge of a self-acting mule for the time being.

2. Save as hereinafter provided it shall be the duty of the occupier of a factory to observe Part I of these Regulations: provided that it shall be the duty of the owner (whether or not he is one of the occupiers) of a tenement factory to observe Part I of these Regulations, except so far as relates to such parts of the machinery as are supplied by the occupier.

It shall be the duty of the persons employed to observe Part II of these Regulations, but it shall be the duty of the occupier, for the purpose of enforcing their observance, to keep a copy of the Regulations in legible characters affixed in every mule room, in a conspicuous position where they may be conveniently read.

PART I.

Duties of Occupiers.

3. After January 1st, 1906, the following parts of every self-acting mule shall be securely fenced as far as is reasonably practicable, unless it can be shown that by their position or construction they are equally safe to every person employed as they would be if securely fenced.

(*a*) Backshaft scrolls and carrier pulleys and draw band pulleys.
(*b*) Front and back carriage wheels.
(*c*) Faller-stops.
(*d*) Quadrant pinions.
(*e*) Back of head-stocks, including rim-pulleys and taking-in scrolls.
(*f*) Rim band tightening pulleys, other than plate wheels, connected with a self-acting mule erected after January 1st, 1906.

PART II.

Duties of persons employed.

4. It shall be the duty of the minder of every self-acting mule to take all reasonable care to ensure:—

(*a*) That no child cleans any part or under any part thereof whilst the mule is in motion by the aid of mechanical power.
(*b*) That no woman, young person, or child works between the fixed and traversing parts thereof whilst the mule is in motion by the aid of mechanical power.
(*c*) That no person is in the space between the fixed and traversing parts thereof unless the mule is stopped on the outward run.

5. No self-acting mule shall be started or re-started except by the minder or at his express order, nor until he has ascertained that no person is in the space between the fixed and traversing parts thereof.

A. AKERS-DOUGLAS,
One of His Majesty's Principal Secretaries of State.

Home Office, Whitehall,
17th October, 1905.

APPENDIX II.

NOTES OF AGREEMENTS.

Fencing and Safeguards.

I. *General Provisions.*

(*a*) On *new* machinery all projecting set-screws on continuously revolving parts shall either be countersunk or be otherwise efficiently protected; where projecting set-screws are placed inside box pulleys they shall be deemed to be efficiently protected.

Projecting set-screws on *existing* machinery are to be dealt with by Inspectors according as the occurrence of accidents may indicate the necessity of countersinking or protection.

(*c*) Ladders, other than step-ladders, shall be fitted with hooks or other non-skid device—provided that in mule rooms or in rooms where persons work with bare feet, ladders shall not be fitted at the bottom with spikes.

(*d*) Heavy overhead main driving belts or ropes shall be guarded underneath in all cases where there is liability of persons having to pass under them.

Note.—This does not refer to the strap that drives the mules, nor to the rope-race in the engine-house.

(*e*) It shall be obligatory on any woman or girl working about machinery to have her hair put up or otherwise confined in a net.

(*f*) All firms are to be urged to keep a supply of sterilised dressings, which shall be kept available for first aid for any operative who receives a cut or wound.

VI. *Self-acting Mules.*

(*a*) The guards for middle backshaft scrolls shall be fitted with flanges to protect the intake of the bands and the side of the scroll. The guards for middle draw band and carrier pulleys shall be either fixed to the bottom creel board, or be so fastened otherwise that they cannot readily be knocked aside. The side pieces of the guard shall be extended inwards far enough to completely guard the nip between the band and the scroll.

(This rule was agreed to in principle, but the exact forms of the guards are to be decided upon later.)

(*b*) On new machines the guards for faller stops shall consist of a cover over the stop. The combined guard and faller stop shall not be deemed to satisfy the requirements of this rule.

(*c*) On new machines the guards for end draw band pulleys shall be extended at least half an inch beyond the end of the pulley.

(*d*) Where persons have to stand on creels to attach driving belts (not countershaft belts), the two creels shall be joined together by timber to form a platform on which to stand, or some other equally safe method shall be adopted to the satisfaction of the Inspector.

(*e*) In new mills the space behind the mules shall not be less than three feet between the rovings.

(*f*) Metal fasteners shall not be used for overhead driving belts unless the belt itself be securely fenced—provided that this rule shall not apply to metal fasteners consisting of a continuous wire stitching held together by a peg other than a metal peg.

VII. *Ring and Throstle Frames.*

(*a*) All cogwheels shall be securely fenced.
(*b*) The outer ends of the frame shall be filled in with metal plates.
(*c*) No banding of spindles shall be allowed while the frame is in motion where there is a double tin roller.

Cleaning Machinery.

I. Young persons shall not be allowed to clean the following parts of machinery while they are in motion:—

(*d*) *Self-Acting Mules*—
(1) Backshaft scrolls, draw band, and carrier pulleys;
(2) Back carriage wheels and back of carriage;
(3) Quadrant pinions;
(4) Back of headstock, including rim pulley and taking-in scrolls;
(5) The whole of the front of the headstock.

It was further agreed that these restrictions should be deemed to apply only to persons under 18 years of age.

Temperature.

The following temperatures were agreed to as being "reasonable":—

	Maximum.	Minimum.
Card Rooms and Ring Rooms ...	80 degrees.	60 degrees.
Mule Rooms	95 ,,	70 ,,

By this it is understood that the means of heating shall be turned off when the temperature reaches the maximum, and that this agreement shall not be deemed to have been broken if under exceptional climatic conditions the temperature should rise above the figures named without the aid of artificial means. Employers agreed to provide thermometers in the Spinning Rooms.

APPENDIX III.

The reserved points were subsequently settled as below by a Committee appointed by the Conference.

An efficient guard must comply with the following conditions:—

I.—General.

(*a*) Any movable parts of the guards must be provided with fastenings to prevent accidental removal or displacement through vibration.

(*b*) The edges of guards made of sheet metal must be wired or beaded (to prevent cuts or scratches).

(*c*) The guards must be securely fixed to the floor or to the machinery.

(*d*) The guards must be so constructed as to be readily opened out or removed to allow the bands to be easily passed round the carrier pulleys and fitted to the scrolls.

(*e*) If the guards are made of sheet metal, the metal should be not less than 24 gauge steel or 20 gauge black iron.

II.—Middle or Intermediate Backshaft Scrolls, Carrier Pulleys, and Draw Bands.

(*a*) The scroll-guard must cover the top and front (wheel-gate side) of the scroll over its entire length; and

(*b*) Be provided with flanges at each side to cover completely the sides of the scroll and any key or other projection on it; and

(*c*) The space between the backshaft and the holes in the flanges, through which the shaft passes, must be small enough to prevent the fingers being inserted.

(*d*) The guard for the draw bands and carrier pulleys must be continued from the scroll-guard to the floor at the front, back, and sides, to enclose completely the draw bands and carrier pulleys. The openings in front (near the floor level) for the passage of the bands, and those at the sides for the purpose of lubrication, must not permit access to the nip between the carrier pulleys and the bands.

III.—End Scrolls and Draw Bands.

(*a*) The guard must cover the top, front, and bottom of the scroll over its entire length. The openings in front for the passage of the bands must not permit access to the nip between the scroll and the bands.

(*b*) The guard must be provided with flanges at each side to cover completely any key or other projection on the scroll. The flange on the inner side to extend from the top to the bottom of the guard, and that on the outer side to extend from the top and bottom of the guard to the frame end.

(*c*) The space between the backshaft and the hole in the inner flange, through which the shaft passes, must be small enough to prevent the finger being inserted.

APPENDIX IV.

NAMES OF MAKERS OF GUARDS FOR SELF-ACTING MULES, COMPLYING WITH THE SPECIFICATIONS IN APPENDIX III.

I.—For Middle Backshaft Scrolls, Carrier Pulleys, and Draw Bands.

James Pickford, 420, Lees Road, Oldham.
George Hargreaves & Sons, Ltd., Brookhouse Lane, Blackburn.
Grundy & Co., Crompton Works, Bradshawgate, Bolton.
Asa Lees & Co., Ltd., Soho Iron Works, Oldham.
Kenyon Bros., Spring Street Tin and Copper Works, Bolton.
James Holt, Hope Works, Buckley Street, Bury (Threlfall Mules).
John Manwood, Ltd., Sheet Metal Workers, Dukinfield.
Manwood, Miller & Co., Tame Valley, Dukinfield.
Jackson Sheet Metal Works, Ltd., Draycott Street, Bolton.
William Eaves, 8, Defence Street, Bolton (Threlfall Mules).
J. Gore, 30, Bolton Road, Atherton, Manchester.
F. Pedley & Sons, 15, Market Place, Middleton, Manchester.
F. J. Rigby, Manager, Ocean Cotton Spinning Co., Ltd., Great Lever, Bolton.
Dobson & Barlow, Ltd., Kay Street, Bolton.
Platt Bros. & Co., Ltd., Hartford Works, Oldham (two models). (1) Platt's; (2) Pickford's.
R. Threlfall, Bridgman Place Works, Bolton.
A. Lever, Clifton Street Tin and Copper Works, Bolton.
James Howorth & Co., Ltd., Victoria Works, Farnworth, Bolton.
B. Robinson & Co., Bark Street, Bolton.
Thomas Mills, Middleton Junction, Manchester.
J. Boardman & Son, 10, Hindsford Street, Hindsford, Atherton.
W. Barratt, Walton Sheet Metal Works, Howard Street, Portwood, Stockport.
R. Whitworth & Sons, Park Tin Works, off High Barn Street, Royton.
A. A. Irving, 9, Smyrna Street, Oldham.
George Crabtree, Quarry Street Works, Stalybridge.
Partington & Co., Under Lane Tin Works, Hollinwood, Oldham.
Benion & Spencer, 9, Adelaide Street, Heywood.
Price & Leather, 32A, Blackbank Street, Bolton.

II.—For End Scrolls on Backshafts.

Asa Lees & Co., Ltd., Soho Iron Works, Oldham.
George Hargreaves & Sons, Ltd., Brookhouse Lane, Blackburn.
A. Dearnaley, Britannia Mills, Oldham.
Platt Bros. & Co., Ltd., Hartford Works, Oldham.
Manwood, Miller & Co., Tame Valley, Dukinfield.
J. Gore, 30, Bolton Road, Atherton, Manchester.
Jackson Sheet Metal Works, Ltd., Draycott Street, Bolton.
Thomas Mills, Middleton Junction, Manchester.
A. A. Irving, 9, Smyrna Street, Oldham.
J. Boardman & Son, 10, Hindsford Street, Hindsford, Atherton.
George Crabtree, Quarry Street Works, Stalybridge.
Partington & Co., Under Lane Tin Works, Hollinwood, Oldham.

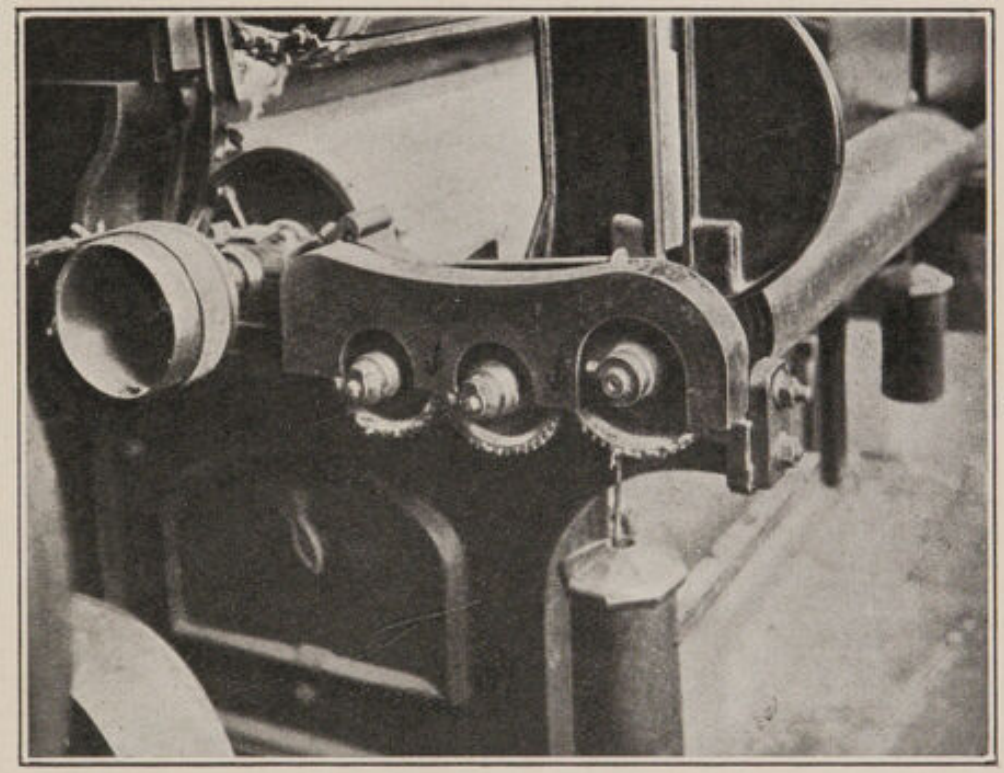


FIG. 1.—Inefficiently fenced cogs (partial cover).

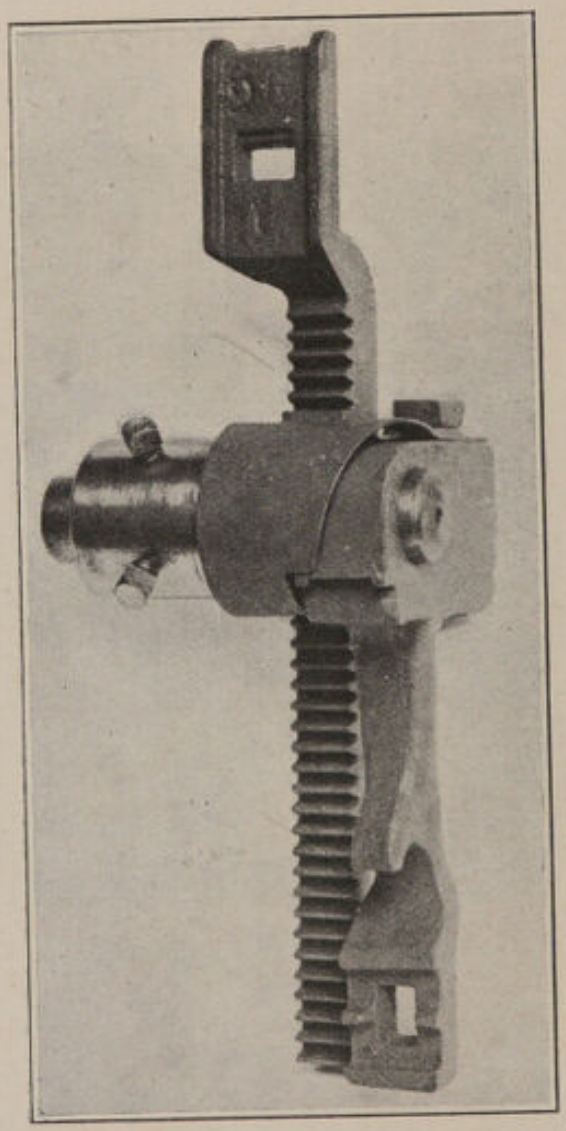


FIG. 2 —Projecting set-pin, unguarded.

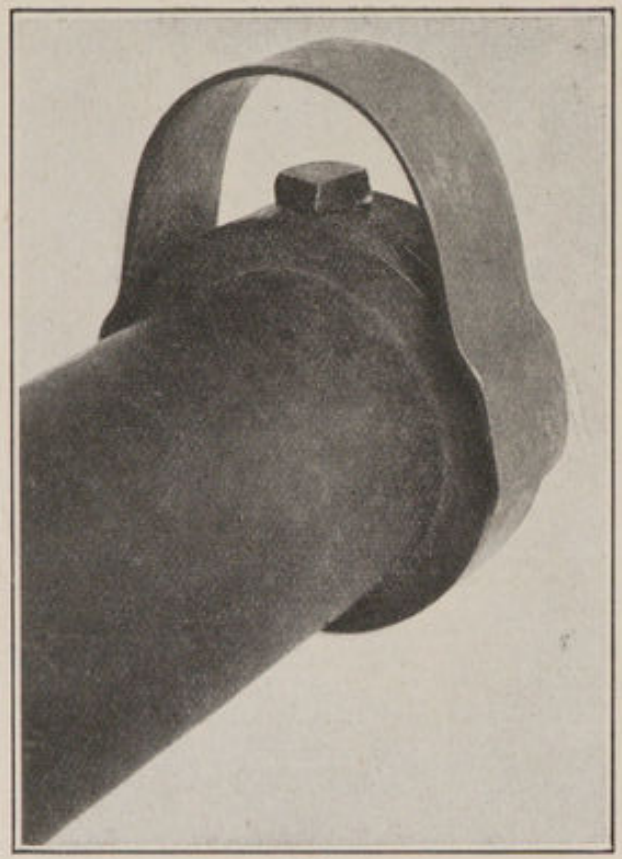


FIG. 3.—Clip guard for projecting set-pin.

FIG. 4.—Incomplete guard for scroll and carrier pulleys.

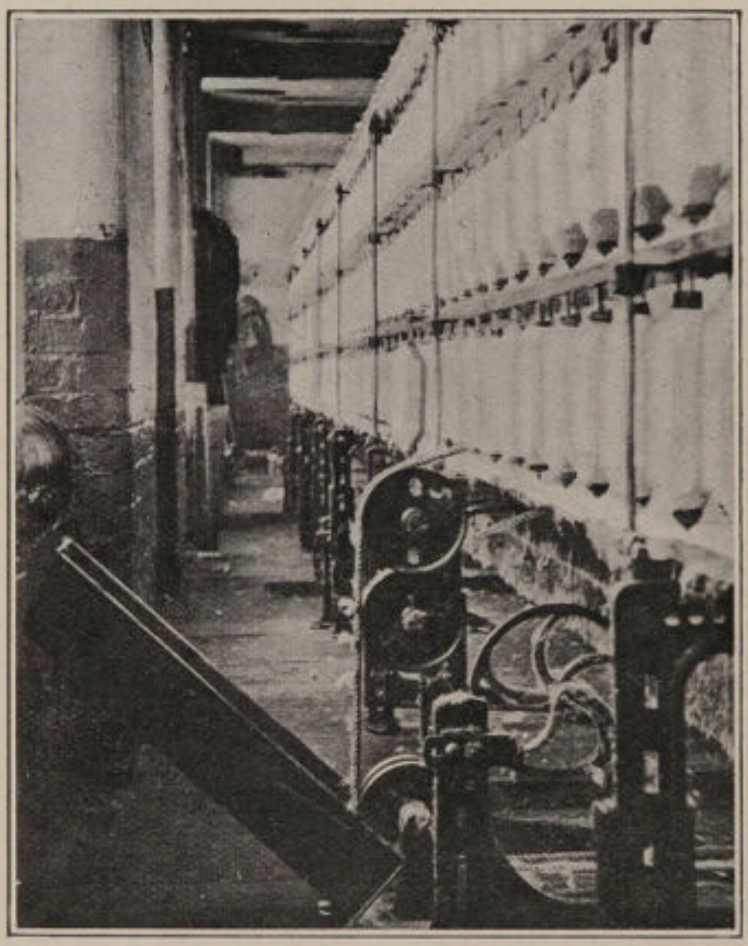


FIG. 5.—Showing how easily the guard in Fig. 4 can be displaced.

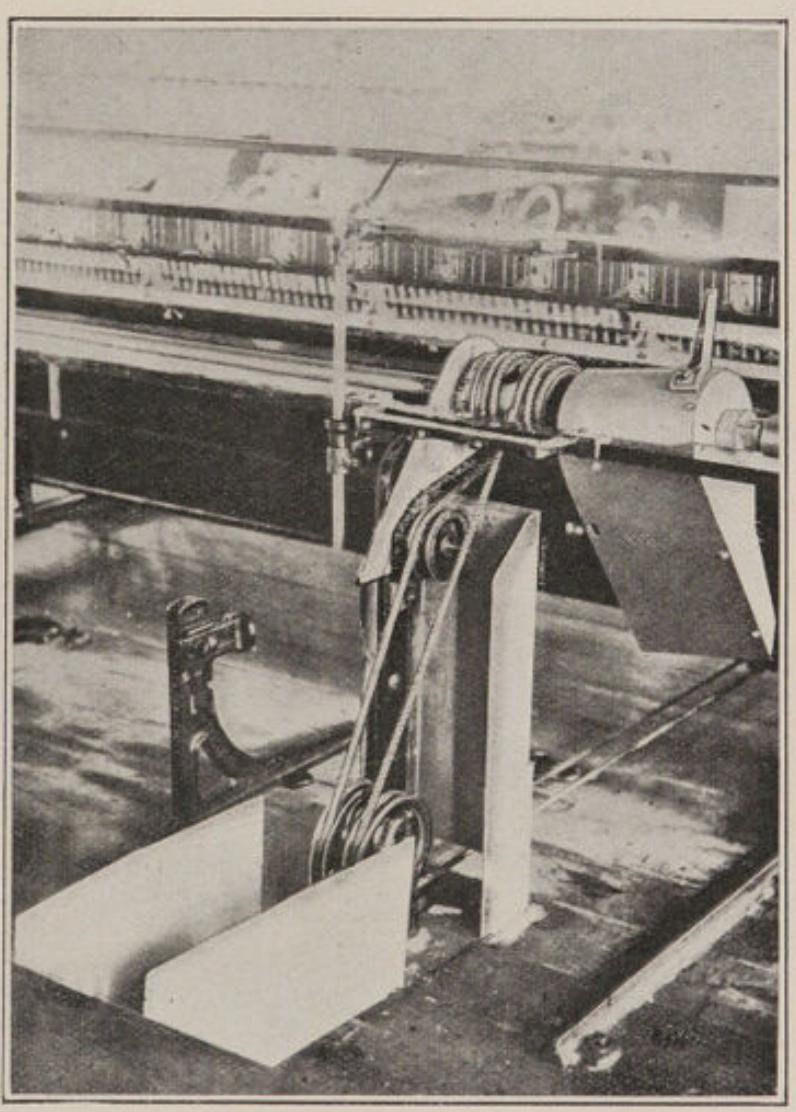


FIG. 6.—Types of approved middle scroll guards. Type A—Guard open.

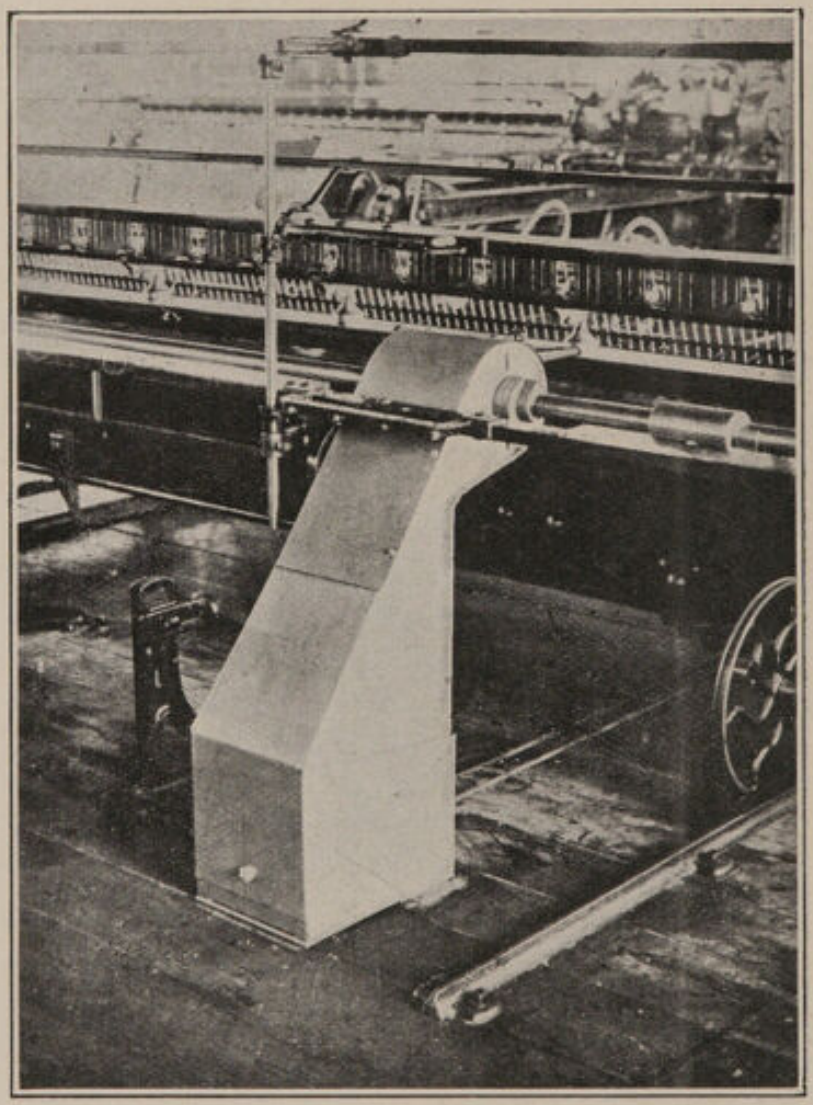


FIG. 6.—Types of approved middle scroll guards. Type A—Guard closed.

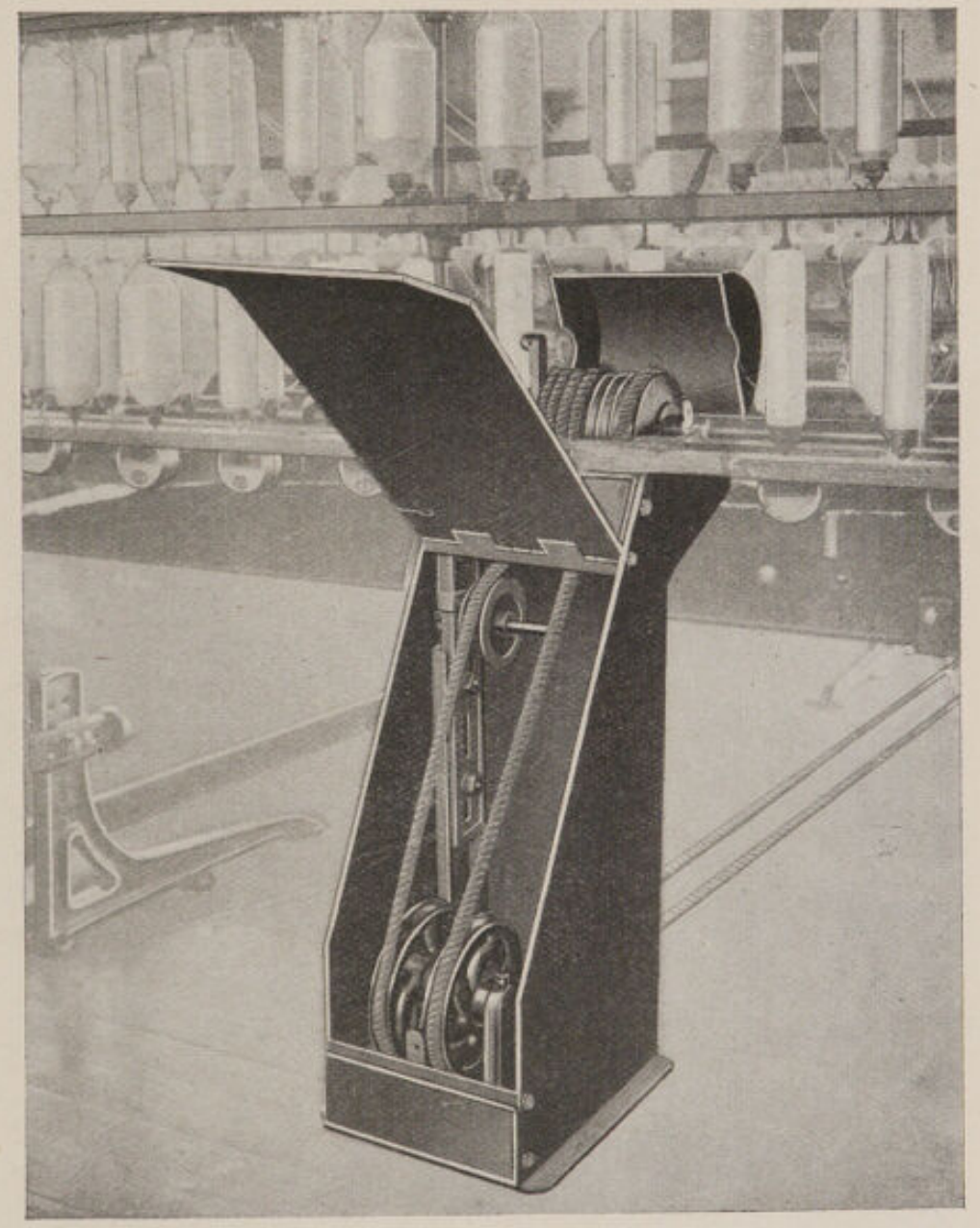


FIG. 6.—Types of approved middle scroll guards. Type B—Guard open.

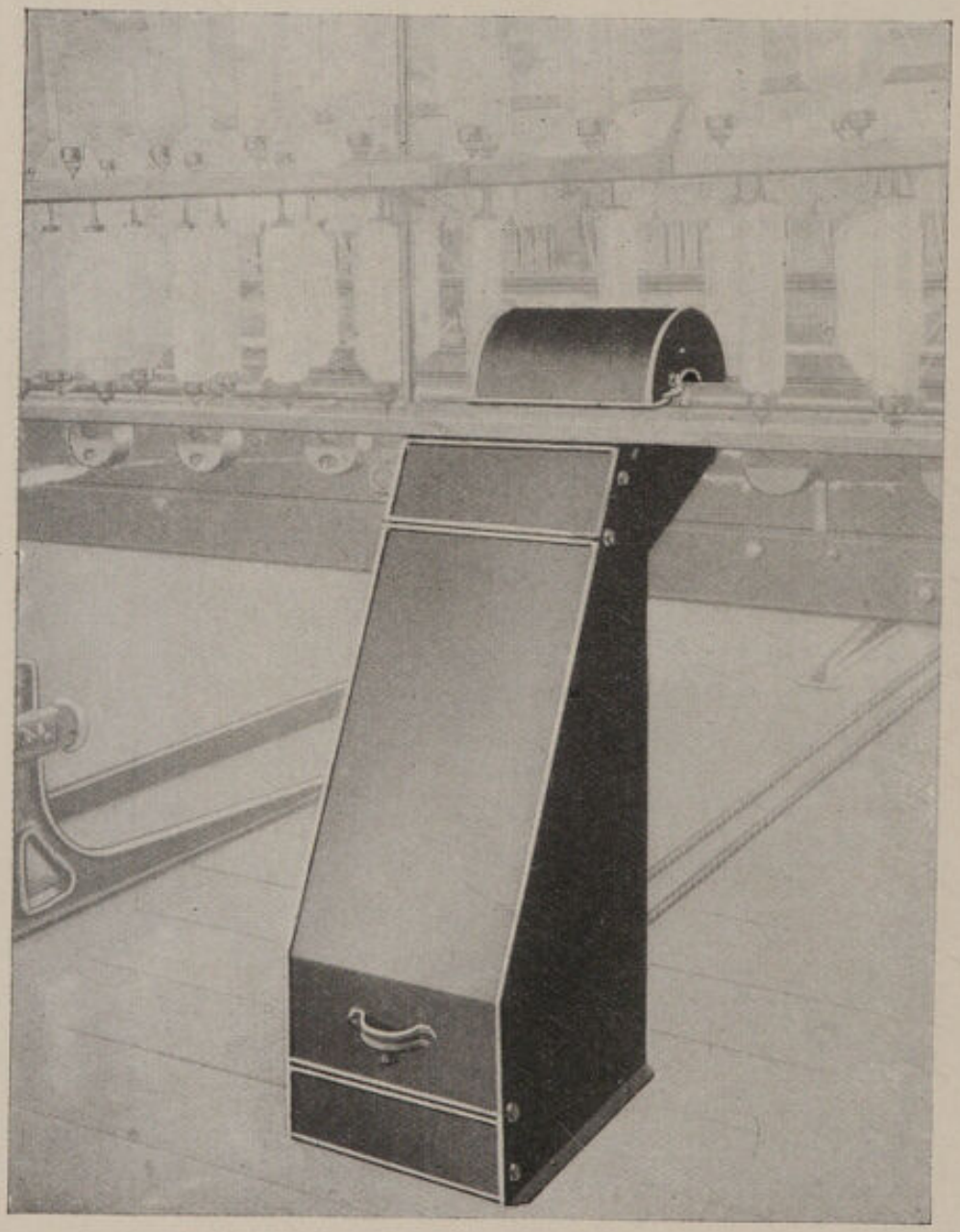


FIG. 6.—Types of approved middle scroll guards. Type B—Guard closed.

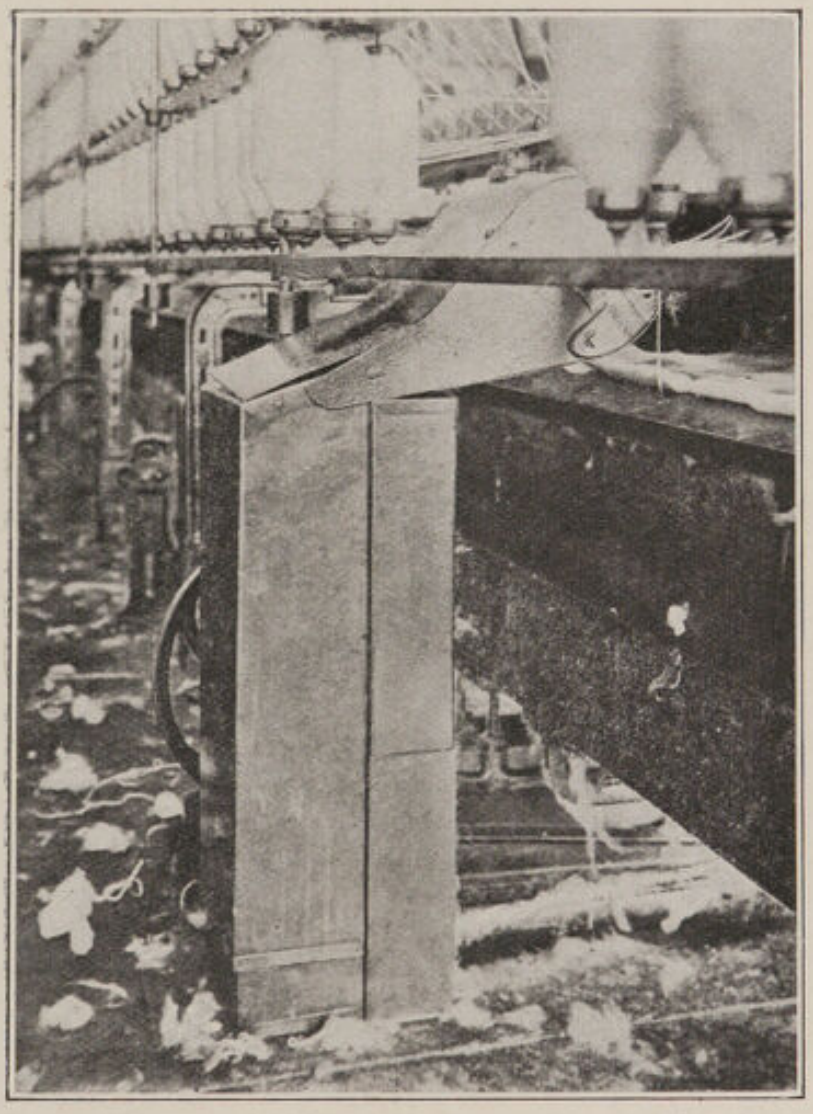


FIG. 6.—Types of approved middle scroll guards. Type C—Guard closed.

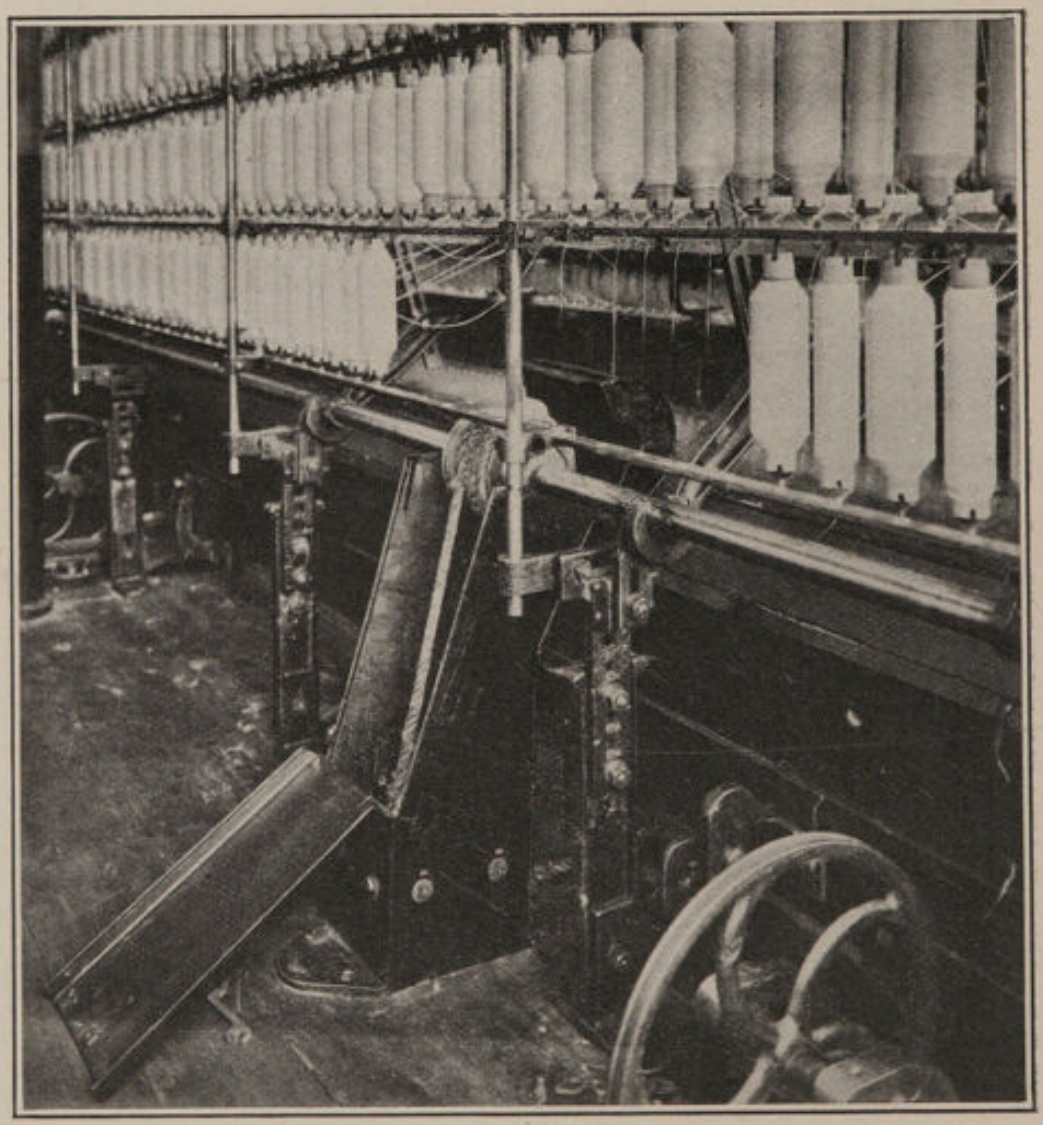


FIG. 6.—Types of approved middle scroll guards. Type D—Guard open.

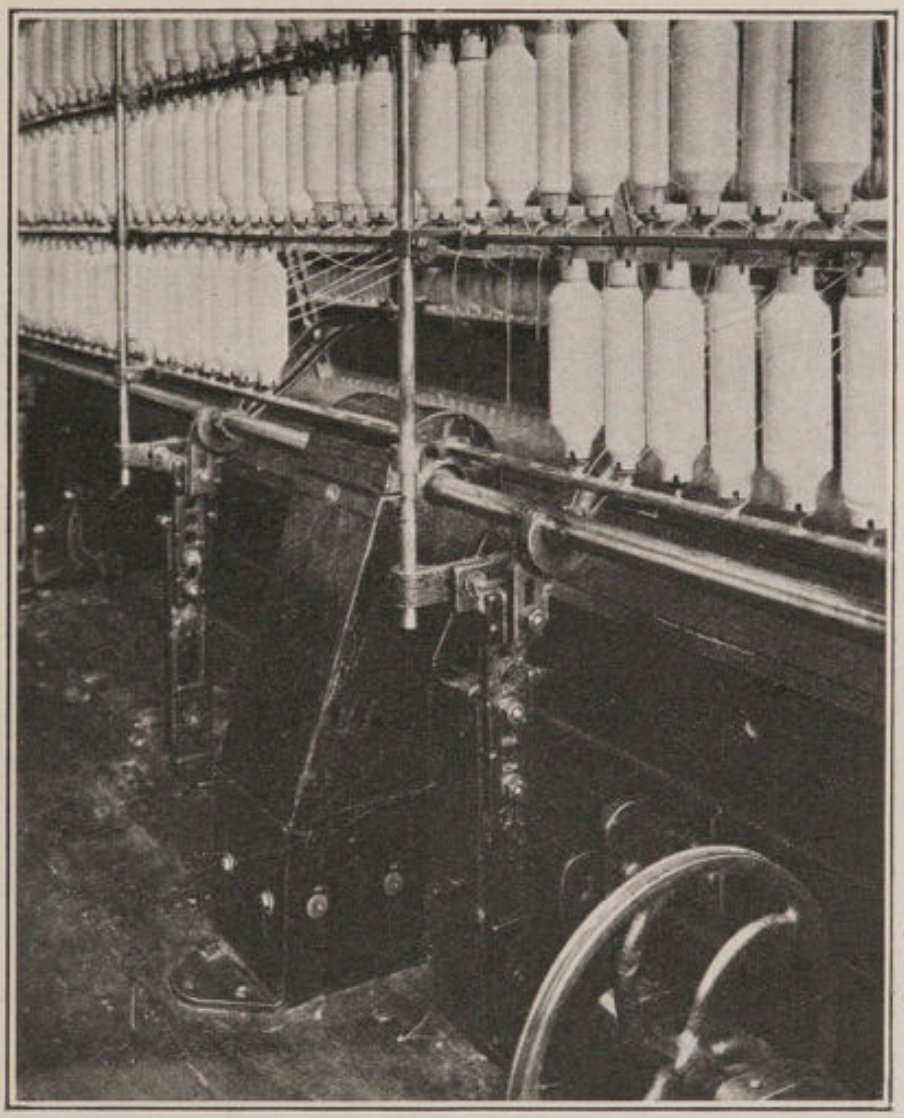
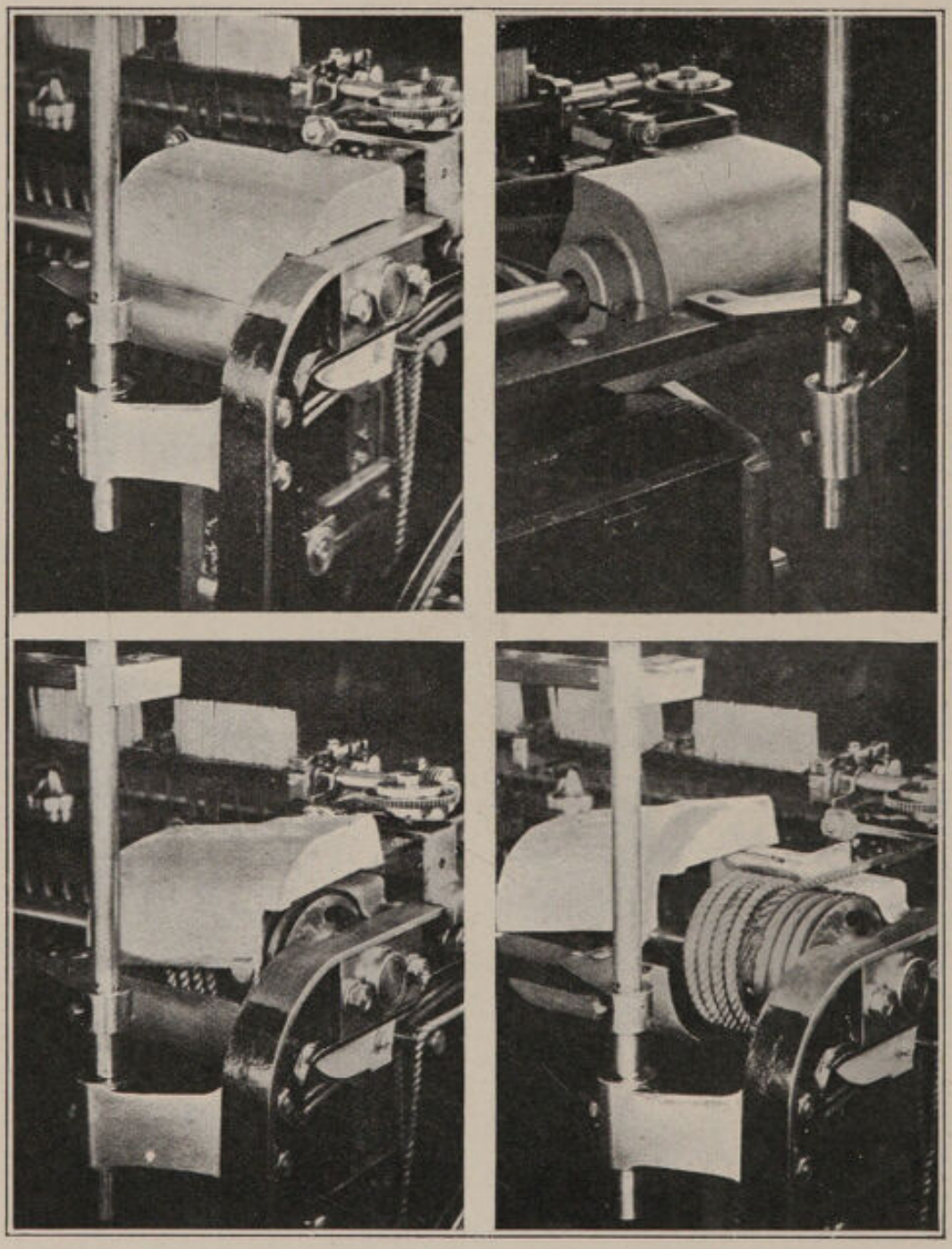


FIG. 6.—Types of approved middle scroll guards. Type D—Guard closed.

(1) (1)



(2) (2)

FIG. 7.—Types of approved end scroll guards. Type A—(1) Guard closed; (2) Guard open.

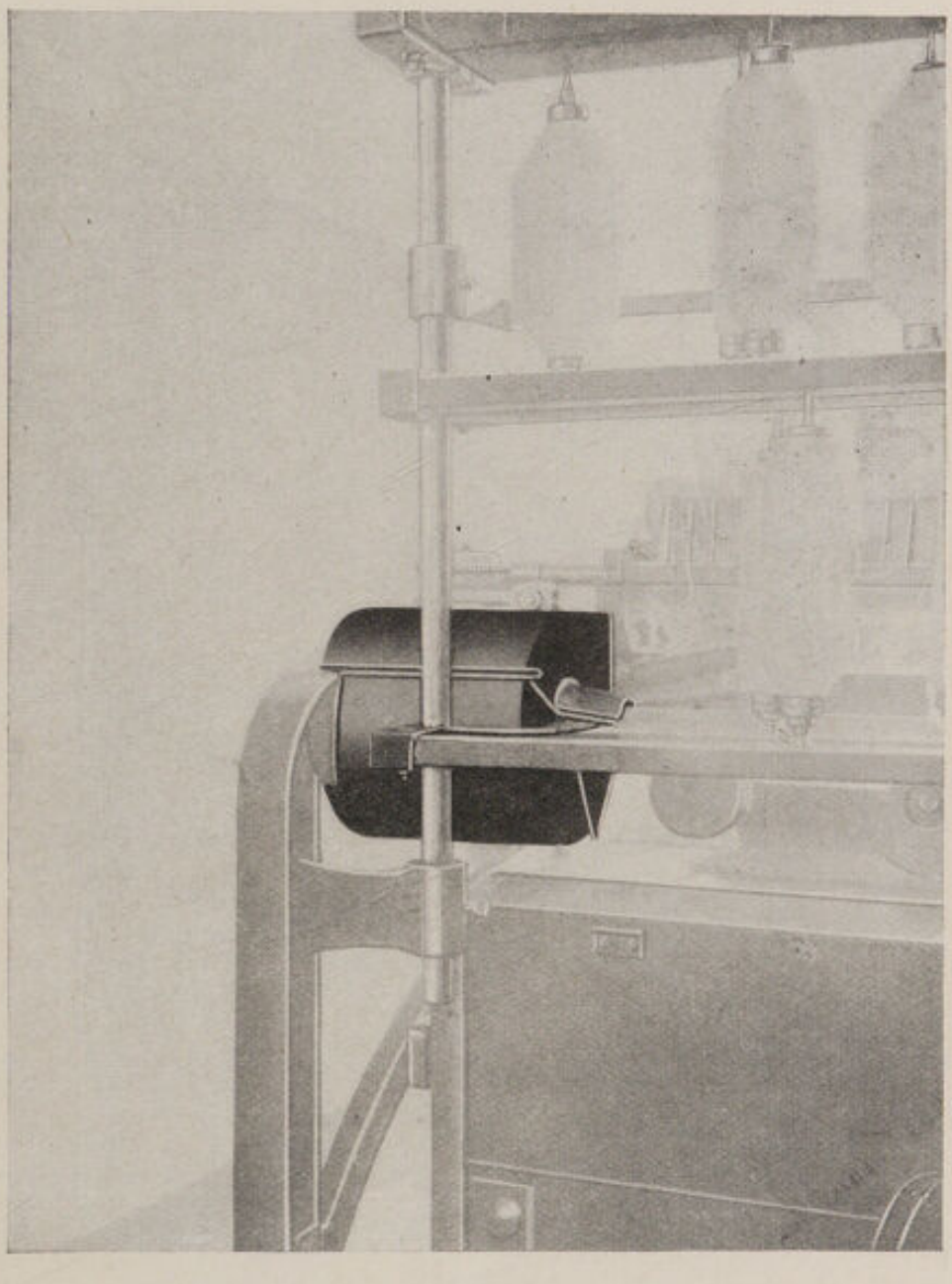


FIG. 7.—Guard for end scrolls. Type B.

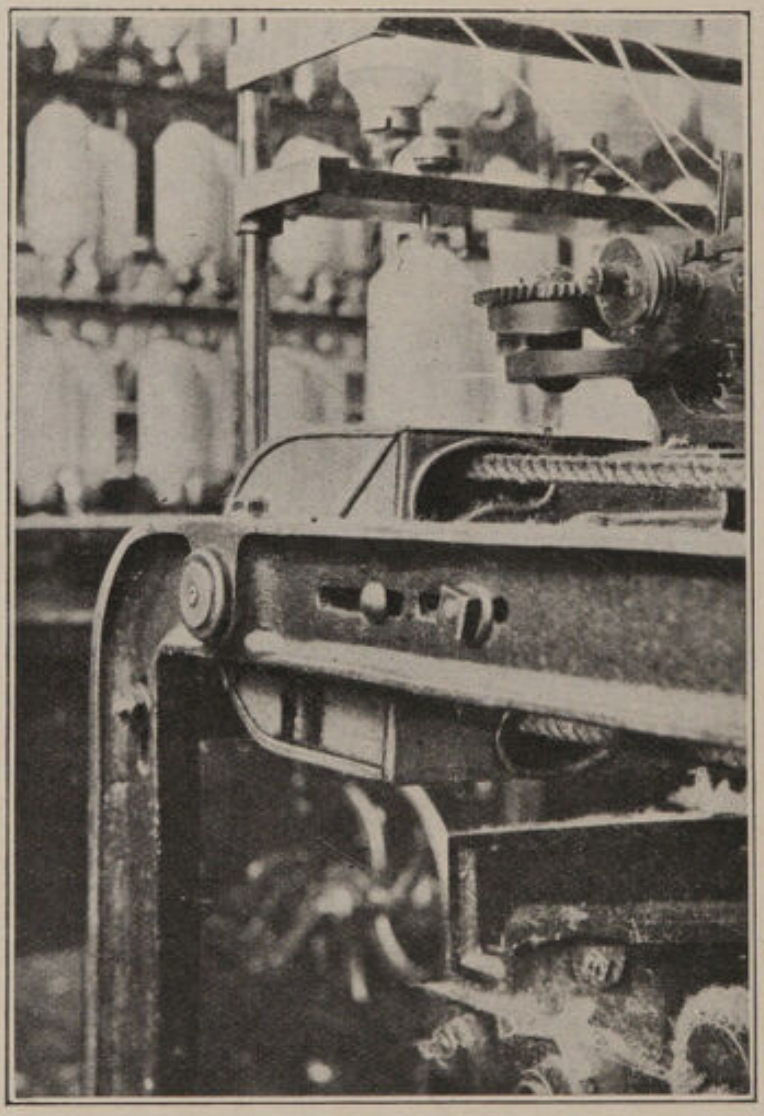


FIG. 7.—Types of approved end scroll guards. Type C, showing opening for traverse of band.

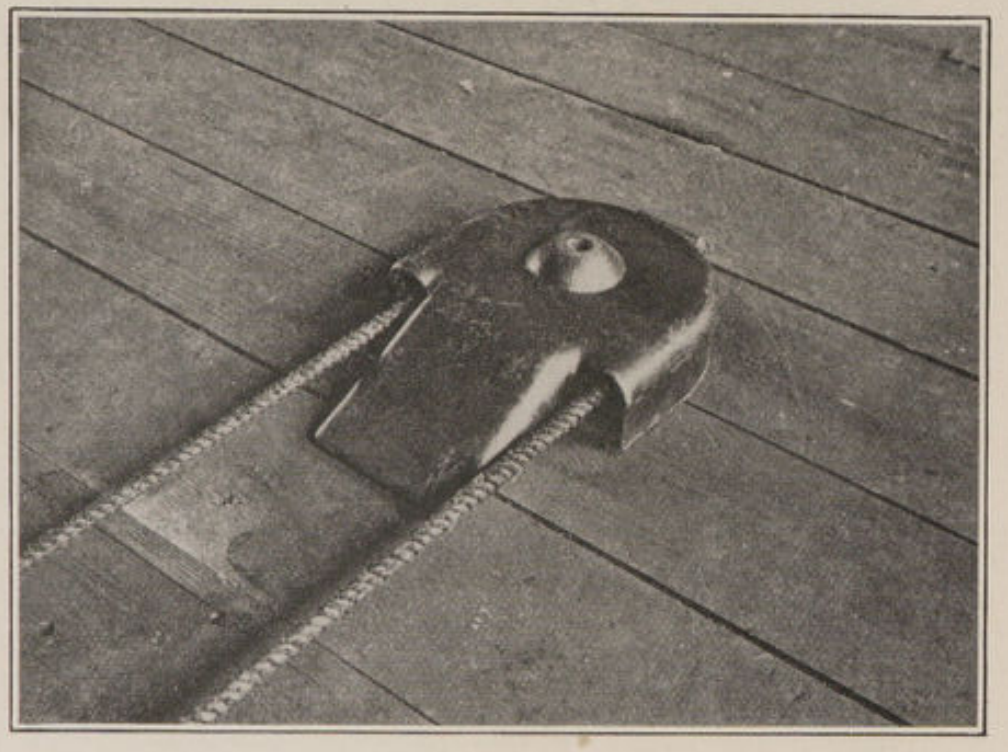


FIG. 8.—Flat draw band pulley in mule gate, with cover.

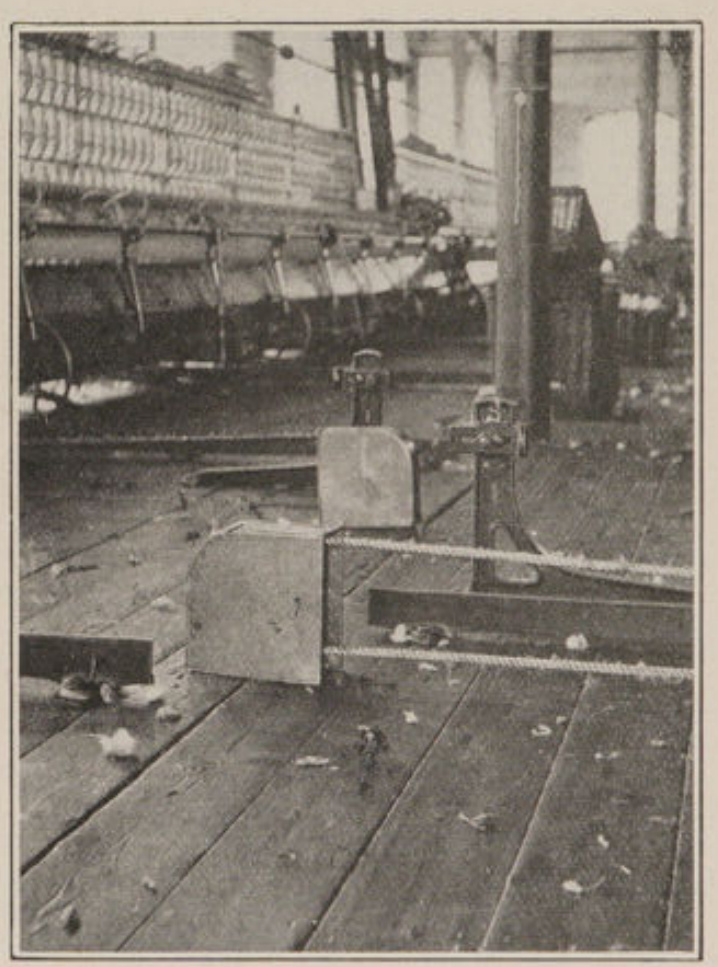


FIG. 9.—Upright draw band pulley in mule gate, with cover.

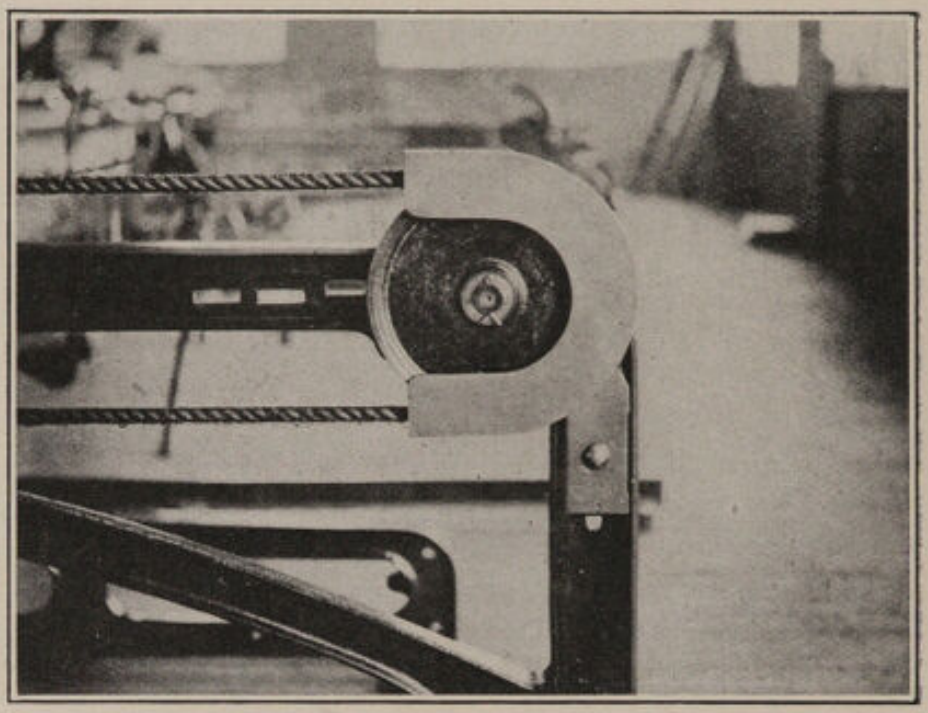


FIG. 10.—Inefficient guard for draw band pulley on frame end.

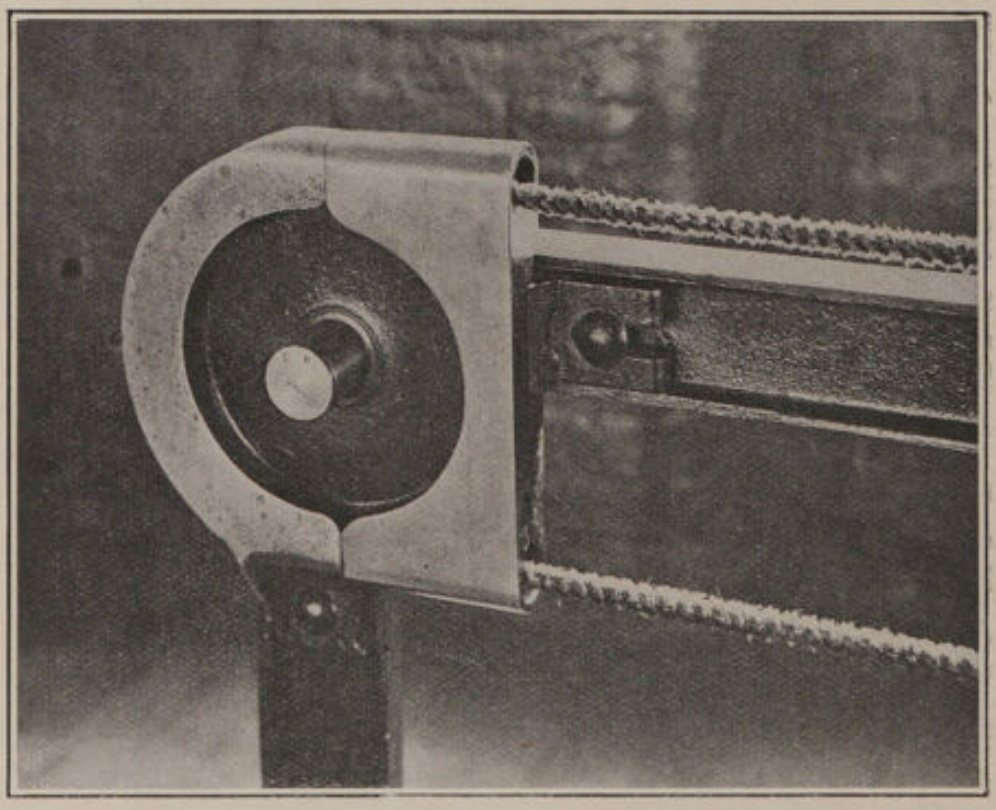


FIG. 11.—Efficient guard for draw band pulley on frame end.

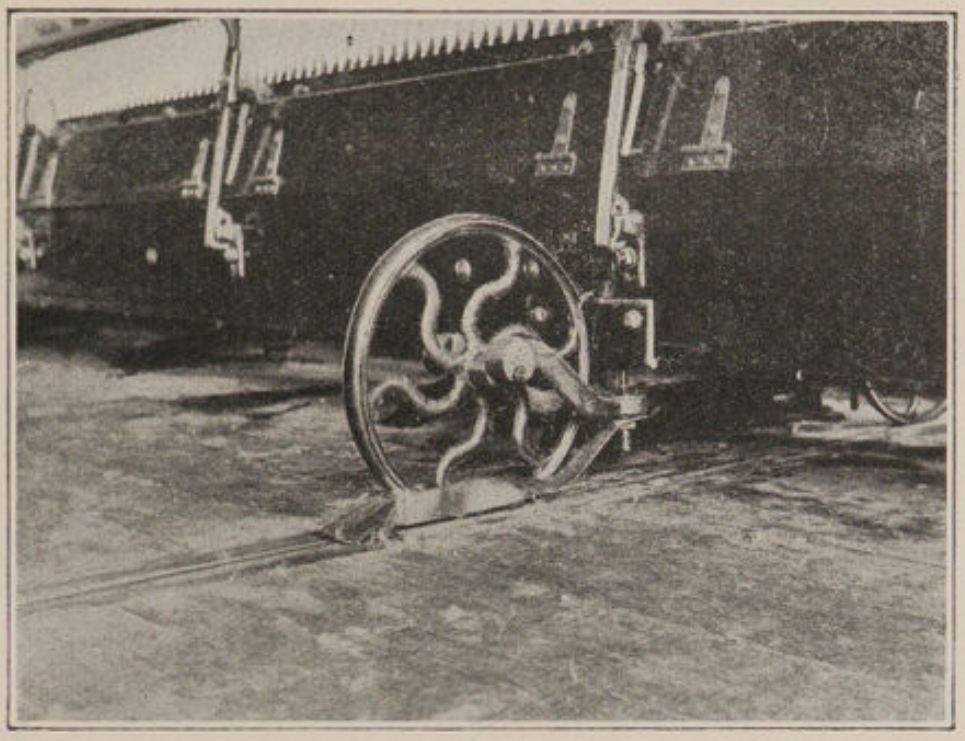


FIG. 12.—Types of carriage wheel g ıards. A.—O.ı sunk slip.

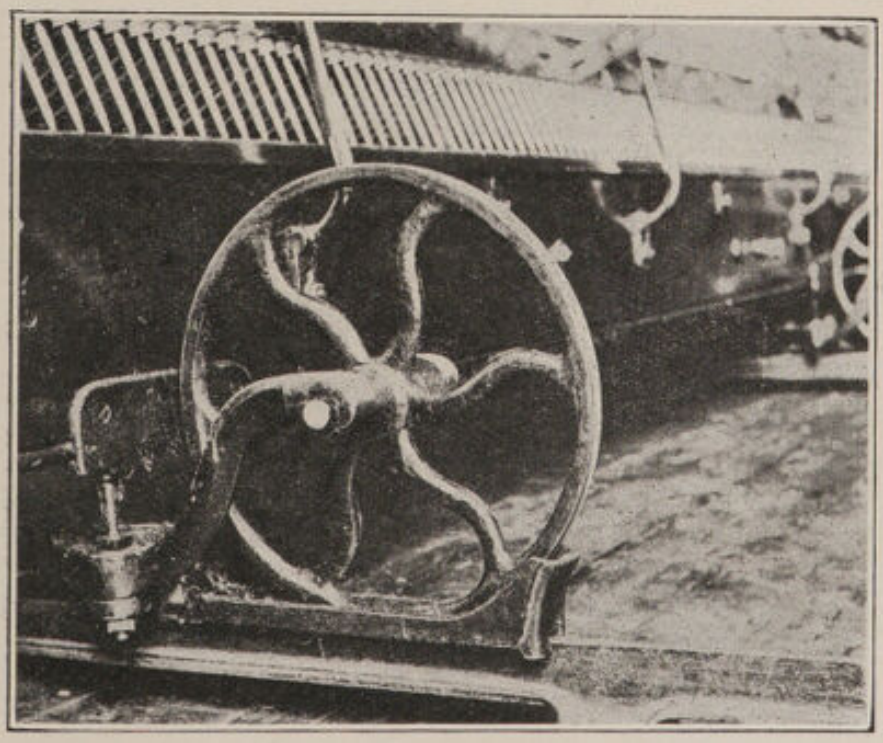


FIG. 12. –Types of carriage wheel guards. B.—On raised slip.

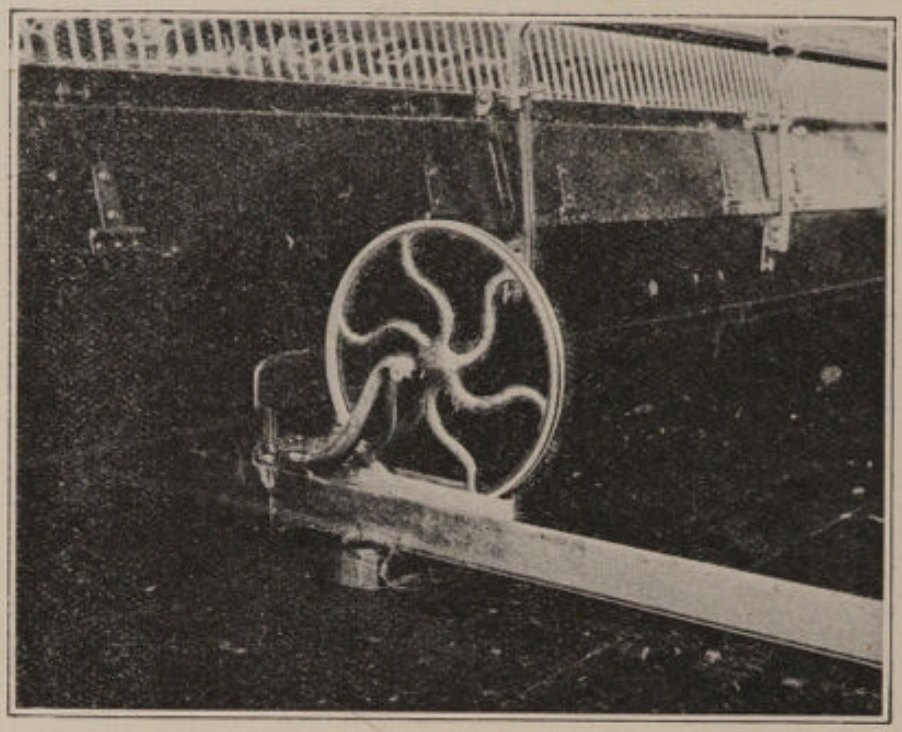


FIG. 12.—Types of carriage wheel guards. C.—On raised slip.

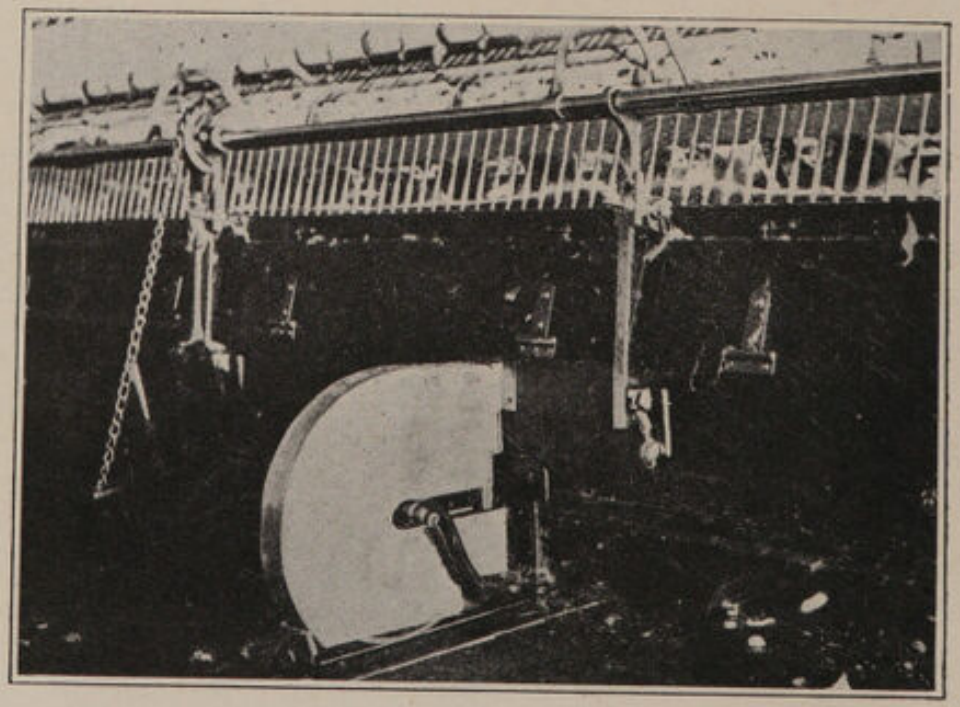


FIG 12.—Types of carriage wheel guards. D.—Complete cover.

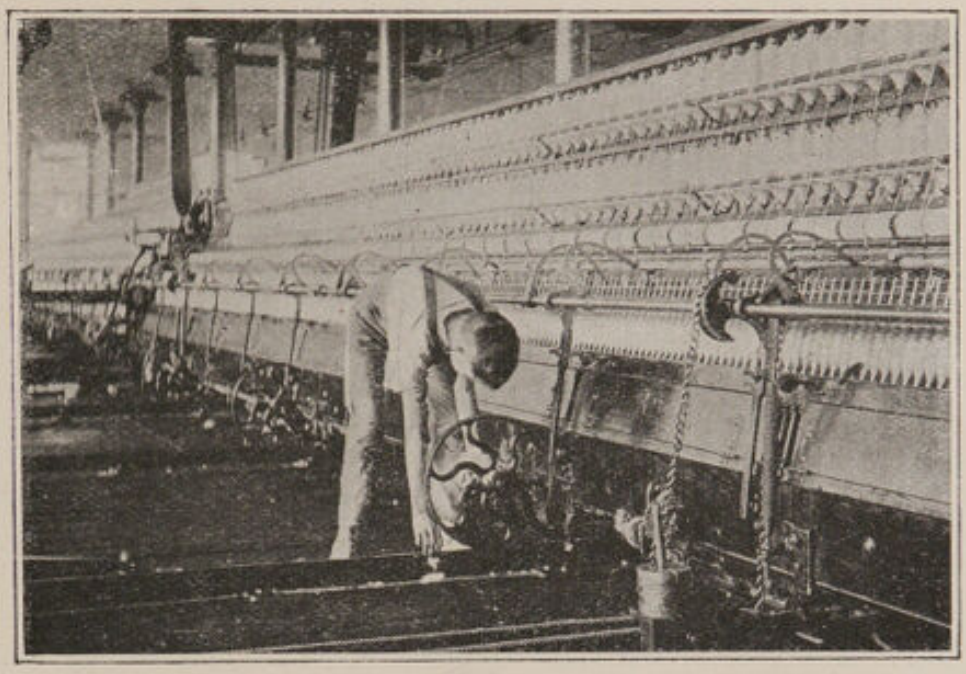


FIG. 13.—Workman picking fluff off carriage wheel.

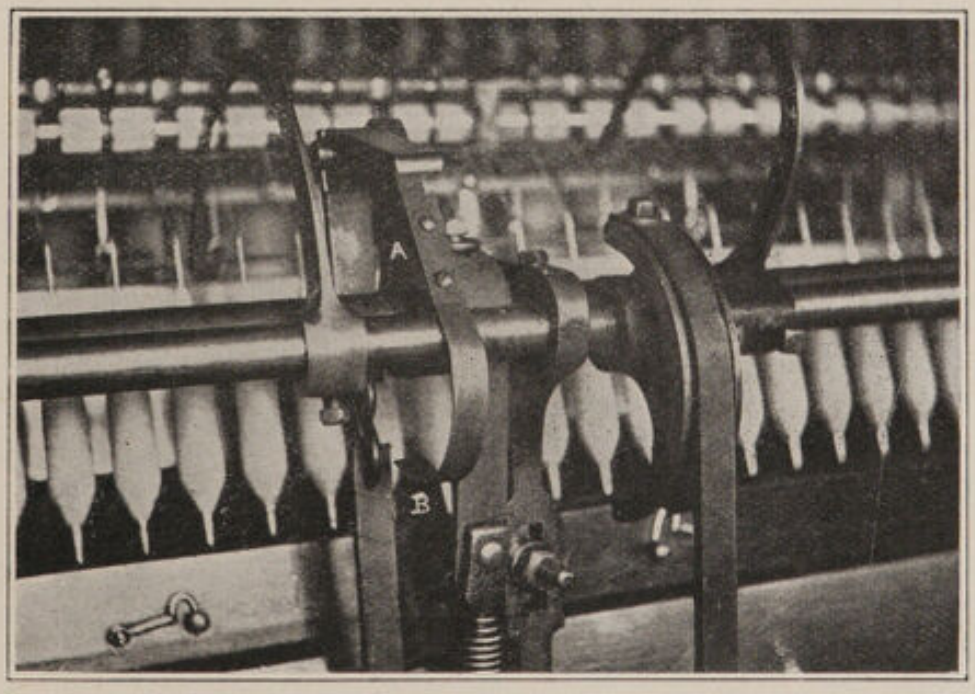


FIG. 14.—Combined faller stop and guard (type not approved).

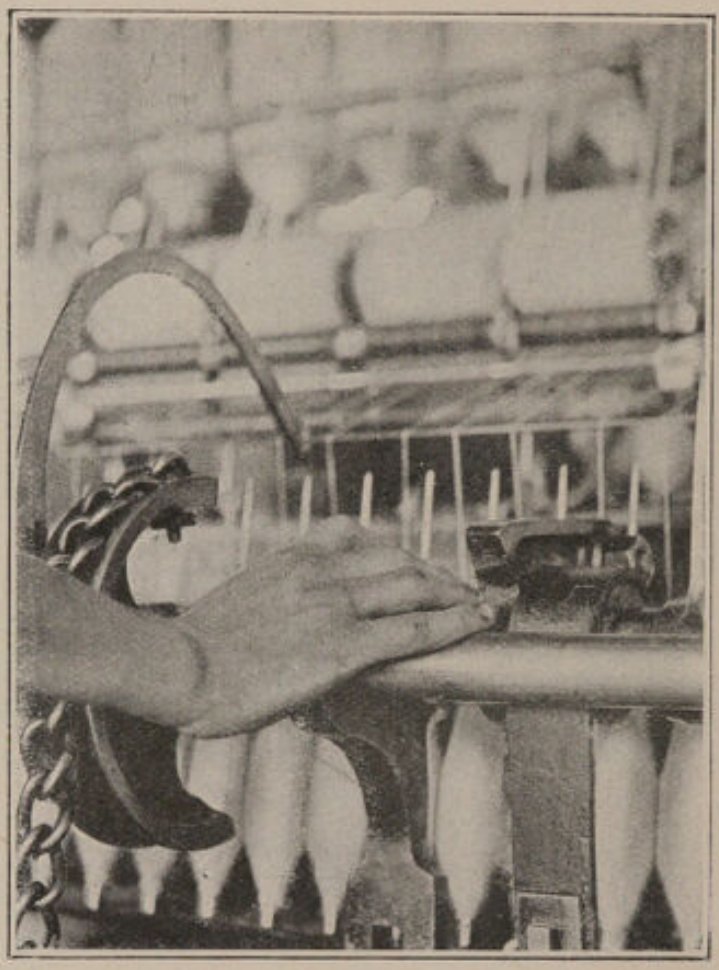


FIG. 15.—Piecer getting finger caught under faller hammer.

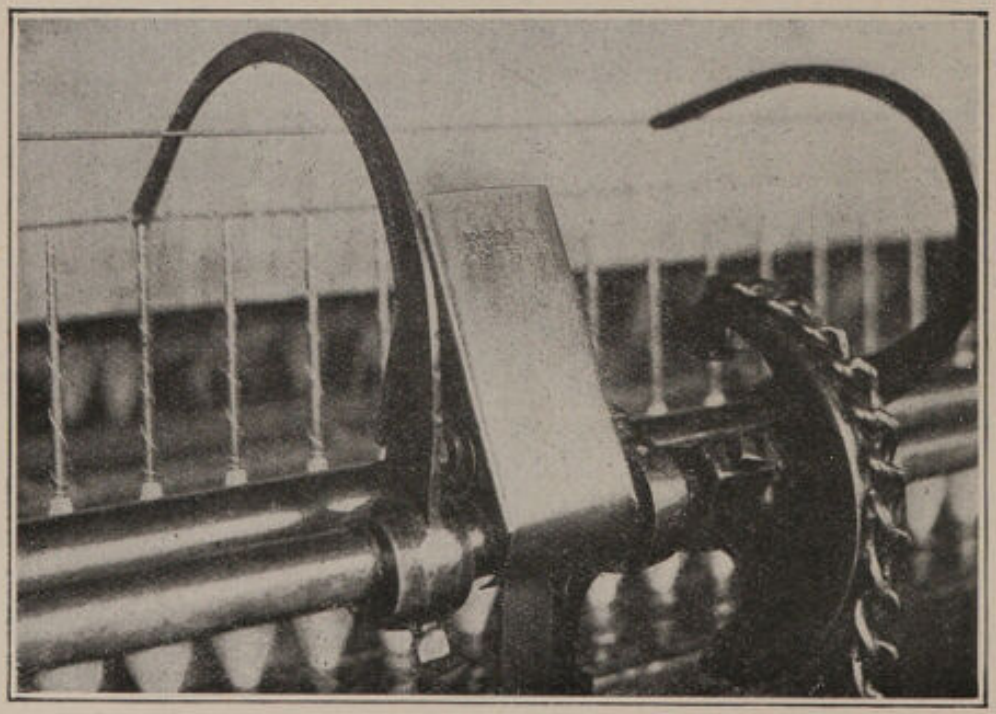


FIG. 16.—Types of faller stop guards. Type A.

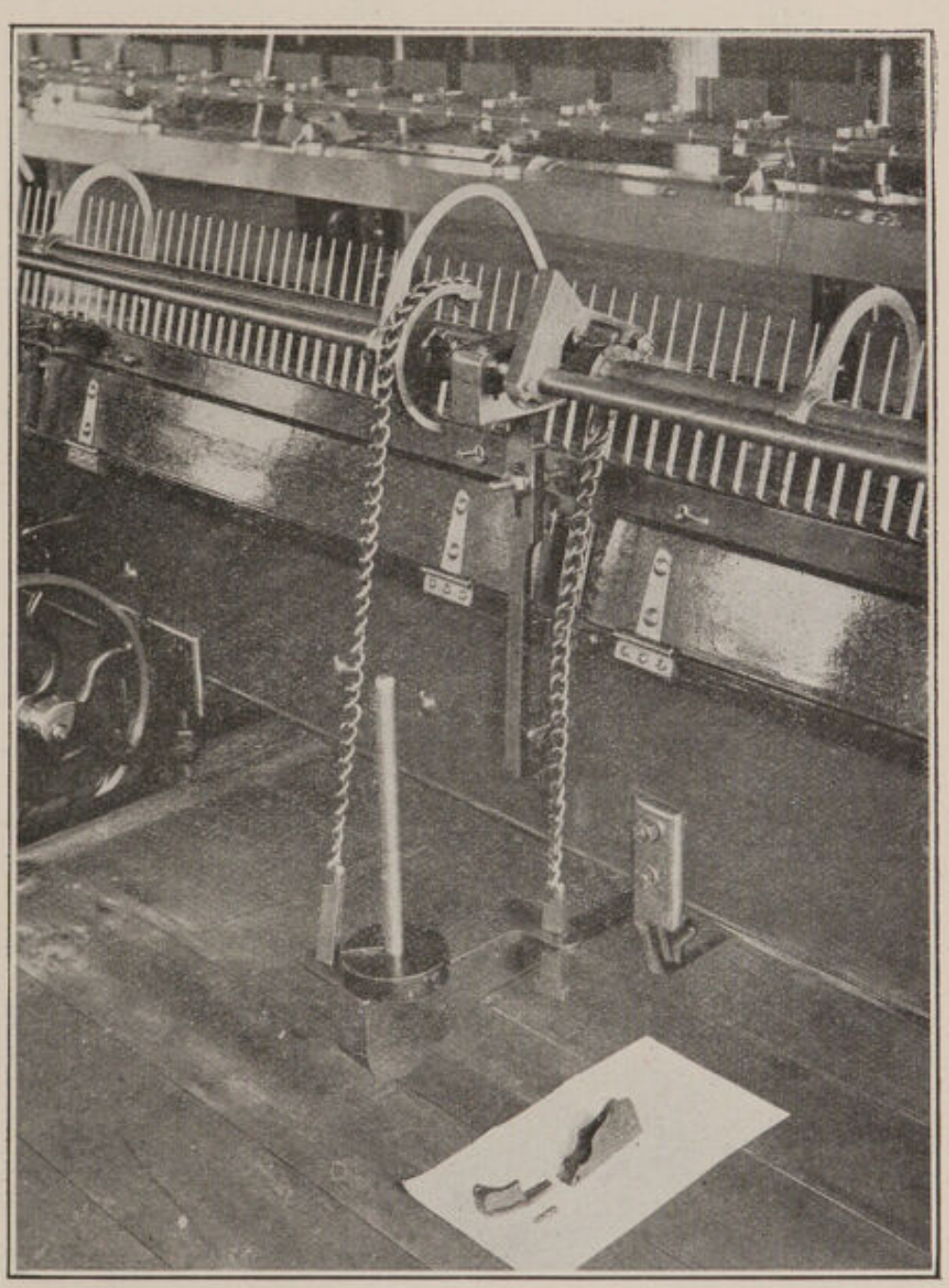


FIG. 16.—Types of faller stop guards. Type B.

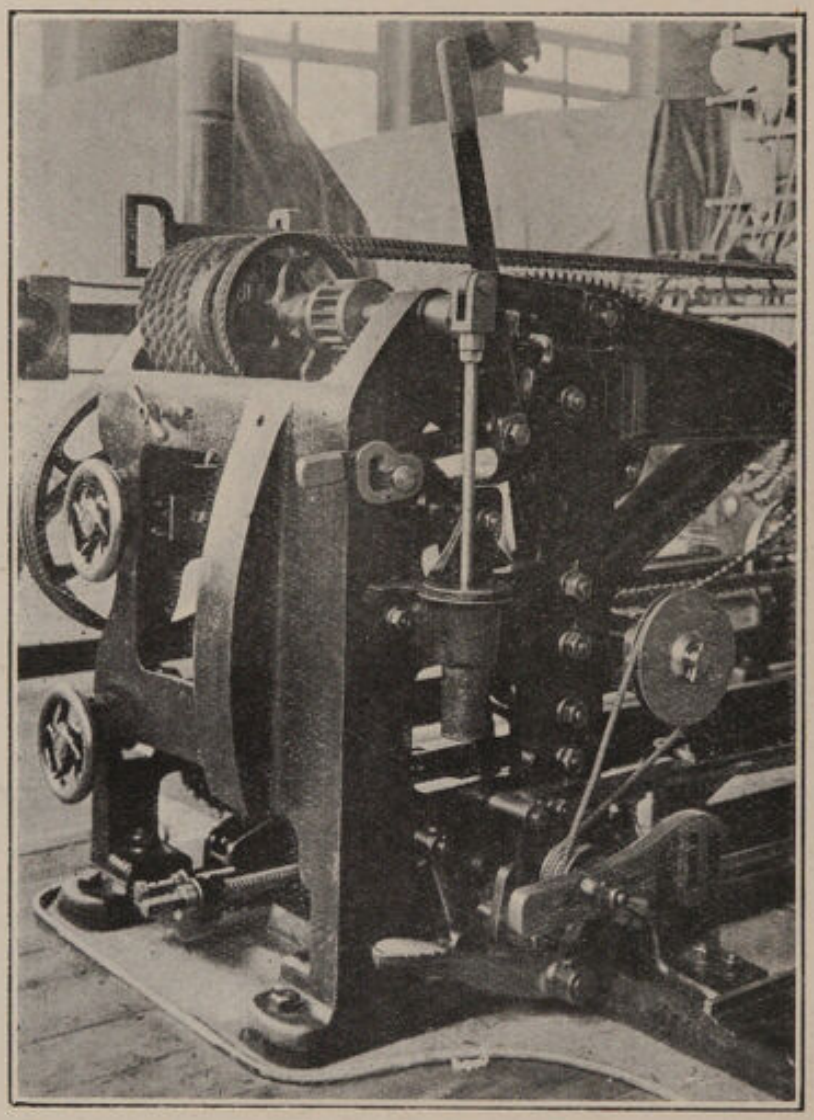


FIG. 17.—Unfenced quadrant pinion on mule.

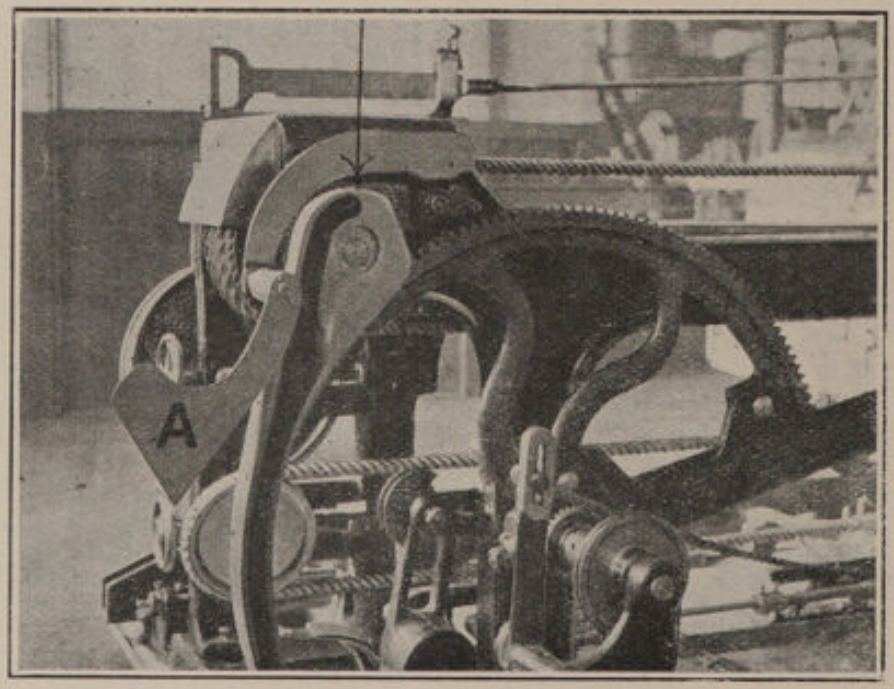


FIG. 18.—Extended guard for quadrant pinion on mule.

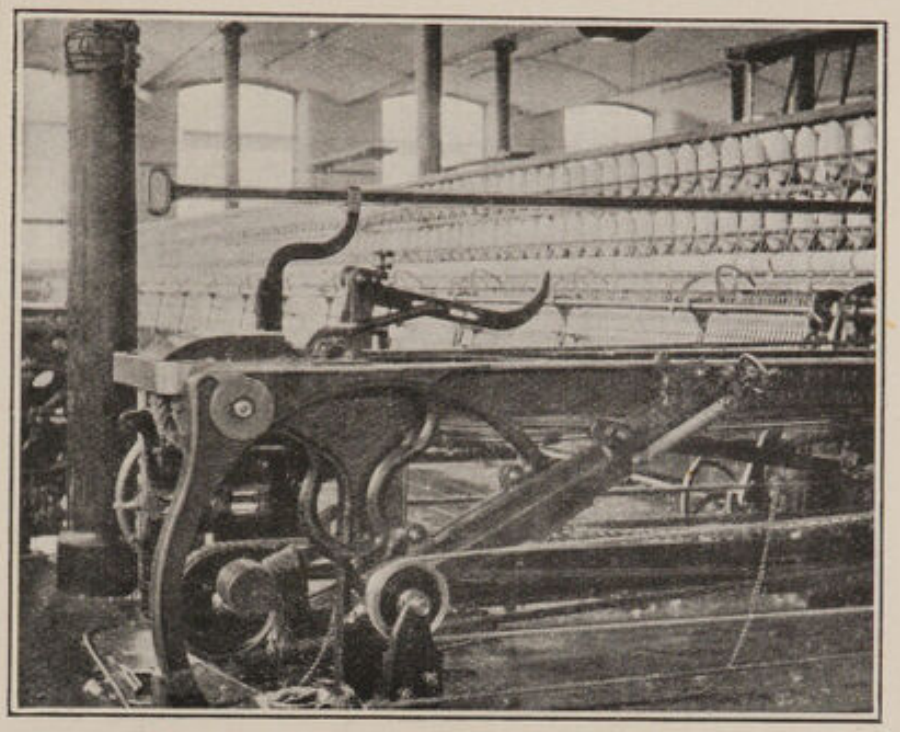


FIG. 19.—Efficient guard for quadrant pinion on mule.

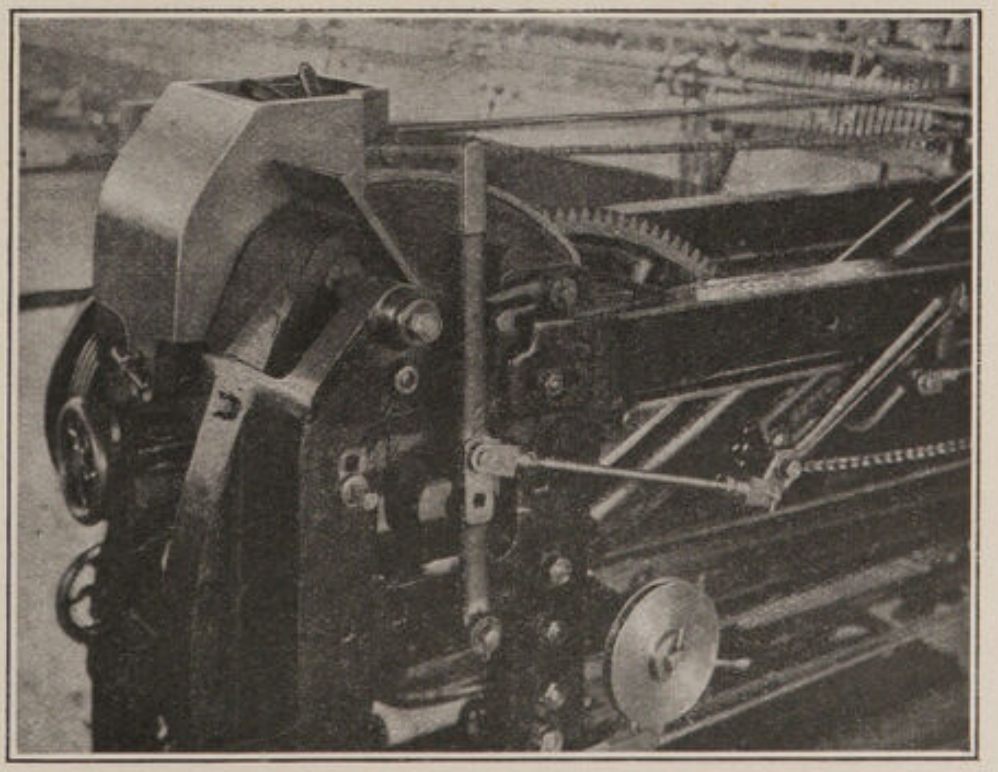


FIG. 20.—Efficient guard for quadrant pinion on mule.

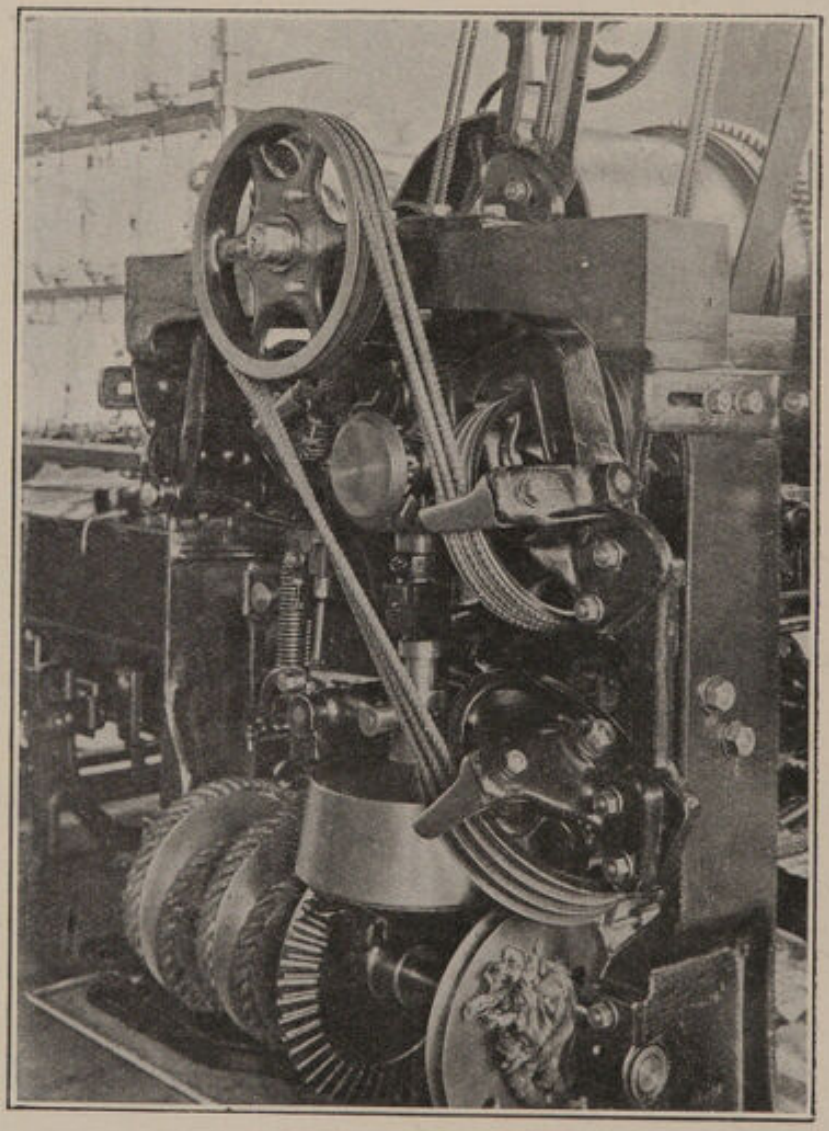


FIG. 21.—Rim band pulley and taking-in scrolls, unfenced.

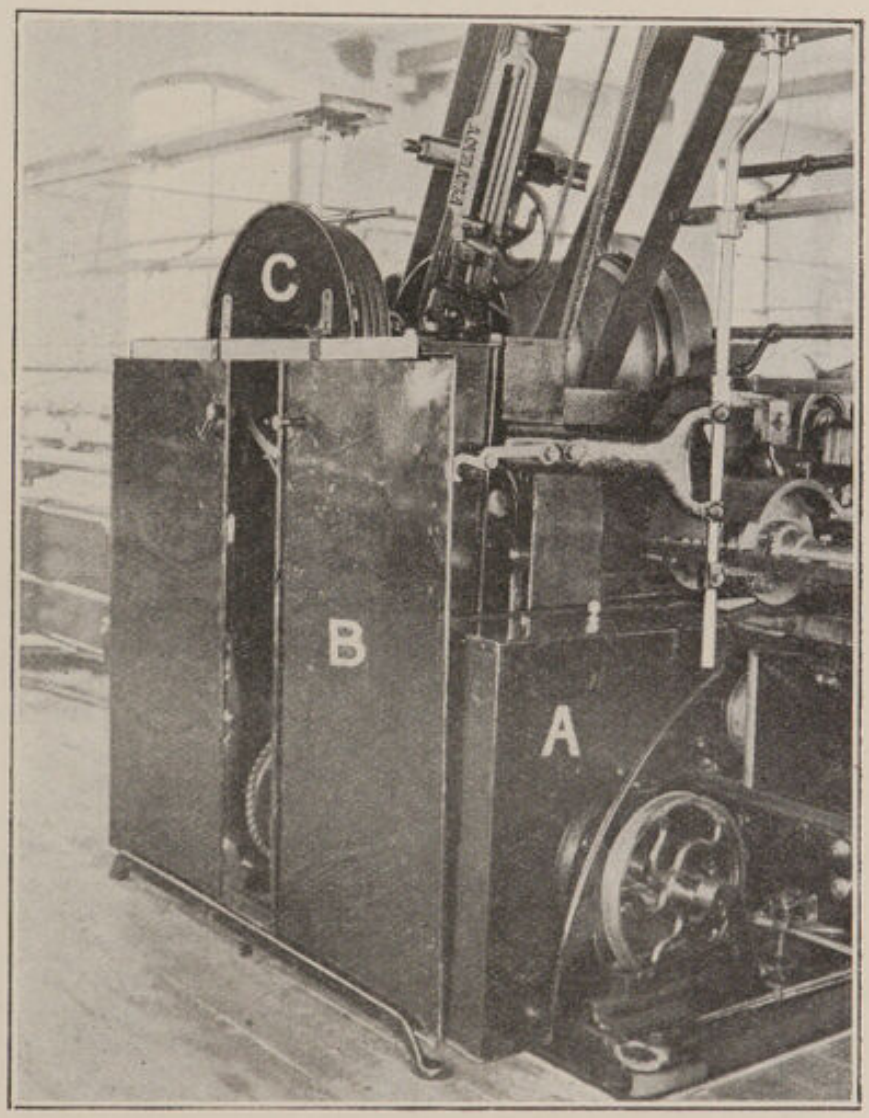


FIG. 22.—Sliding door guard for headstock back :—
A. Extended guard over taking-in scroll.
B. Sliding door to guard headstock.
C. Extension to guard rim band pulley.

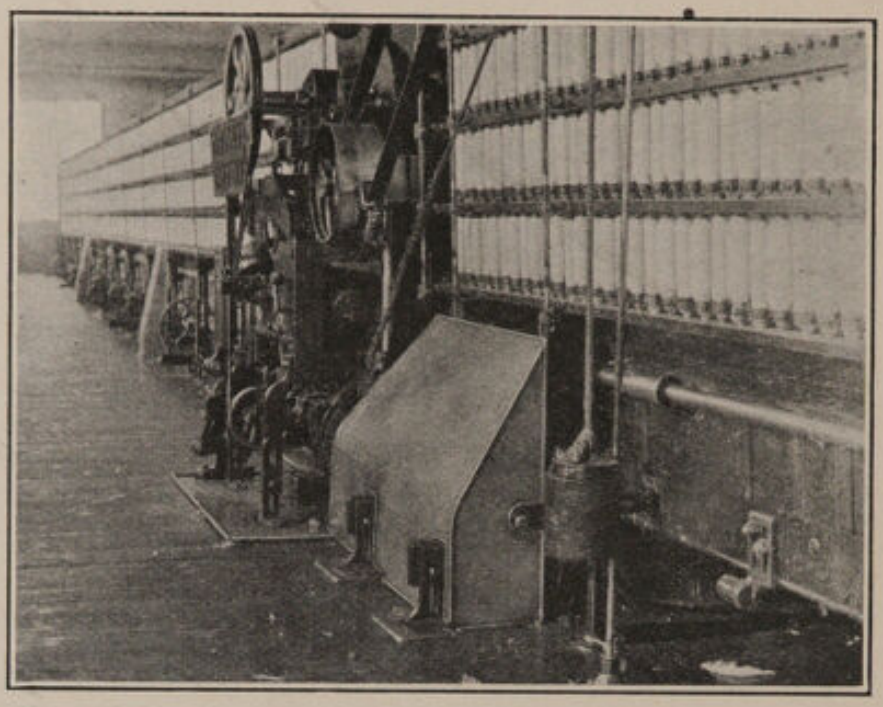


FIG. 23.—Separate guard for taking-in scrolls (back of headstock).

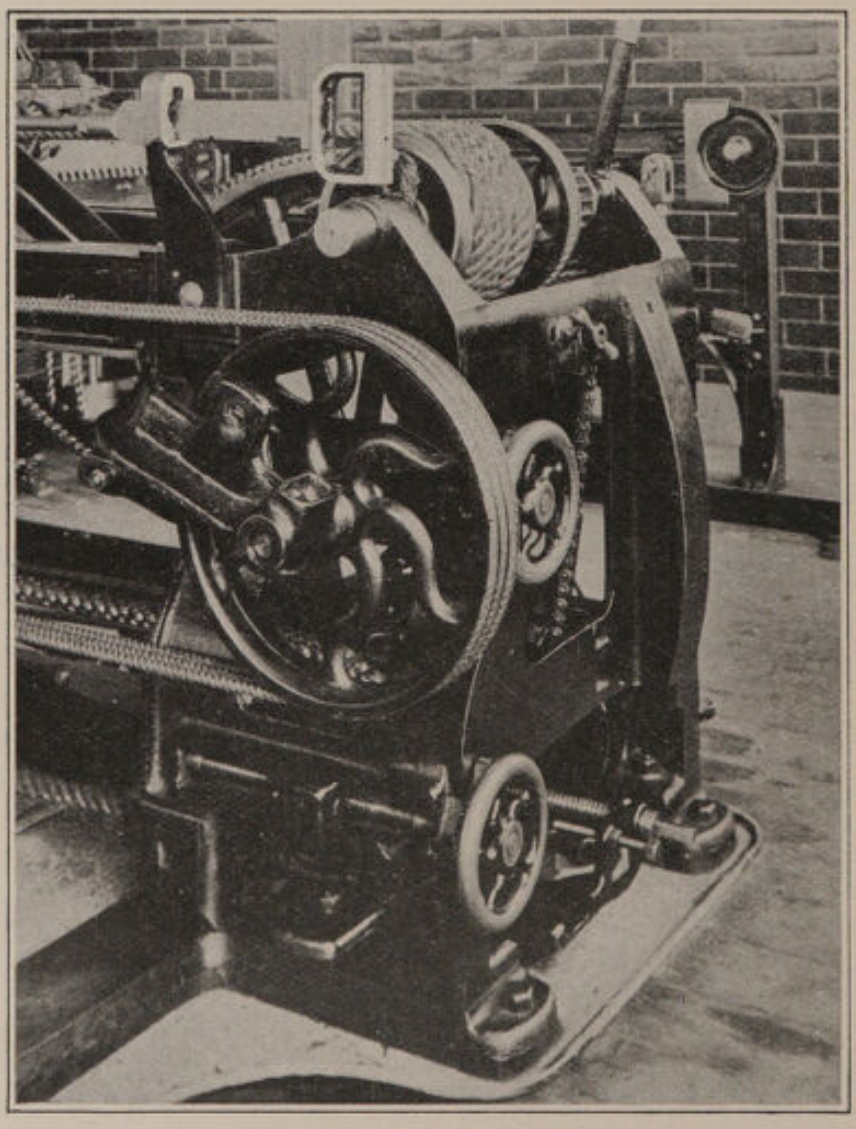


FIG. 24.—Rim band tightening pulley, unfenced.

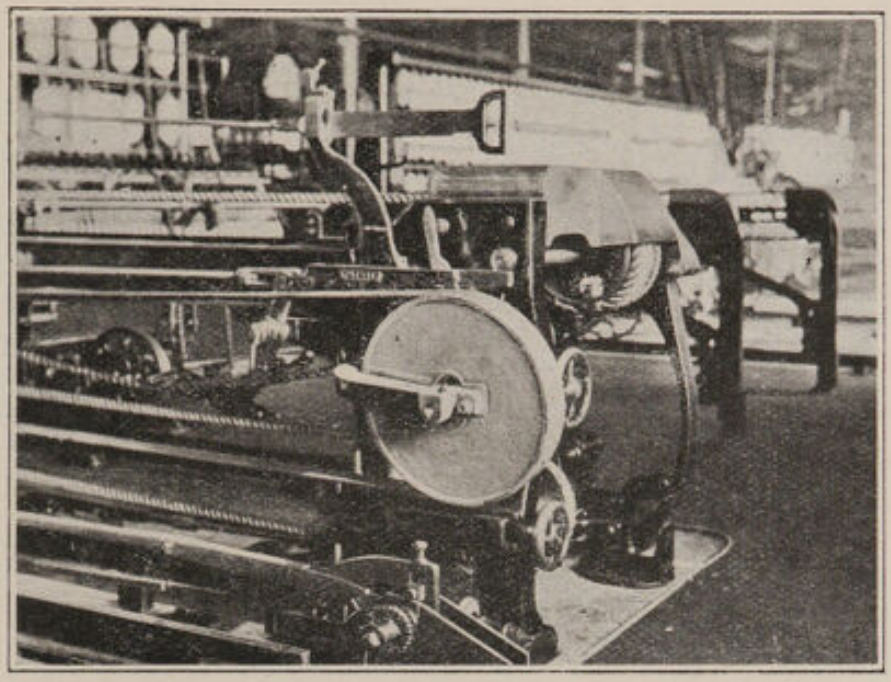


FIG. 25.—Rim band tightening pulley, plated pulley.

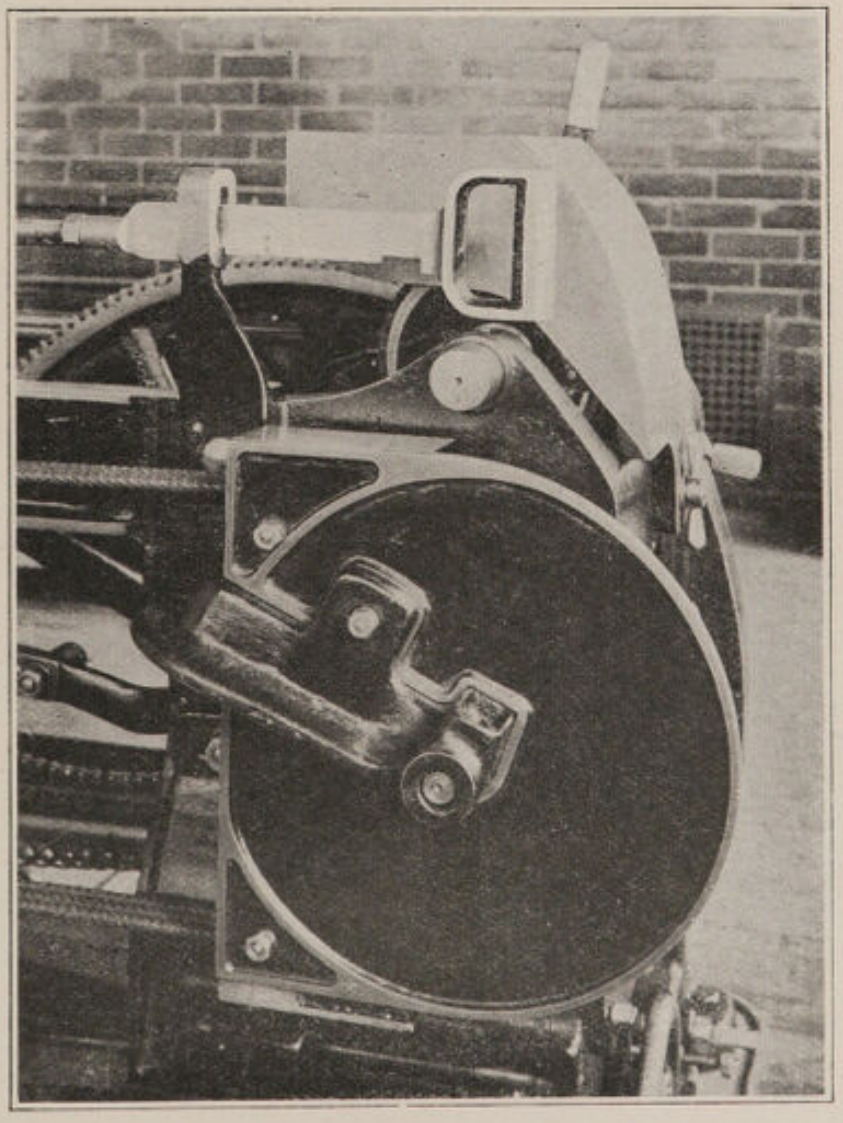


FIG. 26.—Rim band tightening pulley, efficiently fenced.

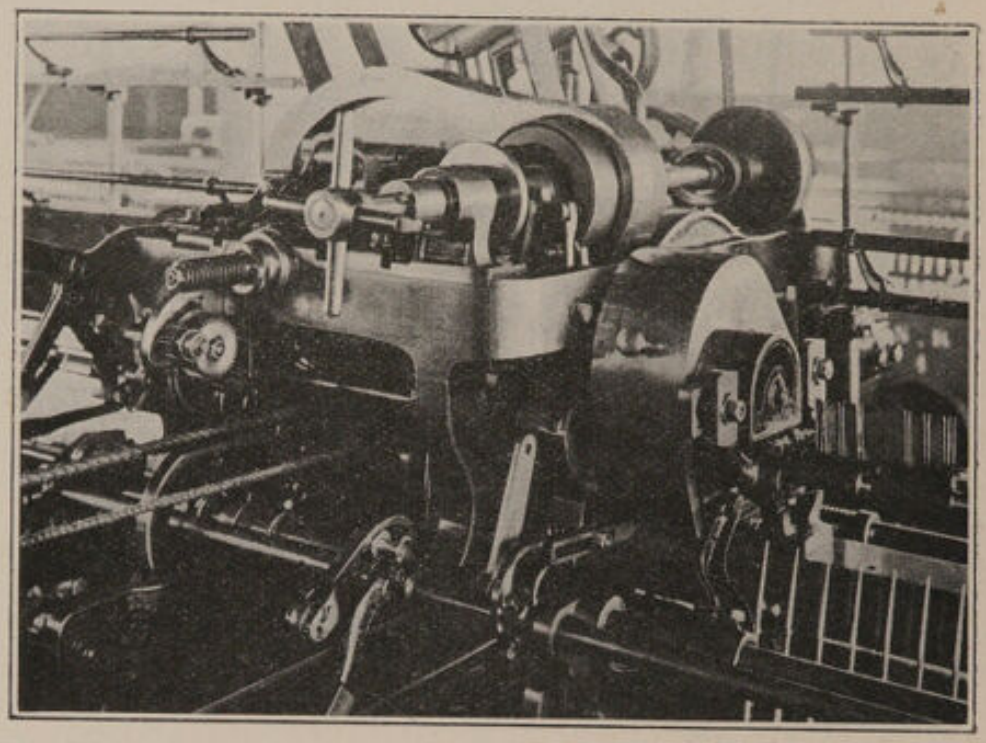


FIG. 27.—Guard for draft wheels on front of headstock.

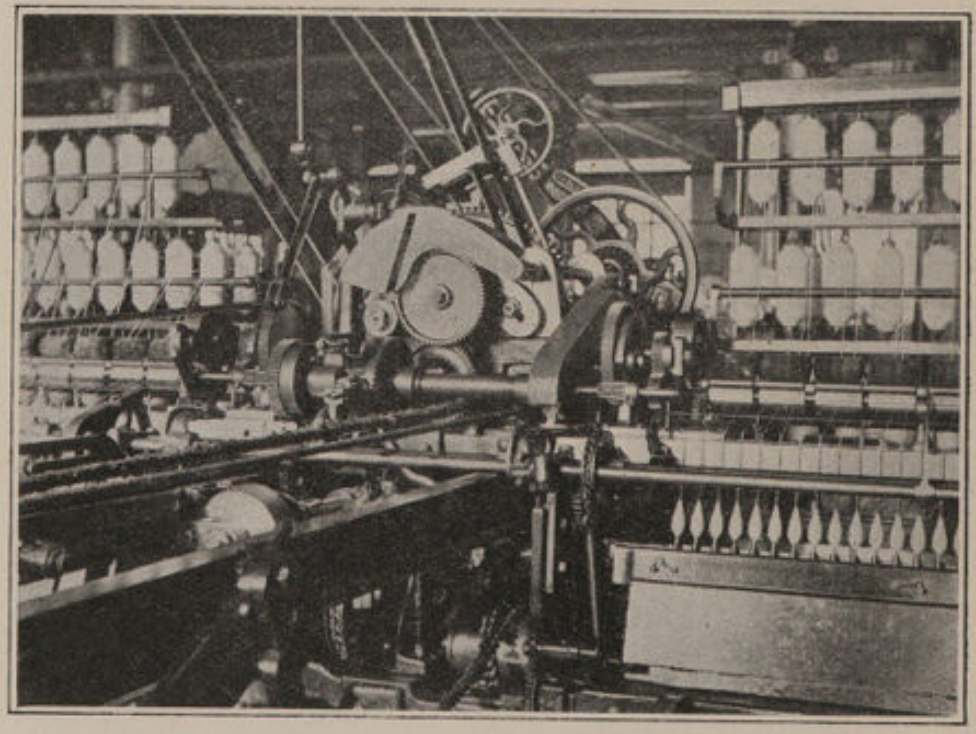


FIG. 28.—Guard for draft wheels on front of headstock.

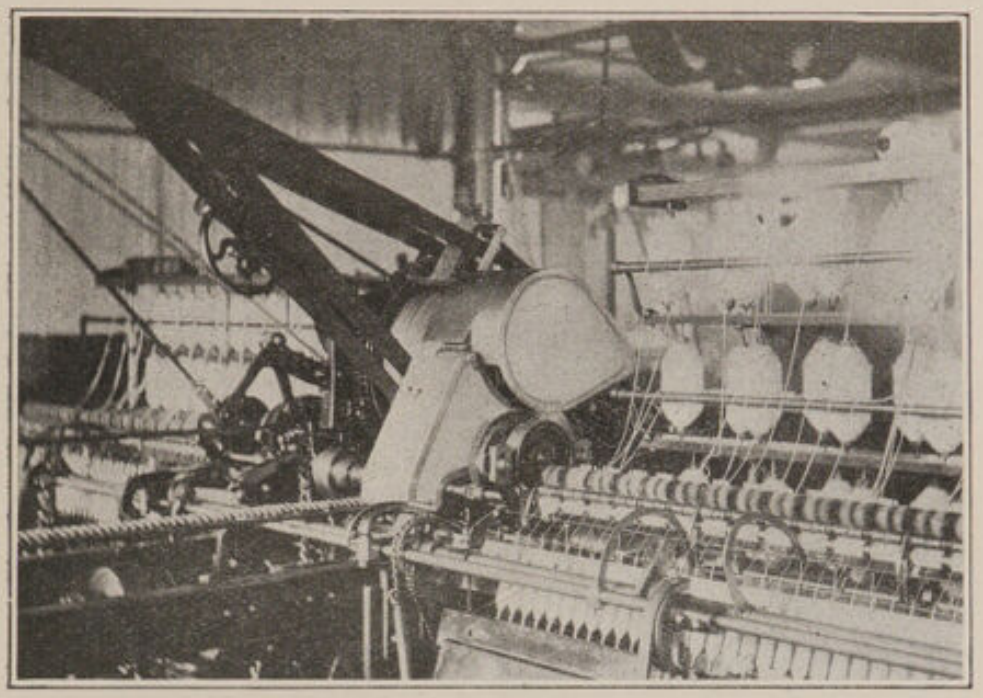


FIG. 29.—Guard for draft wheels on front of headstock. Side view.

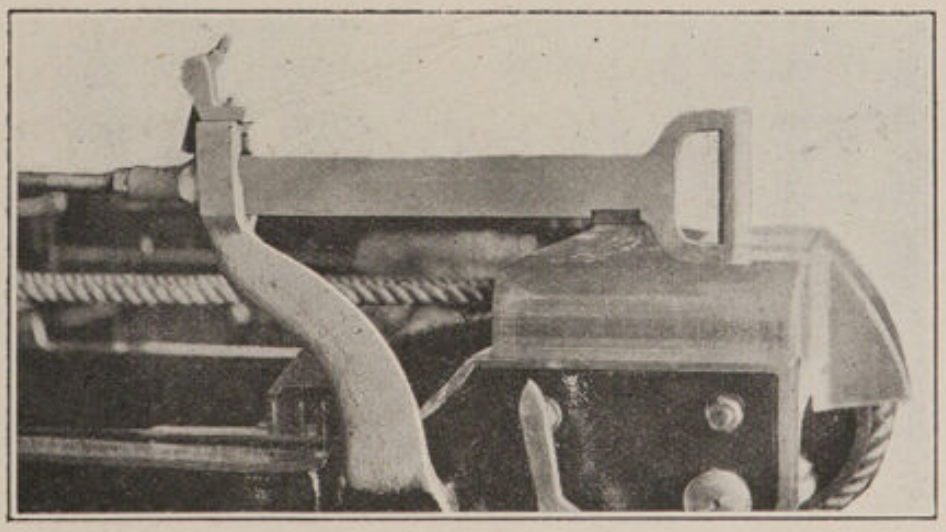


FIG. 30 —Lock for mule starting handle.

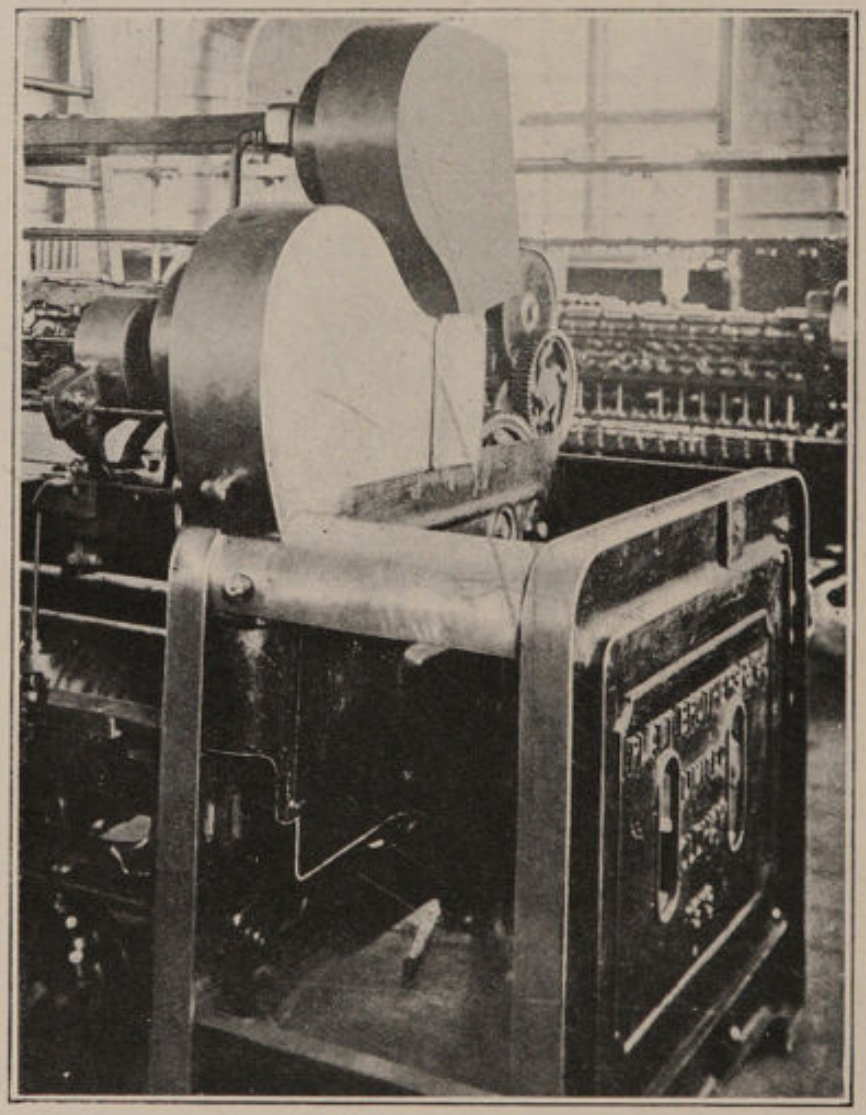


FIG. 31.—Full length guard for gearing end of ring frame.

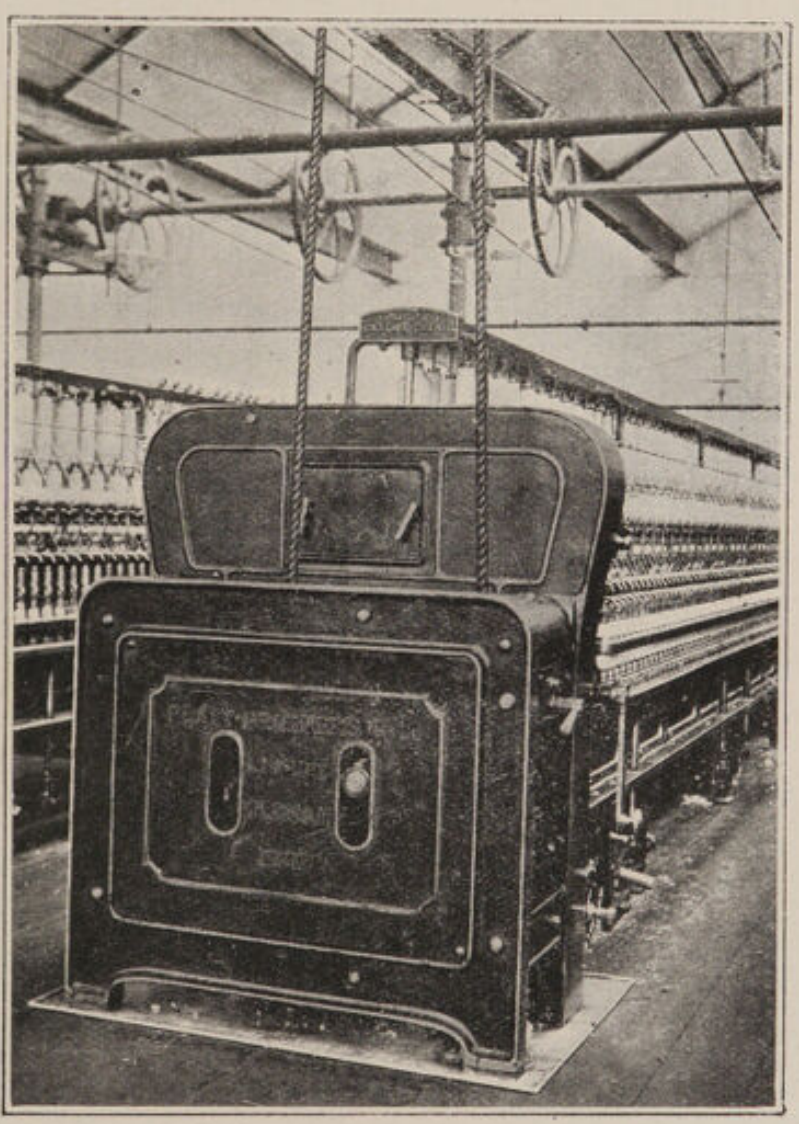


FIG. 32.—Full length guard for gearing end of ring frame.

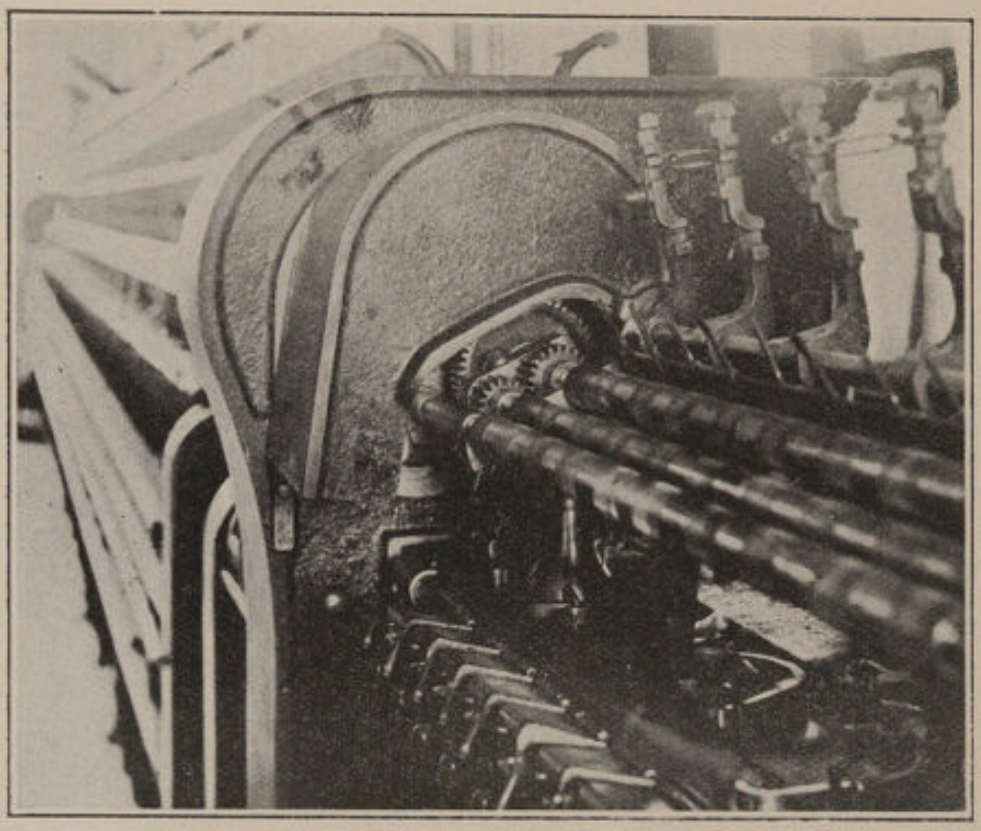


FIG. 33.—Incomplete covers for draft wheels on ring frame.

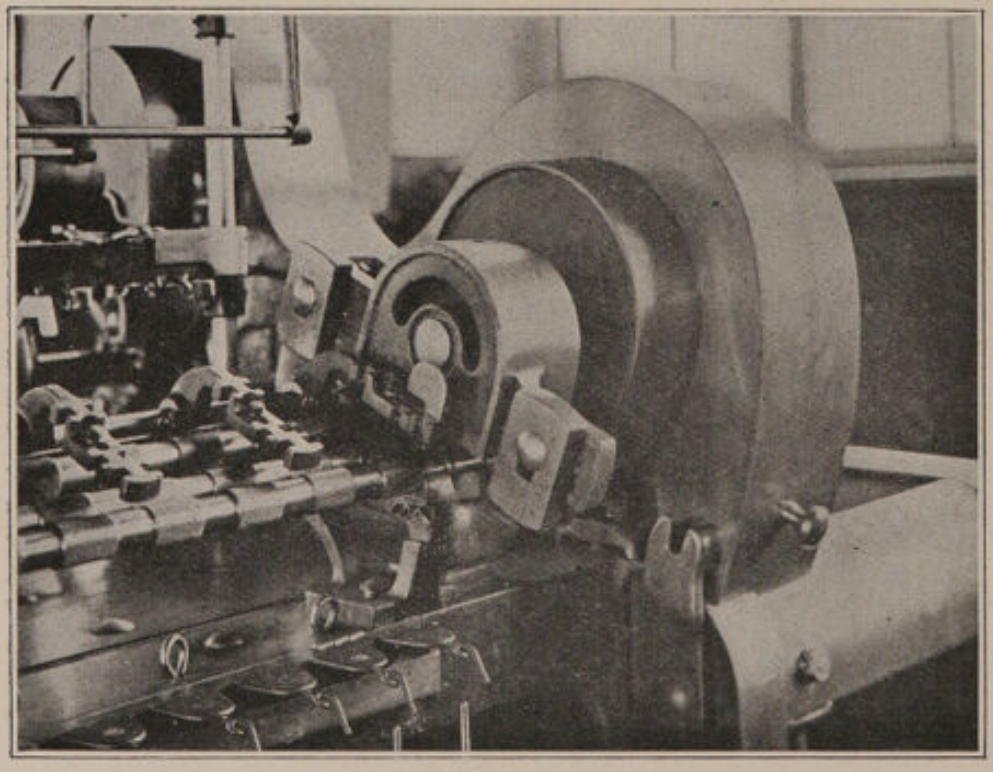


FIG. 34.—Complete covers for draft wheels on ring frame.

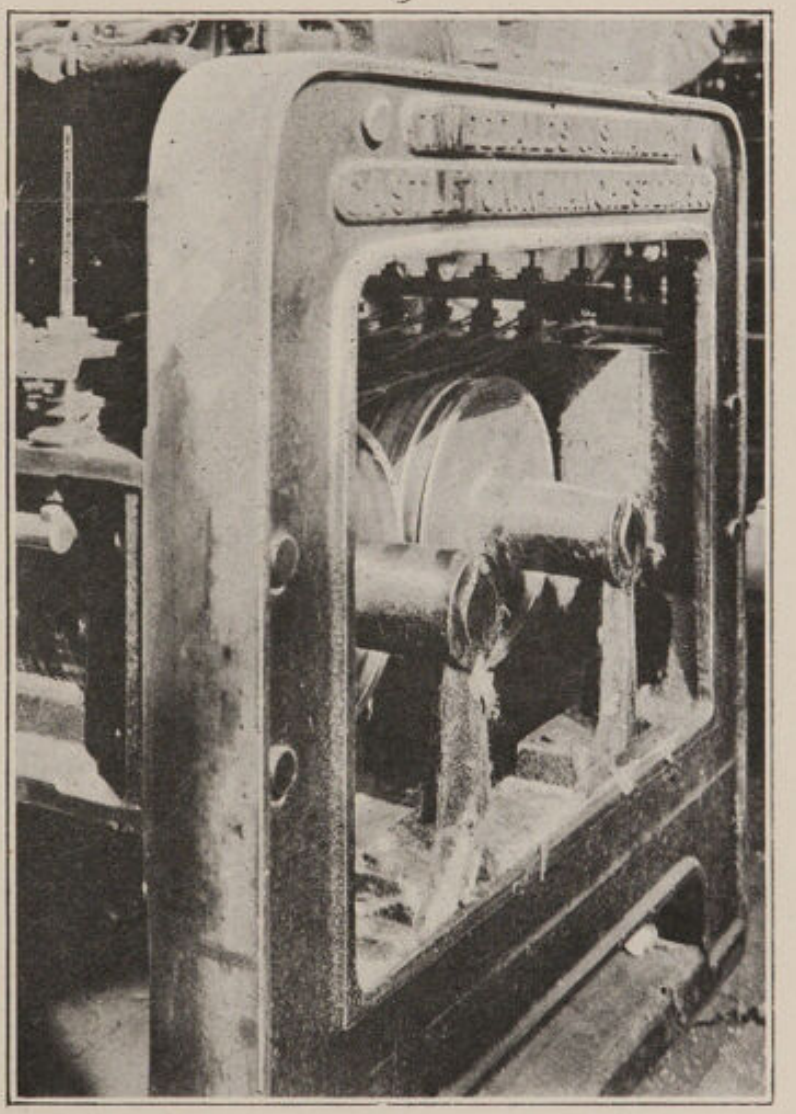


FIG. 35.—Outer-end of ring frame—unfenced.

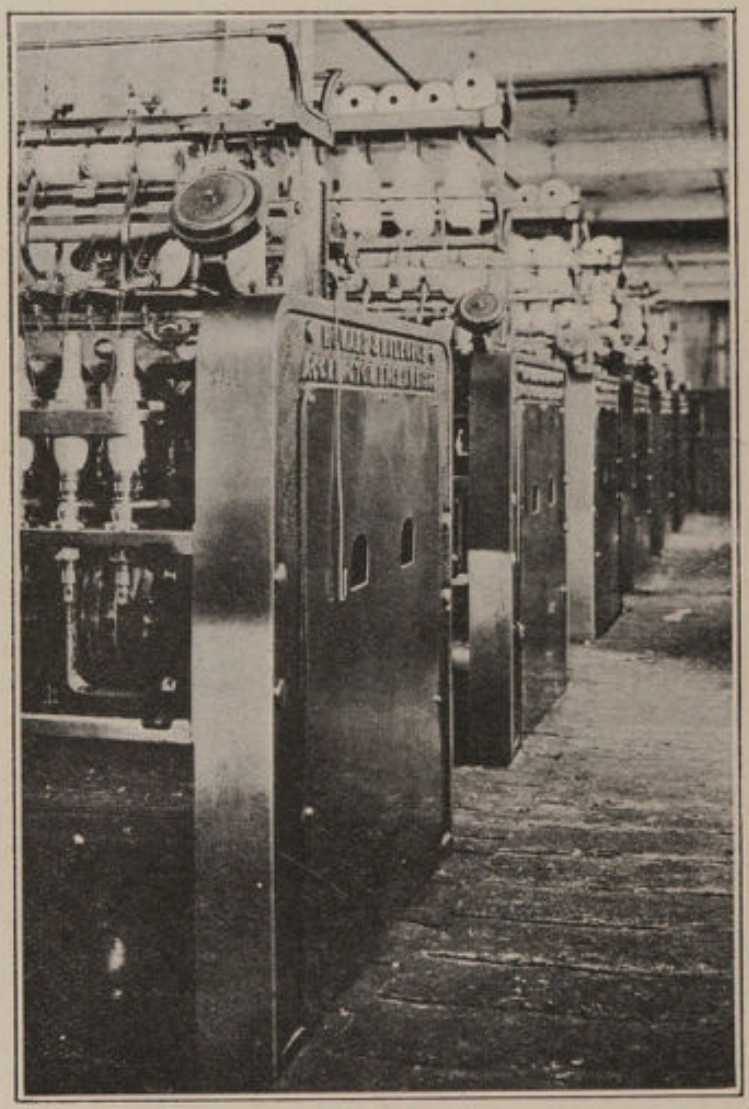


FIG. 36.—Outer-end of ring frame fenced with plate guard.

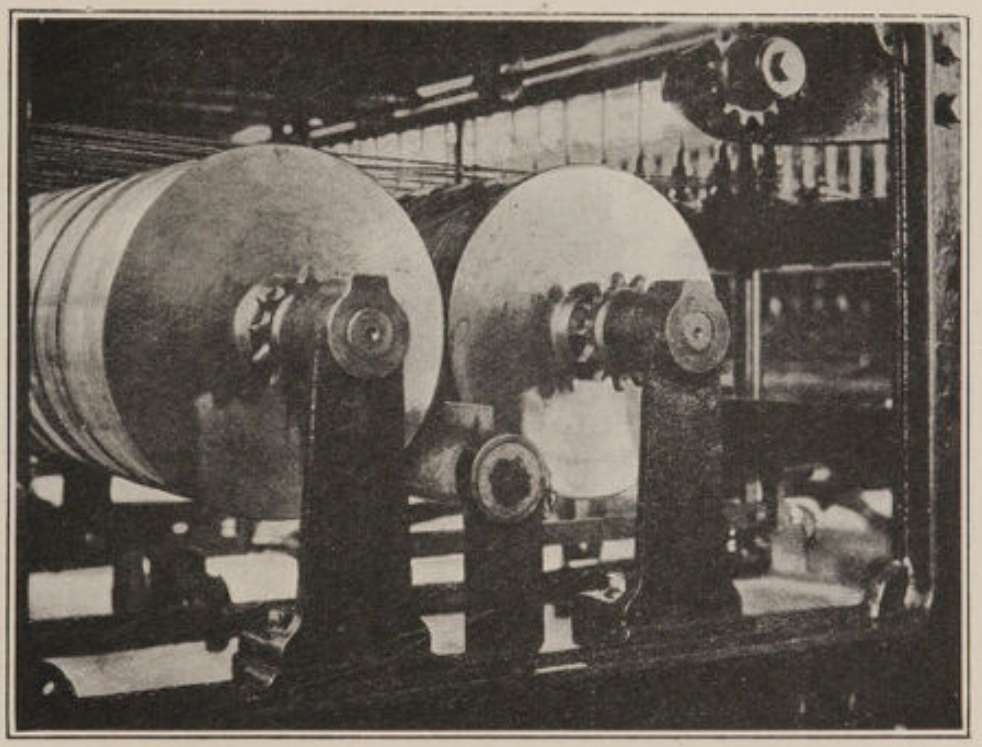


FIG. 37.—Types of guards for ingathering nips of double tin rollers.
Type A.

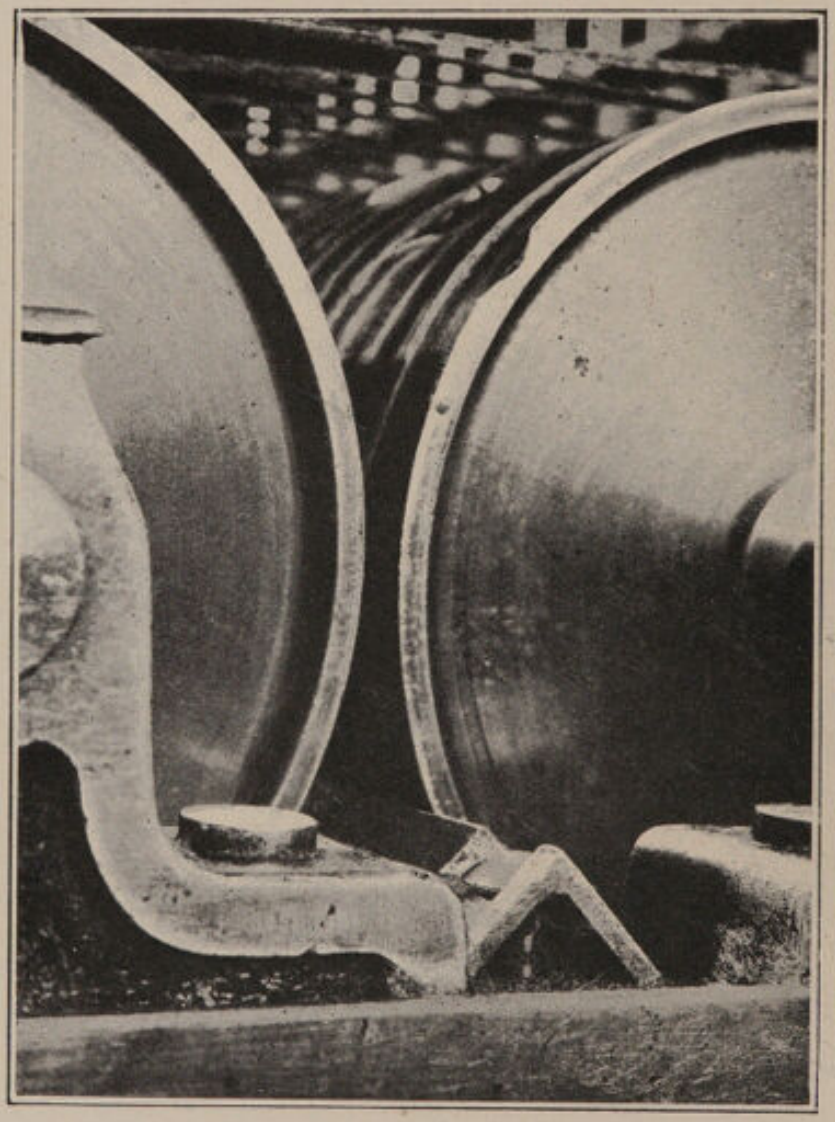


FIG. 37.—Types of guards for ingathering nips of double tin rollers. Type B—Angle iron guard.

FIG. 37.—Types of guards for ingathering nips of double tin rollers.
Type C—Sheet iron guard.

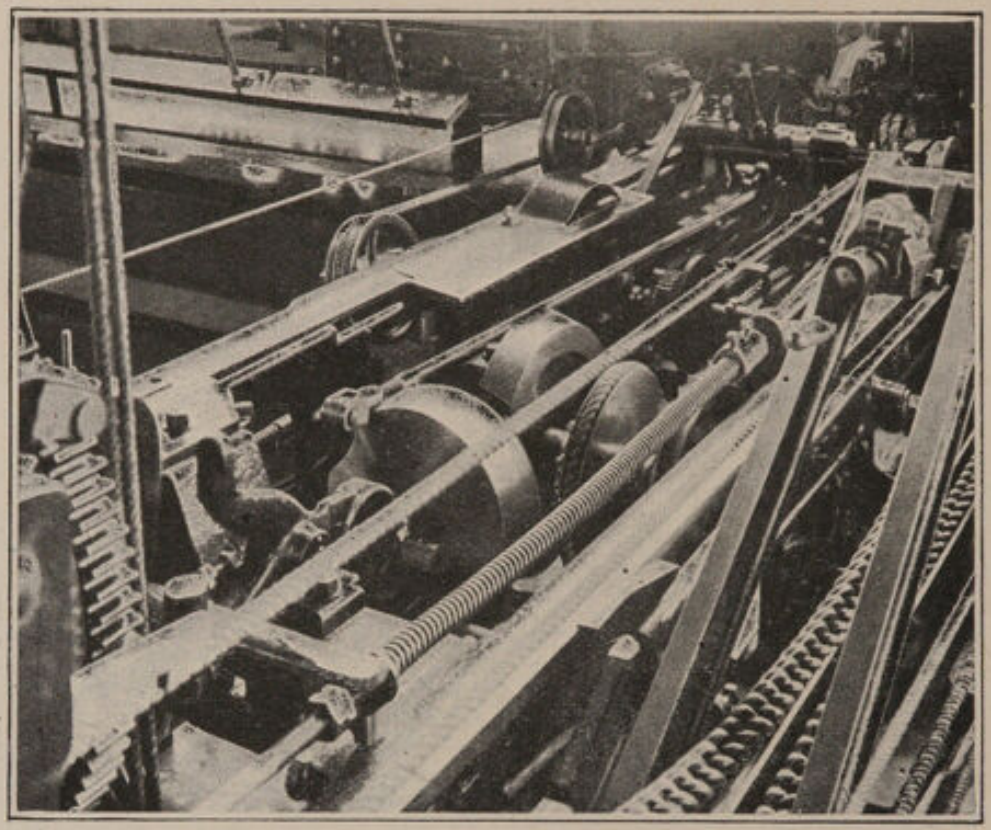


Fig. 38.—Headstock cogs on Twiner—guarded.

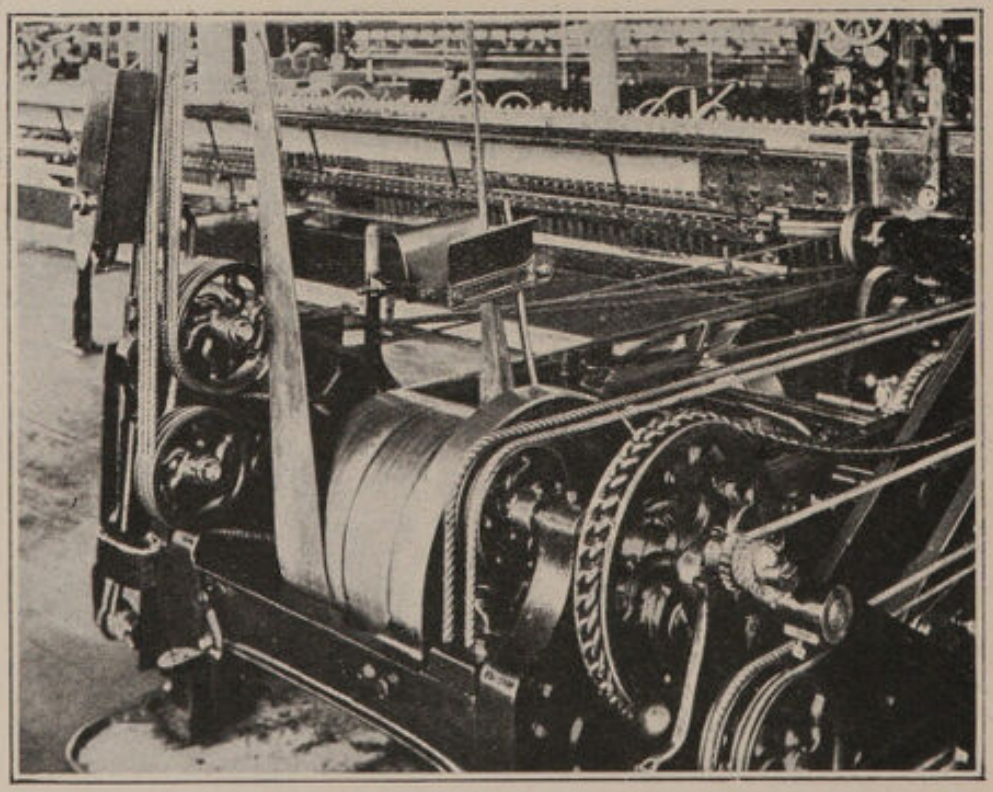


Fig. 39.—Headstock cogs on Twiner—guarded.

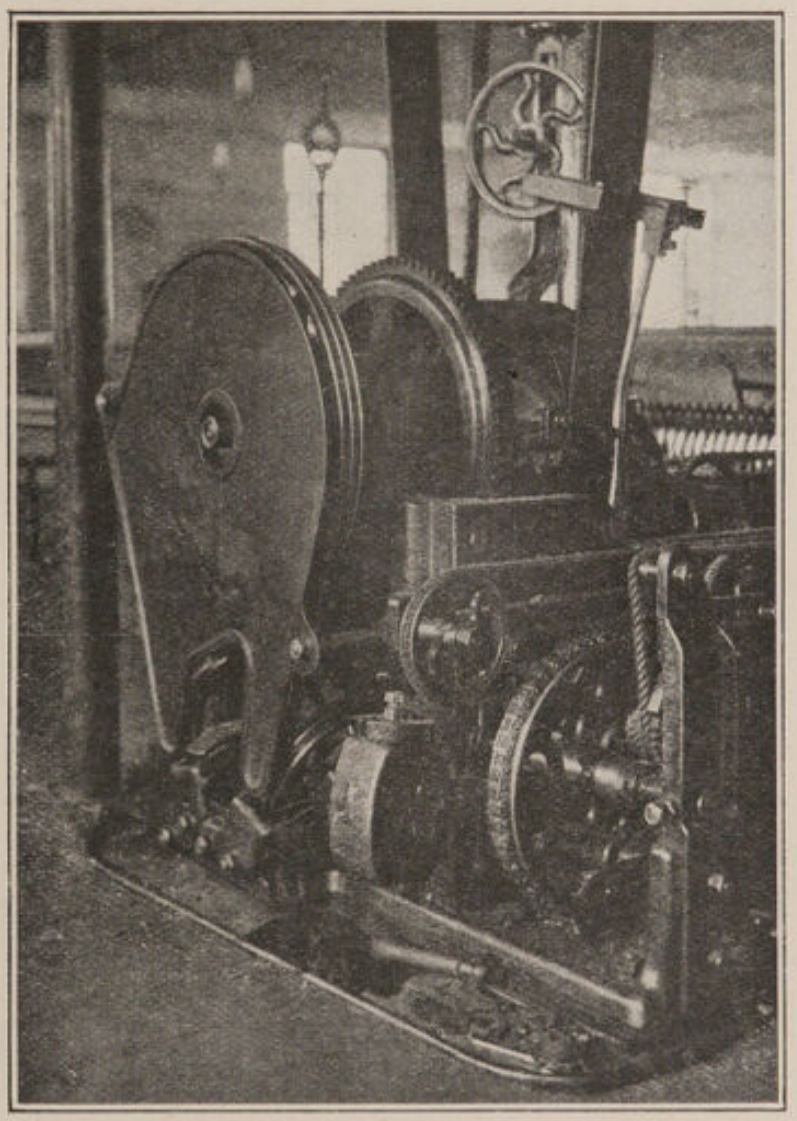


FIG. 40.—Rim band pulley on Twiner—guarded.

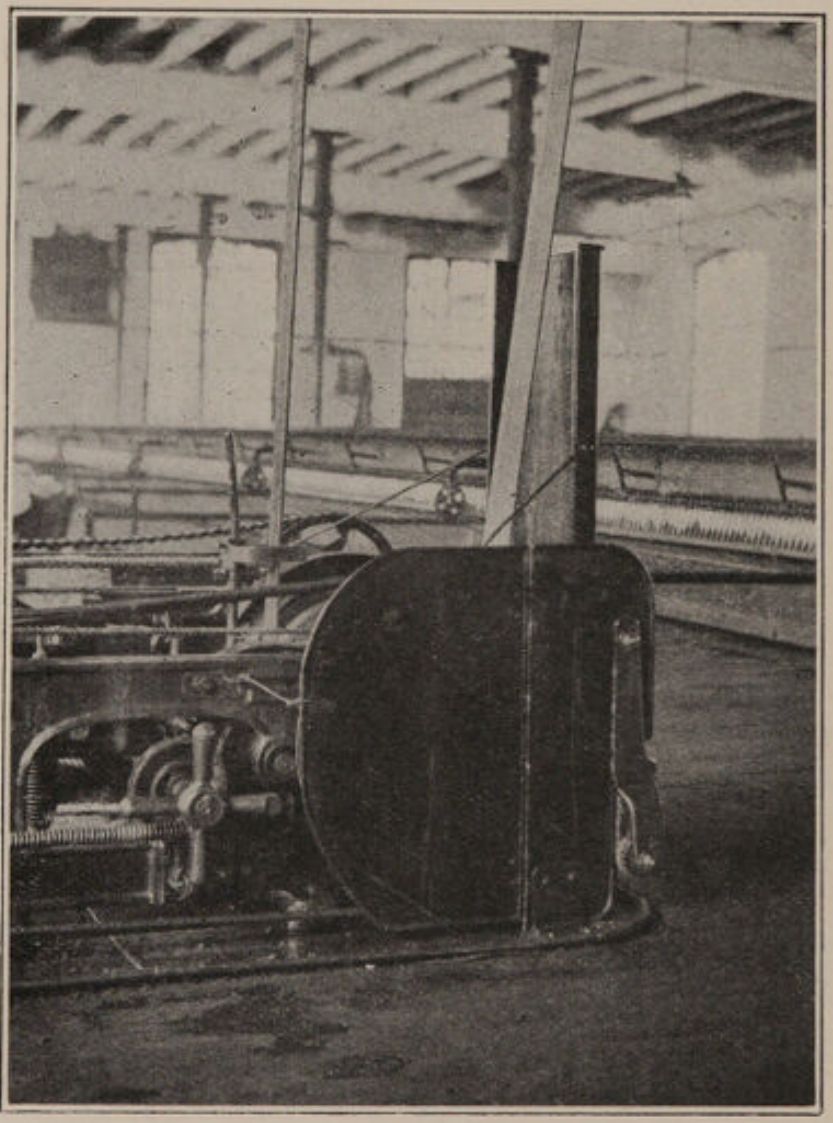


FIG. 41.—Side rim band pulley on Twiner—guarded, and guard for driving belt.

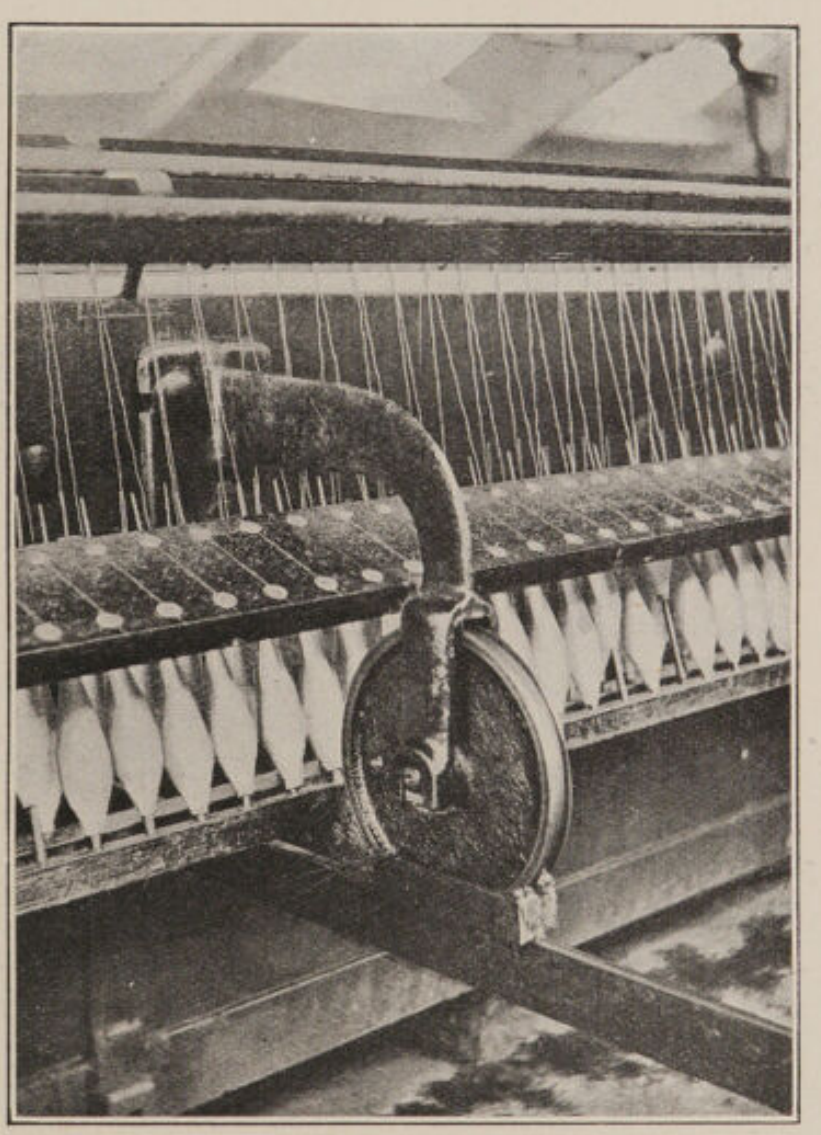


FIG. 42.—Twiner carriage wheel, with slipper guard.

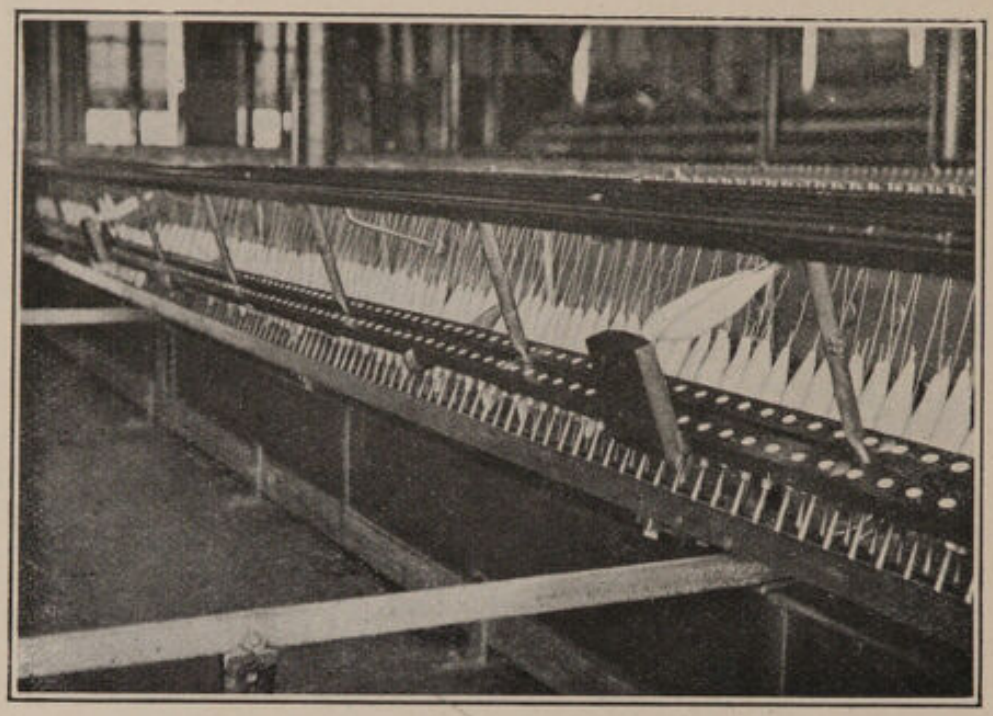


FIG. 43.—Twiner carriage wheel inside carriage.

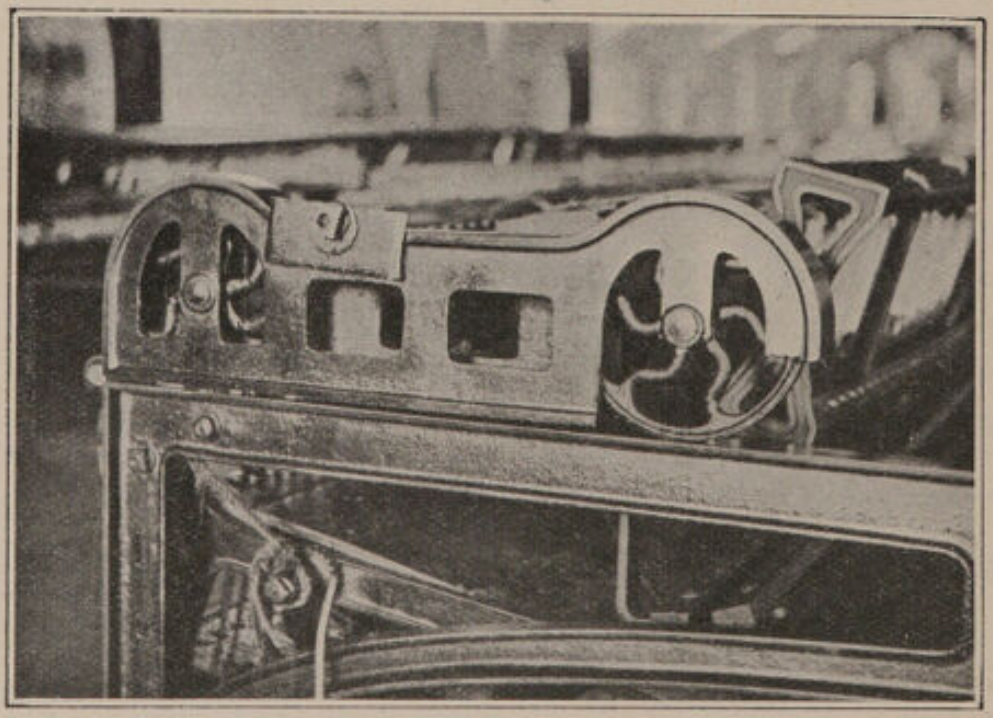


FIG. 44.—Inefficiently fenced wheels on end of Twiner.

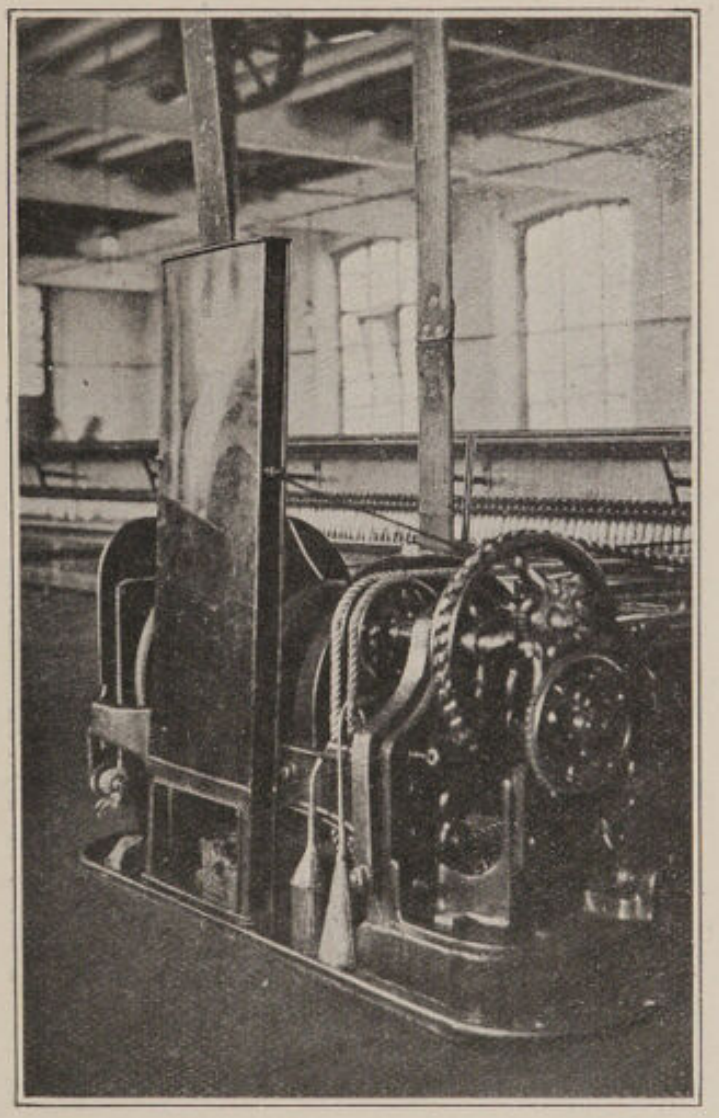


FIG. 45.—Guard for driving belt of Twiner.

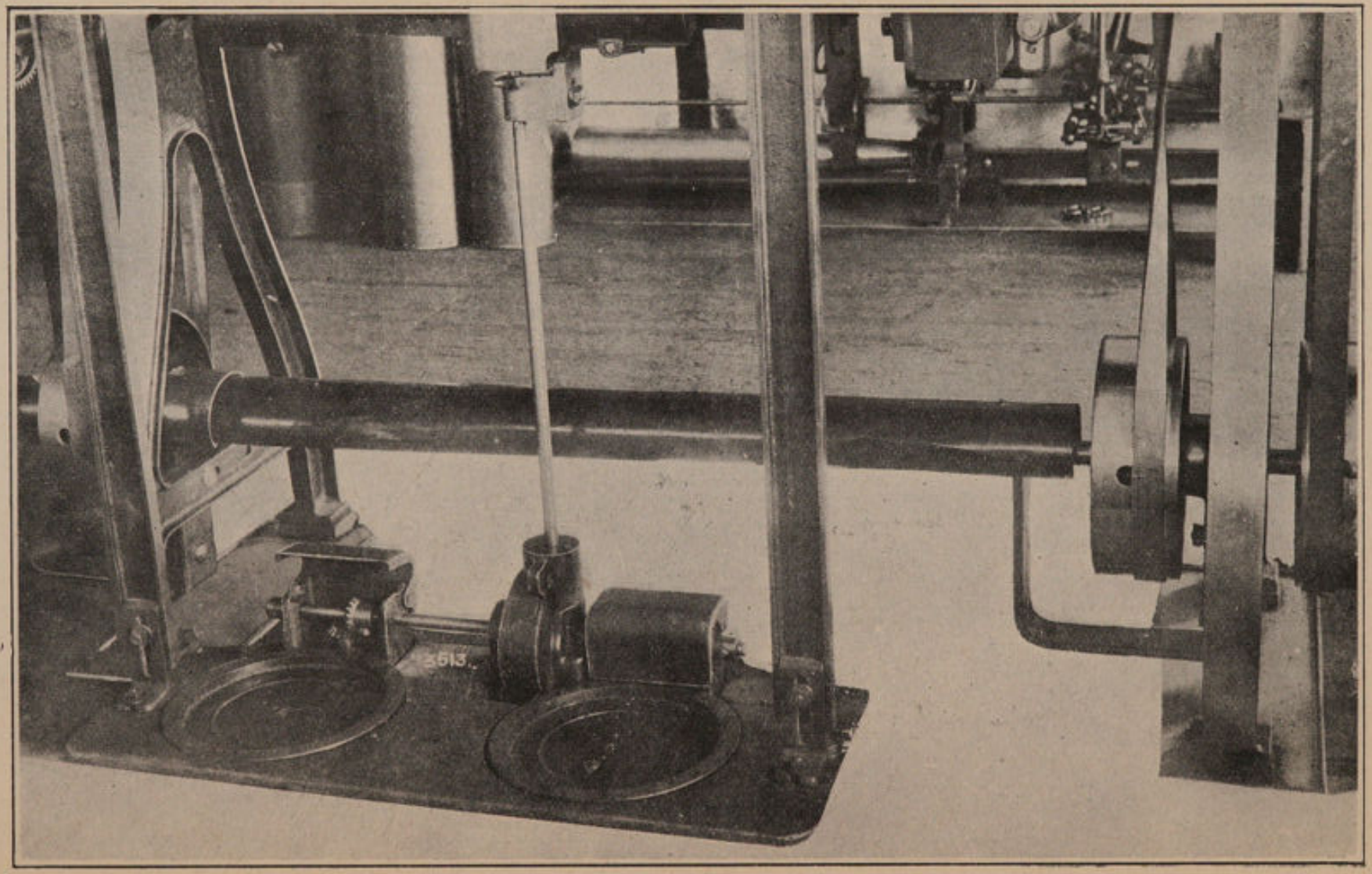


FIG. 46.—Guard for low shafting under frames.

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Hydrographical Publications of the Admiralty are sold by J. D. Potter, 145, Minories, London, E.1.

Patent Office Publications are sold at the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C.2.

Ordnance Survey and Geological Survey Publications can be purchased from the Director-General of the Ordnance Survey, Southampton ; from the Director, Ordnance Survey, Dublin ; or from Agents in most of the Chief Towns in the United Kingdom. They can also be ordered through any Bookseller. Small Scale Maps are on sale at the following branches of H.M. Stationery Office :—28, Abingdon Street, S.W.1 ; 37, Peter Street, Manchester ; 1, St. Andrew's Crescent, Cardiff ; and 23, Forth Street, Edinburgh ; and all Railway Bookstalls.

The Journal of the Ministry of Agriculture is published on the 1st of each month by the Ministry, and is obtainable from the Ministry, 10, Whitehall Place, London, S.W.1. Illustrated 96 pp. Price 6*d*., post free.

The following is a list of some recent Parliamentary and Official Publications. (*All prices are net, and those in parentheses include postage*) :—

FACTORY AND WORKSHOPS.

ANNUAL REPORT FOR 1919 OF THE CHIEF INSPECTOR.

Introduction ; Industrial Developments and State of Trade ; Safety ; Dangerous Trades ; Use of Electricity in Factories ; Sanitation ; Industrial Diseases ; Twister's Disability in the Cotton Trade, commonly known as Twister's Cramp ; Welfare in Factories and Workshops ; Ambulance and First Aid ; Employment ; Hours of Work ; Night Employment of Young Persons ; The Silk Industry ; Joint Industrial Councils and Trade Boards ; Tables.

[Cmd. 941] of Session 1920. Price 1*s*. 6*d*. (1*s*. 9½*d*.)

FIRST AID AND AMBULANCE AT FACTORIES AND WORKSHOPS.—Introduction ; First Aid Boxes ; Ambulance Room ; Removal of Injured Person from the Works ; Organisation of First Aid in the Factory ; Accident Records ; Medical Supervision. Appendices.—Orders of the Secretary of State requiring provision of First Aid and Ambulance Arrangements in Factories ; Record Forms ; Plans of Ambulance Rooms. (*With Plates.*) (1920.) Price 6*d*. (7*d*.)

MESSROOMS AND CANTEENS AT SMALL FACTORIES AND WORKSHOPS.—Introduction ; Numbers to be provided for ; Situation ; Design ; Messroom and Kitchen ; Lavatories and Cloakrooms ; Management and Maintenance ; Attendants. Appendix. (*With Plates and Plan.*) (1919.) Price 3*d*. (4*d*.)

PROTECTIVE CLOTHING FOR WOMEN AND GIRL WORKERS employed in Factories and Workshops. (*With Plates.*) (1917.) Price 3*d*. (4*d*.)

SEATS FOR WORKERS IN FACTORIES AND WORKSHOPS.—Introduction. Seats for work which can be done sitting ; Seats for occasional rest when work must be done standing ; Seats outside workrooms for rest during intervals. (*With Plates and Diagrams.*) (*Welfare Pamphlet No.* 6.) (1920.) Price 6*d*. (7*d*.)