PART IX

CONSTRUCTION OF MACHINERY GUARDS, BELT GUARDS, ETC.

TO prevent accidents to persons coming inadvertently into contact with running machinery, belts and other equipment, various state laws have been enacted to provide for the installation of sheet metal guards, as a protection to workmen. The provision of sheet metal or perforated metal guards affords safety and reduces the expense of liability insurance. Either solid or perforated metal may be employed for constructing guards for belts, flywheels, emery wheels and kindred equipment. The tendency of rotating machinery and whirling belts to gather lint or other flying waste, frequently causes serious congestion and to meet such emergencies it is best to use solid metal sheets for protection. If ventilation be required and it is desired to obviate overheating of bearings, perforated metal guards may be used with advantage. Guards of ordinary size may be double seamed at the corners. If of large size the corners are reenforced by light angle irons and the metal is riveted thereto. A requirement of construction is that the guards be arranged so that they may be removed to afford access to the covered parts and make provision for their fastening, and to facilitate their easy removal. In the present part, various solid and perforated metal guards are described, as well as the methods of fastening the guards, taking measurements and laying out the patterns.

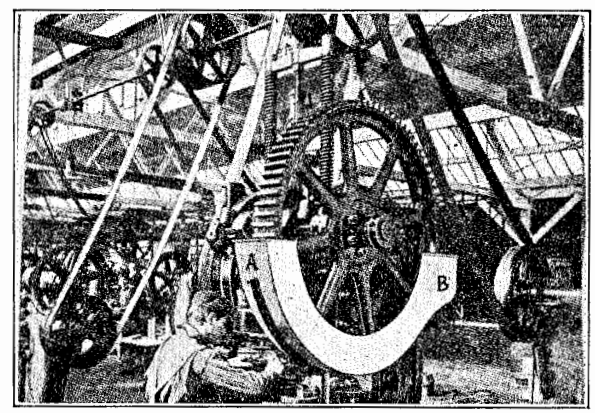

Fig. 648.— View of Metal Guard Covering Large Cog Wheel

A LARGE COG WHEEL GUARD

Solution 195

Fig. 648 is a reproduction of a photograph showing a sheet metal guard covering the lower part of a large cog wheel. As a preparatory step to laying out the pattern for this work it is but necessary to obtain the radius of the wheel by measuring from the center of the shaft to the outside edge of the cogs. This procedure is clearly shown in Fig. 649, where A is the center of the shaft and B is the outside edge of the cogs. We will assume the radius to be 24 in., and add the necessary allowance which in this case is 2 in. With C in the lower diagram as center, with a radius equal to 2 ft. 2 in., describe

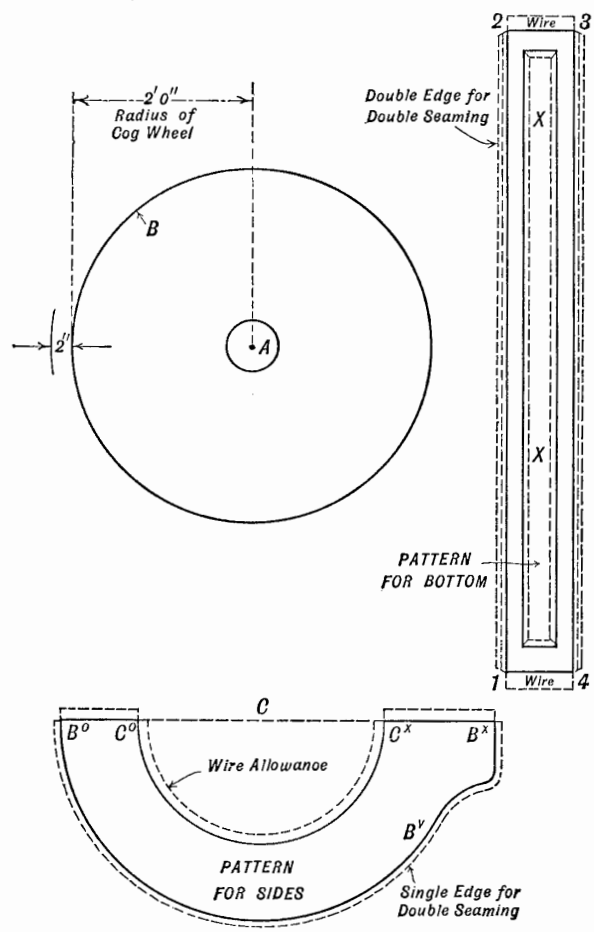

Fig. 649.— Development of Cog Wheel Guard

the outer arc from B° to B^{v}. Add the required pocket B^{v} B^{x} drawing this in free hand, as shown, and through the center C, draw the line B°–B^{x}. At the required width lay off the distance B° C° and using C as center, describe the inner circle C° C^{x}. Provide allowance for wire of three times the thickness of the material in use along the top B° C°, C^{x} B^{x}, also make this allowance along the inner curve C° C^{x}. Allow for a single edge for purposes of double seaming along the outer curve B° B^{v} B^{x}, which completes the side patterns for the guard. The pattern for the bottom of the guard is shown at the right. The distances 2–3 and 1–4 are equal to the width of the cog wheel, plus the required play on each side. The length indicated by 1–2 and 3–4, in the pattern, equals the girth of the outer curve B° B^{v} B^{x}. In the center of the bottom pattern, an opening is cut as indicated by A–B in the view in Fig. 648. Around this opening X X in Fig. 649 make allowance for the wire as indicated by dotted lines. A wire edge is allowed along 1–4 and 2–3, and a double edge for purpose of seaming along 1–2 and 3–4, as shown. This completes the patterns required for covering the lower parts of wheels of this description. The fastening of the guard is effected by means of band iron anchors adjusted to the inside of the machine.

FINDING BEVEL AND PATTERN FOR BELT GUARD

Solution 196

The view at A in Fig. 650 shows a belt guard, of perforated sheet metal. This metal permits the free circulation of air, and the working parts of the machine are rendered visible. The method of obtaining the pattern for this guard is shown in Fig. 651. The first step is to obtain the bevel of the belt as follows: Place the instrument (an ordinary bevel) in the position shown, one arm parallel to the belt and the other arm level. A small spirit level, shown at X, is fastened to the lower arm, permitting the bevel to be opened or closed, until the lower arm is level. Measure the distance from the inside to the inside corners, when the bevel may be closed and then opened to the desired width, in the procedure of preparing the pattern, in the shop. Note that the guard cover is made to the full hight of the pulley. A B C indicates the pattern for the side of the guard. The opposite side is open and the face covering the belt is made as wide as requirement demands. The corner joining the face and side is double seamed, and the edge of the face strip, toward the open side, is wired to insure rigidity.

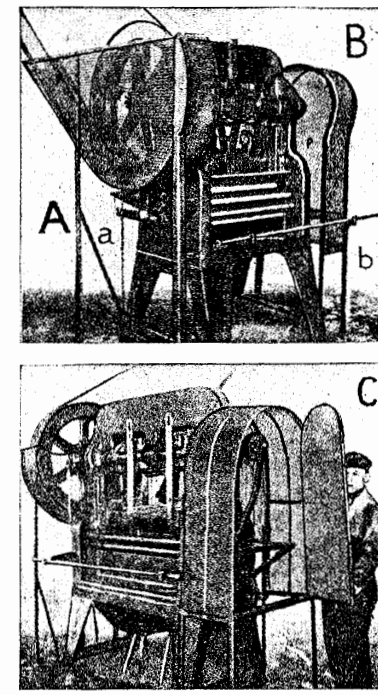

Fig. 650.— Two Views of Perforated Metal Guards over Belt and Moving Machinery

There are various methods of fastening. In the example shown here, angle iron standards are em-

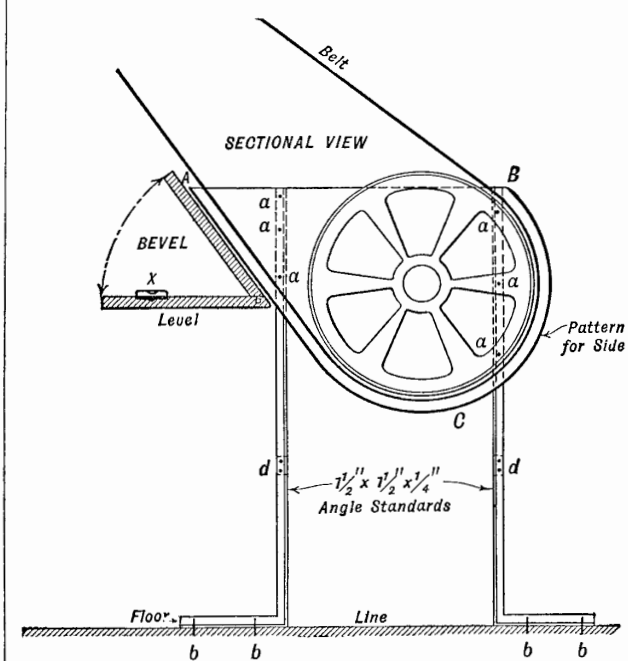

Fig. 651.— Taking Measurements and Bevel of Belt Guard

ployed, of the size indicated. These standards are bolted at *a* and then secured to the floor at *b*. To

maintain rigidity of the guard, an additional leg is bolted at *d* and *d*, as is more clearly shown by *a* in Fig. 650. B in that figure shows an upright guard, secured in position by the standard *b*. This guard has an operating door, shown open, in the second view, at C. The perforated sheet metal may be procured from dealers.

DETAILS AND PATTERNS FOR A REENFORCED SHEET METAL BELT GUARD

Solution 197

Fig. 652 shows end and side elevations of a reenforced sheet metal belt guard, supported by removable standards, with set screws, so that it may be lifted out of the sockets and replaced at will. The laying out belt guards of this kind requires exercise of care in taking measurements. First obtain the radius of the small pulley, as of E; then the radius of the large pulley, F, invariably measuring from the center of the shaft to the outer edge of the pulleys. Next, measure the length between the shaft centers, as from D to N; then the hight from the floor line to the center of the two shafts, as from J to H and L to K. The measurements are then laid out directly on the sheet metal, provision being made for the necessary room for play, between the belt and the guard, as indicated by X. A few inches below the large pulley, establish at pleasure the bottom of the guard, as shown, and allow for the necessary opening around and above the shaft of the large pulley, as shown. Observe that the lower part of the guard is reenforced with 1 x 1 x 3/16 in. angles. The outline indicated by 1–2–3–4–5–6–7–8 gives the pattern for the side, while the depth or return strip is shown in the end elevation from 9 to 10. The inner side of the guard, which is open, is reenforced by means of iron bands of 1 x 1/8 in. thickness, as shown. This guard can be constructed of No. 22 galvanized iron, and the outer corners double seamed, as shown in the detailed section, through A–B. Fly wheels are covered in a corresponding manner, by these methods of construction and fastening.

SAFETY GUARD AROUND TUMBLING BARREL

Solution 198

A legal regulation requires that tumbling barrels, used in foundries, shall be covered with safety guards. Fig. 653 shows a side and end elevation of a guard used for this purpose, with the details of construction. These guards are made to completely enclose the tumbling barrel. That part of the guard which gives access to the tumbling barrel is made to slide backward and forward, in grooves placed

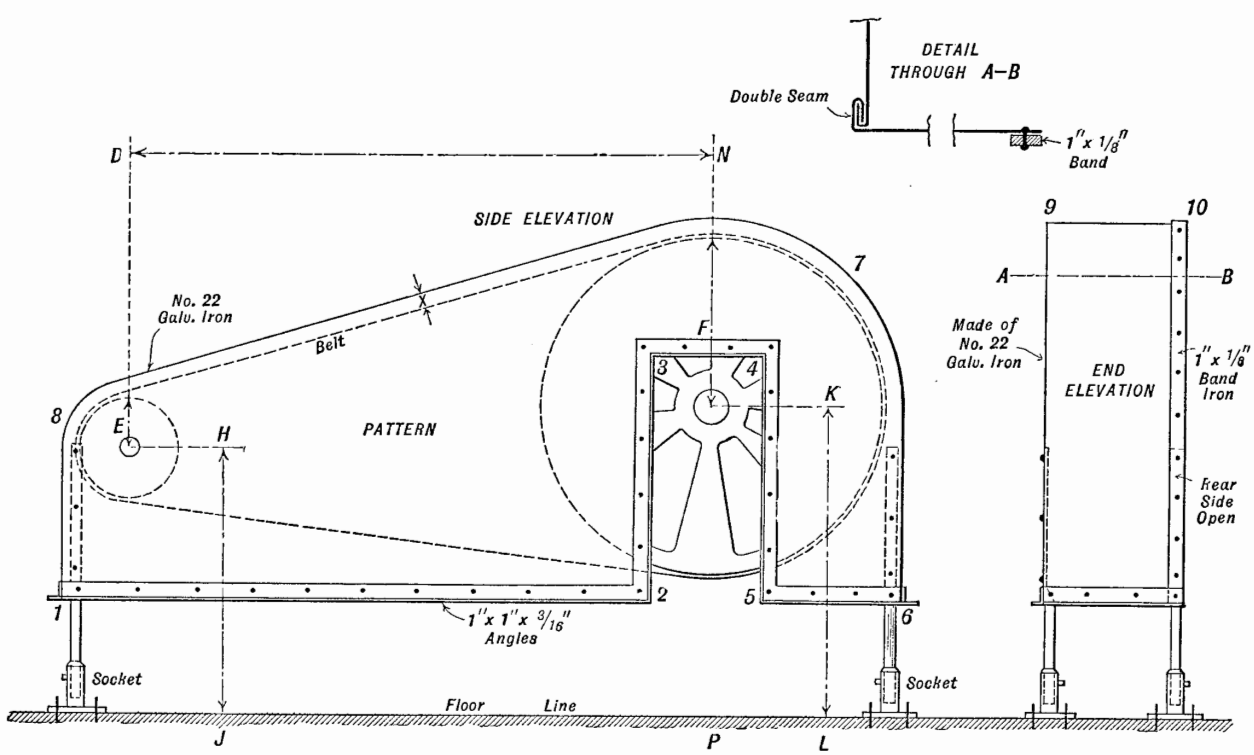

Fig. 652.— Details of Construction of a Reenforced Sheet Metal Belt Guard

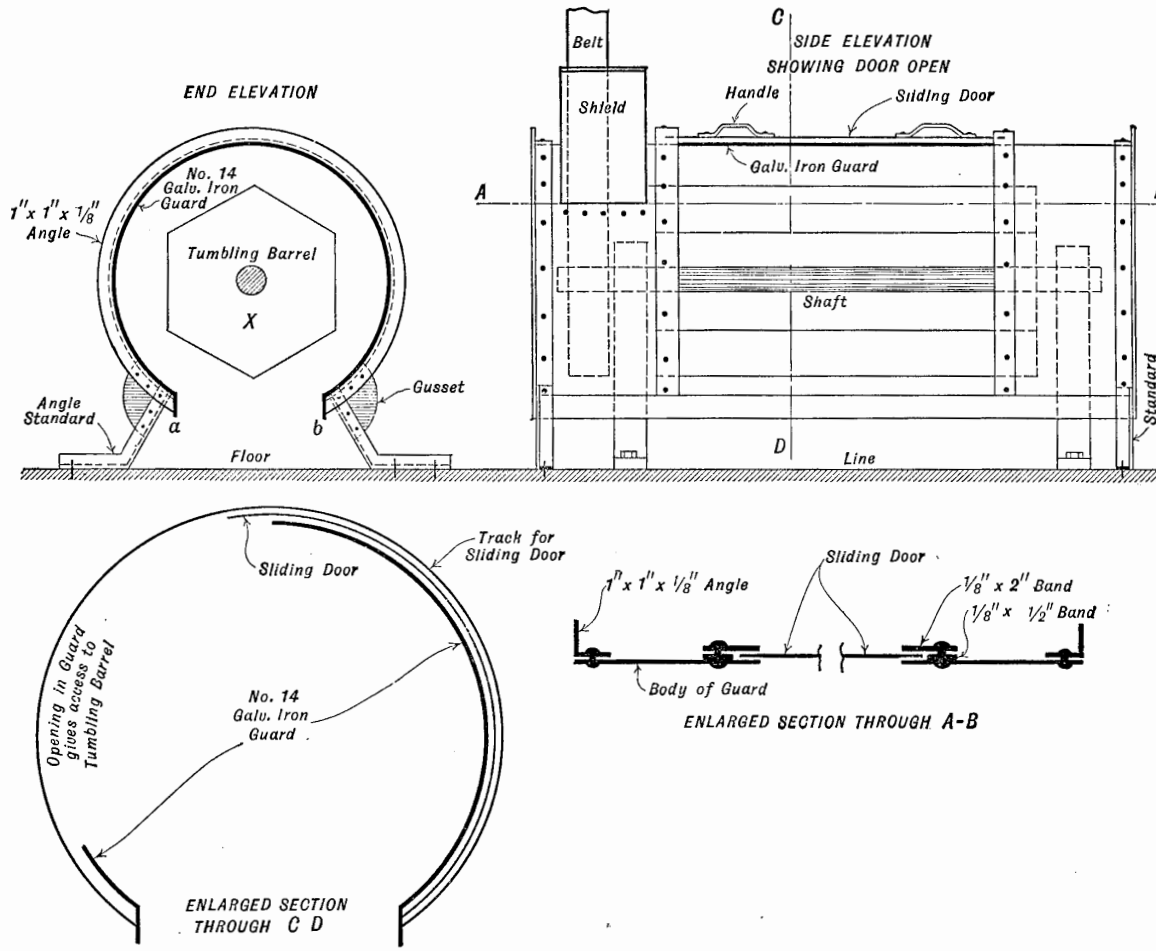

Fig. 653.— Constructing Safety Guard Around Tumbling Barrel

over the body of the guard. The details here shown provide for heavy metal construction. The only variation of practice in the case of barrels of such size that lighter material may be used, is the omission of the angle irons which are not required. The size of the tumbling barrel forms the basis of measurements for laying out the full size detail of the barrel guard. The method is as follows: Let X in end elevation represent the section of the hexagonal shaped barrel. Using the center of the shaft as a center point, describe the body of the guard as shown, giving the required play. Both ends of the guard remain open, to allow the body to slide over the entire barrel. Should the belt pass inside of the guard, safety shields are added as shown. The ends of the guard are reenforced with angles as shown, and the metal of the body is turned downward as indicated at *a* and *b* in the end elevation. This method prevents the door when closed, from sliding beyond *a*, or beyond *b* when it is open. After the opening for access to the tumbling barrel is decided upon, the inner and outer groove bands, of the sizes shown, are riveted correctly in position around the entire body. In this groove, the rolling door slides as shown in the enlarged sections through A B and C D. Accurate punching of all sheets, angles and bands is essential to facilitate assembling. Angle standards are used as shown in the end elevation. These are reenforced by gusset plates, as shown. The sliding door should be made of heavy material to insure rigidity, and handles may be placed in positions indicated in the side elevation. If desired, the two ends can be closed by bolting flat heads to the angle flanges, thus providing for easy removal.