March 10, 1942. J. J. INGELS 2,275,629

MULTIPLE ROLLING MACHINE

Filed June 19, 1939 5 Sheets-Sheet 1

Fig. 1

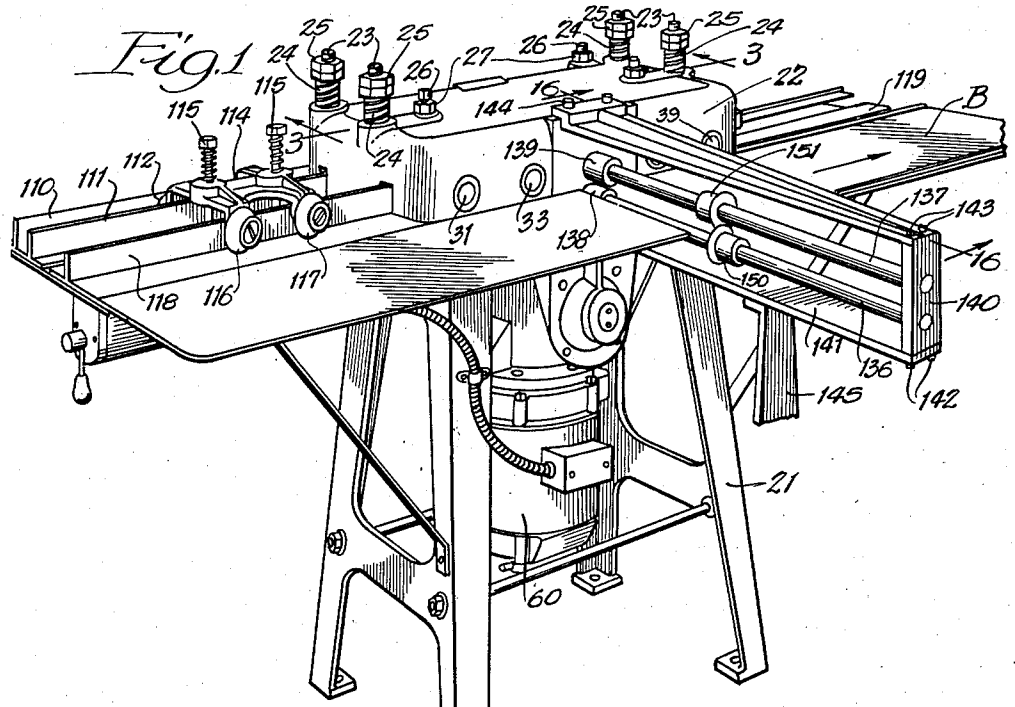
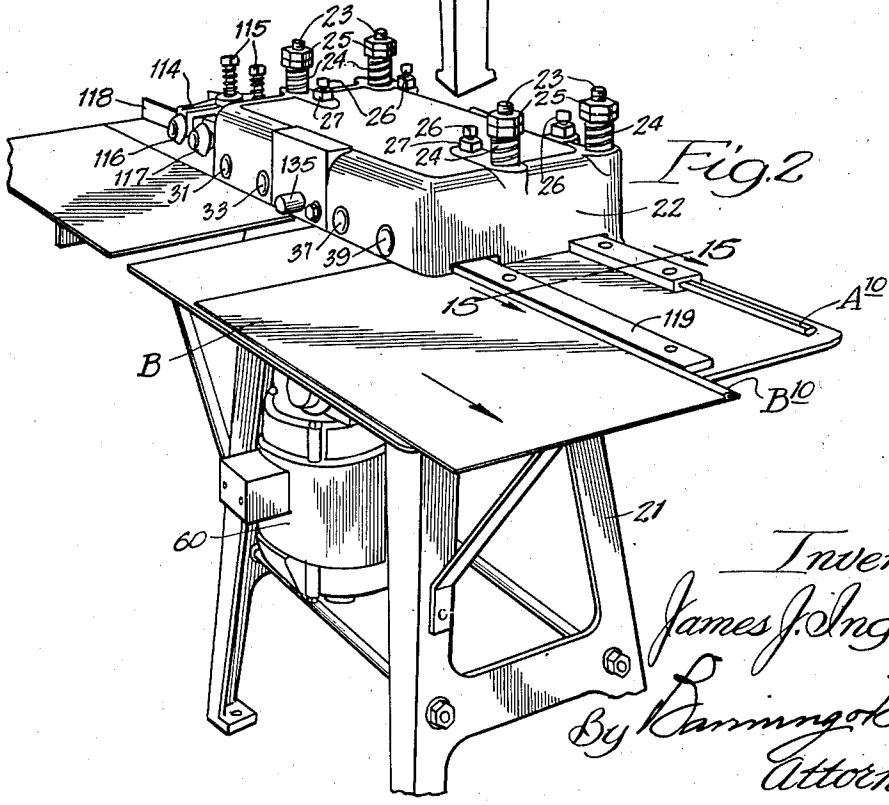


Fig. 2



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MULTIPLE ROLLING MACHINE

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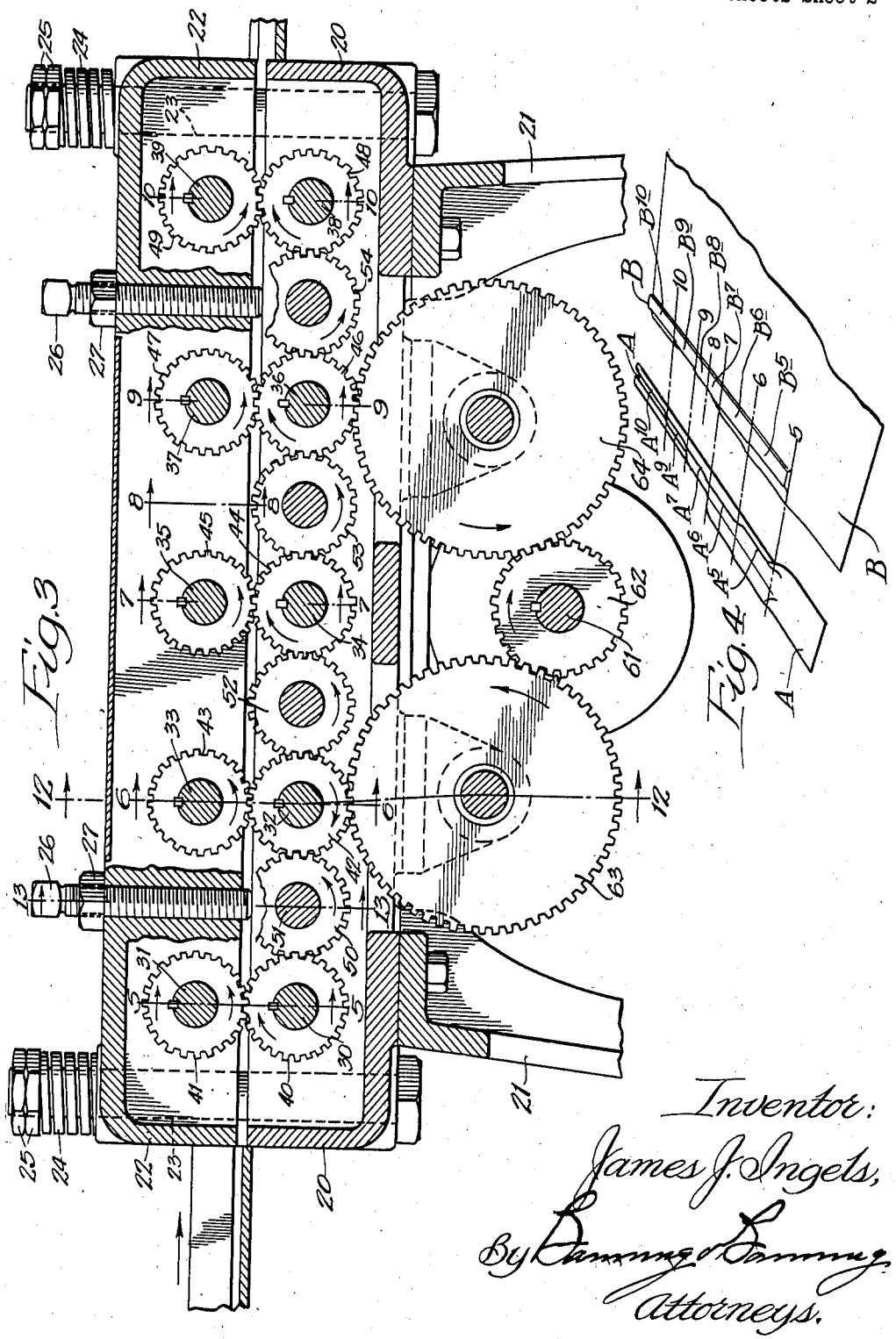

Fig. 3

Fig. 4

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MULTIPLE ROLLING MACHINE

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Fig. 5

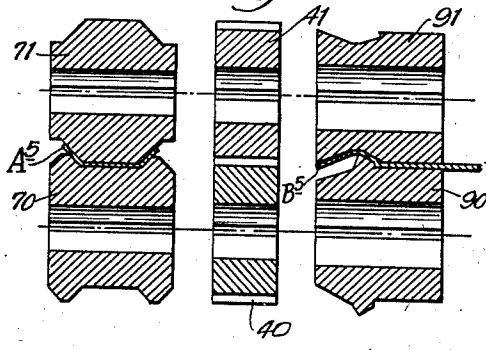


Fig. 6

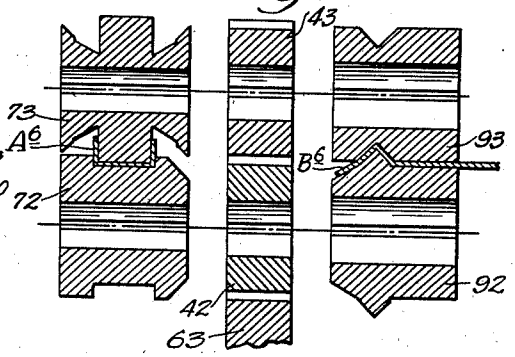


Fig. 7

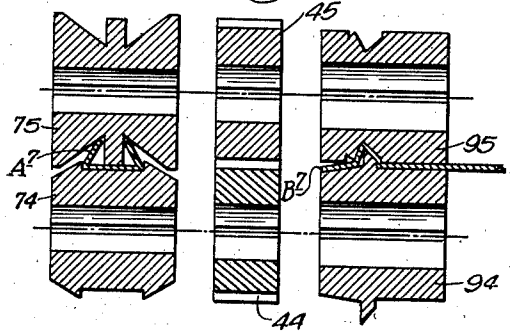


Fig. 8

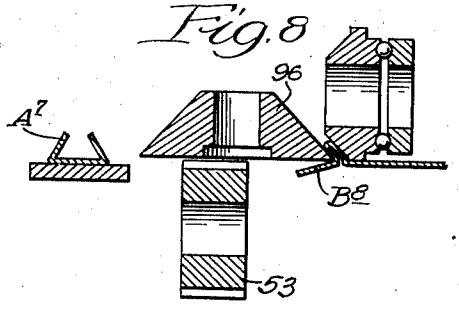


Fig. 9

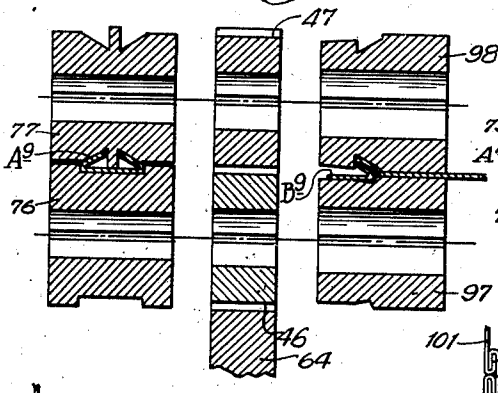


Fig. 10

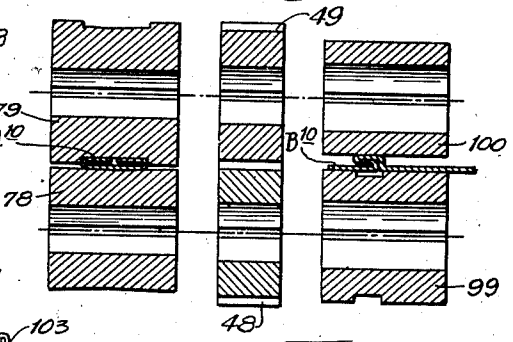
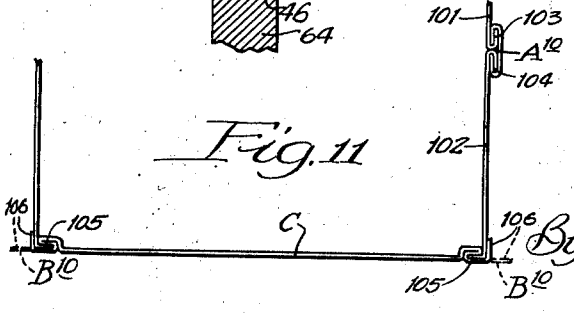


Fig. 11



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March 10, 1942. J. J. INGELS 2,275,629

MULTIPLE ROLLING MACHINE

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Fig. 12

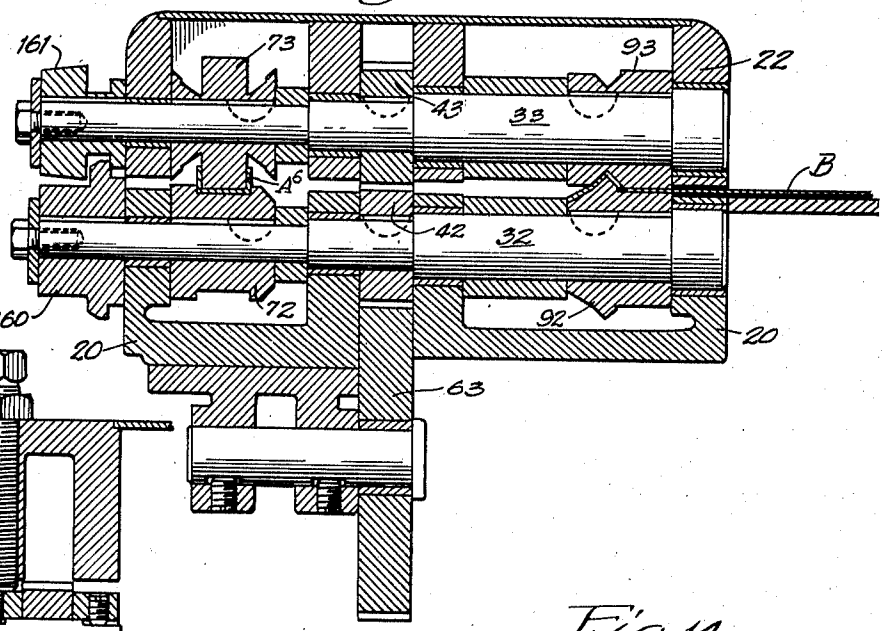


Fig. 13

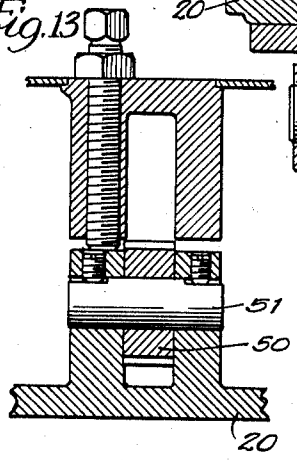


Fig. 14

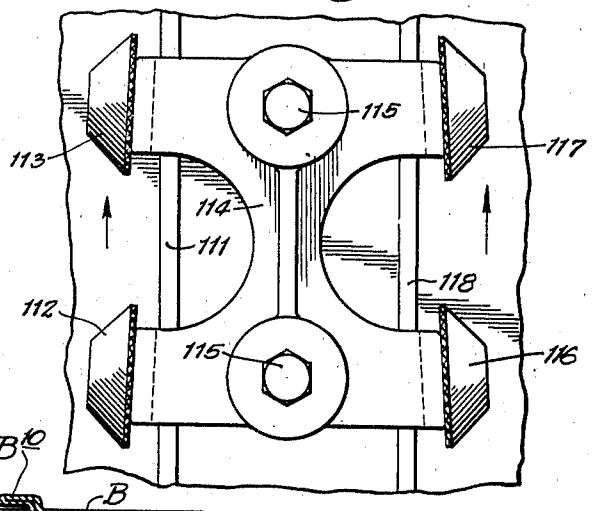
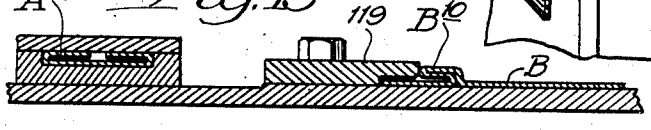


Fig. 15



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March 10, 1942. J. J. INGELS 2,275,629

MULTIPLE ROLLING MACHINE

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Fig. 16

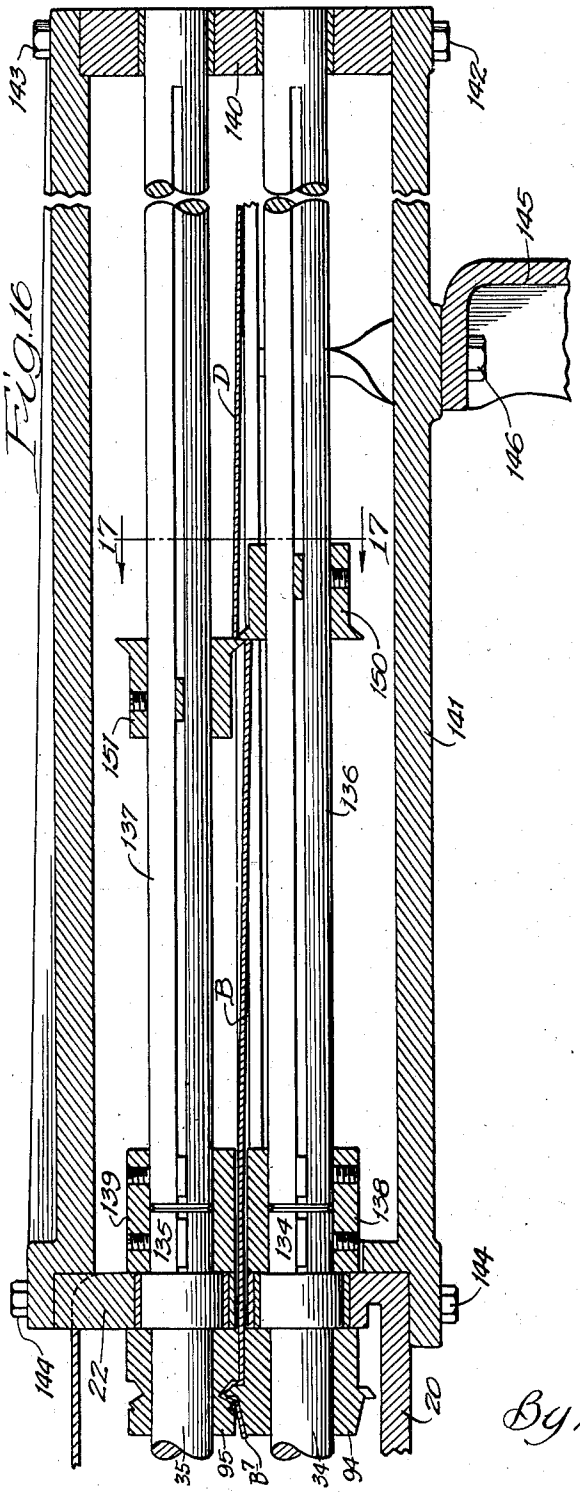
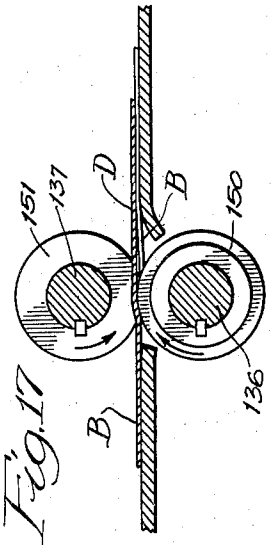


Fig. 17



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Patented Mar. 10, 1942

2,275,629

UNITED STATES PATENT OFFICE

2,275,629

MULTIPLE ROLLING MACHINE

James J. Ingels, Chicago, Ill.

Application June 19, 1939, Serial No. 279,948

6 Claims. (Cl. 153—2)

An object of this invention is to provide an improved form of sheet rolling machine adapted to roll simultaneously, or at different times, two or more strips of sheet metal.

Anther object is the provision of an improved form of drive for such a multiple rolling machine.

Still another object is to provide a firm yet yielding frame for the forming rolls so that sheet metal can be rolled thereby from thirty gage to eighteen gage.

Another object is the provision of means for automatically feeding sheets along predetermined paths so that they enter the forming rolls in a uniform manner.

These and other objects as will hereinafter appear are accomplished by this invention which is fully described in the following specification and shown in the accompanying drawings, in which—

Figures 1 and 2 are perspective views of one embodiment of the multiple rolling machine;

Fig. 3 is an enlarged vertical longitudinal view on the line 3—3 of Fig. 1;

Fig. 4 is a perspective view showing the several stages in rolling two sheets simultaneously with the machine;

Figs. 5 to 10 inclusive are vertical sections through the several sheets of forming rolls and through the gears for driving the same; these figures which show also the progress of the strips of sheet metal through the machine and are taken on the lines 5—5 to 10—10 inclusive of Fig. 3, the shafts, however, being omitted;

Fig. 11 is a fragmentary view showing the use of the driving cleat and of the Pittsburgh lock which are formed by the rolls as here illustrated;

Figs. 12 and 13 are vertical sections on the lines 12—12 and 13—13 of Fig. 3;

Fig. 14 is an enlarged top plan view showing the guides and tucking rolls for guiding the sheet metal into the machine;

Fig. 15 is an enlarged fragmentary section on the line 15—15 of Fig. 2;

Fig. 16 is an enlarged fragmentary vertical section on the line 16—16 of Fig. 1 showing a slitter attachment which is added to the machine as shown in Fig. 1, this section being in line with section 7—7 of Fig. 3; and

Fig. 17 is a partial section on the line 17—17 of Fig. 16.

The embodiment illustrated is designed particularly for simultaneously rolling a drive cleat A^{10} as shown in section at the left of Fig. 15 and a lock B^{10}, commonly known to the trade as a Pittsburgh lock, at the right hand side of this figure. The machine consists essentially of a bed frame or base 20 supported upon suitable legs 21 and having secured thereover a floating frame or head 22. The head and base are provided with registering openings, preferably four in number, adapted to receive guide or leader pins 23 which have heads upon one end, while the opposite end is screw-threaded to receive locking nuts or the like 25 under which are placed compression springs 24. These leader pins are accurately ground to fit the registering openings in the base and head so that the movement of the head with respect to the base, as will later be described, is substantially a parallel one.

Substantially in line with the leader pins are adjusting screws 26 which are adapted to bear upon the upper surface of the base so as normally to maintain the head a fixed distance from the base in opposition to the movement produced by the compression of the springs 24. Locking nuts 27 are provided for these adjusting screws.

The forming rolls for forming the sheet metal and the shafts upon which they are mounted are carried by the base and head and these will now be described. The several pairs of shafts as shown on the lines 5—5, 6—6, 7—7, 9—9 and 10—10 of Fig. 3 are substantial duplicates so that a description of one pair as that shown in Fig. 12 will serve for the other pairs of shafts. For clearance, however, these several shafts will be given separate numbers. Shafts 30, 31 appear on section 5—5; shafts 32, 33 are on sections 6—6 and 12—12; shafts 34, 35 are on section 7—7; shafts 36, 37 are on section 9—9; and shafts 38, 39 are on section 10—10.

Shafts 30, 31 are driven in opposite directions and at equal speeds by means of similar meshing gears 40, 41 keyed thereon; shafts 32, 33 are similarly driven by meshing gears 42, 43; shafts 34, 35 by gears 44, 45; shafts 36, 37 by gears 46, 47; and shafts 38, 39 by gears 48, 49. Between the gears 40 and 42 is placed an idler gear 50 which rotates upon a suitable stud 51; similarly an idler 52 is placed between the gears 42 and 44; an idler gear 53 is likewise placed between the gears 44 and 46; and another idler 54 between the gears 46 and 48.

This train of gears is driven in any suitable manner as by means of a motor 60 (Fig. 1) driven through a suitable gear reduction to a shaft 61 upon which is keyed a gear 62 which meshes with gears 63 and 64 which in turn mesh respectively with gears 42 and 46.

Referring now to Fig. 12, the shaft 32 is suitably journaled, preferably at four points, in the base 20 while the shaft 33 is likewise journaled in the head 22. Fig. 6 shows the same arrangement of forming rolls and meshing gears, as that of Fig. 12, but with the shafts, base and head removed.

Referring to Figs. 4 to 10 inclusive, the rolls for forming the cleat will now be described. The rolls 70, 71 of Fig. 5 bend the flat sheet A of Fig. 4 to the form A^5 of Fig. 5; the rolls 72, 73 of Figs. 6 and 12 bend the strip to the form A^6 of Fig. 4; the rolls 74, 75 of Fig. 7 bend the strip to the form A^7, which remains the same in Fig. 8. The rolls 76, 77 of Fig. 9 close the strip to the form A^9 of Fig. 9; and the rolls 78, 79 complete the operation by closing the strip to the form A^{10} in which condition the driving strip is ready for use. The rolls 90, 91 form the edge B^5 of Figs. 4 and 5; the rolls 92, 93 form the edge B^6; the rolls 94, 95 form the edge B^7; an idler roller 96 (Fig. 8) bends the edge inwardly to the position B^8; the rolls 97, 98 of Fig. 9 bend the edge up to the position B^9 and the rollers 99, 100 complete the Pittsburgh lock as shown at B^{10} (Fig. 10).

In Fig. 11 is shown the use of both the cleat A^{10} and of the Pittsburgh lock B^{10}. Thus the cleat A^{10} is used to lock two abutting sheets 101 and 102, both of which have their edges bent back as shown at 103 and 104, these bent back edges being held firmly within the cleat which is applied by driving it endwise over these bent back edges thereby firmly securing the sheets 101 and 102 together in substantially the same plane.

A sheet C similar to the sheet B is passed twice through the rolls 90 to 100 inclusive with the result that Pittsburgh locks of the type B^{10} are formed on each of its edges. This is done by passing one edge of the sheet through these rolls, then turning the sheet around and passing the other edge through the same rolls so as to form the same lock on both edges. The sheet 102 has its edge turned up at right angles as shown at 105 (Fig. 11) so as to fit under the overhanging portion of the Pittsburgh lock. The outer portion 106 is then bent up from the dotted line position to the full line position so as to firmly lock the sheet 102 to the sheet C.

Referring now to Figs. 1, 2 and 14, the strip A is fed into the machine by hand between the guides 110, 111. As it is pushed forward, it passes under the tucker rolls 112, 113 which are journaled upon suitable stub axles on a frame 114 which is secured to the base by means of bolts 115. These tucker rolls are set at a slight angle toward the guide 111 and have their edges knurled so that as the sheet is fed forward, it will be held against the guide 111 until the strip is caught by the first set of forming rolls. After that, the rolls preserve this alignment. Similarly the sheet B passes under similar tucker rolls 116, 117 which urge the sheet against a longitudinal guide 118 which also serves to hold this sheet until it is cut by the first forming rolls. The impression made upon the sheet serves to guide that sheet from that point on through the succeeding rolls until it comes out under a guide 119 (Fig. 15).

In Figs. 16 and 17 is shown an attachment for forming a Pittsburgh lock on one edge of a sheet B and for simultaneously slitting that sheet so as to sever a sheet D therefrom. In order to do this, the shafts 34 and 35 have extensions 134 and 135 which connect with shafts 136 and 137 by means of couplings 138, 139. The outer ends of these shafts are journaled in suitable bearings in an end member 140 which is carried by a frame 141 to which it is secured by suitable bolts 142, 143, the inner end of the frame being secured to the base 20 as by means of bolts 144. The outer end of the frame 141 may be supported as by means of a leg 145 secured thereto by means of bolts 146. Slitter rolls 150, 151 are adjustably secured on the shafts 134, 135 at any desired point so as to provide a sheet B (Fig. 16) of a desired width.

Thus it will be seen that a very simple and efficient means is provided for forming any desired edge on one side of a sheet and simultaneously slitting the sheet to a desired width. This greatly speeds up the whole forming operation, reduces the number of handlings of the sheet, and also reduces the amount of machinery necessary to perform these various operations.

A third set of rolls may be added as shown in Fig. 12. Thus the forming roll shafts, as 32 and 33, (Fig. 12), may be extended to receive a third set of forming rolls as 160, 161 of a series to form say a flange and lock of still another form from that previously described. The forms of rolls illustrated are exemplifications only. Any suitable edge forming rolls may be used.

It will be readily observed upon inspection of Fig. 3 that the head frame 22 is supported on the base frame 20 that it may readily yield vertically in opposition to the springs 24 while the adjusting screws 26 effect a predetermined minimum spacing between the frames as well as the forming rolls carried by the shafts. Furthermore, such predetermined minimum spacing may readily be varied upon loosening the nuts 27 and turning the screws 26 in one direction or the other, the springs 24 at all times maintaining the free ends of the screws in engagement with the base frame.

A further important feature of this invention is the specific mounting of the various shafts wherein each of such shafts is supported in four spaced bearings as is more clearly illustrated in Fig. 12. Such construction provides for the mounting of the forming rolls between adjacent bearings, the driving gears between the innermost bearings and if desired other forming rolls externally of the frames adjacent certain of the bearings. This provides a well-balanced construction as well as providing sufficient resistance to bending or deformation of the shaft as may be occasioned in prior construction having substantial distances between adjacent bearings.

I claim:

1. In a machine of the class described, a series of parallel shafts arranged in horizontally spaced pairs, each pair of shafts being vertically disposed and carrying a plurality of pairs of forming rolls spaced axially of the shafts, meshing gears keyed on the shafts and located between said rolls, a frame including head and base portions, corresponding shafts of said pairs thereof being journaled in the base portion, the other corresponding shafts of said pairs being journaled in the head portion, the journals for said shafts comprising a plurality of bearings spaced axially thereof with certain of said bearings disposed between said meshing gears and said rolls, and others thereof disposed adjacent opposed ends of said rolls, and other gears supported on stud shafts in the base portion in horizontal alignment

with said first corresponding shafts and meshing with the gears thereon.

2. In a machine as defined in claim 1 wherein certain of said shafts extend beyond corresponding sides of said frames, and additional work forming rolls supoprted by said shafts adjacent certain of said bearings.

3. In a machine of the class described, a base frame, a head frame yieldably supported on said base frame, a plurality of pairs of shafts rotatably journaled in said frames, a plurality of pairs of cooperating work forming rolls secured to each pair of said shafts, one pair of said shafts extending beyond corresponding walls of said frames, a frame detachably secured to said first frame, a pair of shafts having corresponding ends thereof rotatably journaled in said last frame and the other ends thereof detachably connected with the projecting ends of said first pair of shafts for rotation therewith and cooperating slitting rolls secured to said last named shafts.

4. Means for guiding sheet material to the forming rolls of a sheet metal rolling machine comprising a straight vertically disposed sheet edge engaging member for guiding said edge to said rolls, and a tucking roll laterally spaced from said sheet edge engaging member and with its axis inclined thereto, and means for yieldably urging the tucker roll into engagement with said sheet of material.

5. Means for guiding sheets of material to the forming rolls of a sheet metal rolling machine comprising a pair of spaced parallel sheet edge guiding members, a pair of tucking rolls disposed laterally of each said member with their axes inclined thereto for engaging and directing the edges of sheet material into contact with said members, and means for yieldably urging said tucking rolls into engagement with said sheets of material.

6. In a machine of the class described, a series of parallel shafts arranged in horizontally spaced pairs, each pair of shafts being vertically spaced and carrying a plurality of pairs of forming rolls spaced axially of the shafts, meshing gears keyed on the shafts and located between the rolls, a frame having separate head and base portions, the lower shafts of said pairs of shafts being journaled in the base portion, the upper shafts of said pairs being journaled in the head portion, the journal for each said shafts comprising a plurality of pairs of bearings in the frame portion which support it, such bearings being spaced axially of the shaft with the bearings of one pair disposed between the gear on the shaft and the rolls of one of the pairs of rolls on said shaft, and other gears supoprted on stud shafts in said base portion between said lower shafts and meshing with the gears thereon between said plurality of pairs of bearings.

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