July 7, 1925. 1,545,192

G. W. LENTZ

SHEET METAL EXPANDING MACHINE

Filed Jan. 15, 1923 6 Sheets-Sheet 1

Fig. 1

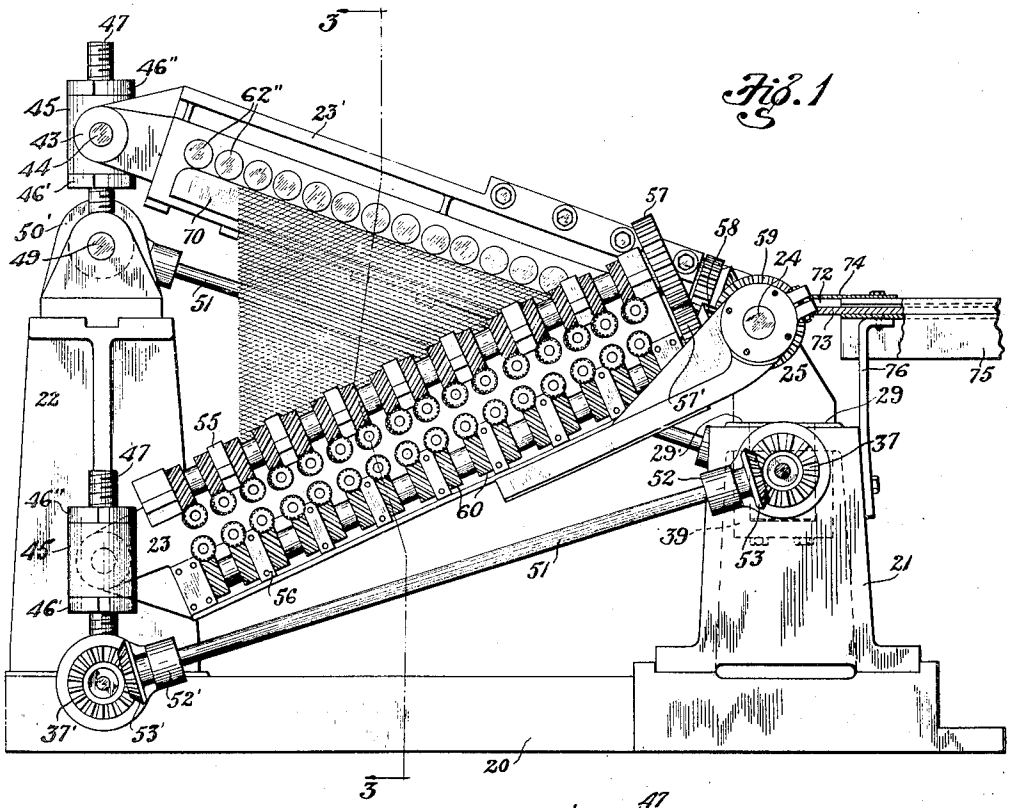
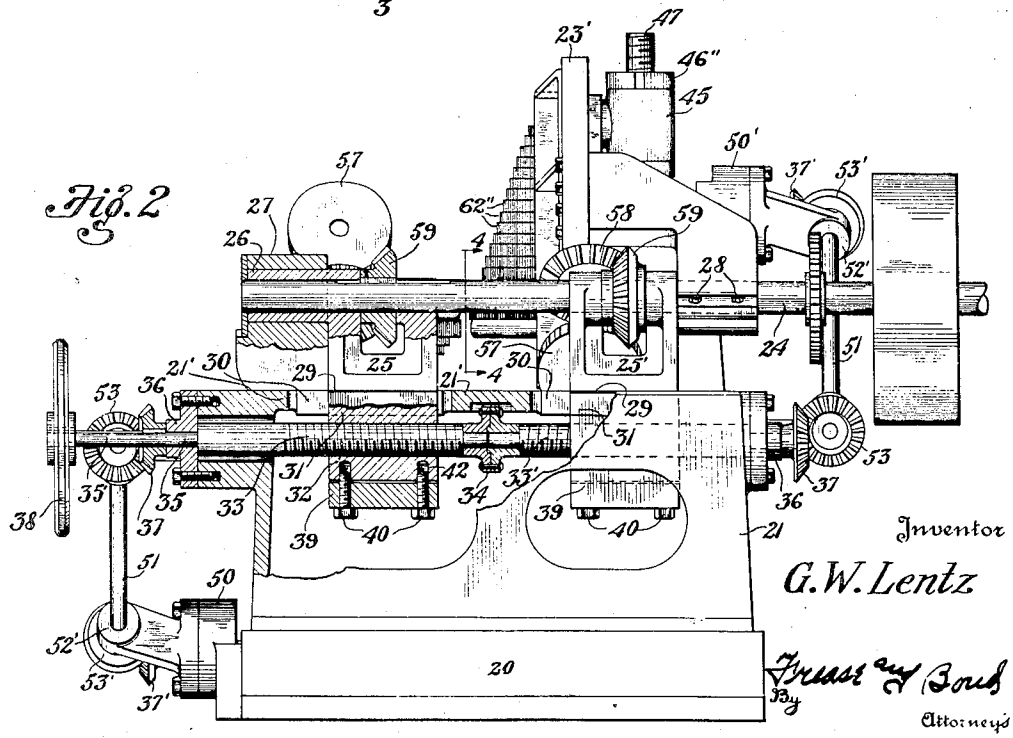


Fig. 2



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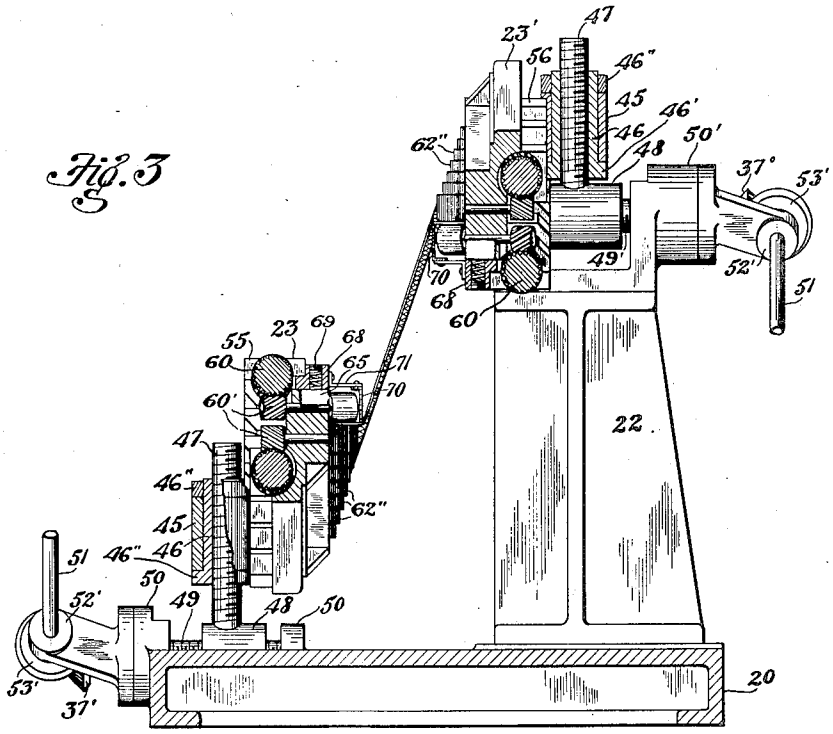
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G. W. LENTZ

SHEET METAL EXPANDING MACHINE

Filed Jan. 15, 1923 6 Sheets-Sheet 2

Fig. 3



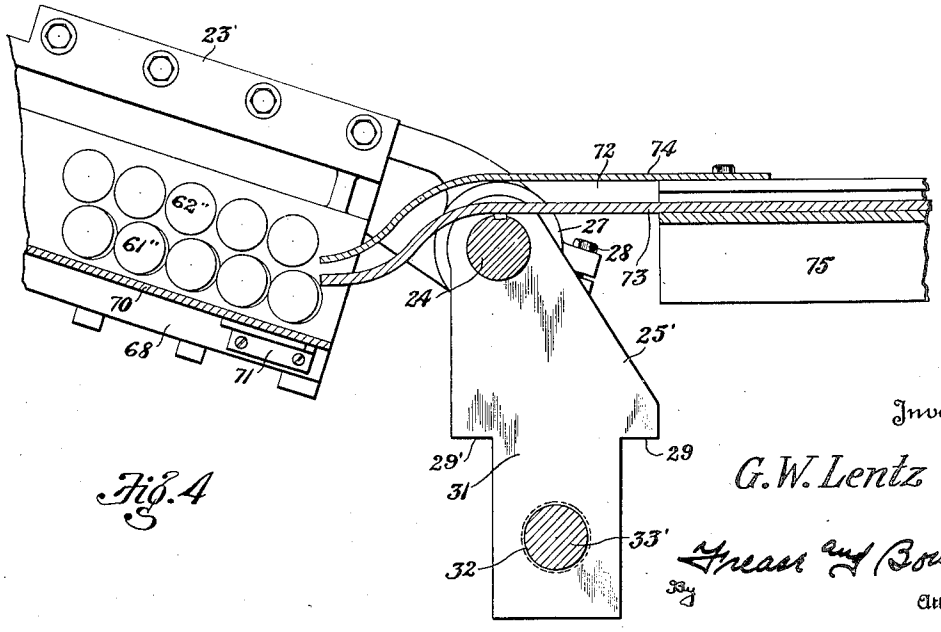


Fig. 4

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July 7, 1925. 1,545,192

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SHEET METAL EXPANDING MACHINE

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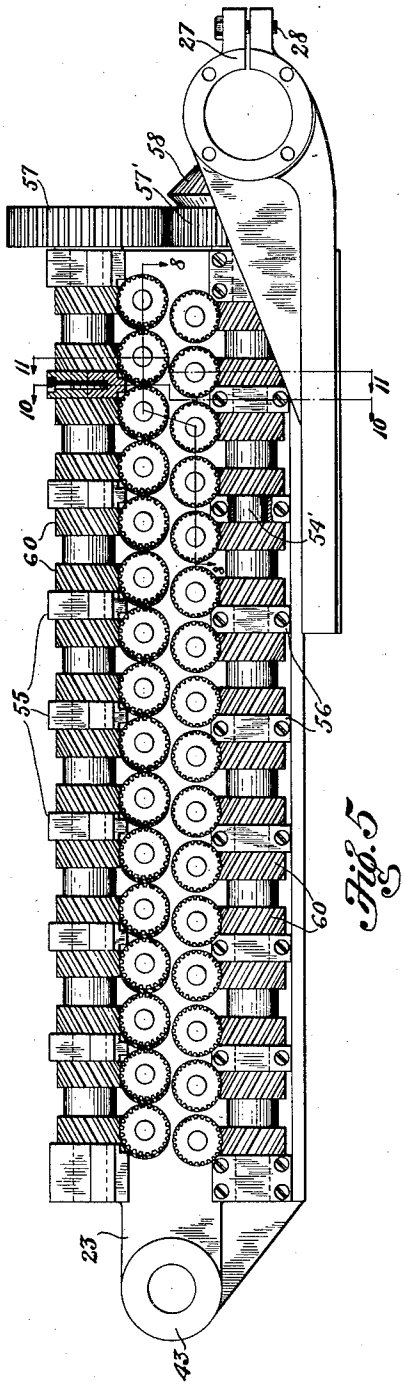


Fig. 5

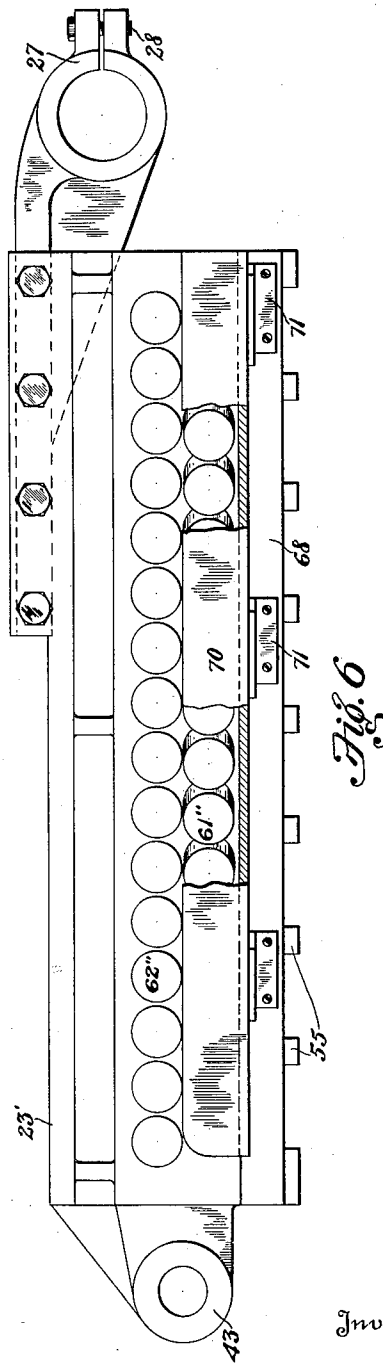


Fig. 6

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July 7, 1925. 1,545,192

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SHEET METAL EXPANDING MACHINE

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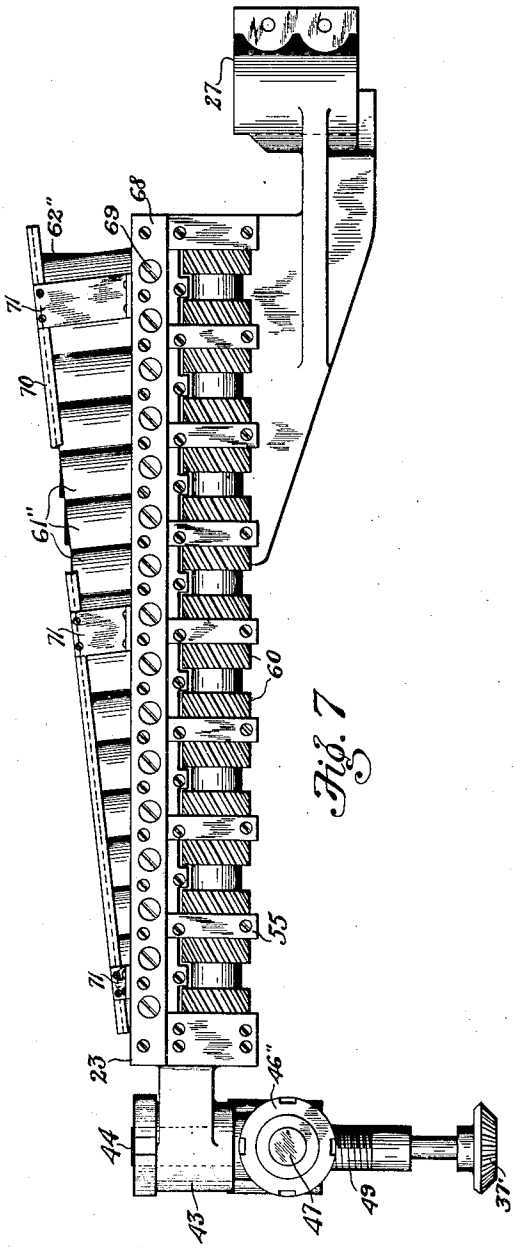


Fig. 7

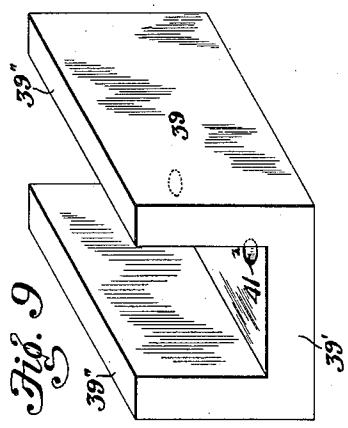


Fig. 9

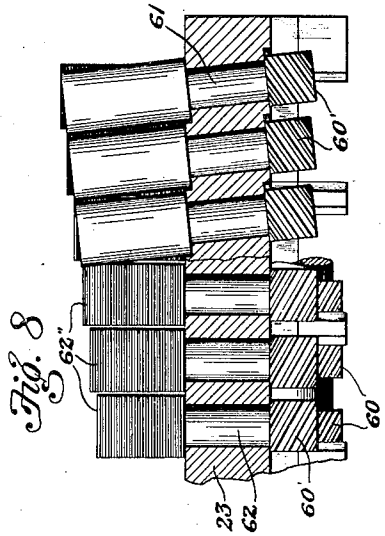


Fig. 8

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SHEET METAL EXPANDING MACHINE

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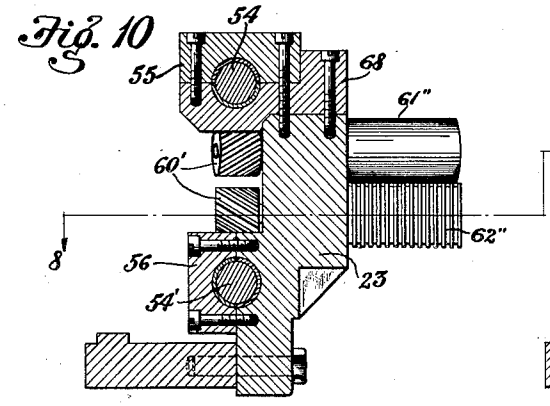


Fig. 10

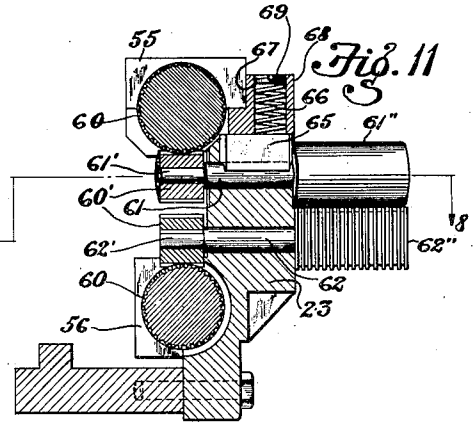


Fig. 11

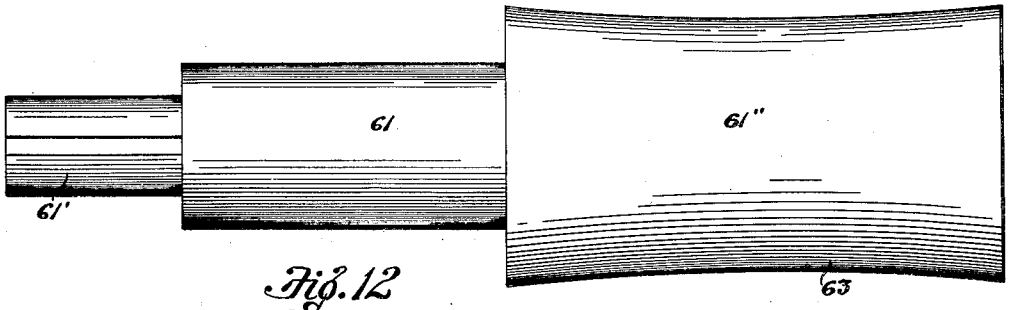


Fig. 12

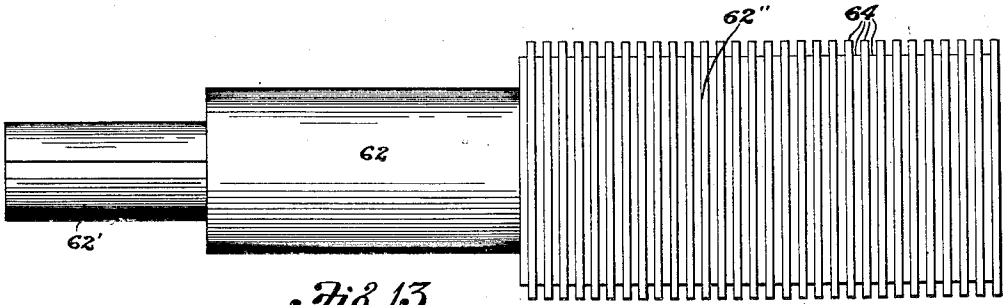


Fig. 13

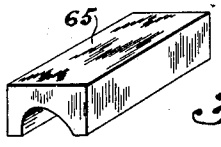


Fig. 14

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July 7, 1925. 1,545,192

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SHEET METAL EXPANDING MACHINE

Filed Jan. 15, 1923 6 Sheets-Sheet 6

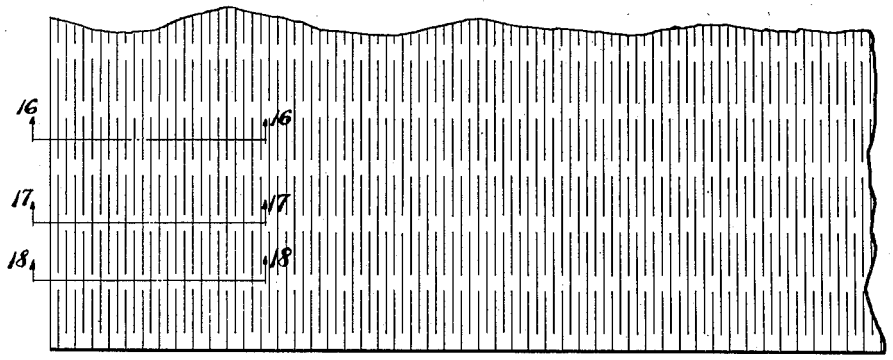


Fig. 15



Fig. 16

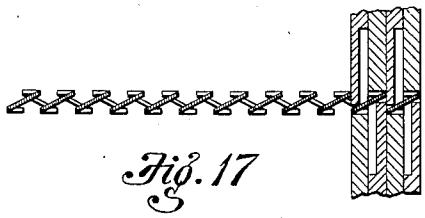


Fig. 17

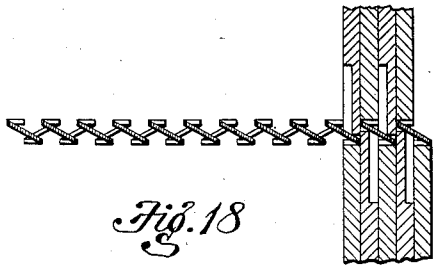


Fig. 18

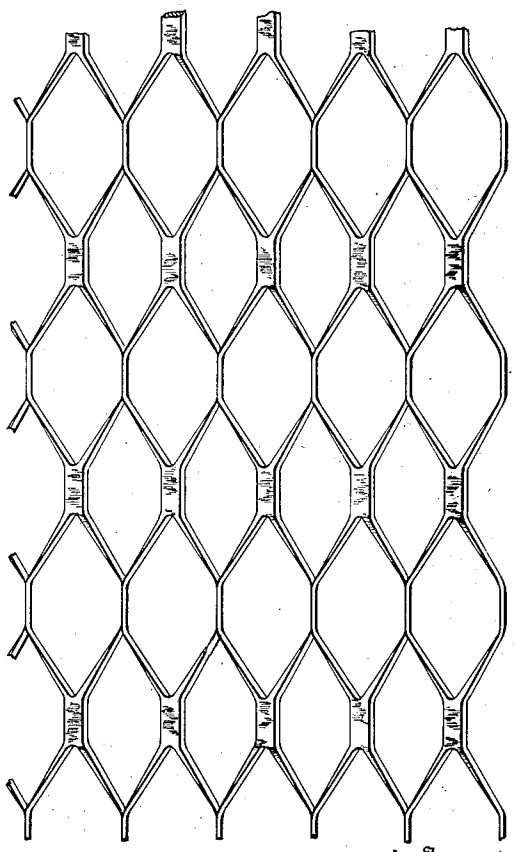


Fig. 19

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Patented July 7, 1925. 1,545,192

UNITED STATES PATENT OFFICE.

GEORGE W. LENTZ, OF CANTON, OHIO, ASSIGNOR TO UNITED ALLOY STEEL CORPORATION, OF CANTON, OHIO, A CORPORATION OF NEW YORK.

SHEET-METAL-EXPANDING MACHINE.

Application filed January 15, 1923. Serial No. 612,748.

To all whom it may concern:

Be it known that I, GEORGE W. LENTZ, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Sheet-Metal-Expanding Machines, of which the following is a specification.

The invention relates to machines for expanding sheet metal which has been provided with series of interrupted slits in staggered relation, to form strands and bonds for producing diamond meshes; and the object of the improvement is to simplify the construction of such machines, to reduce the expense of maintaining the same, to more readily adjust the expander arms, to produce an expanded sheet with regular and uniform diamond meshes; and to save a waste of material by producing an expanded sheet with square ends.

When caterpillar conveyers are employed for engaging the unexpanded portions of a sheet for expanding the intermediate portion thereof, the wear upon the faces of the links and the connecting pivots and bushings, is so rapid that the life of a conveyer chain is only about fifty hours, until a repair or replacement is required.

This difficulty is overcome in the present improvement, by the use of roller conveyers for engaging the unexpanded portions of a sheet during the expanding operation. The life of the roller conveyer is comparatively unlimited, and the same will operate for at least six months without a regrinding of the faces of the rolls.

A lateral adjustment of the expanding arms is required for operating upon slit sheets or strips of different gages, and in the present improvement such an adjustment is facilitated by the use of coordinated mechanism for laterally adjusting both ends of both arms in unison, by a single operation.

An imperfect sheet is made and a waste of material occurs when an expanding produces irregular or distorted meshes, which results in retarding the intermediate portion of a sheet so as to concave one end and convex the other end thereof.

This difficulty is avoided in the present improvement, by diverging the expander arms at an angle substantially the same as the angle of divergence of the strands of the expanded sheet; so that the diamond meshes are uniformly made true and complete as the sheet passes over the breaking edges of the guide plates of the machine.

An embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a left side elevation of the expanding machine;

Fig. 2, a front elevation of the same, omitting the guide means and being broken away in parts to show details of construction;

Fig. 3, an elevation section, on line 3—3, Fig. 1, with parts broken away to show details of construction;

Fig. 4, a fragmentary section, as on line 4—4, Fig. 2, omitting the gear wheels and bearings, and showing the forward support for the expanding arms;

Fig. 5, an outer side view of each of the expander arms, detached from the machine, being an elevation of the lower left arm and an inverted view of the upper right arm;

Fig. 6, an inner side view of each of the expander arms detached from the machine, being an elevation of the upper right arm and an inverted view of the lower left arm;

Fig. 7, an under side view of the upper expander arm, being a plan view of the lower expander arm;

Fig. 8, a fragmentary plan section, as on line 8—8, Fig. 5 and Figs. 10 and 11, showing three of the smooth rolls and three of the grooved rolls;

Fig. 9, a detached perspective view of the clamping yoke;

Fig. 10, a fragmentary section through one expander arm, as on line 10—10, Fig. 5;

Fig. 11, a similar section as on line 11—11, Fig. 5;

Fig. 12, a side view of one skewed roll, showing a smooth periphery;

Fig. 13, a similar view of one normal roll, showing a grooved periphery;

Fig. 14, a fragmentary detached perspective view of a pressure bearing box;

Fig. 15, a fragmentary plan view of a slit sheet;

Fig. 16, a detached section of the same, on line 16—16, Fig. 15;

Fig. 17, an enlarged section, as on line 17—17, Fig. 15, showing the operation of cutting disks;

Fig. 18, an enlarged section, as on line

18—18, Fig. 15, showing the operation of cutting disks; and

Fig. 19, an enlarged fragmentary plan view, showing the mesh of an expanded sheet.

Similar numerals refer to similar parts throughout the drawings.

The machine frame may include a base 20, a forward standard 21, a rear standard 22, a left side or lower expander arm 23, and a right side or upper expander arm 23′.

A transverse driving shaft 24 is journaled in bearings 25 and 25′, which are adjustably mounted upon the forward standard 21; and these bearings are provided with laterally extending bearing sleeves 26 upon which are supported the forward ends of the respective expander arms by means of split bearings 27, which are clamped upon the sleeves by bolts 28.

Each bearing 25 is formed with shoulders 29 and 29′ bearing upon the edges of a slotted opening 30 in the bearing wall 21′ of the standard 21, through which opening a guide block 31 extends downward from the bearing into the cavity of the forward standard, and is provided with a threaded bearing 32 for a transverse adjusting screw 33, one of such screws being provided in each side of the machine.

The adjusting screws 33 and 33′ are reversely threaded and are coupled together in the middle of the machine, as at 34. The outer end of each screw is provided with a reduced journal 35 supported in a bearing 36, outside of which bearing a beveled gear 37 is secured upon an extension 35′ of the journal. On one side of the machine the journal may be further extended and may be provided on its end with a hand wheel 38, by means of which the bearings 25 and 25′ may be adjusted to and from each other in unison, by turning of the connected screws 33 and 33′.

A channel yoke 39 is engaged, from below, over each guide block 31, and bolts 40 are passed through smooth bores 41 in the connecting web 39′ of the yoke and are turned into tapped bores 42 in the lower end of the guide block, for clamping the edges 39″ of the yoke flanges against the top of the bearing wall 21′ of the standard and the shoulders 29 and 29′ against the top of the wall, at each side of the slotted opening 30 therein; thereby holding the bearings 25 and 25′ rigidly in a given position of adjustment.

The forward end of each expander arm is provided with a bearing 43 mounted on a spindle 44 extending laterally from the side of a bearing sleeve 45 and swiveled around an adjusting bushing 46 provided with a tapped bore for turning upon an upright screw post 47 rising from a bearing head 48 provided with a tapped bore mounted upon an adjusting screw 49 swiveled in a bearing 50 or 50′ provided on the base of the machine. The outer journal of each adjusting screw 49 and 49′ is extended beyond the bearing 50 or 50′, and to the end of the extension is secured a bevel gear 37′.

A shaft 51 is mounted on each side of the machine in journal bearings 52 and 52′, upon the ends of which are secured bevel gears 53 and 53′ meshing respectively with the bevel gears 37 and 37′ on the ends of the transverse adjusting screws.

The adjusting screws 49 and 49′ are reversely threaded like the adjusting screws 33 and 33′, and it is evident that by means of the connecting gearing, a turning of the hand wheel 38 one way or the other serves to adjust the supporting bearings for the rear as well as for the forward ends of the expander arms in unison, toward or away from each other.

Each adjusting bushing 46 is provided with a collar head 46′ on its lower end and a collar nut 46″ on its upper end, abutting the ends of the bearing sleeve 45; by means of which the bearing sleeve 45, which supports the rear end of the corresponding expander arm, may be adjusted upward and downward by loosening the collar nut 46″ and turning the adjusting bushing upon the screw post 47, after which the parts are clamped in a given position of adjustment by again tightening the collar nut 42″; it being understood that the clamping bolts 28 are loosened to release the split bearings 27, for an adjustment of the rear ends of the expander arms to vary the vertical angle of divergence of one from the other.

The expander arms 23 and 23′ are exactly alike, excepting that the position of one is inverted with reference to the other, and a description of the lower left arm will suffice for a description of the upper right arm by a mere transposition of the terms "upper" and "lower."

A shaft 54 is journaled in bearings 55 secured to the upper edge of the expander arm 23 so as to overhang the outer side thereof, and a shaft 54′ is journaled in bearings 56 secured upon the outer side along the lower edge of the arm.

Upon the forward ends of these shafts are secured gear wheels 57 and 57′, meshing with each other, and upon the forward end of the lower shaft 54′ is also provided a bevel gear 58, which may be integral with the gear wheel 57′, and which meshes with a bevel gear 59 splined upon the driving shaft 24, by means of which the shafts 54 and 54′ are rotated in unison in opposite directions.

A plurality of spiral drive gears 60, are formed upon the shafts 54 and 54′, one on each side of the bearings 52 and 56, and a plurality of spindles 61 are transversely journaled in the expander arm below the shafts 54 which are provided with inwardly

extending shanks 61′ upon which are secured spiral driven gears 60′ meshing with the drive gears 60 upon the shaft 54; and a plurality of spindles 62 are transversely journaled in the expander arm above the shafts 54, which are provided with inwardly extending shanks 62′ upon which are secured spiral driven gears 57′ meshing with the drive gears 60 upon the shaft 54, by means of which the spindles 61 and 62 are rotated in unison in opposite directions.

Upon the inner end of each spindle 61 is formed or secured a roller 61″, and upon the outer end of each spindle 62 is formed or secured a roller 62″, which rollers protrude from the inner side of the expander arm 23 and cooperate with each other to form a roller conveyer for engaging the unexpanded portions of a slit sheet, and moving the same rearward through the machine during the expanding operation.

Each upper roller 61″ may be and preferably is formed with a smooth surface, and its axis is slightly inclined to skew the inner end of the roll forward and the outer end of the roll rearward from the plane of the axis of the corresponding lower roll 62″ and the periphery 63 of the upper roll 61″ is slightly concaved endwise so as to fit the cylindric periphery of the lower roll 62″, to give a contact therewith throughout its length. Each lower roll 62″ is preferably provided with a series of circumferential grooves or corrugations 64, to increase the frictional engagement of the roll with the sheet metal.

The bearing for the spindle 61 for each upper roll, preferably includes a half box 65 bearing upon the upper side of the spindle immediately inside of the roll 61″, and this bearing box is preferably pressed downward by means of a compression spring 66, adjustably secured in a socket 67 provided in a bar 68 secured to the upper edge of the expander arm, which bar may be integral with the lower portions of the bearing 55. These springs may be adjusted by a plug 69 screwed into the upper end of the socket.

The rollers 61″ are gradually reduced in length from the forward to the rear end of the expander arm, so that the inner ends of the skewed rollers are located in a straight line diverging outward from the median line of the machine at the forward end of the expander bar, to the inner face of the expander bar at the rear end thereof; while the inner ends of the lower rolls 62″ are located in a stepped relation, with the centers thereof in the same plane with the ends of the upper rolls.

A guide plate 70 may be and preferably is mounted along and adjacent to the inner ends of the upper rolls, and may be supported by brackets 71 secured to the inner side of the bearing bar 68. The lower edge of the plate 70 is located in the plane of the line of the nip of the rolls 61″ and 62″, and forms an inclined breaking edge upon and over which the sheet is drawn during the expanding operation, in a manner well known in the expanded metal art.

The upper right expander arm is inclined upward, and the lower left expanding arm is inclined downward, from front to rear, and the inner ends of the conveyer rolls likewise diverge from front to rear; and the parts are so proportioned and arranged that the diverging angle formed by the ends of the rolls, or by the breaking edge of the guide plate when the same is used, is substantially the same as the angle of divergence designed to be given to the strands of the expanded sheet; which angle of divergence results in the formation of true and uniform diamond meshes as the sheet passes over the breaking edge of the guide bar, and produces an expanded sheet in which the bonds are truly aligned across the sheet and in which both ends are formed square.

Slit sheets may be fed into the machine through a guideway 72 formed by a bottom plate 73 and a top plate 74 extending from a feed table 75, which may be supported by a bracket 76 upon the forward standard 21 of the frame; and the guide plates preferably extend over the driving shaft 24, and are thence curved downward and rearward so as to deliver the sheet into the nip of the forward rolls of the conveyer, as shown in Fig. 4.

The conveyer rolls on the respective expander arms at the forward end of the machine, engage substantially the whole of the corresponding half of the slit sheet; and as the sheet is moved rearward through the machine, it is conveyed and controlled by the rolls during the expanding operation, during which they engage the entire width of the unexpanded portions of the sheet.

The skewed rolls act to draw the unexpanded portions of the sheets outward against the inward pull of the sheet during the expanding operation and hold the edges of the sheet against the inner faces of the expander arms; and the grooved peripheries of the normal rolls engage the sheet and prevent any inward slipping of the same. The two sets of rolls in each arm cooperate to engage the entire width of the unexpanded portion of the slit sheet throughout the entire expanding operation.

As the sheet progresses rearward through the machine, the expansion of the mesh takes place as the succeeding portions of sheet pass over the breaking edge of the guide plate; and the continuity, as well as the angularity of the same, as herein described, results in giving a uniform and complete formation of the diamond meshes as the same pass over the breaking edge until the entire

sheet is conveyed through and expanded by the machine.

The uniform and full formation of the diamond meshes, as the sheet passes over the breaking edge of the guide plate, completes the expansion of the sheet, as the same moves rearward through the machine; and although the expanded sheet is held taut between the breaking edges, there is no further tension upon the same to cause any lateral extension or lineal contraction, so that the ends of the sheet remain straight throughout the entire operation, as well shown for the advancing end, in Fig. 2.

I claim:—

1. A machine for expanding slitted sheets including diverging expander arms, conveyer means thereon engaging the unexpanded portions of the sheet, supporting bearings for the ends of the arms, and means for laterally adjusting all the bearings in unison.

2. A machine for expanding slitted metal sheets including diverging expander arms, means thereon conveying the sheets through the machine comprising sets of cooperating rollers engaging the entire width of the unexpanded portions of the slit sheet throughout the expanding operation.

3. A machine for expanding slitted metal sheets including diverging expander arms, means thereon conveying the sheets through the machine comprising sets of cooperating rollers of differential lengths engaging the entire width of unexpanded portions of the slit sheet throughout the expanding operation.

4. A machine for expanding slitted metal sheets including diverging expander arms, means thereon conveying the sheets through the machine comprising sets of cooperating rollers engaging the unexpanded portions of the slit sheet, the rollers of one set only being provided with circumferential grooves to increase frictional engagement with the sheet.

5. A machine for expanding slitted sheets including diverging expander arms, and means conveying the sheets through the machine comprising cooperating sets of rollers engaging the unexpanded portions of the sheet, the rollers of one set being skewed to draw the side portions of the sheet outward and hold its edges against the faces of the expander arms.

6. A machine for expanding slitted sheets including diverging expander arms, and means thereon conveying the sheets through the machine comprising cooperating sets of rollers engaging the unexpanded portions of the sheet, the rollers of one set being normal and the rollers of the other set being skewed.

7. A machine for expanding slitted sheets including diverging expander arms, and means thereon conveying the sheets through the machine comprising cooperating sets of rollers engaging the unexpanded portions of the sheet, the rollers of one set being normal and provided with circumferential grooves and the rollers of the other set being skewed.

8. A machine for expanding slitted sheets including diverging expander arms, and means thereon conveying the sheets through the machine comprising cooperating sets of rollers engaging the unexpanded portions of the sheet, the rollers of one set being normal and the rollers of the other set being skewed and the peripheries of one set being concaved longitudinally to contact full length with the rollers of the other set.

9. A machine for expanding slitted sheets including diverging expander arms and means thereon conveying the sheets through the machine comprising cooperating sets of rollers engaging the unexpanded portions of the slit sheets, the inner ends of the rollers being located in planes diverging laterally from front to rear.

10. A machine for expanding metal sheets slitted to form diamond mesh strands including means conveying the sheet through the machine engaging the unexpanded portions thereof and having breaking edges diverging at an angle corresponding to the designed divergence of the strands of the diamond mesh.

11. A machine for expanding metal sheets slitted to form diamond mesh strands including means conveying the sheet through the machine engaging the unexpanded portion thereof and provided with guide plates forming breaking edges diverging at an angle corresponding to the designed divergence of the strands of the diamond mesh.

12. A machine for expanding metal sheets to form diamond mesh strands including diverging expander arms, conveyer means thereon engaging the unexpanded portions of the sheet and provided with guide plates forming breaking edges, and means for adjusting the arms to diverge the breaking edges at an angle corresponding to the designed divergence of the strands of the diamond mesh.

GEORGE W. LENTZ.