Nov. 25, 1930. O. WILD ET AL 1,782,641

MACHINE FOR FLANGING PLATE DISKS

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FIG. 1

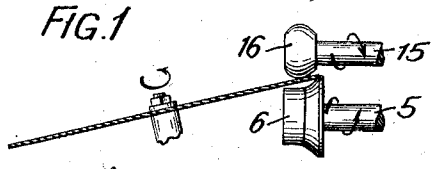


FIG. 2

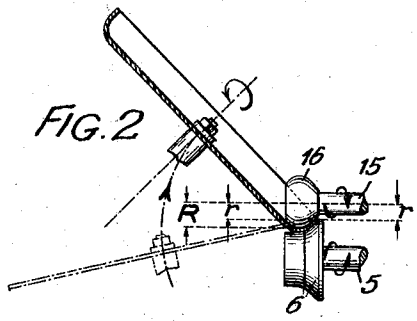


FIG. 7

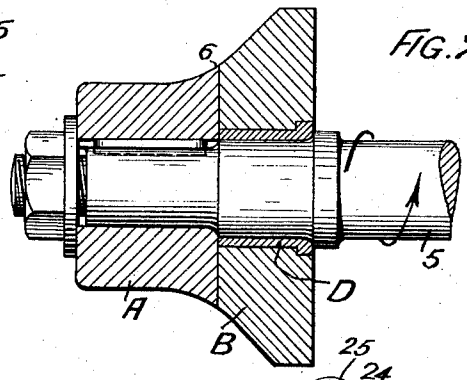


FIG. 3

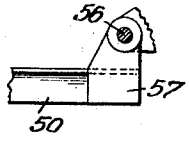


FIG. 6

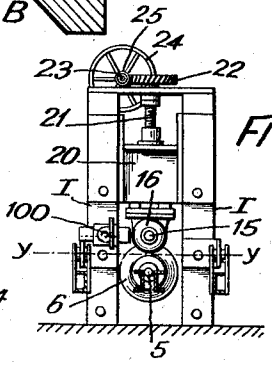
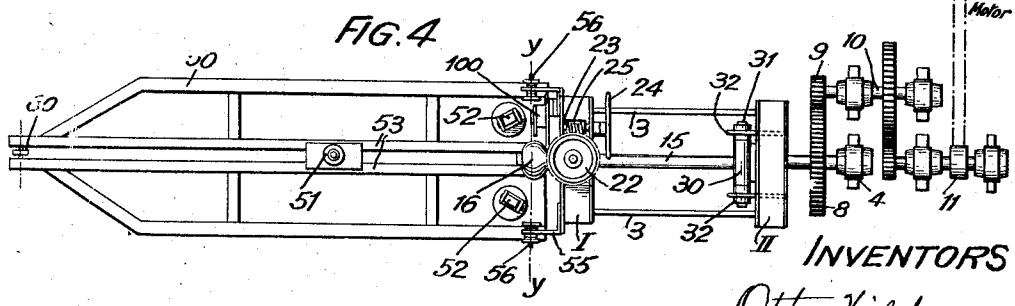


FIG. 5

FIG. 4



INVENTORS

Otto Wild

Louis Wild

By Kenny & Atty's

Atty

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MACHINE FOR FLANGING PLATE DISKS

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FIG. 11

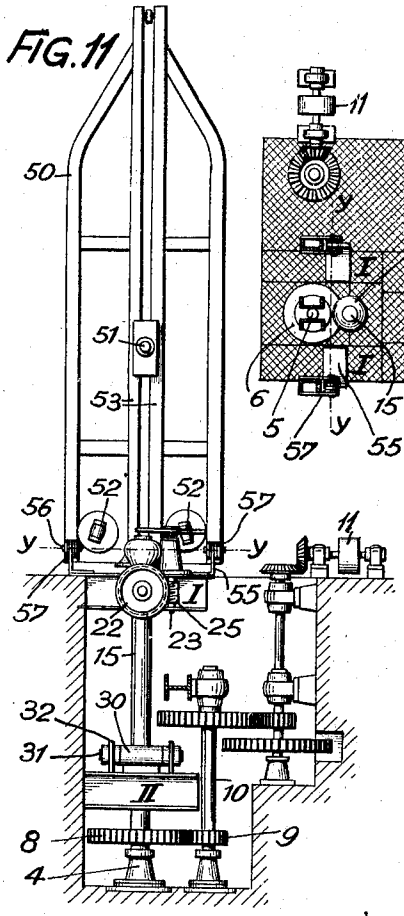


FIG. 13

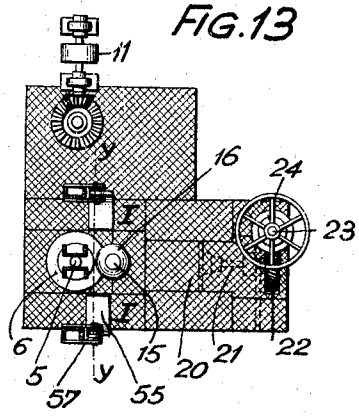


FIG. 12

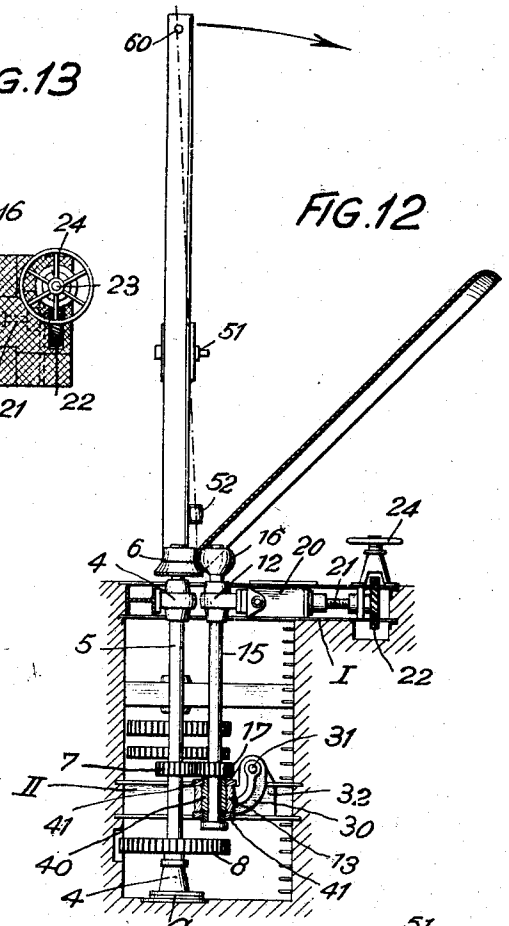


FIG. 9

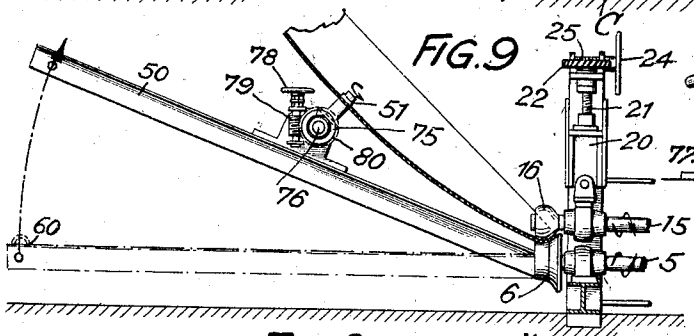


FIG. 10

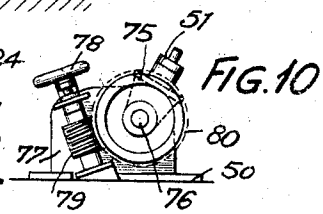
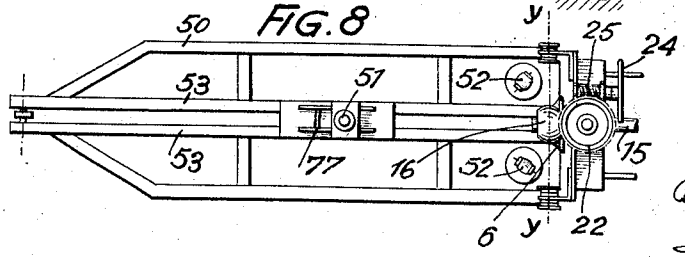


FIG. 8



INVENTOR:

Otto Wild

Louis Wild

By Kenny Orth Jr

Atty

Patented Nov. 25, 1930 1,782,641

UNITED STATES PATENT OFFICE

OTTO WILD AND LOUIS WILD, OF MURI, SWITZERLAND

MACHINE FOR FLANGING PLATE DISKS

Application filed July 30, 1928, Serial No. 296,173, and in Germany June 20, 1928.

In order to flange a disk of sheet metal it is old to clamp the disk centrally and to cause two adjustable rollers of appropriate profile to act on the periphery of the disk and to approach these rollers towards each other during the flanging process. Usually flanges are shaped in such manner that the outer wall of the flange forms a cylinder coaxial to the axis of the sheet metal disk. In the method heretofore applied the bending of the flange portion around or behind the roller working on the inside of the flange causes considerable difficulties. The working effect on the sheet metal during the flanging process begins within the rounded portion of the flange and ends in the wall of the latter. Naturally the circumferential velocity of the above mentioned roller is much larger on the extreme edge of the said roller than it is at the inner end of its rounded portion. Therefore, a slip between the sheet metal disk and individual parts of the roller is unavoidable. According to experience the said slip and the difference between the extreme and the innermost edges of the rounded portion of the said roller are to be kept within certain limits in order to avoid disturbances and scraps.

For many purposes flanged sheet metal disks having a relatively broad cylindrical portion are required, which for reasons cited above cannot be made by the known method. The forming of flanges having a broad cylindrical portion on sheet metal disks even causes difficulties when forging presses are used. Moreover forging presses, as is well known, require much more attention, are costly and take up more room than flange rolling machines and besides show the great drawback that for each diameter of sheet metal disks to be flanged special dies and punches are required.

It is further old to mount a sheet metal disk rotatable about its centre while otherwise it remains stationary and to work it by means of rollers which besides being adjustable towards each other, during the flanging operation can be displaced angularly towards the disk. This working method has the great disadvantage that the drive of the rollers cannot be arranged stationary and owing to the adjustability of the rollers is of a very complicated nature, especially if pieces of sheet metal of large thickness are to be treated.

The present invention is adapted to overcome these difficulties in that the position of the rollers during the flanging operation besides being adjustable remains unchanged and that the central rotatable supporting device for the sheet metal disk is angularly displaced. At the beginning the flanging mainly is carried out by adjusting the rollers towards each other and keeping the central, rotatable mounting of the sheet metal disk in the same position, and in the latter stage of rolling, mainly the central rotatable mounting is angularly displaced. At the beginning the outer part of the curved portion and the cylindrical wall of the flange is worked in the direction from inside to outside. Afterwards the inner part of the curved portion of the flange is acted upon from outside to inside, whereby the flange is given its final position relatively to the sheet metal disk.

Figs. 1–6 refer to a first constructional example of a flanging machine according to the present invention.

Referring to the drawings in which like parts are similarly designated:

Figures 1 and 2 illustrate the manner of presenting a disk to the flanging rollers;

Figure 3 illustrates a detail of the machine;

Figure 4 is a plan, Fig. 5, is a side elevation and Fig. 6 an end elevation of a machine embodying our invention;

Fig. 7 is a section of one of the rolls.

Figs. 8, 9, and 10 show mechanism for supporting a dished disk during flanging;

Fig. 11 is a front elevation;

Fig. 12, a side elevation and

Fig. 13 a plan of the machine arranged vertically.

The sheet metal disk is mounted according to Fig. 1. At the beginning of rolling the central rotatable connection is kept unchanged and primarily the extreme part of the rounded portion and the cylindrical wall of the flange are treated by approaching the

roller 16 toward roller 6. During the further rolling action the central rotatable connection of the sheet metal disk is moved upwards (as shown in Fig. 2) whereby as may be seen the inner part of the rounded portion is made and the depending flange is given its final position relatively to the sheet metal disk. The fundamental differences in reference to the usual method are evident. In the radial direction the outer part of the rounded portion as well as the cylindrical wall of the flange are formed in the outward direction and the inner part of the rounded portion in the inward direction. The roller 6 is divided into two parts A and B, one rotatable with respect to the other. Consequently much larger flanges can be rolled than with the usual method. In fact already on the first application of the method stiff sheet metal plates of Thomas Steel of a thickness of 12 m/m. and a diameter of from 1 to 4 meters were provided with a depending flange having a rounded portion of 120 m/m. radius and a cylindrical portion of a width of 80 m/m.

The machine shown in Figs. 3–6 has two standards I and II which are interconnected by strong bracings 3. In the foot of the standard I, the one bearing 4 of a shaft 5 is placed, the second bearing 4 of which is planted on a footing C. The flanging roller 6 is secured to one overhanging end of the shaft 5. Between the standards I and II the pinion 7 is mounted on the shaft 5 and between the standard II and the footing C the gear wheel 8. The latter meshes with a pinion 9 mounted on a transmission shaft 10 which is in operative connection with a second transmission shaft by means of gear wheels, which second transmission shaft carries a pulley 11 driven from a motor by means of a belt. Above the shaft 5 the shaft 15 is mounted in bearings 12 and 13. The shaft 15 carries on its overhanging end the flanging roller 16 and between the standards I and II the pinion 17 which is of the same diameter as the pinion 7 and meshes with the latter. The bearing 12 is connected to a sliding block 20 which is guided in the standard I and suspended from a spindle 21, for which the hub of a worm wheel 22 serves as a nut. The worm wheel 22 is rotatably mounted on the head piece of the standard I on which the shaft 23 with the worm 25 and the hand wheel 24 are further mounted.

The bearing 13 of the shaft 15 of the flanging roller is carried by an arm 30 which is connected to a shaft 31 mounted in supports 32 on the standard II. The shaft 31 is placed centrally above the gear wheel 17. When the bearing 12 is pulled upwards the pinions 7 and 17 remain in proper operative connection. For the purpose of displacing the flanging roller 16 relatively to the roller 6 also in axial direction a bush 40 is secured to the shaft 15, in which bush the shaft 15 is carried in the bearing 13 and the two ends of which that project beyond the bearing 13 are provided with screw thread. With these screw threads nuts 41 cooperate, which press from both sides on the bearing 13. If one of these nuts 41 is loosened and the other one tightened in the same direction the shaft 15 is shifted axially in either direction and the flanging roller 16 together with it.

In front of the standard I a table 50 built up of steel sections is placed which carries a supporting stud 51 rotatable about its center and two guide rollers 52. The supporting stud 51 is displaceable on two bars 53 of the frame 50 which extend in the direction of the axes of the flanging rollers 6, 16 and is adapted to be secured in any position thereon.

To the standard I two heavy angle irons 55 are secured, which carry on their free legs pins 56 from which the frame of the table 50 is suspended by means of tie plates 57. The axes of the two pins 56 lie in a line y—y and this line as shown in Figs. 4–6 passes through the gap between the two flanging rollers 6 and 16. By choosing an appropriate position for the fulcrum pins 56 about which the table tilts the central rotatable supporting stud upon tilting of the table is guided conformably to the shortening of the radius which takes place when forming flanges. On the other end of the frame of the table 50 a ring 60 is provided for attaching a tie member 70 thereto by means of which the table can be tilted upwards about the axis y—y provided by the pins 56. The table 50 has guide rollers 52 which participate in the displacement of the central rotatable supporting device of the sheet metal disk and guide the rim of the sheet metal disk in the working range of the rollers 6 and 16.

The rollers 6 and 16 are arranged so as to be easily exchangeable. If necessary rollers of different profiles may be used in the same machine.

A part of the roller 6 may preferably be constructed in the manner of a so called idler as shown in Fig. 7; the part A of the roller is keyed on to the shaft 5, the part B of the roller is journaled on the shaft by means of a bronze bush D to rotate freely thereon. Therefore that part of the flanging roller which works the outside of the depending flange acts within the range of the interior part of the rounded portion in the manner of a driven roller and within the range of the exterior part and of the wall of the rounded portion in the manner of an idler.

The manner of working of the machine is as follows:

The shaft 15 by means of the nuts 41 is adjusted so that the upper flanging roller 16 is separated from the lower flanging roller 6 by the thickness of the piece to be worked. The table 50 is brought into horizontal posi-

tion and the central rotatable supporting stud 51 is placed on the same in the position corresponding to the diameter of the piece to be worked. After the roller 16 has been raised by moving the sliding block 20 upwards the disk which has been previously cut to correspond to the size of the piece to be worked and which has been provided with a central hole is slid on the stud 51 of the central rotatable supporting stud. Now the guide rollers 52 are adjusted in height so that the edge of the sheet metal disk bears on the rearward extreme circumference of the flanging roller 6. After the machine is set in motion the upper flanging roller 16 is pressed on to the edge of the sheet metal disk by screwing down the sliding block 20 and is gradually moved downwards until a gap is left between the upper and the lower flanging roller of a width which is equal to the thickness of metal of the piece to be worked.

Then the exterior and the middle part of the depending flange to be formed is finished. Now the table 50 is slowly raised by means of a pulling member 70, for example, a chain of a tackle suspended from the ceiling of the working room so that the edge of the sheet metal disk also bears on the front side of the flanging profile of the flanging roller 16. This is continued until the interior portion of the sheet metal disk has assumed a certain angle in reference to the wall of the flange which is required for the sheet metal disk of the piece of work to be produced for instance a right angle.

Instead of a draw member a jack or any arrangement for turning the table about the turning axis may be used.

While in the above the forming of flanges around plain sheet metal disks has been described by way of example, Figs. 8–11 illustrate the forming of a flange around an embossed sheet metal disk, a so called dished boiler end head.

The construction and the manner of operation of the machine are the same as per Figs. 3–6 with the difference that the central rotatable supporting device 51 is secured to a support 75 which is adapted to be moved towards the flanging rollers 6 and 16 which support is keyed on to a pivotable pin 76 and is mounted on a slide 77. The central rotatable supporting stud 51 can be manually adjusted corresponding to the angle of tangent of the respective curvature of the disk by means of a hand wheel 78, a worm 79 and a worm wheel 80. The slide 77 is adapted to be displaced on two bars 53 of the frame 50 extending towards the flanging rollers 6, 16 and to be fixed thereon in any desired position.

While in the above the forming of flanges on sheet metal disks by means of flanging rollers with horizontal axles was described, the Figs. 11, 12 and 13 illustrate a machine for forming flanges by means of rollers having vertical axles.

As far as the drilling of the sheet metal disk in its center portion for applying the central rotatable supporting device is concerned the respective perforations have to be plugged afterwards which preferably is done by welding. It will be clear that the forming of flanges on sheet metal disks of soft material or in red hot state naturally is attained more readily and in a shorter time than if as in the previously described examples the disks consist of stiff material in cold state.

The same mounting of the sheet metal disk in the machine adapted for forming flanges also enables the edge of the disk to be trimmed so that an edge suitable for welding or caulking can be milled thereon, machining it with at least one tool. The tool or tools respectively are fixed in one or more supports (as at 100 in Fig. 4) which are mounted either on the frame of the flanging rollers or on the table of the central rotatable connection or on both.

We claim:

1. In a machine for flanging plate disks, in combination, two flanging rollers adapted to be adjusted in their distance from each other, one of said rollers having the shape of a bulb and a profile corresponding to the inside of the curved portion and of the cylindrical wall of the flange, the opposite roller having the profile of the outside of the cylindrical wall and of one half of the outside of the curved portion of the depending flange, the second mentioned roller consisting of a part which acts in the manner of a driving roller and another part which acts in the manner of an idler, supporting means for rotatably holding the center portion of the plate disk, and means for angularly displacing said supporting means along an arc having its center between said rollers.

2. In a machine for flanging plate disks, in combination, two flanging rollers adapted to be adjusted in their distance from each other, supporting means for rotatably holding the center portion of the plate disk, a table on which said supporting means are displaceably mounted, means to cause an angular displacement of said table about an axis passing between said rollers and at right angles to the axes of the latter, and fulcrum pins defining the axis about which the table is angularly displaced, said pins being arranged eccentric to the axis about which the flange is curved to take into account the shortening of the radius of the disk during the flanging operation.

3. In a machine for flanging plate disks, in combination, two flanging rollers adapted to be adjusted in their distance from each other, a frame in which said rollers are mounted,

supporting means for rotatably holding the center portion of the plate disk, a table on which said supporting means are displaceably mounted, said table being journalled on said frame about an axle located between said rollers at right angles to the axes of the latter, and including fulcrum pins defining the axis about which the table is angularly displaced and arranged eccentric to the axis about which the flange is curved to take into account the shortening of the radius of the disk during flanging.

4. In a machine for flanging plate disks, in combination, two flanging rollers adapted to be adjusted in their distance from each other, a frame in which said rollers are mounted, supporting means for rotatably holding the center portion of the plate disk, a table on which said supporting means are displaceably mounted, said table being journalled on said frame about an axle located between said rollers at right angles to the axes of the latter. and means to adjust said journals between table and frame to take into account different shortenings of the radius when utilizing rollers of a different profile.

In testimony whereof we have signed our names to this specification.

OTTO WILD.
LOUIS WILD.