W. H. MORGAN.

METHOD OF AND MACHINE FOR FLANGING PLATES.

APPLICATION FILED OCT. 9, 1909.

974,173.

Patented Nov. 1, 1910.

4 SHEETS—SHEET 1.

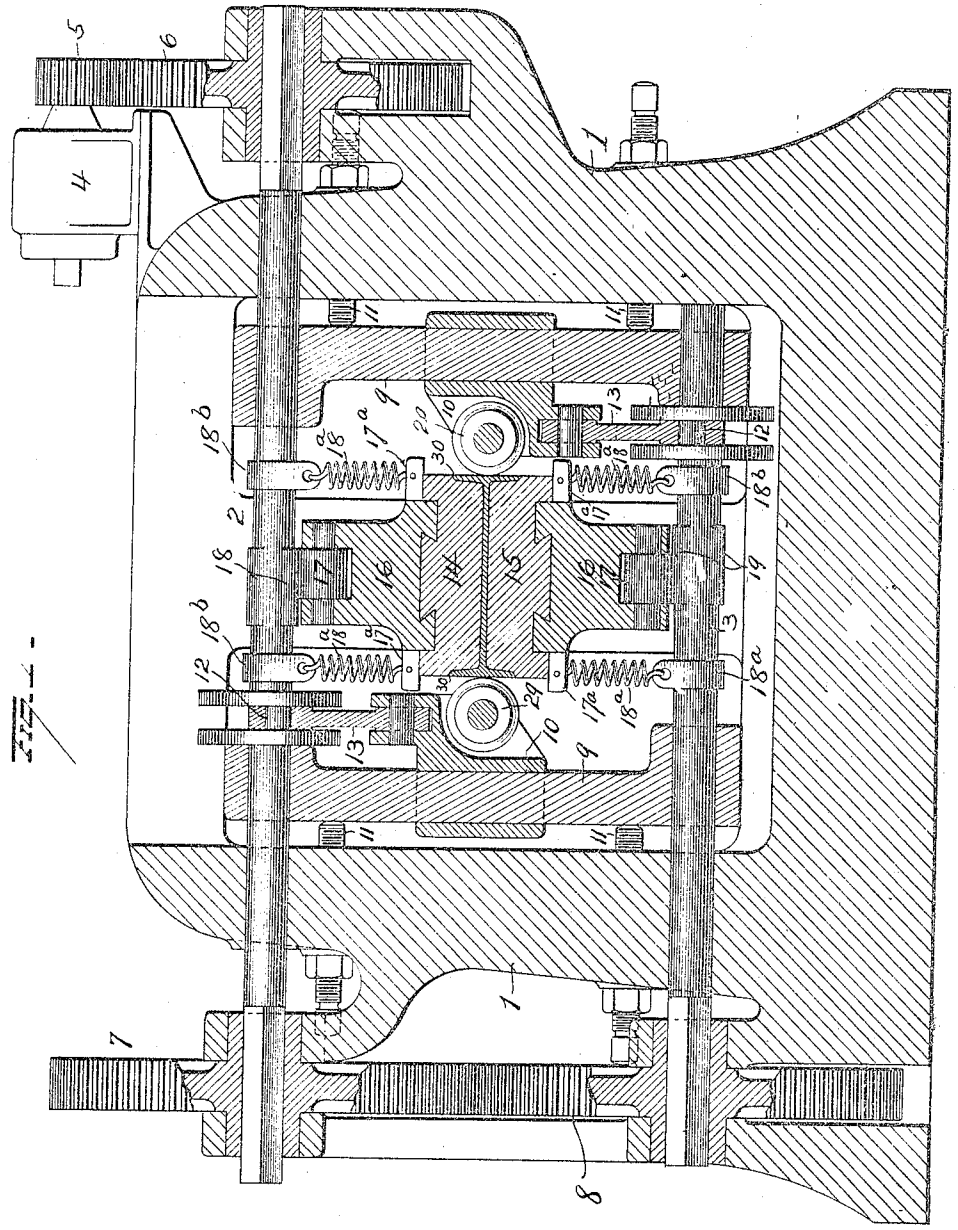

Fig. 1.

WITNESSES

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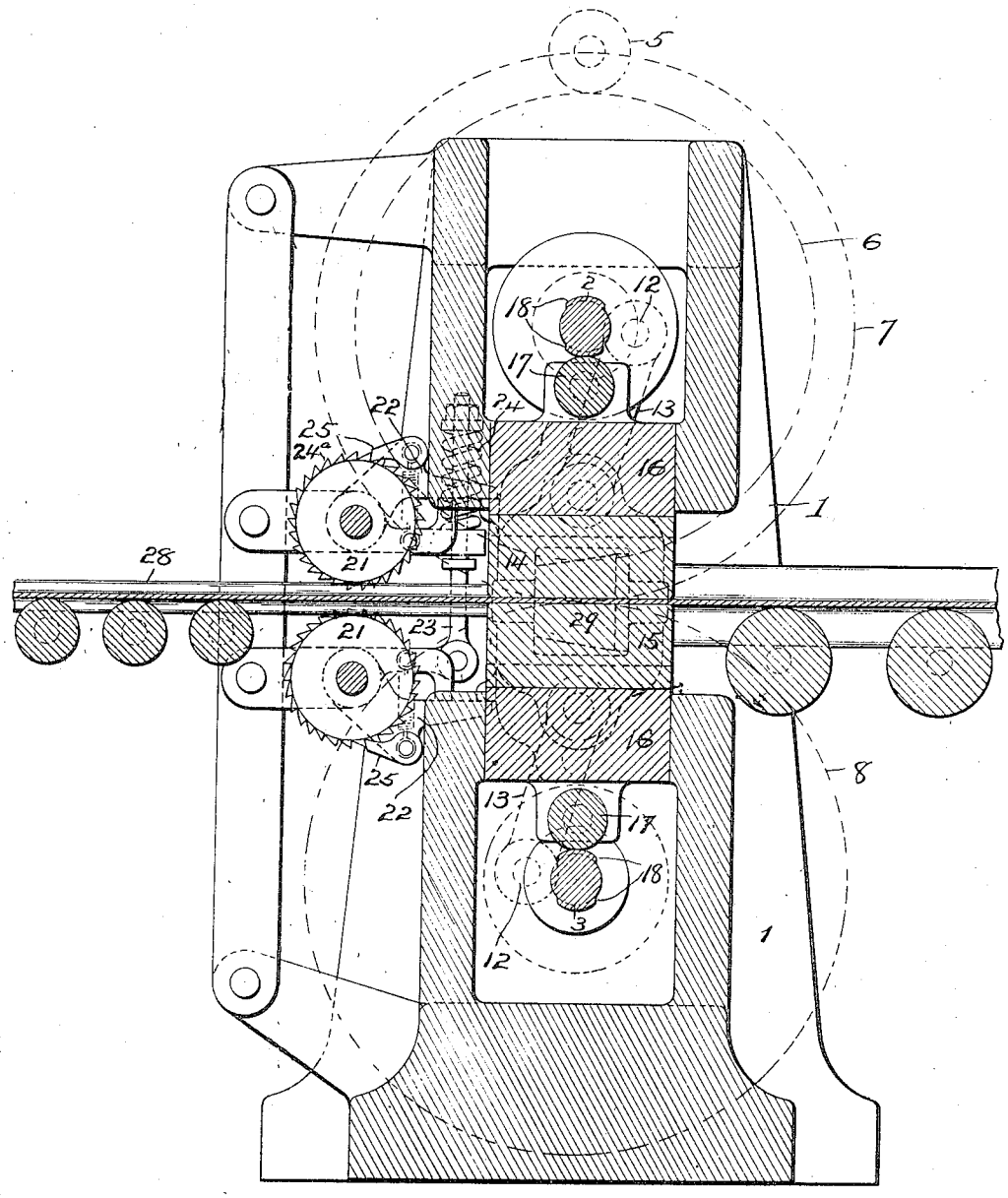
4 SHEETS—SHEET 2.

Fig. 2.



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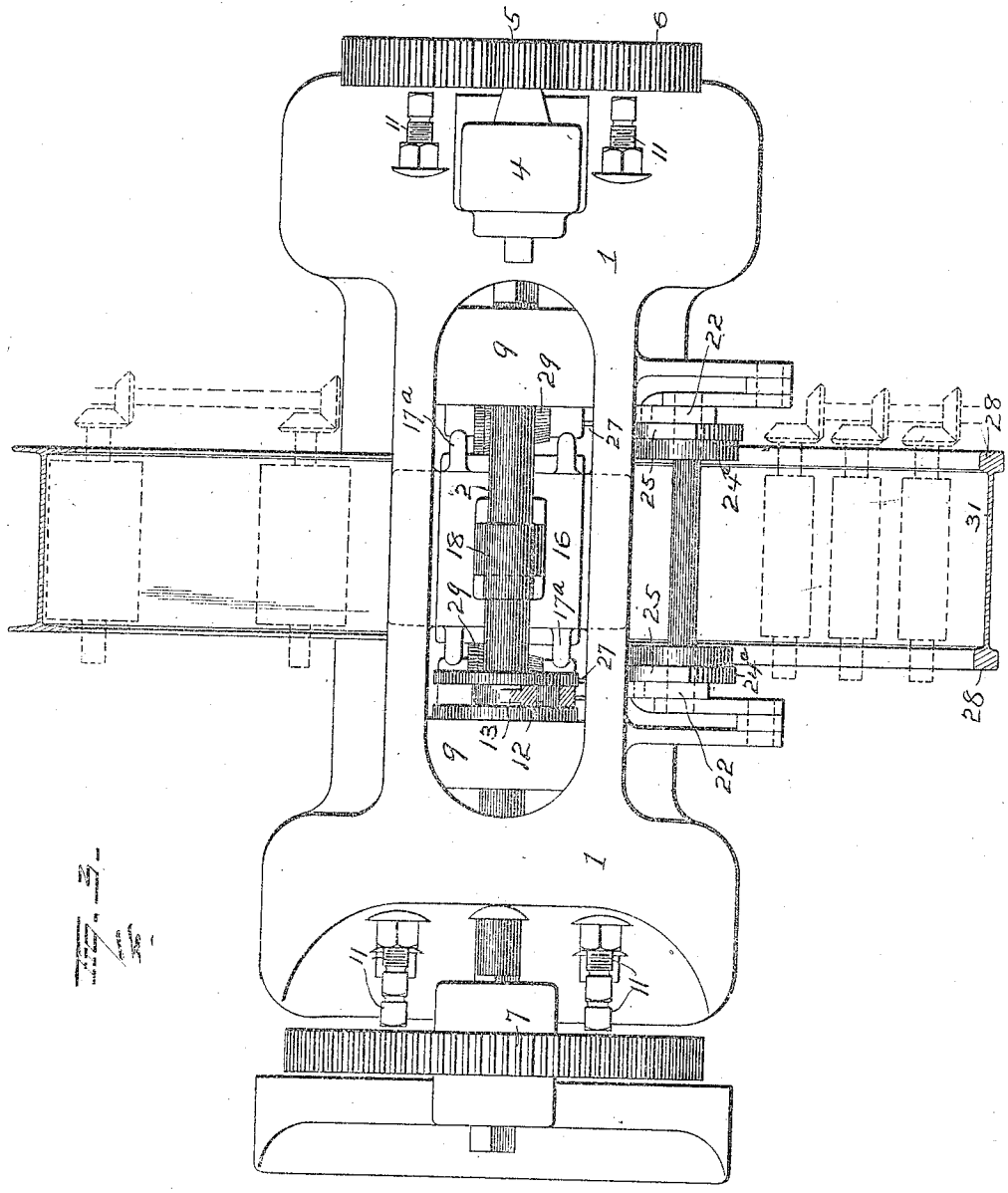

Fig. 3.

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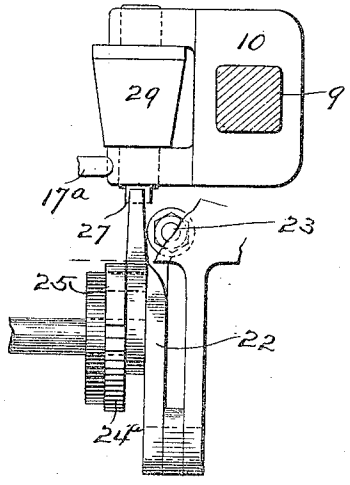
4 SHEETS—SHEET 4.

FIG. 4.



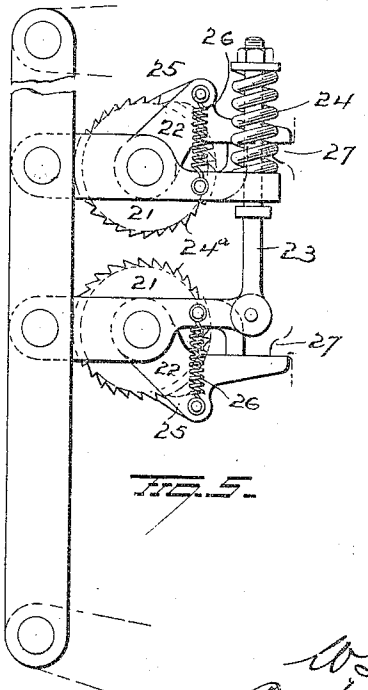


FIG. 5.

WITNESSES

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UNITED STATES PATENT OFFICE.

WILLIAM H. MORGAN, OF ALLIANCE, OHIO.

METHOD OF AND MACHINE FOR FLANGING PLATES.

974,173. Specification of Letters Patent. Patented Nov. 1, 1910.

Application filed October 9, 1909. Serial No. 521,909.

To all whom it may concern:

Be it known that I, WILLIAM H. MORGAN, of Alliance, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Methods of and Machines for Flanging Plates; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in the method of and apparatus for flanging beams or plates.

With the ordinary grooved rolls, such as are now commonly used for rolling flanged beams, the depth and width of the flanges, rolled thereby, are, owing to the differences in speed of portions between the axis and periphery of the rolls, positively limited and fixed. Universal mills for producing larger beams with larger flanges, have been constructed, but owing to their many parts, and the cost of, and power required for operating them, their use is confined exclusively to the larger plants.

The object of my invention is to provide a comparatively simple apparatus adapted to be used in connection with an ordinary plate mill, for flanging plates of any width, and for forming flanges of any reasonable width and thickness on said plates, and my invention consists in a clamp for holding a rolled plate leaving the edge thereof exposed, and flanging or swaging devices mounted to move crosswise the edges of the plate.

My invention further consists in means for holding the plate to be flanged and conical swaging devices mounted to move crosswise the edges of the plate and in contact with the latter.

My invention further consists in means for clamping a plate, means for feeding the latter in a step by step movement, and a swaging device mounted in a cross head and adapted to travel transversely to the direction of movement of the plate.

My invention further consists in dies for holding the plate to be flanged and a swaging device mounted to travel in a direction at right angles to the direction of feeding movement of the plate and in contact with the edge thereof, whereby the projecting ends of the plate will be forced or swaged into the recesses in the die thus producing flanges.

In the accompanying drawings, Figure 1 is a view in vertical section through the apparatus. Fig. 2 is a view in transverse vertical section. Fig. 3 is a view in plan. Fig. 4 is a view in plan of the details of the feeding mechanism, and Fig. 5 is a view in elevation of the latter.

1 represents a housing shaped as shown in Figs. 1 and 2 and carrying the shafts 2 and 3, the former of which extends through the housing from end to end, while the latter extends part way only. The upper shaft is driven by motor 4 and gears 5 and 6 the latter of which is mounted on the squared end of shaft 2 so as to permit the latter to be adjusted or moved lengthwise as will be hereinafter explained. The opposite end of shaft 2 is also squared and carries toothed wheel 7 meshing with pinion 8 on the square end of shaft 3.

Located within the open center of the housing 1, are the adjustable column guides 9 through which the shafts 2 and 3 pass and on which the cross heads 10 are mounted to reciprocate vertically. As shown, in Fig. 1, these column guides are in their extreme outer positions for the largest size plate that can be flanged in the machine, and they are designed to be adjusted toward each other, for smaller size plate by the screws 11 passing through the housing and connected at their inner ends to the column guides. The upper shaft 2 is provided with a crank 12 carrying a pitman 13 connected at its lower end to one cross head 10, and the lower shaft 3 is provided with a similar crank 12 carrying a pitman 13 connected at its upper end to the other cross head. The cranks are so arranged that both cross heads move up and down simultaneously.

14 represents the upper die and 15 the lower die, shaped to receive the plate to be flanged, and provided with recessed seats into which the metal at the side edges of the plate is forced by the swaging devices to be hereinafter referred to. These dies are secured to the blocks 16, each of which has a roller 17, one of which latter bears against the double throw cam 18 on the upper shaft 2, while the lower one rests on the cam 19 on the lower shaft 3, the cams operating to

force the dies against the plate and clamp the latter while the swaging devices are moving over the edges of the plate to form the flange. Each cam is in effect a double cam, in that it forces its block and die carried thereby, against the plate being flanged, twice at each revolution of the shafts. Each complete revolution of the shafts 2 and 3 move the cross heads carrying the flanging or swaging devices up and down, and as there is a feeding forward of the plate just prior to each up and down movement of the cross heads, it will be seen that the plate must be freed at the end of each movement, and clamped during each movement of the cross heads carrying the flanging or swaging devices.

The cams 18 are of greater length than the rollers 17 so as to provide for adjustment of the parts for plates of different widths. To adjust the parts from that shown in Fig. 1, for smaller dies to flange a smaller plate, the two column guides 9 would be moved in by their screws 11, thus moving the upper shaft 2 longitudinally to the right and the lower shaft 3 longitudinally to the left, the square ends of the shafts and the lengths of the cams permitting of the necessary movements.

The plate being flanged, is as shown in Fig. 2 supported on opposite sides of the flanging apparatus by roller tables, and to withdraw the dies from the plates in order to free the latter from the feeding movement, I have provided the upper block 16 with laterally projecting fingers 17^a to which the springs 18^a are secured, these springs being suspended from stirrups 18^b mounted on the shaft 2. These springs are designed to lift the upper die and its block and cause the roller on the latter to stay in contact with the double cam. The lower block 16 is provided with similar fingers 17^a and springs 18^a for preventing the lower die from sticking to the plate.

Ordinarily the weight of the lower die and its block will be sufficient to carry the lower die away from the plate being flanged after the descent of the cross heads and when forced by cam 19, hence the springs for the lower block are provided simply to release the lower die in the event the latter should stick to the plate. It will therefore be seen that the plate is freed from the dies both on the ascent and the descent of the cross heads, and the longitudinal feed of the plate takes place each time the latter is freed from the dies.

The plate rests on roller tables on opposite sides of the housing 1 and on the entrance side it passes between the feed rolls 21 which latter are adapted to bear against the opposite sides of the thickened edges of the plate to be flanged. These feed rolls 21 are mounted on the pivoted levers 22 which latter are connected at their free ends by a bolt 23, the spring 24 bearing against the head of said bolt and one of said levers, operating to yieldingly hold the feed wheels in contact with the plate. Each feed wheel is provided with a ratchet 24^a engaged by a pawl 25, the latter being yieldingly held in contact with its ratchet by a spring 26. Each lever 22 projects inwardly toward the cross heads 10, and the inner end of each lever rests in the path of a finger 27 on the cross head, so that as the cross head ascends, its fingers striking the pawl carrying lever of the upper feed rolls, turns the latter in a direction to feed the plate toward the dies, and upon the descent of the cross head their lower fingers coming in contact with the levers carrying the pawls of the lower feed wheels turn the latter in a direction to feed the plate toward the dies. It will therefore be seen that this feeding movement of the plate is progressive or step by step as the plate is released from the dies, so as to bring the projecting edges 28 of the plate into the path of movement of the laterally movable flanging or swaging tools 29. The dies are necessarily as wide as the plate to be flanged, but they need be no longer than the flanging or swaging tools 29, and as shown are located between roller tables on which the projecting ends of the plate rests while being flanged. The two dies are recessed at their ends as shown at 30 into which recesses the surplus metal at the edges of the plate is forced as shown in Fig. 1 to form the flanges. The swaging tools 29 are conical in shape throughout the major portion of the lengths and are cylindrical the remaining portions, and are mounted in the vertically sliding cross heads 10. These tools are arranged horizontally and the plate is fed toward the apices or smaller ends of the cones, the construction being such that the feeding action of the plate occurs after the tools have passed over the edges thus leaving the plate free to be fed forwardly.

In the operation of the apparatus a bloom or ingot is rolled in an ordinary plate mill into the form in cross section of the plate shown at 31 in Fig. 3, sufficient metal being left in the edges 28 thereof to form the flanges which may be of any width. After the first rolling in the plate mill, the plate may be again heated if necessary, and if desired, a furnace may be located adjacent to the dies, and through which the plate will pass on its way to the dies. After the plate has been properly placed between the dies, the roller tables and feed are started thus moving the plate step by step, but rapidly toward the swaging tools 29. As the end of the plate makes contact with the tools 29, the conical ends of the latter, gradually reduce the stub edges 28 of the plates, until the

latter have been expanded and spread out into the recesses 30 in the sides, by the reciprocation of the tools, the cylindrical section of the tools simply finishing the bases of the flanges.

The feeding movement of the plate takes place after each half stroke of the cross heads carrying the tools, so that at each half stroke of the cross heads, the plate will be fed a short distance forwardly thus bringing the entire edges 28 of the plate, by a step by step movement, into the path of movement of the tools 29. The two tools 29 are located to operate on the two edges of the plate simultaneously, hence each tool operates as a brace or stay for the other thus taking to a great extent the lateral strain from the dies. The lateral movements of the tools with relation to the plate need be only sufficient to clear the outer flanges of the plate, and as the tools are not driven, but on the contrary are loose and are simply rotated by their contact with the plate, it will be seen that the lateral movement of the tools over the edge of the plate simply swages or expands the metal down into the flange shapes 30 in the dies 14 and 15. By means of the conical tools reciprocating in a path at right angles to the direction of feed of the plate, I can flange a plate of any length and width, and produce flanges of any width.

In the drawings I have shown dies and tools for making I-beams, but it is clearly evident that a channel beam can be formed by providing means for moving the tools out of contact with the flange of the plate during the return movement of the tools, or I can make a Z-beam by moving one tool out of contact during the down stroke and the other out of contact during the up stroke, hence in flanging shapes in which the flanges are to one side of the web or body, the plate will have feeding movement imparted once at each revolution, instead of once at each stroke of the flanging tool.

It is evident that many slight changes might be resorted to in the relative arrangement of parts shown and described without departing from the spirit and scope of my invention hence I would have it understood that I do not wish to confine myself to the exact construction and arrangement of parts shown and described, but,

Having fully described my invention what I claim as new and desire to secure by Letters-Patent, is:—

1. The method of flanging an elongated article consisting in simultaneously subjecting the opposite edges of approximately the same transverse portion of the article to the action of flanging devices moving at right angles to the length of the article.

2. The method of flanging an elongated article consisting in clamping the article between dies with the two sides of the article projecting beyond the dies, and subjecting the opposite projecting edges of approximately the same transverse portion of the article to the action of flanging devices moving at right angles to the length of the article.

3. The method of flanging an elongated article, which consists in subjecting the opposite edges of approximately the same transverse portion of the article to a step by step flanging pressure sufficient to laterally expand said edges.

4. The method of flanging elongated articles having a web and enlarged edges, which consists in simultaneously subjecting both enlarged edges to a step by step flanging pressure, the said flanging pressure being applied simultaneously to approximately the same transverse portion of the article.

5. The method of flanging elongated articles, consisting in alternately feeding the article longitudinally and then clamping it against movement, and simultaneously subjecting both edges thereof adjacent to the clamped section, to the action of flanging tools moving laterally with respect to the article.

6. The method of flanging a work piece comprising a thin elongated longitudinally extending portion, which consists in simultaneously subjecting the opposite side portions of the same transverse portion of the work piece to a step by step flanging pressure, which forces the metal laterally with respect to the thin portion and in such manner that a broad flange will be expanded at each edge of said thin portion.

7. The method of flanging elongated articles, consisting in moving the article in a step by step movement, and simultaneously subjecting both edges of approximately the same transverse portion of the article to a step by step flanging pressure sufficient to laterally expand both edges of the article.

8. The combination with dies adapted to clamp an elongated article between them, of two expanding or swaging devices mounted in laterally movable frames, and adapted to operate simultaneously on the opposite side edges of approximately the same transverse portion of the article.

9. In an apparatus for flanging elongated articles, the combination with dies, of two conical flanging tools located with their axes parallel with the length of the article clamped between the dies and adapted to be moved laterally across the projecting edges of said article, whereby the projecting edges of approximately the same transverse portion of the article are expanded laterally into flanges.

10. In an apparatus for flanging elongated articles, the combination with clamping dies for holding the article to be flanged, of

two conical flanging tools located on opposite sides of the dies and adapted to be reciprocated bodily over the projecting edges of the article, the said tools being located with their axes parallel with the length of said article, and simultaneously operating upon substantially the same transverse portion of same.

11. In an apparatus for flanging elongated articles the combination with two swaging tools adapted to operate simultaneously upon the opposite edges of substantially the same transverse portion of the article, of means intermediate the flanging tools for holding and supporting the article intermediate its two edges.

12. In an apparatus for flanging elongated articles, the combination with two swaging tools adapted to operate simultaneously upon the opposite edges of substantially the same transverse portion of the article, of clamping dies for said article, the said dies being narrower than the article so as to permit the two edges of the latter to project beyond the dies so as to be engaged by the swaging tools.

13. In an apparatus for flanging elongated articles, the combination with two swaging tools adapted to operate simultaneously upon the opposite edges of substantially the same transverse portion of the article, of clamping dies located intermediate the two swaging tools for supporting the transverse portion of the article being operated upon by said tools, and means for opening and closing the dies.

14. In an apparatus for swaging elongated articles, the combination with two swaging tools adapted to operate simultaneously upon the opposite edges of substantially the same transverse portion of the article, of clamping dies located intermediate the two swaging tools for supporting the transverse portion of the article being operated upon by said tools, means for opening and closing the dies, and means for feeding the article between the dies and swaging tools in a step by step movement.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses.

WILLIAM H. MORGAN.

Witnesses:
WILBUR ZIMMERMAN,
A. W. BRIGHT.