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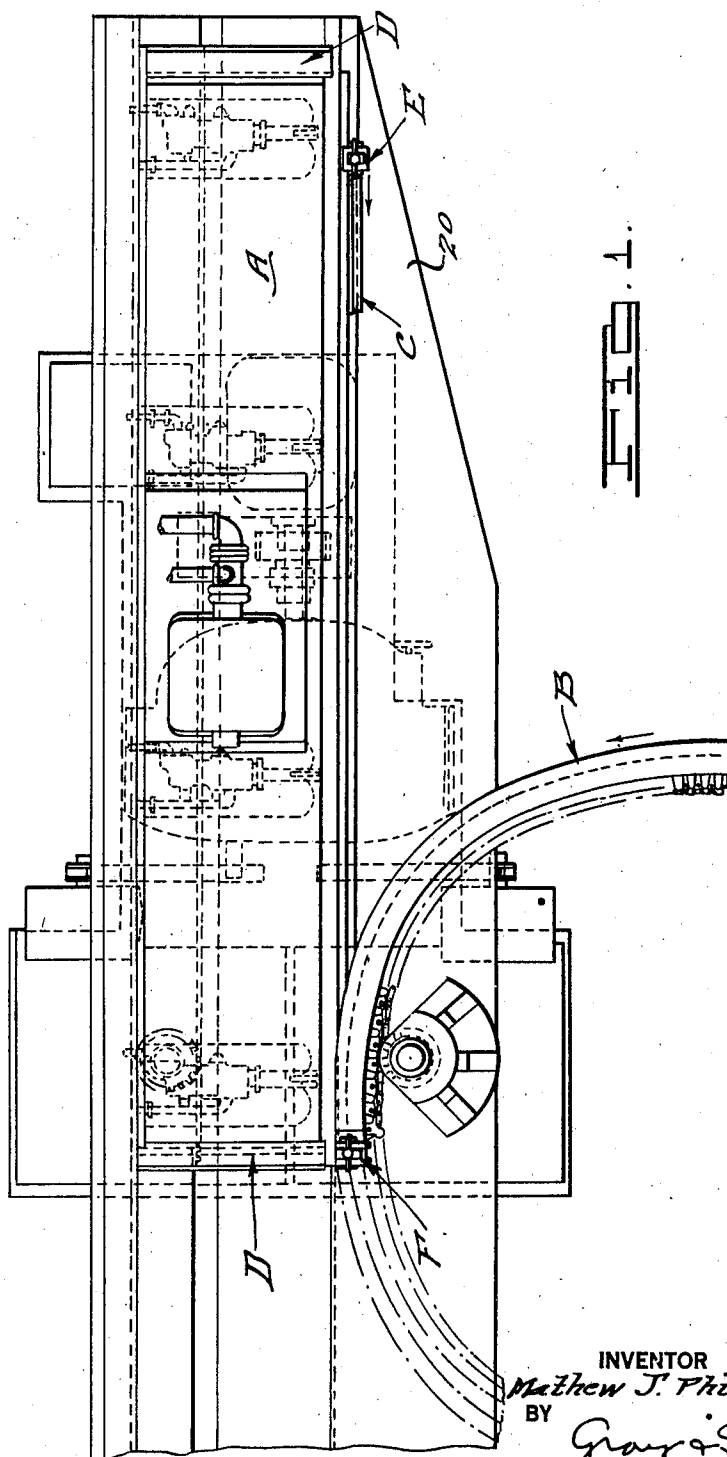
M. J. PHILIPPSEN

2,338,256

DEVICE FOR CLAMPING METAL BARS OR STRIPS

Filed Nov. 9, 1942

3 Sheets-Sheet 1



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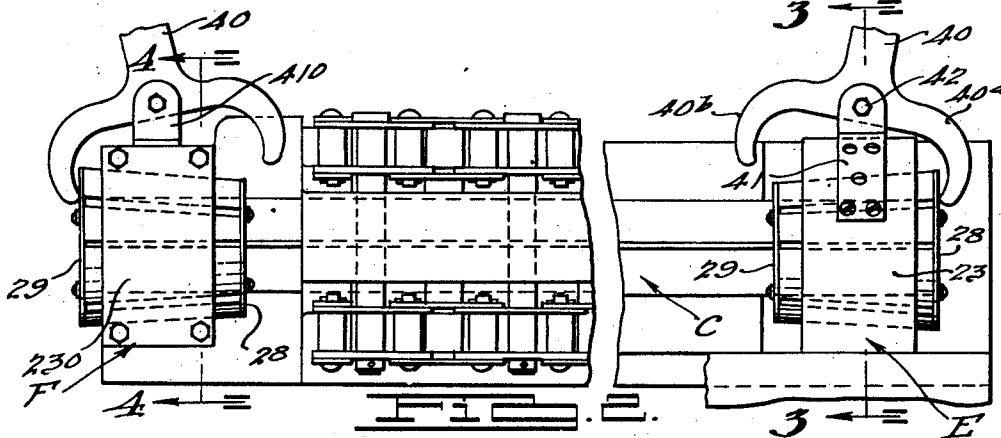
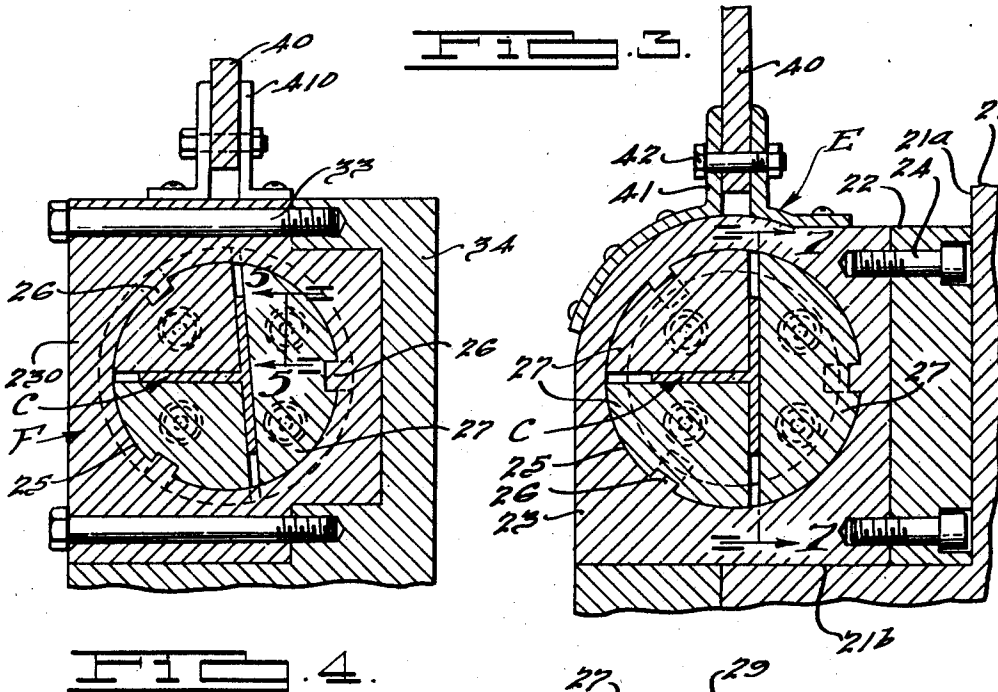
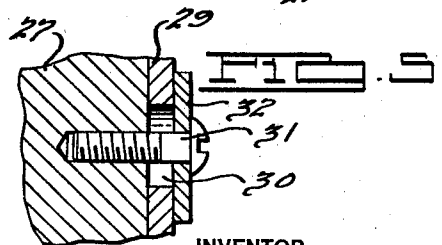
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DEVICE FOR CLAMPING METAL BARS OR STRIPS

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3 Sheets-Sheet 2



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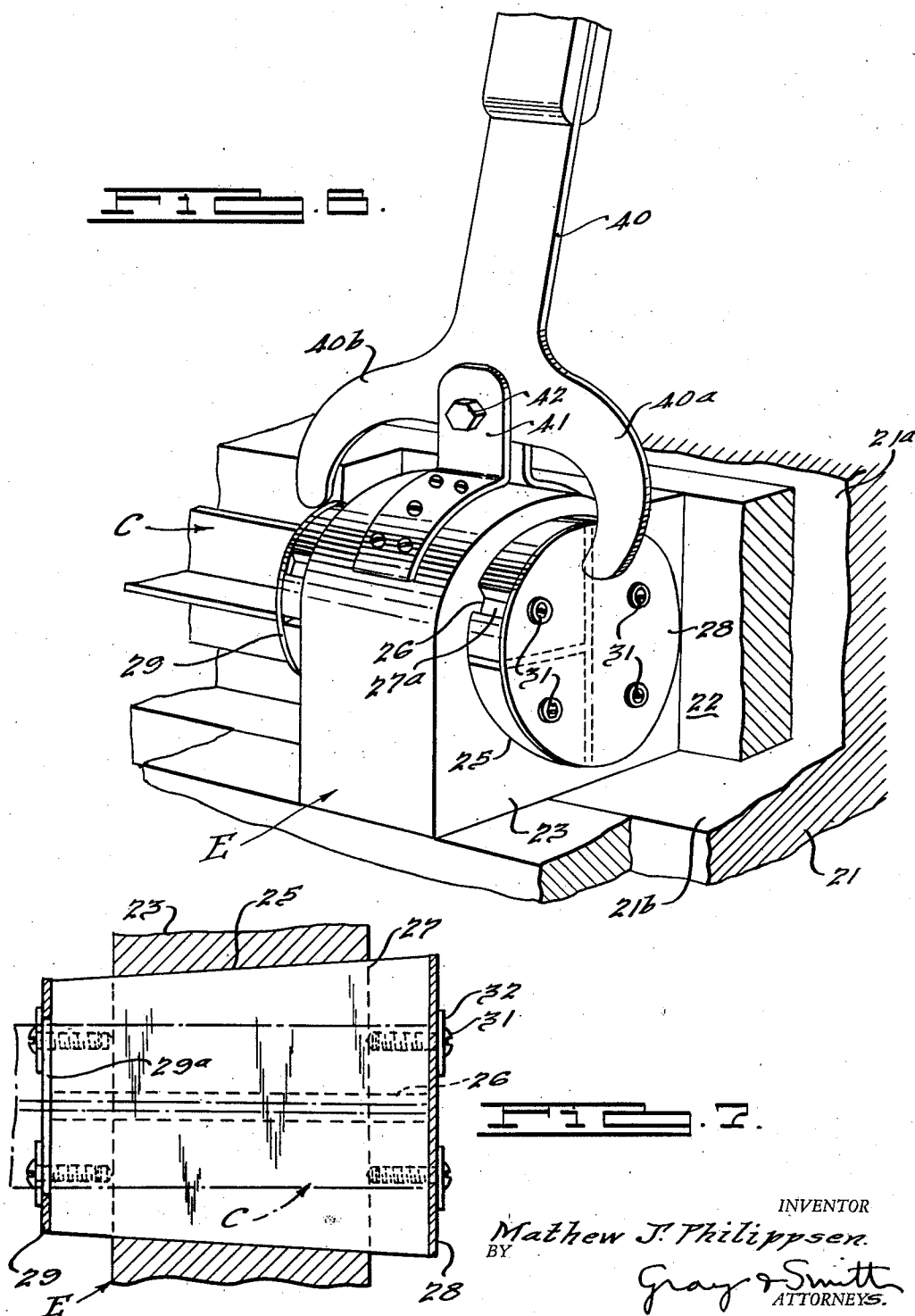
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DEVICE FOR CLAMPING METAL BARS OR STRIPS

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3 Sheets-Sheet 3



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DEVICE FOR CLAMPING METAL BARS OR STRIPS

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15 Claims. (Cl. 24—263)

This invention relates to devices for clamping metal bars or strips and particularly to devices adapted to be employed in machines for bending, shaping or otherwise forming lengths or strips of metal of various cross-sectional shapes or configurations, such as angles, channels, T-sections, Z-sections, and the like.

The invention is susceptible of application to various types of machines. For example, a machine to which the invention is applicable may comprise a curved forming member shiftable endwise in a curvilinear path in the plane of one flange of the metal strip, such as a T-section as herein shown. The leading end of the strip is attached to the leading end of the forming member and the trailing end of the strip is attached to a fixed portion of the machine. Thus, as the forming member is fed endwise in a predetermined path the metal strip is bent in conformance to the shape of the forming member by being wrapped thereon.

An object of the present invention is to provide improved means for clamping one end of the metal strip to the forming slide or other shiftable portion of the machine and also for clamping the opposite end of the strip to a fixed portion of the machine.

A further object of the invention is to provide an improved device adaptable for clamping either end of the metal strip to either the forming slide or a fixed part of the machine, which device may be readily manipulated to permit installation of the metal strip and also to clamp the same in position or release the same.

Another object of the invention is to provide improved means in the form of a readily operable wedge device for frictionally clamping the end of a metal bar of structural shape, such as an angle or T-section, and capable of rigidly holding or gripping the member during bending, forming or stretching thereof.

A further object of the invention is to provide a clamping device for frictionally clamping or gripping a metal strip of angular cross section comprising clamping segments shiftable within a frusto-conical or tapered recess in a supporting block or holder for the segments, the construction being such that the metal strip may be readily inserted into slots or spaces between adjacent angular faces of the segments whereupon the segments may be shifted to clamp the strip in position.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying draw-

ings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a top plan view of a bending machine embodying the present invention.

Fig. 2 is a fragmentary side elevation illustrating the clamping devices for clamping opposite ends of a metal bar to be bent in the machine.

Fig. 3 is an enlarged fragmentary section taken substantially through lines 3—3 of Fig. 2 looking in the direction of the arrows.

Fig. 4 is an enlarged fragmentary section taken substantially through lines 4—4 of Fig. 2 looking in the direction of the arrows.

Fig. 5 is an enlarged fragmentary section taken substantially through lines 5—5 of Fig. 4 looking in the direction of the arrows.

Fig. 6 is a fragmentary perspective view of the clamping device mounted at the trailing end of the metal bar or strip to be bent in the machine.

Fig. 7 is an enlarged fragmentary section taken substantially through lines 7—7 of Fig. 3 looking in the direction of the arrows.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In the drawings there is illustrated one embodiment of the invention as applied to a machine for bending and at the same time stretching a metal strip or bar of T-section. This machine comprises a main slide A shiftable in a rectilinear path and a main slide B of predetermined curved configuration movable simultaneously with the slide A in a curvilinear path. Thus, the two slides A and B move in predetermined angularly related paths for the purpose of bending a metal strip C of any desired cross-sectional shape, the strip in the present instance being shown as a T-section. This metal strip C is bent into a curved shape and this bending takes place in the plane of the central web of the strip.

The slide A, which may be termed the workpiece carrying slide, is adapted to clamp by means of a clamping device E the tail end of the workpiece C and the forming slide B is adapted to clamp by means of a clamping device F the forward or leading end of the metal strip. The workpiece carrying slide A is of duplex construc-

tion so that it may be initially shifted transversely in ways D to clamp the workpiece against the forming slide B at the tangential point of engagement of the two slides. After the workpiece has been clamped at this point between the two slides A and B, the two slides are shifted simultaneously in the direction of the arrows shown in Fig. 1, the slide A being shifted in a rectilinear path tangential to the curved path of travel which is imparted by suitable mechanism to the forming slide B. As a consequence, as the two slides move forwardly together, one tangentially with respect to the other, the metal strip C is, in effect, wrapped upon the curved forming slide B. A differential speed of travel is imparted to the two slides, the slide B moving at a slightly greater linear speed than the slide A. Due to the differential speed between the two slides the metal strip C will be stretched progressively.

Briefly, the machine comprises a suitable table or bed 20 supported above the floor. The slide A comprises a slide member 21 having vertical and horizontal walls 21a and 21b, respectively, see Figs. 3 and 6. Mounted within the angle of the slide 21 is a pressure plate 22, this plate being suitably bolted to the vertical face 21a of the slide. The clamping device E for the trailing end of the metal strip C comprises a block 23 which is set into a notched portion of the pressure plate 22, the purpose of this construction being so that the vertical web of the strip C will bear against the vertical face of the pressure plate during the forming operation. The block 23 is attached to the notched end of the pressure plate 22 by means of screws 24, see Fig. 3. This block is provided with a generally frusto-conical or tapered bore 25 which is formed with integral inwardly projecting ribs or keys 26, three being shown in the present instance. The ribs or keys 26 extend the full length of the bore or hole 25 in an inclined direction corresponding to the taper of the bore. Within the tapered bore 25 are shiftable mounted a plurality of clamping segments 27. In the present instance for the purpose of clamping a metal strip of T-section there are provided three segments 27 as clearly illustrated in Fig. 3. Each of these clamping segments is tapered exteriorly to fit smoothly within a portion of the tapered bore 25, and each segment is provided with a longitudinal slot or key-way 27a to receive one of the keys or ribs 26.

From the foregoing it will be seen that the clamping segments 27 are shiftable longitudinally within the frusto-conical bore 25 and are guided in this movement by means of the cooperating key and keyway construction 26 and 27a. Mounted against opposite end faces of the segments 27 are two thrust disks or plates 28 and 29. The thrust disk 29 is provided with a T-shaped slot 29a to permit insertion therethrough of the metal strip C, this slot, therefore, conforming substantially to the shape and configuration of the strip C. The rear thrust disk 28 in the present instance is made solid, as shown in Figs. 6 and 7, so as to provide a stop or abutment for the end of the metal strip C when inserted through the slots formed between the adjacent faces of the segments 27. Each thrust disk 28 and 29 is provided with enlarged holes 30, four being shown in the present instance. The disks are attached to the ends of the segments 27, as shown in Fig. 5, by means of screws 31 extending through the holes or apertures 30, enlarged

washers 32 being interposed between the heads of the screws and the metal of the disks 28 and 29 surrounding the holes 30. The apertures 30 are considerably larger than the diameter of the screws 31 and the washers 32 are larger in diameter than the apertures 30. From this construction it will be seen that the segments 27 may shift or move outwardly with respect to the end plates 28 and 29, the size of the apertures 30 and the washers 32 permitting outward and inward movement of the screws within the apertures.

The segments 27 may be shifted within the bore 25 by means of a manually operable fork lever 40 pivoted at 42 to a bracket 41 secured as by means of screws to the upper face of the clamping block 23. The lever 40 comprises bifurcated ends 40a and 40b, the part 40a extending into position to engage the thrust disk 23 and the part 40b extending into position to engage the thrust disk 29 when the lever is shifted in one direction or the other. From this construction it will be seen that by swinging the lever 40 to engage the forked end 40b with the thrust disk 29 the segments 27 will be shifted rearwardly, or to the right in Fig. 6, thereby releasing the segments from wedging engagement with the bore of the clamping block 23. Conversely, by swinging the lever 40 to engage the forked end 40a with the thrust disk 23 the segments will be shifted forwardly, or to the left in Fig. 6, thereby causing the segments to be wedged tightly within the tapered bore or hole 25 of the block 23.

The clamping device F for clamping the leading end of the metal strip C is substantially the same in construction as the clamping device E for the tail end of the strip, above described. This clamping device F for the leading end of the strip is illustrated in Figs. 2 and 4 and comprises a female block 230 secured by bolts 33 to the leading end 34 of the forming slide B. The block 230 fits within a notch or recess in the end 34 of the slide, the construction being such as to provide proper alignment of the front and rear clamping devices F and E so as to permit the strip C to be properly clamped at its opposite ends before commencement of the bending operation. The clamping block 230 is provided with a frusto-conical bore or hole 25 having inclined keys or ribs 26 fitting into correspondingly shaped keyways in a series of three clamping segments 27. The forward clamping device F for clamping the leading end of the strip is substantially identical with the clamping device E for the rear end of the strip, described above, excepting in the following respects. As illustrated in Fig. 4, the adjacent upright faces of the clamping segments 27 are inclined to permit the web of the strip C to be bent at an angle against the pressure plate 22 during the forming operation, as described in the above mentioned copending application. In addition, the rear pressure plate 23 of the front clamping device F is provided with a T-shaped slot similar to the slot in the thrust disk 29 so as to permit the strip C to extend through the clamping device, the construction otherwise being the same. The operating lever for the clamping segments 27 of the front clamping device F is pivoted to angle brackets 410 secured to the top face of the block 230.

In preparing the machine for a bending operation the levers 40 are swung to shift the clamping segments 27 of each device E and F toward the larger end of the tapered bores 25, thus freeing or releasing the clamping segments. The

metal strip C is then inserted endwise through the front clamping device F and thence through the rear clamping device E until the tail end of the strip abuts against the solid thrust disk 28 of the rear clamping device E, see Figs. 6 and 7. The levers 40 are then swung in the opposite directions to shift the clamping segments 27 toward the narrower ends of the tapered bores 25. This operation causes the segments to be drawn or forced together, thereby rigidly clamping the opposite ends of the metal strip C. If desired, the bearing faces of the segments 27 which contact the strip C may be knurled or serrated in order to increase the grip of the clamping devices upon the opposite ends of the metal strip. After the bending operation the bent strip C may be readily and quickly withdrawn from the machine by swinging the levers 40 and releasing the clamping segments 27 from the ends of the strip.

It will be seen that in releasing the clamping blocks or segments by shifting them through the medium of the forked end 40b to the right in Fig. 6, the disk 29 will act as a stop engageable with the ends of the splines or keys 26, thus limiting movement of the blocks outwardly through the tapered passage 25.

I claim:

1. A device for clamping the end of a metal bar or strip comprising a member having a tapered passage therethrough, a plurality of clamping blocks having a sliding fit in said passage and adapted to receive the bar therebetween, a pair of thrust plates each uniformly engaging the corresponding ends of said clamping blocks and one thereof being slotted to permit passage therethrough of the bar, said blocks being connected to said plates for shiftable movement transverse to the longitudinal axis of the passage, and means cooperable selectively with said plates for simultaneously shifting said clamping blocks into wedging engagement with the wall of the passage to grip said bar.

2. A device for clamping the end of a metal bar or strip comprising a member having a tapered passage therethrough, a plurality of tapered clamping blocks having a sliding fit in said passage and adapted to receive the bar therebetween, cooperating keying means on the member and blocks for guiding said blocks within the passage, and swingable lever means selectively and simultaneously cooperable with opposite corresponding ends of the blocks for shifting them into and out of positions in said passage to clamp the bar.

3. A device for clamping the end of a metal bar or strip comprising a member having a tapered passage therethrough, a plurality of clamping blocks having a sliding fit in said passage and adapted to receive the bar therebetween, cooperating keying means on the member and blocks for guiding said blocks within said passage, a pair of thrust plates each uniformly engaging the corresponding ends of said clamping blocks and one thereof being slotted to permit passage therethrough of the bar, said blocks being connected to said plates for shiftable movement transverse to the longitudinal axis of the passage, and means cooperable selectively with said plates for simultaneously shifting said clamping blocks into wedging engagement with the wall of the passage to grip said bar.

4. A device for clamping the end of a metal bar or strip comprising a member having a tapered passage therethrough, a plurality of clamp-

ing blocks having a sliding fit in said passage and adapted to receive the bar therebetween, a pair of thrust plates each uniformly engaging the corresponding ends of said clamping blocks and one thereof being slotted to permit passage therethrough of the bar, said blocks being connected to said plates for shiftable movement transverse to the longitudinal axis of the passage, and means cooperable selectively with said plates for simultaneously shifting said clamping blocks into wedging engagement with the wall of the passage to grip said bar, at least one of said plates having a slot for the passage of said bar therethrough.

5. A device for clamping the end of a metal bar or strip comprising a member having a tapered passage therethrough, a plurality of clamping blocks having a sliding fit in said passage and adapted to receive the bar therebetween, a pair of thrust plates each uniformly engaging the corresponding ends of said clamping blocks and one thereof being slotted to permit passage therethrough of the bar, said blocks being connected to said plates for shiftable movement transverse to the longitudinal axis of the passage, and means cooperable selectively with said plates for simultaneously shifting said clamping blocks into wedging engagement with the wall of the passage to grip said bar, one of said plates having a slot for the passage of said bar therethrough and the other being unslotted to form a stop for the end of the bar.

6. A device for clamping the end of a metal bar or strip comprising a member having a tapered passage therethrough, a plurality of tapered clamping blocks having a sliding fit in said passage and adapted to receive the bar therebetween, cooperating keying means on the member and blocks for guiding said blocks within the passage, and swingable lever means mounted on said member and selectively and simultaneously cooperable with opposite corresponding ends of the blocks for shifting them into and out of positions in said passage to clamp the bar.

7. A device for clamping the end of a metal bar or strip comprising a member having a tapered passage therethrough, a plurality of clamping blocks having a sliding fit in said passage and adapted to receive the bar therebetween, a pair of thrust plates each uniformly engaging the corresponding ends of said clamping blocks and one thereof being slotted to permit passage therethrough of the bar, said blocks being connected to said plates for shiftable movement transverse to the longitudinal axis of the passage, and means mounted on said member and cooperable selectively with said plates for simultaneously shifting said clamping blocks into wedging engagement with the wall of the passage to grip said bar.

8. A device for clamping the end of a metal bar or strip comprising a member having a tapered passage therethrough, a plurality of tapered clamping blocks splined to said member and having a sliding fit in said passage and adapted to receive the bar therebetween, and swingable lever means selectively and simultaneously cooperable with opposite corresponding ends of the blocks for shifting them into and out of positions in said passage to clamp the bar.

9. A device for clamping the end of a metal bar or strip comprising a member having a tapered frustoconical passage therethrough, a plurality of segmental clamping blocks having a sliding fit in said passage and adapted to receive the bar therebetween, a pair of thrust disks each uni-

formly engaging the corresponding ends of said clamping blocks and one thereof being slotted to permit passage therethrough of the bar, said blocks being connected to said disks for shiftable movement transverse to the longitudinal axis of the passage, and means cooperable selectively with said disks for simultaneously shifting said clamping blocks into wedging engagement with the wall of the passage to grip said bar.

10. A device for clamping the end of a metal bar or strip comprising a member having a tapered frustoconical passage therethrough, a plurality of segmental clamping blocks having a sliding fit in said passage and adapted to receive the bar therebetween, a pair of thrust disks each uniformly engaging the corresponding ends of said clamping blocks and one thereof being slotted to permit passage therethrough of the bar, said blocks being connected to said disks for shiftable movement transverse to the longitudinal axis of the passage, and means cooperable selectively with said disks for simultaneously shifting said clamping blocks into wedging engagement with the wall of the passage to grip said bar, at least one of said disks having a slot for the passage of said bar therethrough.

11. A device for clamping the end of a metal bar or strip comprising a member having a tapered passage therethrough, a plurality of tapered clamping blocks splined to said member and having a sliding fit in said passage and adapted to receive the bar therebetween, thrust members engaging opposite corresponding ends of said blocks, and swingable lever means selectively and simultaneously cooperable with said thrust members at opposite corresponding ends of the blocks for shifting them into and out of positions in said passage to clamp the bar, at least one of said members having a slot for the passage of said bar therethrough.

12. Mechanism for clamping a metal bar or strip, angular in cross-section, for a bending or forming operation, comprising a housing member having a passage therethrough, a plurality of clamping wedge blocks in said passage and adapted to receive the bar therebetween, a pair of thrust members engageable with opposite ends of said blocks, and means cooperable with said

members for simultaneously shifting the blocks within the housing member into wedging position within the passage to clamp the bar.

13. Mechanism for clamping a metal bar or strip, angular in cross-section, for a bending or forming operation, comprising a housing member having a passage therethrough, a plurality of clamping wedge blocks in said passage and adapted to receive the bar therebetween, a pair of thrust members engageable with opposite ends of said blocks, and means cooperable with the thrust members for simultaneously shifting the blocks within the housing member into and out of wedging position within the passage to clamp the bar, said blocks being splined to said housing member.

14. Mechanism for clamping a metal bar or strip, angular in cross-section, for a bending or forming operation, comprising a housing member having a passage therethrough, a set of clamping wedge blocks slidable in said passage, a pair of thrust members engageable with opposite ends of said blocks, and means cooperable with the thrust members for simultaneously shifting the blocks within the housing member into wedging position within the passage to clamp the bar, one of the thrust members being slotted for the passage of the bar therethrough and the other member being unslotted to form a stop for the end of the bar.

15. Mechanism for clamping a metal bar or strip, angular in cross-section, for a bending or forming operation, comprising a housing member having a passage therethrough, a set of clamping wedge blocks in said passage and adapted to receive the bar therebetween, a pair of thrust members engaging opposite ends of said blocks, and means cooperable with the thrust members for simultaneously shifting the blocks within the housing member into wedging position within the passage to clamp the bar, said passage having longitudinal splines engageable in slots in said blocks and one of the members being engageable with the ends of the splines to limit movement of the blocks within the passage in one direction.

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