Nov. 7, 1939. A. E. BRICKMAN ET AL 2,178,926

BENDING MACHINE

Filed April 24, 1937 3 Sheets-Sheet 1

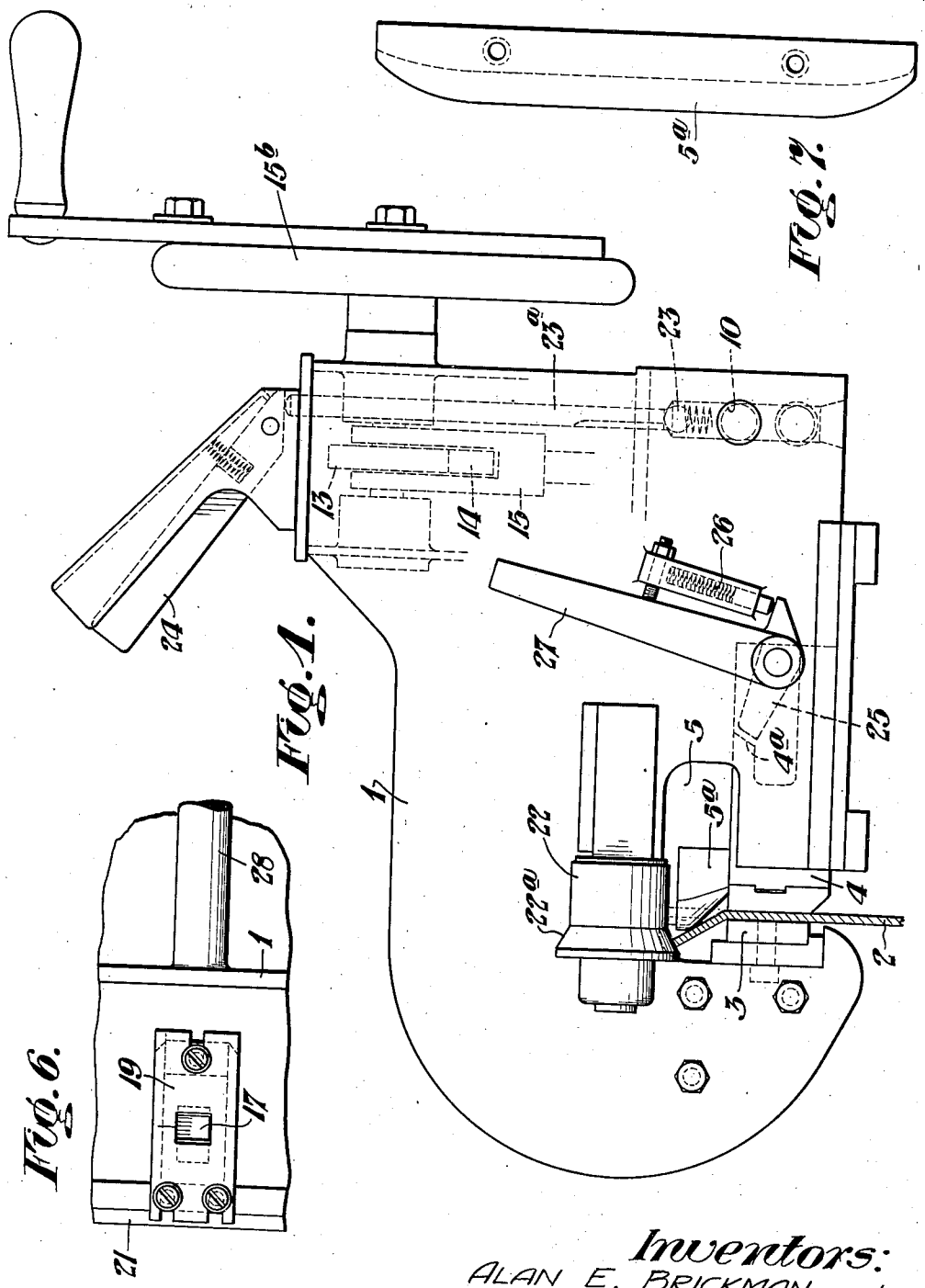


Fig. 1.

Fig. 2.

Fig. 6.

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Fig. 2.

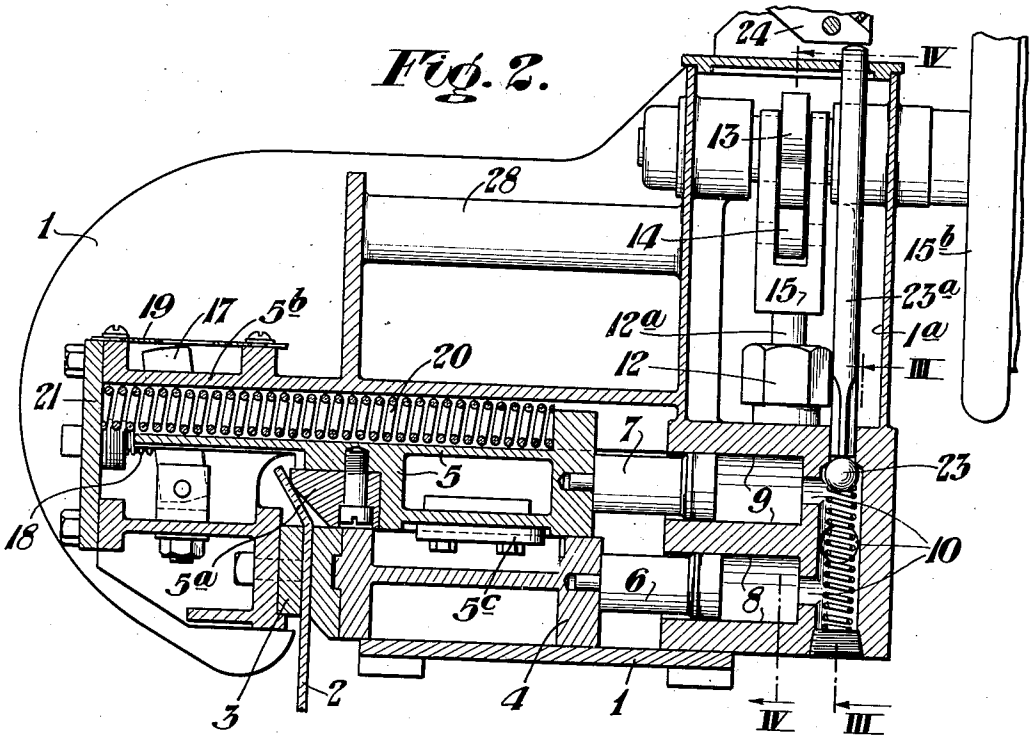
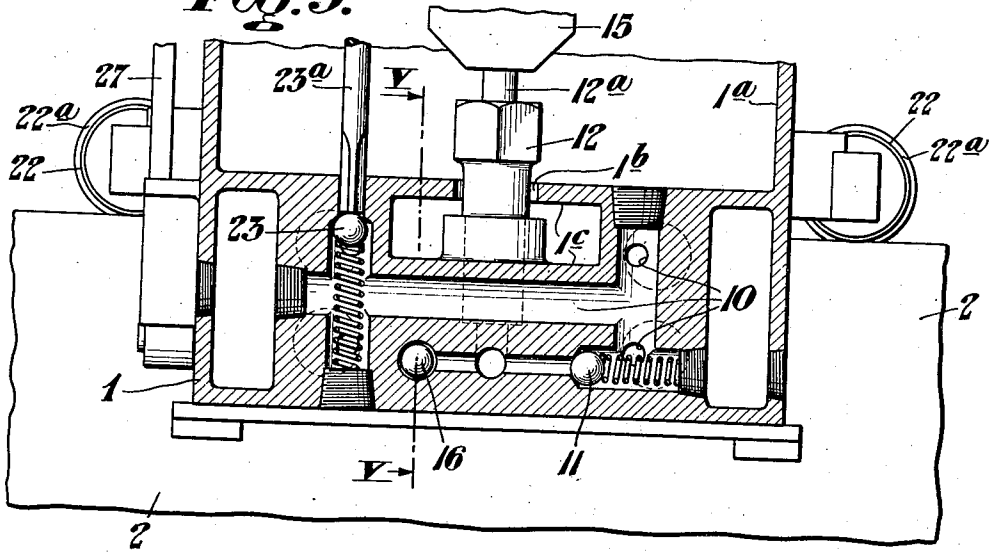


Fig. 3.



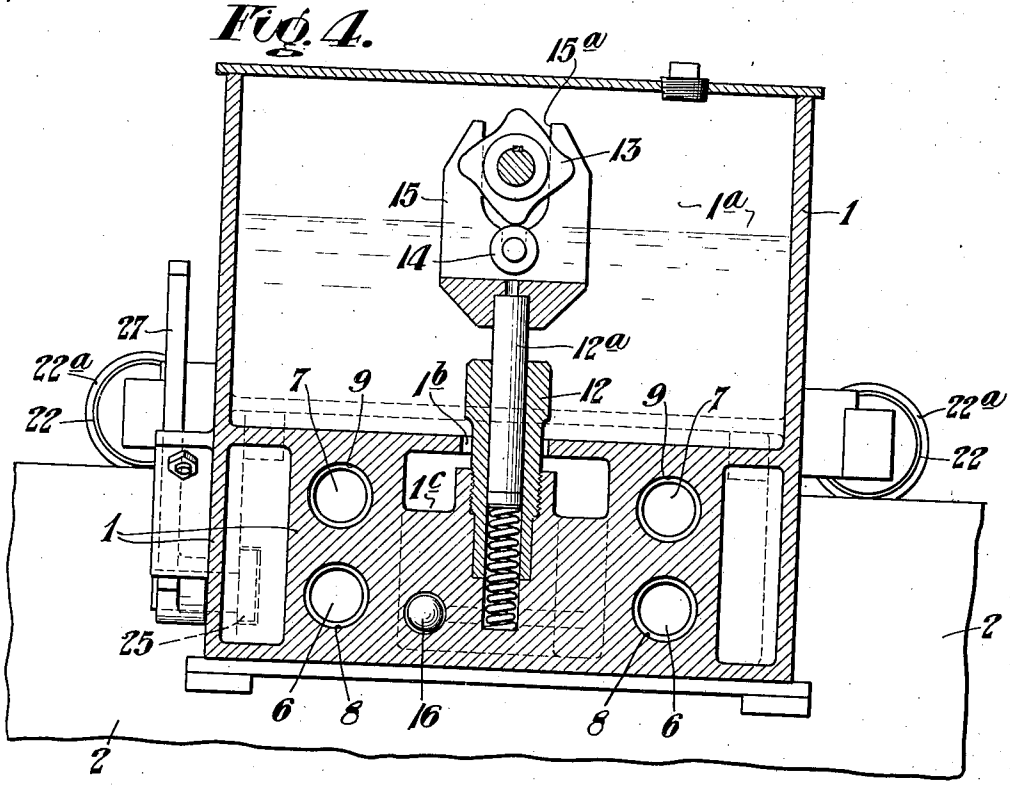
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Fig. 4.



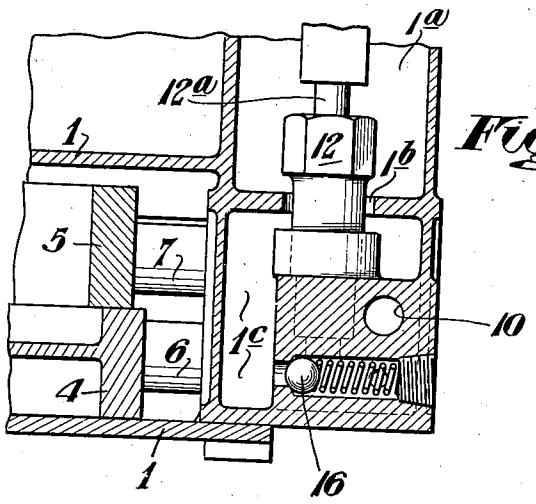


Fig. 5.

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UNITED STATES PATENT OFFICE

2,178,926

BENDING MACHINE

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Application April 24, 1937, Serial No. 138,826

8 Claims. (Cl. 153—21)

This invention is a machine for bending the edge portions of sheet and strip metal. It is particularly intended to be used for bending the top edge portion of installed metal strip guard rails. Highway road guards embodying this type of rail have proven quite efficient. However, the sharp top edge of the rail is capable of functioning like a knife during collisions, and for this reason it is desirable to bend this edge away from the traffic side of the guard. An example of the machine is illustrated by the accompanying drawings in which:

Figure 1 is a side view,

Figure 2 is a cross-section,

Figures 3 and 4 are sections taken from the lines III—III and IV—IV in Figure 2,

Figure 5 is a cross-section taken from the line V—V of Figure 3, and

Figure 6 is a detail in plan of an element shown by Figure 2.

Figure 7 is a detail.

The various parts of the machine are carried by a frame 1 that is constructed to fit about the upper portion of a road guard rail 2, it being understood that this is an installed road guard rail of the flat metal strip type. This installation is, of course, in a vertical plane. The shape of the frame 1 is immaterial so long as it provides a transverse passageway for the strip in the form of an upwardly extending slot or the like.

An anvil 3 is carried by the frame 1 so as to engage one side of the rail 2 adjacent its top edge portion. A reciprocative jaw 4 is also carried by the frame so as to engage the other side of the rail opposite the anvil 3. This anvil and jaw provide a vise for holding the rail 2.

The frame 1 also carries a reciprocative tool 5 above the jaw 4 for the purpose of engaging the side of the rail engaged by this jaw and bending the part of the rail projecting above the anvil and jaw to the angle desired. This tool 5 is provided with an insert 5^a having a working surface that is beveled to the angle desired, and having rounded leading edges to provide smooth stroke fade-away bends. The jaw 4 and the tool 5 respectively connect with pistons 6 and 7 working in cylinders 8 and 9 formed in the frame 1.

These cylinders 8 and 9 are interconnected by a passage 10 into which fluid may be pumped through a check valve 11 by a fluid pump 12. This pump 12 includes a spring returned piston 12^a which is operated by a cam 13 through a roller 14 and a cross-head 15, this cam 13 being turned by a hand-wheel 15^b. The cross-head 15 is guided by being provided with a slot 15^a which rides on the shaft mounting the cam 13. The frame 1 is constructed to provide a fluid reservoir 1^a which encloses the cam 13 and the reciprocative parts of the pump 12. The fluid used is preferably oil, and this arrangement therefore provides for the lubrication of the cam and the reciprocating parts, providing the oil level is kept sufficiently high.

To reach the chamber of the pump 12 the oil flows through a passageway 1^b and to a lower oil chamber 1^c, from whence it is removed by the pump through a suitable check valve 16, this valve functioning in conjunction with the valve 11 to provide a proper pumping action.

Operation of the machine as it is so far described is fairly obvious. Rotation of the hand-wheel 15^b rotates the cam-wheel 13 and thus operates the pump 12. The oil flows from the reservoir 1^a to the chamber 1^c and into the pump chamber by way of the check valve 16. The oil exits from the pump chamber by way of the passage 10 and thus eventually forces the pistons 6 and 7 out of the cylinders 8 and 9 so as to apply holding and bending forces, respectively, to the jaw 4 and tool 5. Due to the cylinders 8 and 9 being interconnected, pressure in these cylinders is always equalized, whereby full bending force cannot be applied to the tool 5 until the jaw 4 has firmly clamped the rail against the anvil 3.

It is obvious that continued operation of the pump 12 by rotation of the hand-wheel 15^b will cause continued bending of the top portion of the rail 2. That is to say, the angle at which the top portion of this rail is bent will depend largely upon the extent to which the pump 12 is operated. The forming of fade-away bends at the bracket mountings of the guard is accomplished by the curved leading edge of tool insert 5^a.

In view of the above, the frame of the machine pivotally mounts an indicator 17 which is pressed by a spring 18 into a slot formed in an extension 5^b of the tool 5. The top of this indicator is graduated and is covered by a shield 19 having a central opening through which the indicator may be seen, this shield being provided with a suitable pointer beneath which the graduations of the indicator play. By observing the play of the graduations of the indicator 17, it is possible for the operator to determine the angle to which the top portion of the rail is being bent.

The return of the jaws 4 and 5 is effected by one or more coil springs 20 which work at one end directly against the tool 5 and at the other end against a plate 21 bolted to the frame 1. However, it is impossible for this spring return means to operate as long as pressure is held in the cylinders 8 and 9. Therefore, a release valve 23 is placed in the passage 10 where it may be operated by a push-rod 23^a which can, in turn, be depressed by a hand-lever 24 on the outside of the frame. When this hand-lever is operated, the push-rod 23^a opens the valve 23 so that the oil may flow back into the reservoir 1^a, this permitting the one or more springs 20 to return the tool 5. This tool is provided with an abut-

ment 5c which engages the jaw 4 after the front face of the forming tool 5a is in line with the clamping face of the jaw 4, and thus enables the one or more springs to return this jaw. It is necessary for the front face of the forming tool 5a to return in line with the clamping face of the jaw 4 to permit advancing of the machine to a new position.

Rollers 22 are carried by the sides of the frame 1 so as to ride on the top edge of the guard rail 2. These rollers function not only to enable the machine to be rolled along the top edge of the rail in the manner of a carriage, but also function to properly position the anvil, jaw, and tool respecting the rail. If desired, these rollers may be made adjustable, whereby the depth of the rail portion bent may be varied. These rollers 22 flare from cylinders to larger diameters as at 22a this increase in their diameter being proportioned so that the top edge of the rail in its unbent condition can support the cylindrical portions of the rollers and, when bent, its edge can support the flared portions 22a. In addition, this construction of the rollers permits the bending operation to be performed without interference.

Although not previously mentioned, it should be understood that the anvil 3, jaw 4 and tool 5 may be made any width that is considered desirable, it being understood that the wider these elements are, the longer the bent portion will be for each operation. In the interests of smooth and accurate operation, both the jaw and tool are preferably provided with a plurality of cylinders and pistons, the drawings showing two in each instance.

The jaw 4 is provided with a cam surface 4a, and a dog 25 works against this surface to limit the return of the jaw 4 so that when the valve 23 is operated to permit the one or more springs 20 to function, this jaw is returned just sufficiently to release the rail This will not permit removal of the machine from the rail but does permit the machine to be rolled over the rail to the next portion to be bent.

Released return of the jaw 4 and tool 5 normally comes to position with the stop face 4a in contact with the dog 25 which, in turn, is positioned by the spring 26. This governed amount of return permits the advance of the machine to a new position on the guard rail 2 and thus promotes a saving of work motion and time element in the performance of a machine cycle. By operation of the lever 27 placing the spring 26 in added compression, the dog 25 takes position which permits further return of the jaw 4 and tool 5. This fully returned position is necessary for the removal of the machine from the completed bent edge of the guard rail 2, the frame 1 being provided with a handle 28 for facilitating the removal and handling of the machine.

A summary of the operation of the machine is as follows:

The operator lifts the machine by its handle 28 and places it on the rail whose top portion is to be bent, with the rail projecting up into the machine so that its top edge carries the latter by its rollers 22. The operator then turns the hand-wheel 15b until the indicator 17 shows the proper angle. He then operates the lever 24 so that the spring returning means can return the tool 5 and the jaw 4 to an extent sufficient to permit the machine to travel, whereupon the operator pushes the machine along to a new location. He continues to do this in sequence until he approaches one of the road guard brackets. At this point it is necessary to remove the machine, so that it can be placed upon the other side of the bracket, and to do this the operator throws the lever 27 so as to permit complete return of the tool 5 and jaw 4. These operations are continued until the job is completed.

We claim:

1. A portable machine for bending the edge portions of sheet and strip metal, including an anvil for engaging one side of the work adjacent its edge portions, a reciprocative jaw for engaging the other side of the work opposite said anvil, a reciprocative bending tool moving parallel said jaw for engaging said other side of the work and bending the latter between the part engaged by said anvil and jaw and its edge, a piston and cylinder motor for reciprocating said jaw toward said anvil, a piston and cylinder motor for reciprocating said tool toward the work, means for applying fluid under pressure to the cylinders of said motors and means for constantly equalizing the fluid pressure in said cylinders, said machine including spring returning means working against said tool, a valve for releasing the pressure in said cylinders and means on said tool for engaging said jaw upon partial return of said tool by said returning means so as to thereupon effect the return of said jaw.

2. A portable machine for bending the top edge portion of installed metal strip guard rails, including a frame constructed to fit about the upper portion of the rail, a vise carried by said frame for holding the rail adjacent its edge portion, a tool carried by said frame above said vise for engaging and bending the rail projecting above the latter, means for applying holding force to said vise and bending force to said tool and carrier elements fixed to said frame on both sides of said vise and said tool so said elements ride on the top edge of the rail and carry said frame so as to properly position said vise and said tool respecting the rail.

3. A portable machine for bending the top edge portion of installed metal strip guard rails, including a frame constructed to fit about the upper portion of the rail, a vise carried by said frame for holding the rail adjacent its edge portion, a tool carried by said frame above said vise for engaging and bending the rail projecting above the latter, means for applying holding force to said vise and bending force to said tool and carrier elements fixed to said frame on both sides of said vise and tool so said elements can ride on the top edge of the rail and carry said frame so as to properly position said vise and said tool respecting the rail, said elements being in the form of rollers that increase in diameter in the direction the top edge portion of the rail is bent by said tool to such a degree that they can ride the edge of the rail both before and after its top portion is bent.

4. A machine for bending the top edge portion of installed metal strip guard rails, including a frame constructed to fit about the upper portion of the rail, an anvil carried by said frame for engaging one side of the rail adjacent its top edge portion, a reciprocating jaw carried by said frame for engaging the other side of the rail opposite said anvil, a reciprocative bending tool carried by said frame above said jaw for engaging said other side of the rail and bending the part of the latter projecting above said anvil and said jaw, said jaw and said tool moving parallel, a piston and cylinder motor carried by said frame for reciprocating said jaw toward said an-

vil, a piston and cylinder motor carried by said frame for reciprocating said tool toward the rail, a pump carried by said frame for applying fluid under pressure to the cylinders of said motors, means associated with said motors for equalizing the pressure in said cylinders, spring returning means carried by said frame for said jaw and said tool, a valve carried by said frame for releasing the pressure in said cylinders so that said returning means can function and carrier elements fixed to the sides of said frame so as to ride on the top edge of the rail and properly position said anvil, jaw and tool respecting the rail.

5. A machine for bending the top edge portion of installed metal strip guard rails, including a frame constructed to fit about the upper portion of the rail, an anvil carried by said frame for engaging one side of the rail adjacent its top edge portion, a reciprocative jaw carried by said frame for engaging the other side of the rail opposite said anvil, a reciprocative bending tool carried by said frame above said jaw for engaging said other side of the rail and bending the part of the latter projecting above said anvil and said jaw, said jaw and said tool moving parallel, a piston and cylinder motor carried by said frame for reciprocating said jaw toward said anvil, a piston and cylinder motor carried by said frame for reciprocating said tool toward the rail, a pump carried by said frame for applying fluid under pressure to the cylinders of said motors, means associated with said motors for equalizing the pressure in said cylinders, spring returning means carried by said frame for said jaw and said tool, a valve carried by said frame for releasing the pressure in said cylinders so that said returning means can function and carrier elements fixed to the sides of said frame so as to ride on the top edge of the rail and properly position said anvil, jaw and tool respecting the rail, said frame also carrying an indicator connected with said tool for indicating the extent of operation of the latter.

6. A machine for bending the top edge portion of installed metal strip guard rails, including a frame constructed to fit about the upper portion of the rail, an anvil carried by said frame for engaging one side of the rail adjacent its top edge portion, a reciprocative jaw carried by said frame for engaging the other side of the rail opposite said anvil, a reciprocative bending tool carried by said frame above said jaw for engaging said other side of the rail and bending the part of the latter projecting above said anvil and said jaw, said jaw and said tool moving parallel, a piston and cylinder motor carried by said frame for reciprocating said jaw toward said anvil, a piston and cylinder motor carried by said frame for reciprocating said tool toward the rail, a pump carried by said frame for applying fluid under pressure to the cylinders of said motors, means associated with said motors for equalizing the pressure in said cylinders, spring returning means carried by said frame for said jaw and said tool, a valve carried by said frame for releasing the pressure in said cylinders so that said returning means can function and carrier elements fixed to the sides of said frame so as to ride on the top edge of the rail and properly position said anvil, jaw and tool respecting the rail, said carrier elements being in the form of rollers that increase in diameter in the direction the top edge portion of rail is bent by said tool to such a degree that they can ride the edge of the rail both before and after its top portion is bent.

7. A machine for bending the top edge portion of installed metal strip guard rails, including a frame constructed to fit about the upper portion of the rail, an anvil carried by said frame for engaging one side of the rail adjacent its top edge portion, a reciprocative jaw carried by said frame for engaging the other side of the rail opposite said anvil, a reciprocative bending tool carried by said frame above said jaw for engaging said other side of the rail and bending the part of the latter projecting above said anvil and said jaw, said jaw and said tool moving parallel, a piston and cylinder motor carried by said frame for reciprocating said jaw toward said anvil, a piston and cylinder motor carried by said frame for reciprocating said tool toward the rail, a pump carried by said frame for applying fluid under pressure to the cylinders of said motors, means associated with said motors for equalizing the pressure in said cylinders, spring returning means carried by said frame for said jaw and said tool, a valve carried by said frame for releasing the pressure in said cylinders so that said returning means can function and carrier elements fixed to the sides of said frame so as to ride on the top edge of the rail and properly position said anvil, jaw and tool respecting the rail, said carrier elements being in the form of rollers that increase in diameter in the direction the top edge portion of rail is bent by said tool to such a degree that they can ride the edge of the rail both before and after its top portion is bent, and said frame carrying releasable means for limiting the return of said jaw and said tool by said returning means to an extent just sufficient to permit said frame to be moved along the rail.

8. A machine for bending the top edge portion of installed metal strip guard rails, including a frame constructed to fit about the upper portion of the rail, an anvil carried by said frame for engaging one side of the rail adjacent its top edge portion, a reciprocative jaw carried by said frame for engaging the other side of the rail opposite said anvil, a reciprocative bending tool carried by said frame above said jaw for engaging said other side of the rail and bending the part of the latter projecting above said anvil and said jaw, said jaw and said tool moving parallel, a piston and cylinder motor carried by said frame for reciprocating said jaw toward said anvil, a piston and cylinder motor carried by said frame for reciprocating said tool toward the rail, a pump carried by said frame for applying fluid under pressure to the cylinders of said motors, means associated with said motors for equalizing the pressure in said cylinders, spring returning means carried by said frame for said jaw and said tool, a valve carried by said frame for releasing the pressure in said cylinders so that said returning means can function and carrier elements fixed to the sides of said frame so as to ride on the top edge of the rail and properly position said anvil, jaw and tool respecting the rail, said returning means working on said jaw through said tool, the latter being provided with an abutment arranged to engage said jaw subsequent to release of said tool from the rail.

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