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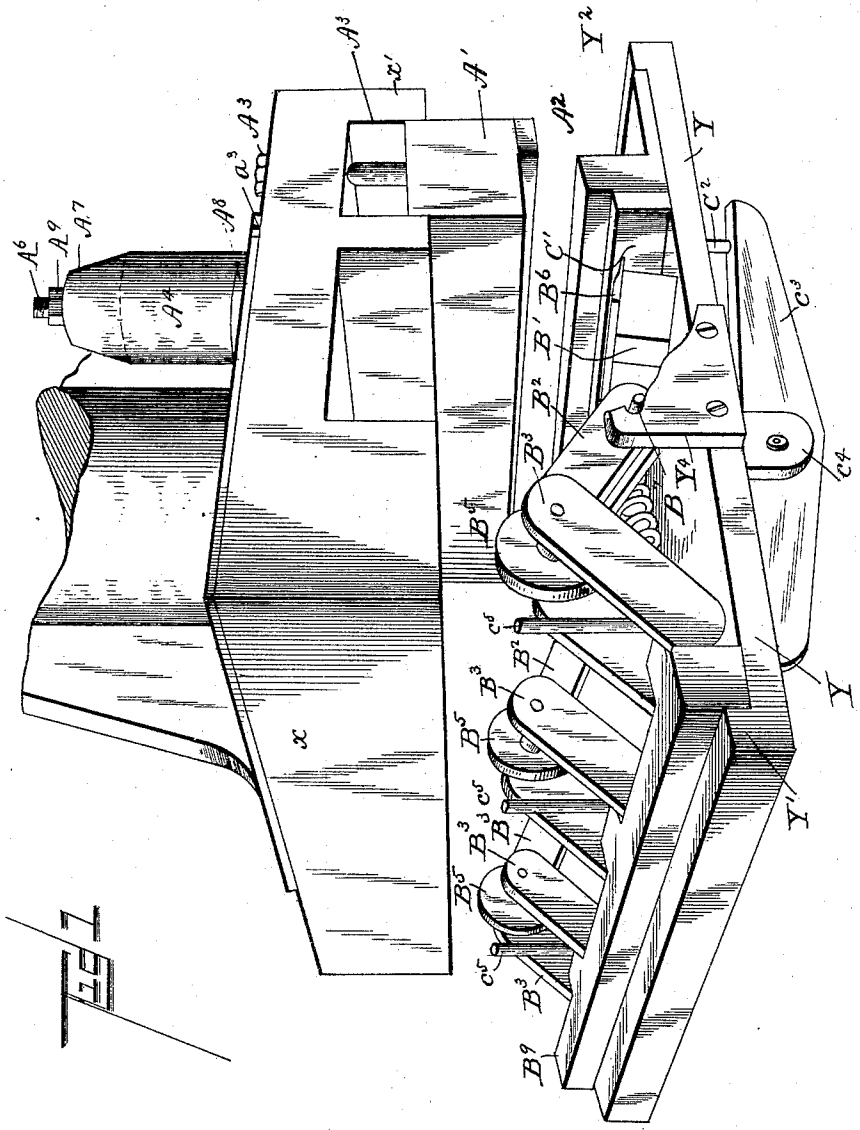
W. R. KINNEAR.

SHEET METAL BENDING MACHINE.

No. 468,462. Patented Feb. 9, 1892.



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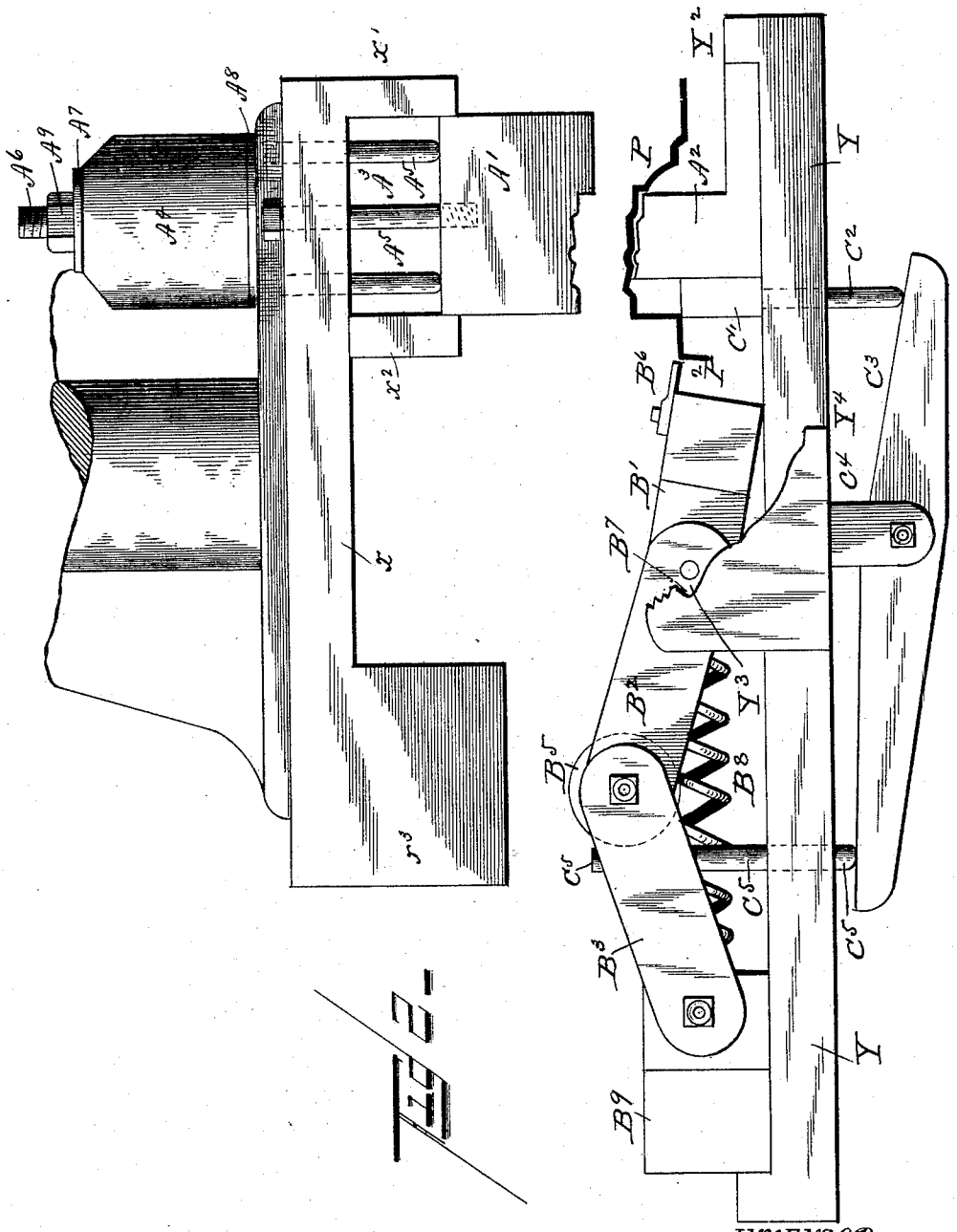

FIG. 2.

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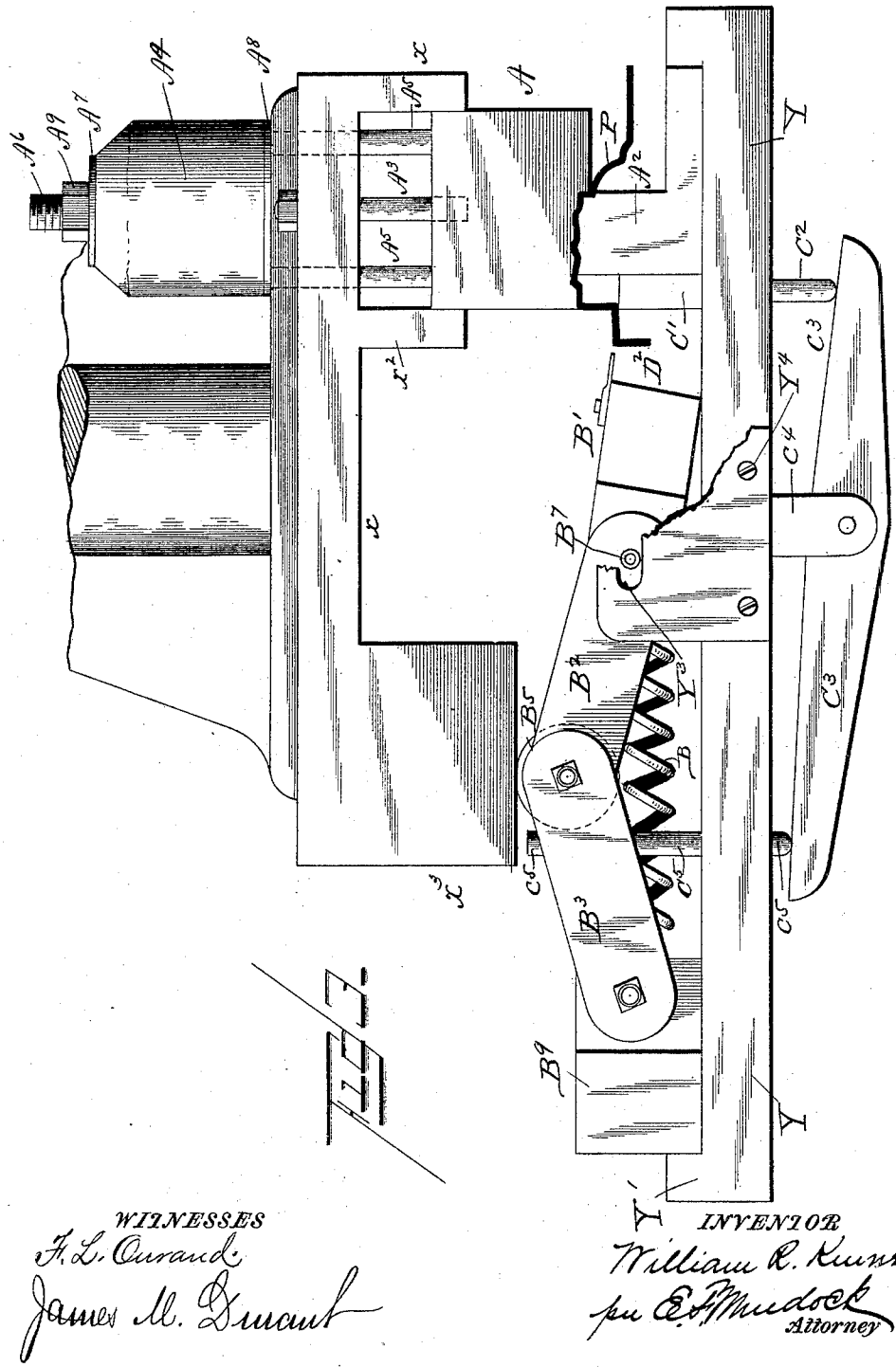
SHEET METAL BENDING MACHINE.

No. 468,462. Patented Feb. 9, 1892.



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(No Model.) 6 Sheets—Sheet 4.

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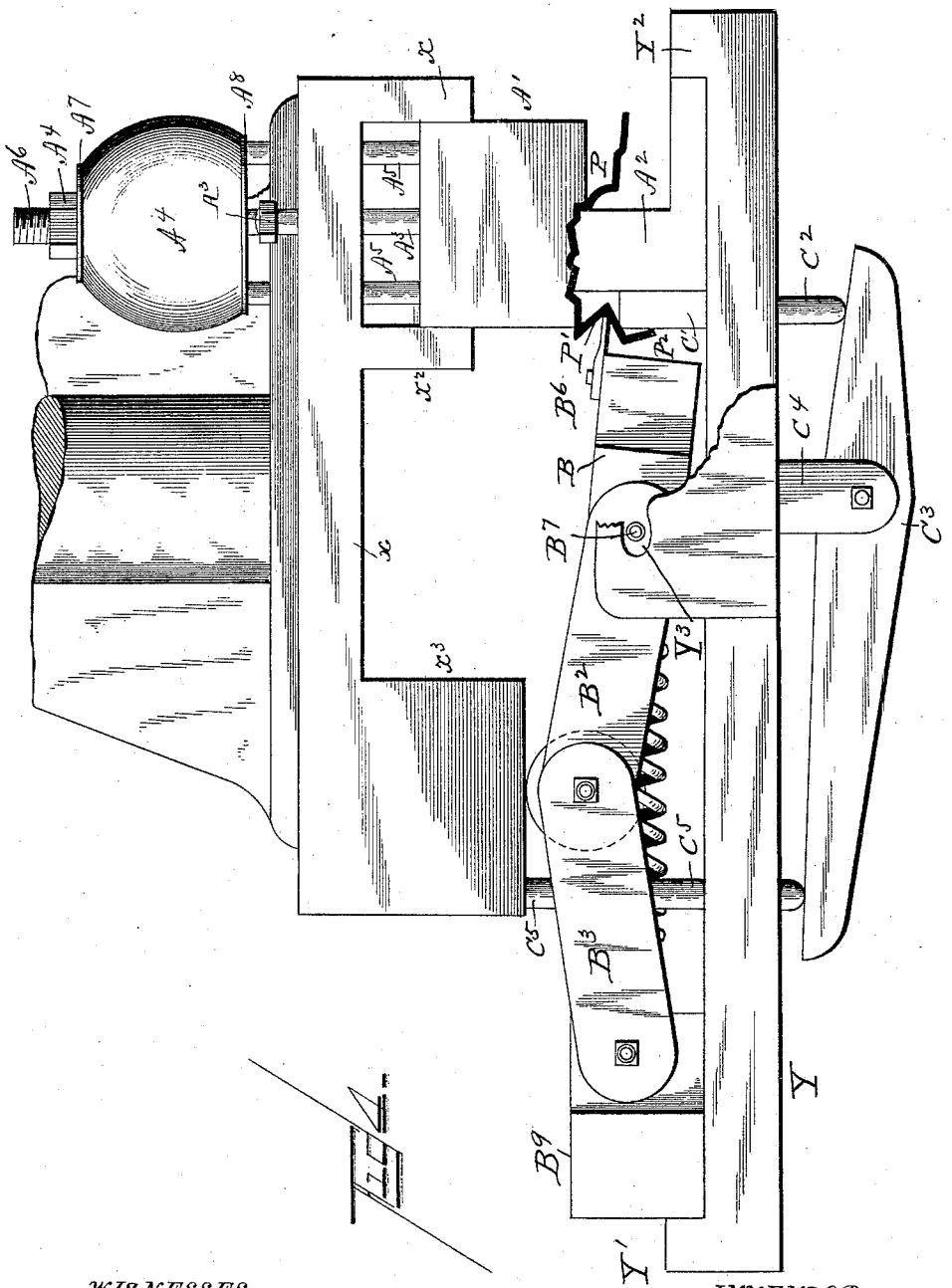
SHEET METAL BENDING MACHINE.

No. 468,462. Patented Feb. 9, 1892.



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(No Model.) 6 Sheets—Sheet 5.

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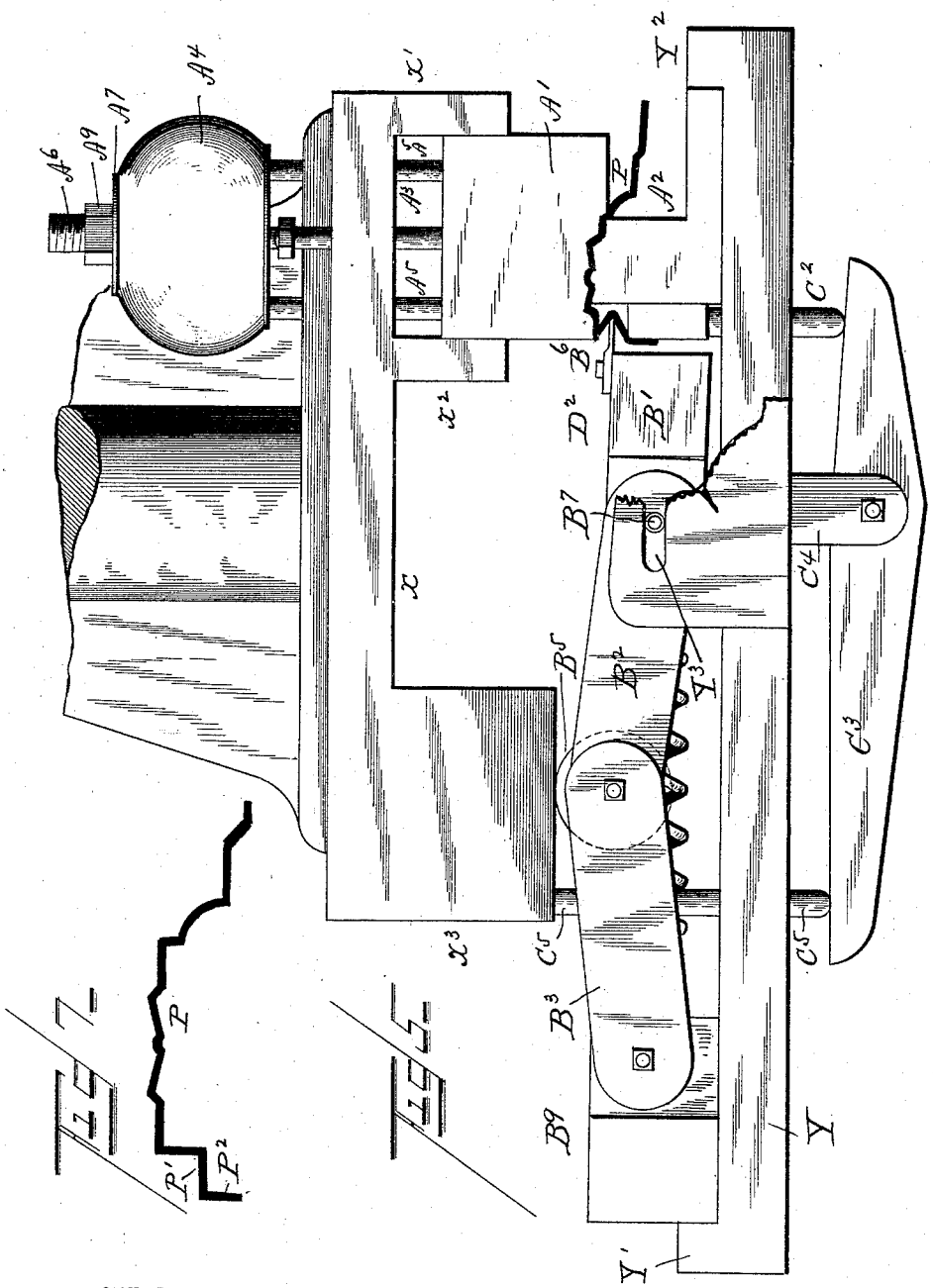
SHEET METAL BENDING MACHINE.

No. 468,462. Patented Feb. 9, 1892.



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SHEET METAL BENDING MACHINE.

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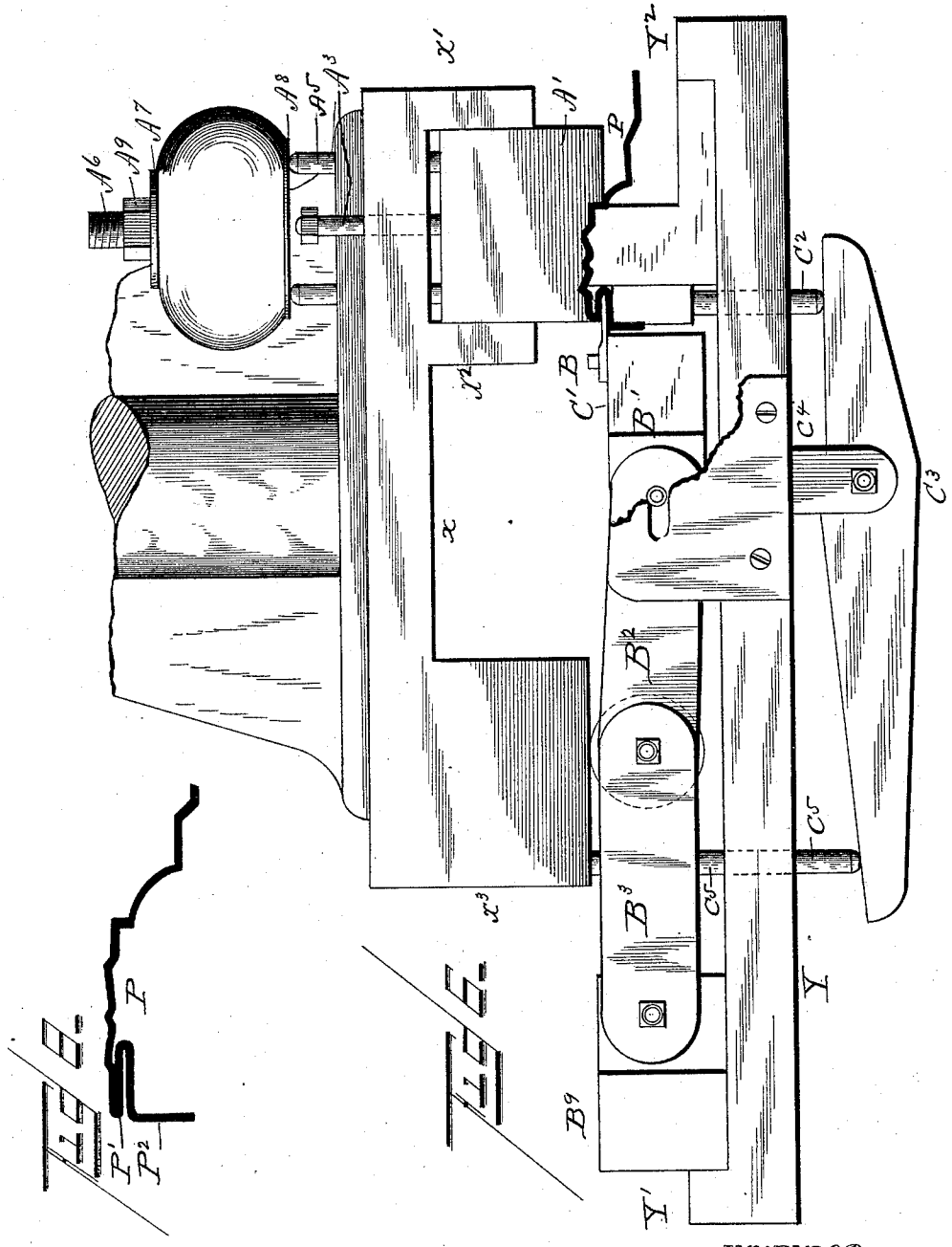

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UNITED STATES PATENT OFFICE.

WILLIAM R. KINNEAR, OF COLUMBUS, OHIO.

SHEET-METAL-BENDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 468,462, dated February 9, 1892.

Application filed April 28, 1891. Serial No. 390,777. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM R. KINNEAR, a citizen of the United States, residing at Columbus, in the county of Franklin, State of Ohio, have invented certain Improvements in Sheet-Metal-Bending Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in sheet-metal bending and forming machines; and it consists in the construction and arrangement of the parts herein shown and described.

The present purpose for which this invention is designed is to form on the edge of sheet-metal articles a groove and a strengthening edge or flange attached to the groove by turning the surplus metal remaining after forming the groove to an abrupt angle to the margin of the article, and, further, to accomplish this twofold object in one operation.

The particular article to facilitate the manufacture of which this invention is designed is the ceiling-panel for which I have secured Letters Patent of the United States which bear the number 443,324. In these panels, as set forth in the patent, an essential element to the joint is the strengthening-flange. By the presses in present use, while an angle may be turned on the edge of the margin, the groove and its strengthening-edge cannot. It is to obviate this difficulty in this manufacture that the present invention is particularly designed.

In the drawings, Figure 1 is a perspective of the invention. Fig. 2 is a side elevation of the same in an inactive position. Fig. 3 is a side elevation of the same, showing the first step in operation. Fig. 4 is a side elevation of the same, showing the second step in operation. Fig. 5 is a side elevation of the same, showing the third step in the operation. Fig. 6 is a side elevation of the same, showing the final operation. Fig. 7 is a detail showing the margin of the article as it comes to this machine. Fig. 8 is a detail showing the margin after having been operated upon by this machine.

For the convenience of description and the more intelligible reading of the drawings a common distinguishing-letter has been used to designate all of the members belonging to the different series of co-operative parts, while the added numeral will discriminate between the separate members of each series. Thus the clamping-blocks and their adjuncts will bear the common distinguishing-letter A, the thrusting-bar and its adjuncts the letter B, and the forming-bar and its adjuncts the letter C.

Before reaching the stage of manufacture for which this machine is employed the panels have been stamped with a perfected margin and the extra metal from which the groove and strengthening-flange are to be formed has been depressed to form the angular-shaped edging shown in Fig. 8 of the drawings. The formation of this angular edging is the initial step in the production of the groove P′ and strengthening-flange P^2 shown in Fig. 8, for the angles regulate the lines on which the metal is subsequently bent. In this condition the panel is now placed in this machine, resting the margin P of the panel on the block A^2 and adjusted thereon to preserve any decoration on the margin, for which provision has been made, as shown in Fig. 2.

The clamping-blocks A′ and A^2 are provided for the purpose of retaining the margin rigidly in position while the groove and strengthening-flange are being formed. They are attached to the mandrel X and bolster Y of the press, respectively, the block A^2 being rigidly attached to the bolster Y, while the block A′ is loosely attached to the mandrel. The purpose in so attaching the block A′ is to cause it to close upon the interposed margin P previous to the beginning of the operation of the other parts of the machine and to maintain an independent pressure on the said block during such subsequent action. This is here accomplished by hanging the block on the rods A^3, which are loosely mounted in perforations in the mandrel X and are provided with heads too large to pass through the perforations, which thus act to suspend the block. The block rises and falls between the flanges X′ and X^2, which maintain the block in position during the continuance of the pressure. The pressure is exerted upon the block by means of the buffer-springs A^4 through the intermediate pins A^5. The buffer-springs are

preferably constructed of heavy rubber and are mounted around the rods A^6, between two metal disks A^7 and A^8. The disk A^8 rests on the head of the pins A^5 and the disk A^7 on the top of the buffer-springs, in which position it is maintained by the screw-nut A^9. By means of this screw-nut the tension of the buffer-springs may be regulated by forcing the disk A^7 down on the buffer-springs, or it may relieve the tension by releasing the same. The pins A^5 are rigidly attached to the block and pass loosely through perforations in the mandrel under the disk A^8.

In the normal position of the machine, when the mandrel is raised to its full extent, the buffer-springs act to project the block A′ to the full limit of motion that the rods A^3 will allow, as seen in Fig. 2 of the drawings. In this position when the mandrel is moved down it will be seen that the block A′ strikes the interposed margin P, while the other operative elements of the machine are in a condition of inactivity, as shown in Fig. 3, and thus during the remainder of the downward stroke the tension of the buffer-spring is increased, maintaining the block in position; also, that with the withdrawal of the mandrel and the other operative parts of the machine the pressure is maintained and the margin P held firmly until they have been entirely withdrawn. By means of this action of the machine the margin is secured against damage which would result from the catching of any of the parts and bending or otherwise disfiguring the margin.

At the opposite side of the mandrel from that to which the block A′ is suspended is the striker-head X^3, which extends downward from the body of the mandrel X somewhat less than the block A′. (See Fig. 2.) Its office is to strike upon the joint of the toggle-arms B^2 and B^3 and to drive the thrusting-bar B′ forward. That this movement should be smooth the joints are provided with the friction-rollers B^5. To the rear of these the toggles are pivotally secured to the block B^9, which is maintained in position by the shoulder Y′, set upon the bolster and forming a counterpart to the shoulder Y^2, set upon the opposite side behind the block A^2, which shoulders receive the strain caused by the action of the toggles. At the forward end the toggles are pivotally secured to the thrusting-bar B′. This bar is unsupported by other than the pivoted connection of the toggles, and when in the inactive position of the machine it rests on the surface of the bolster Y. (See Fig. 2.) This surface regulates the altitude of the initial stroke of the thrusting-bar, and it is obvious that at any time the guides may be interposed to raise or lower the thrusting-bar without altering the spirit of this invention. The thrusting-bar is provided along its upper edge with the blade B^6. It is by this blade that the depth and opening of the groove are maintained. The blade B^6 is secured in position on the thrusting-bar by means of bolts, so that it may be easily removed and replaced. It is advanced in front of the thrusting-bar just the depth of the intended groove. Forward ends of the outside toggles are maintained in the line of action by means of the pins B^7, which operate in the slots Y^3 in the plates Y^4. By means of these pins and slots the blade B^6 is maintained in a level position when the groove has finally formed with the said blade in it, as seen in Fig. 6, and thus the free withdrawal of the blade is provided for. This withdrawal is accomplished by means of the spiral springs B^8, the ends of which are secured to the block B^9 and the thrusting-bar between the toggles. This spring acts to draw the toggles into their normal position. (Shown in Fig. 2 in the drawings.) In its operation the blade B^6, in being advanced, strikes the angled edge of margin P just over the first angle and into the second or the inner angle. This it carries back, bending the metal, as shown in the drawings at Fig. 5. At this stage of the operation the metal and inclosed blade are raised until, when the blade has reached the full extent of its forward movement, it and the metal have been raised and tightly squeezed against the block A′ by the forming-bar C′. (Shown in Figs. 5, 6, and 7.) The forming-bar C′ extends across the face of the clamping-block A^2 and just below the bends of the angled edge of the prepared margin P when placed on the said block. (See Fig. 2.) It is provided with pins C^2, which pass loosely through perforations in the bolster Y. Directly under the lower ends of these pins are the short arms of the levers C^3, which are pivoted in brackets C^4, secured to the bolster. On the ends of the long arms rest the loose pins C^5, which are passed through perforations in the bolster and reach into the path of the head X^3 of the mandrel somewhat below the line to which the friction-roller B^5 of the toggles extend when drawn back by the springs B^8. By means of this adjustment of these parts the thrusting-bar is allowed to get into operation first and start the bend in the metal (shown at Fig. 4) before the forming-bar C′ is started on its upward course to form and press the metal into the groove P′, as shown in Figs. 5 and 6. As these two elements, the thrusting-bar and forming-bar, are thus operating, the last bend P^2 of the angled edge of the margin P is is maintained and forced into shape by the thrusting-bar B′ coming in contact with and pressing it into shape against the forming-bar C′, and thus forming the strengthening-edge P^2 of the article. When now the mandrel begins to rise, the forming-bar C′ and thrusting-bar B′, with its blade B^6, are gradually withdrawn, the blade retiring on a level, having been in the operation raised to a level with the ends of the toggles resting on the pins B^7. When entirely withdrawn, the thrusting-bar B′ falls to the surface of the bolster. It is now when the blade has entirely withdrawn that the mandrel raises

far enough to release the strain on the buffer-springs A^4 and lifts the block A′ off the margin P of the panel, which is then withdrawn having formed thereon a groove and strengthening-edge, as shown in Fig. 8, and that in one completed operation of the machine.

Having thus described this invention, what I desire to claim is—

1. In a metal bending and forming machine such as described, the combination, with clamping-blocks to maintain the metal in position, of a thrusting-edge to project the metal to the depth of the desired formation, a forming-bar to force the metal to conform to the shape of the said thrusting-edge, and a thrusting-bar to maintain a flange on the edge of the said formation at an angle to the same, substantially as described.

2. In a metal bending and forming machine such as described, the combination, with the clamping-blocks to maintain the metal in position, of a forming-bar adapted to rise against one of the said clamping-blocks after the same has rigidly secured the metal in position, a thrusting-edge to project the metal to the depth of the desired formation and interpose it between the said clamping-block and forming-bar, and intermediate connections between the said forming-bar and thrusting-edge adapted to advance the latter between the said clamping-blocks and forming-bar previous to the commencement of the operation of the latter, substantially as described.

3. In a metal bending and forming machine such as described, the combination, with the clamping-blocks to maintain the metal in position, of a forming-bar adapted to rise toward one of the said clamping-blocks after the same has rigidly secured the metal in position, a thrusting-edge to project the metal to the depth of the desired formation and interpose it between the said clamping-block and forming-bar, intermediate connections between the said forming-bar and thrusting-edge adapted to advance the latter between the said clamping-blocks and forming-bar previous to the initiation of the operation of the latter, and suitable connections to withdraw the said thrusting-bar from between the said clamping-block and forming-bar previous to the releasing of the metal by the clamping-blocks, substantially as described.

4. In a metal bending and forming machine such as described, the combination of the mandrel X, provided with the spring-actuated clamping-blocks A′, the bolster Y, provided with the clamping-block A^2, the interposed thrusting-bar B′, and forming-bar C′, provided with intermediate connections adapted to be operated upon in succession by the said mandrel, substantially as described.

5. In a metal bending and forming machine such as described, the combination of the mandrel X, provided with the spring-actuated clamping-block A′, the bolster Y, provided with the clamping-block A^2, the interposed thrusting-bar B′, and the forming-bar C′, provided with intermediate connections to withdraw the thrusting-edge previous to the withdrawal of the clamping-block A′ by the said mandrel, substantially as described.

6. In a metal bending and forming machine such as described, the combination, with the mandrel X, provided with the spring-actuated clamping-block A′, of the bolster Y, provided with the clamping-block A^2, the interposed thrusting-bar B′, pivotally attached to the ends of the toggles B^2 B^3 at the rear and guided at the forward end to the initial point of its operation, toggles B^2 B^3, pivotally secured to the bolster Y in the rear and interposed in their highest point in the path of the mandrel X, and the side plates Y^4, supporting the forward end of the toggles and rear of the thrusting-bar B′ in such position as to allow the said thrusting-bar to withdraw in a direct line with the opening of the formation of the metal by which it has been surrounded, substantially as described.

WILLIAM R. KINNEAR.

In presence of—
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L. A. DOREMUS.