

G. A. OHL.

METAL BENDING MACHINE.

No. 338,100.

Patented Mar. 16, 1886.

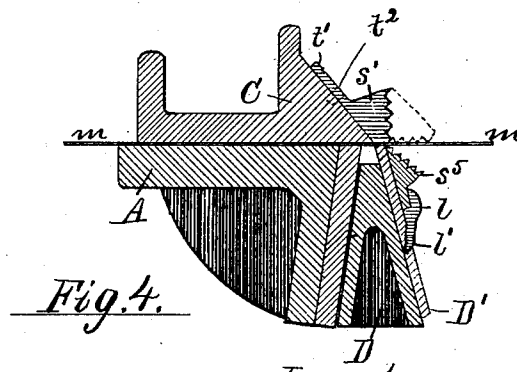
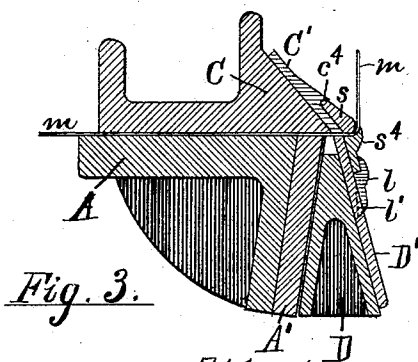
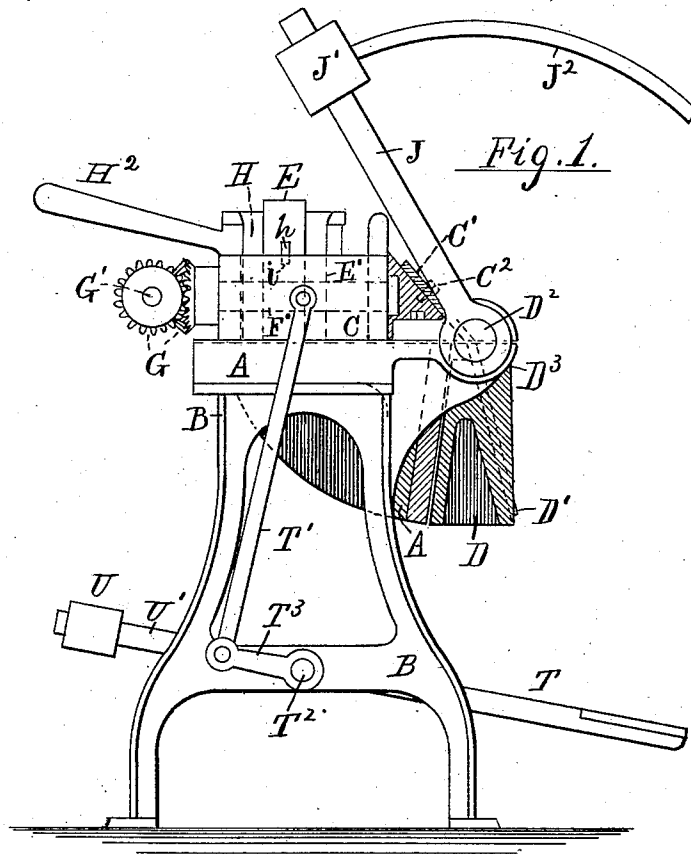


Fig. 3.

Fig. 4.

Attest.

Inventor.

L. Lee.
Henry J. Theberath.

Geo. A. Ohl. per
Crane & Miller, attys.

(No Model.)

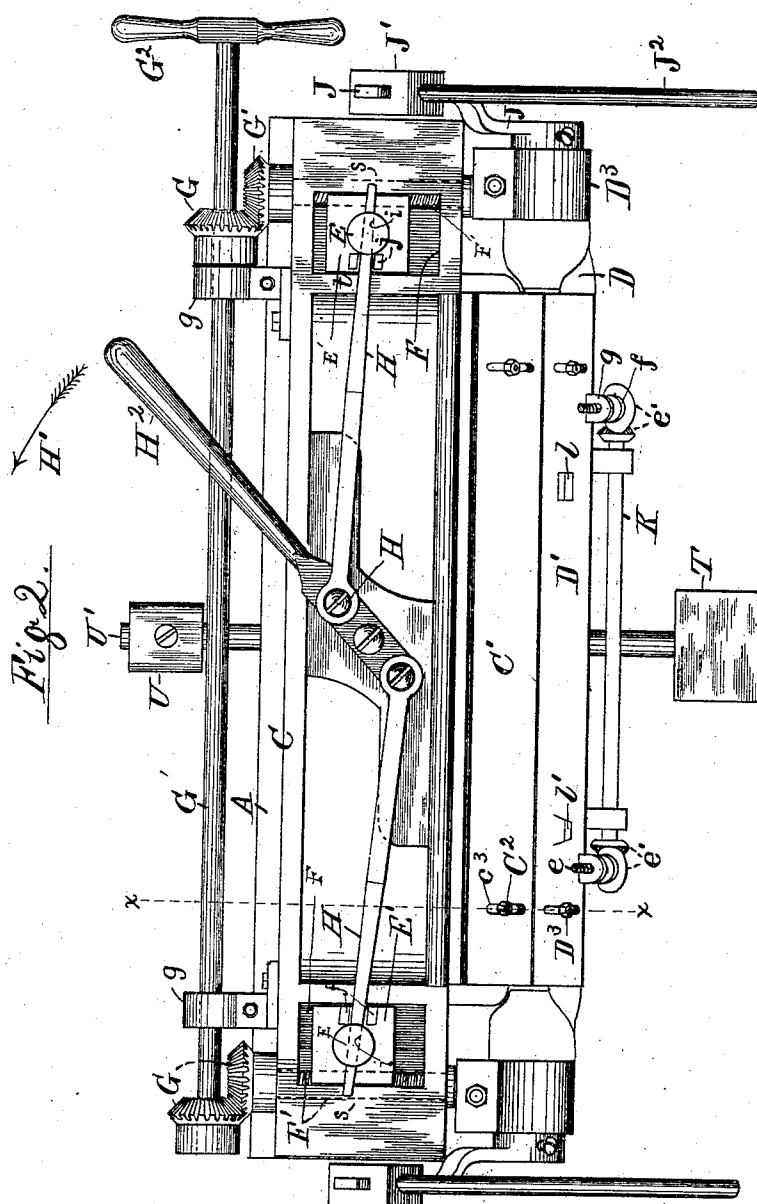
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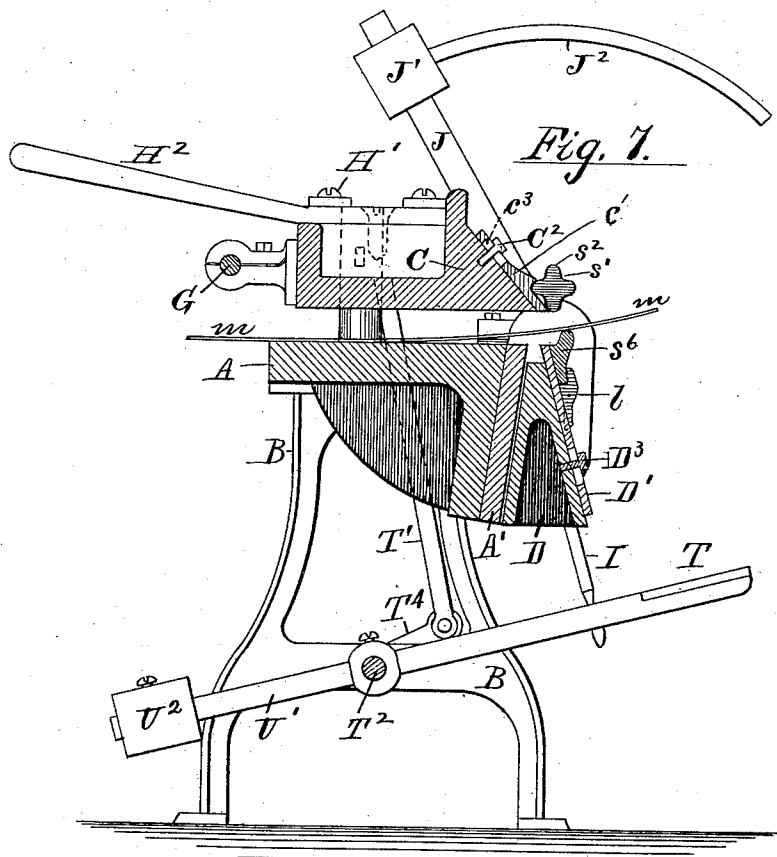
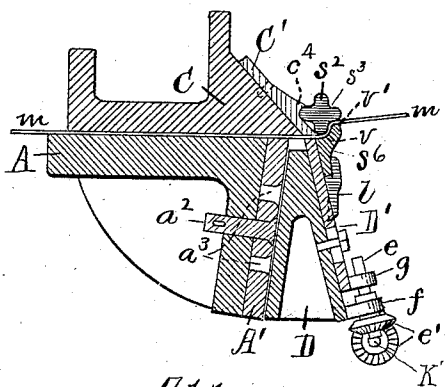


Fig. 5.

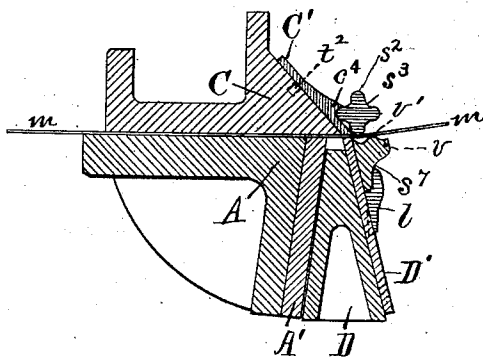


Attest.

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Fig. 6.



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UNITED STATES PATENT OFFICE.

GEORGE A. OHL, OF NEWARK, NEW JERSEY.

METAL-BENDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 338,100, dated March 16, 1886.

Application filed June 15, 1885. Serial No. 162,698. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. OHL, a citizen of the United States, residing in Newark, Essex county, New Jersey, have invented certain new and useful Improvements in Metal-Bending Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to that class of machines in which two so-called "leaves" are provided for clamping the sheet metal, and a third leaf is hinged before the joint of the others and operated to bend the metal to the desired form. In such machines the front corners of the clamping-jaws are commonly made acute and arranged in close proximity to the center of the hinged leaf, so that angular bends may be readily formed in succession and in such relation to one another as to produce by their combination a variety of designs or moldings.

Heretofore it has been common to affix so-called "formers" having a convex edge upon the upper leaf of such machines, and to curve the sheet metal by bending the same against such former; but no means has been employed in connection with such clamping-jaws by which reverse bends or curves could be produced in the sheet metal adjacent to the angles previously formed without first bending one part of the curve against a suitable former, then removing the sheet from the clamping-jaws and turning it over to reverse its relation to the former, and enabling the operator to bend the other part of the curve by pressing the sheet metal over the same or another former.

The object of my invention is to avoid such unclamping of the machine and reversing of the sheet metal; and my improvements consist in the attachment to a cornice-bending machine adapted to form a succession of angular bends in the same sheet of metal of complementary formers adapted to produce reverse curves in the same sheet of metal adjacent to such angular bends by a single actuation of the hinged leaf.

In cornice-brakes adapted to form a succession of acute or right angles in the sheet metal the metal bar (or former) provided with a convex edge has always been attached to one of the clamping-leaves in such position that

the movement of the hinged leaf would operate to fold the metal over the edge of such bar and produce a corresponding curvature therein; but in my invention the hinged leaf is also provided with a bar (or former) having a convex or projecting edge, which is adapted to produce a curvature in the sheet metal opposite to that produced by the former or bar upon the clamping-leaf. I therefore employ two formers operating conjointly, and as they are intended to be opposed to one another in their action upon the sheet metal I form the projection or projections upon one to fit the grooves or depressions upon the other, their opposite construction thus rendering them complementary to one another and capable of producing opposite bends simultaneously. The former upon the hinged leaf thus operates not only by folding the metal around the upper former, but by compressing the metal between two complementary protuberant and salient surfaces, so as to impart to the metal at a single operation the entire shape of such forming-surfaces.

As the same formers or complementary dies may be affixed to the two leaves in various relations to the plane of the clamping-jaws and the metal held between them, it is obvious that the hinged die or former may operate to bend the sheet metal more or less before compressing and shaping it into salient angles, and that the effect of such compression in molding the sheet metal may be greatly varied in relation to such parts of the metal as have been already bent or are still unaffected. With such complementary dies affixed to the upper and hinged leaves it is also possible to bend and shape the metal by the mere closing of the clamping-leaves, and to effect such closing with suitable force, so as to shape the metal effectively, I provide the upper clamping-leaf with a foot-treadle, and so connect it that the opening of said leaf is affected by a counter-balance, and the power of the foot may then be applied to the closing of the leaf, and thus to actuate the shaping-dies.

I am fully aware that complementary formers have been extensively used in special machines designed to duplicate a large number of uniform objects, as eaves-troughs and moldings of a specified pattern, as may be

seen in United States Patents Nos. 63,012, 85,531, 115,281, and 246,736, and I do not therefore claim as my invention the formation of a reverse bend in sheet metal by a single operation of complementary formers, nor the combination, broadly, of such complementary formers with a clamping device to hold the sheet metal during the bending operation; but I am not aware of any machine of the general character hereinbefore specified that is adapted to produce in the same sheet of metal a succession of angular bends and reverse curves by one movement of the hinged leaf, and consider that I have entirely changed the functions of the ordinary cornice-brake by applying a convex former to the turning leaf to operate in conjunction with a convex former upon the fixed or clamping leaf.

My invention also includes the combination, with the separate opposed formers or complementary dies, of adjusting-slides, by which they are held upon the respective leaves, and by which they are adjusted in the right relation to one another and to the plane of the sheet metal.

The invention is fully shown in the annexed drawings, in which Figure 1 is an end view of a machine provided with certain of my improvements. Fig. 2 is a plan view of the same. Fig. 3 is a section of the three leaves only on line *x x* in Fig. 2, with a single concave die on the hinged leaf. Fig. 4 is a similar section with complementary corrugating dies or formers upon the hinged leaf and upper leaf. Fig. 5 is a similar section with a four-sided former on the upper leaf and a compound-faced die on the lower leaf. Fig. 6 is a similar section of the parts shown in Fig. 5, with the exception of the form given to the lower die. Fig. 7 is a vertical section of the whole machine on line *x x* in Fig. 2.

In this construction the lower leaf, A, is secured rigidly to the leg of the frame B, and the upper leaf, C, is connected with a treadle, T, by links T', so as to be moved by the foot of the operator.

T² is a treadle-shaft journaled in the frame B; T³ T⁴, cranks on the ends of the shaft, and U a counterbalance-weight attached to the shaft by an arm, U'.

In Fig. 1 the weight is shown proportioned to merely balance the weight of the treadle, and the cranks are turned opposite to the treadle, so that the depression of the latter serves to merely raise the leaf C for the insertion of the sheet metal to be bent or pressed into shape.

E are vertical guide-pins upon the leaf A, near its ends.

E' are boxes fitted to move transversely in slots F in the ends of the leaf C, and provided with holes to fit the pins E, and with screws F', to adjust the boxes and to hold them in the desired position in the slots.

G are bevel-gears; G', a longitudinal shaft mounted upon the rear side of the leaf C, to operate the screws F' simultaneously.

i are slots formed through the tops of the pins E, and H are wedges actuated by a lever, H², pivoted centrally upon the top of the leaf C. j are guide-lugs formed on the tops of the boxes E', to retain the wedges opposite the slots when the wedges are retracted by moving the lever H² in the direction of the arrow H'.

The construction of the wedges and pins E is more fully shown and claimed by me in the copending application No. 168,705, and is not therefore claimed specifically herein.

In Figs. 1 and 2 an adjustable plate or slide, C', is shown applied to the upper leaf, C, and secured thereto by bolts C², fitted to slots c² in the slide. The front edge of the plate is shown with an acute angle, as is required in making sharp bends; but in Fig. 4 the front edge of the plate is shown converted into a corrugated die. In the other figures the plate C' is shown provided with a ridge, c', having a concave face on its lower side, to serve as an abutment for the removable dies or formers commonly applied to the upper leaf.

D is the hinged leaf, having pivots D² mounted in bearings D³, formed on the frame B, and provided at its lower edge with the usual turning-handles, I.

J are levers affixed to the pivots D², J' weights on the same to balance the leaf D in its rotary movements, and J² curved bars attached to the weights and extended forward concentric with the pivots D², to serve as handles for turning the leaf when the handles I are inaccessible by the projection of the sheet metal over the leaf D, as often occurs before the metal is bent.

D' is a slide affixed to the face of the leaf D by bolts D³, and e, Figs. 2 and 5, are screws fitted to lugs f upon the leaf D, and to nuts g upon the slide D'.

K is a shaft fixed in bearings on the leaf D, and connected with the screws e by bevel-gears e', so that the screws will turn alike when a wrench is applied to the square formed on the head of each.

l l are detachable clips inserted in sloping slots l', formed in the face of the slide D', the outer ends of the clips being projected toward the turning center, and offset from the slide sufficiently to admit the flanges of different formers or dies, as shown at s' s' s' s' in Figs. 3, 4, 5, and 6. One of the clips is shown in its slot in Fig. 2, and one of the slots is shown empty in the same figure.

In Fig. 5, A' is a slide affixed to the lower leaf by means of steadying pins or bolts a², with its upper edge at a level with the leaf A, and a³ are additional holes formed in the slide to sustain the same in a higher or lower position, as is required in certain bending operations not described herein, but claimed in my copending application No. 168,705.

The dies shown in Figs. 3 to 7, inclusive, operate to form reversed bends or curves in the sheet metal in a single operation, and thereby differ from the formers heretofore used

in cornice-brakes in the following respects: The hinged leaf in the brake has heretofore been regarded merely as a bending agent, and has therefore generally been formed with a flat face extending from the center of motion radially, and it operated by merely pushing the metal which projected from the other leaves upward around any pattern or former that was fixed upon the upper leaf. A plate has also been heretofore applied to the face of the hinged leaf, and provided with a sharp edge to press the sheet metal more effectively toward the former upon the upper leaf; but in such case the edge only of the plate has operated against the sheet metal to bend it over a convex surface. In any cases wherein a surface other than radial has been formed upon the hinged or turning leaf the sheet metal has been merely bent over such convex surface by the use of some agent which touched the metal in a mere line, and operated exclusively by bending the metal without compressing the same.

In my invention reversed and compound curves and bends may be made at one operation, as dies formed of opposite (or complementary) sectional form are employed and operate independently of the bending, which they may effect in the metal before the dies close, to finally press the metal closely between the opposed faces, and to press the metal in a single operation into any compound curve or bend that may have been formed in the dies.

In the drawings various ways are shown of applying and operating such dies, the latter being preferably attached to the leaves close to the turning center, so that the leverage given to the turning leaf by its handle I or J² may be most effective in pressing the dies together upon the metal. The stationary die may also be fixed upon its leaf in any desired relation or angle to the joint of the leaves which clamp the metal, so that the bends or curves given to the metal by the dies may be in the general plane of the sheet, or at any angle therewith. The corrugated die *s'* shown in Fig. 4 is drawn in full lines at right angles to the plane of the sheet metal *m*, and in dotted lines in the same plane to show the application of this principle, and the die is shown held to the face of the upper leaf, C, by pins *t*², secured in the flange *t'* of the die, and fitted to suitable holes in the face of the leaf. Such a fastening is quite suitable when the operative pressure is toward the face of the upper leaf, and the die can thus be readily removed and another replaced. The same means may be used for holding a die upon the surface of the adjustable slide C', and the die is then fitted by its connection with the slide, both for positive adjustment and for convenient removal.

In Fig. 7 is shown the construction by which the treadle is adapted to press the upper leaf downward with sufficient force to form certain shapes between the complementary dies without operating the hinged leaf D. In this view

the treadle-shaft is shown provided with cranks T¹, projected toward the front of the machine, and with a counter-balance, U², opposed to the cranks and having sufficient weight to entirely lift the upper leaf. The leaf is then held normally open, as shown in the figure, except when pressed down by the operator or locked by forcing the wedges H into the slots *h*. This construction enables the operator to adjust the sheet metal *m* between the leaves without sustaining the upper leaf, and to then bring the leaf down with considerable force for the purpose of pressing the complementary dies strongly together.

In Figs. 5 and 6 is shown a die in the nature of a four-sided loose bar formed with four channels, *s*³, of slightly-different curvatures in its four sides or faces, and with four rounded corners, *s*², adapted to fit singly into the concave face of the ridge *c*¹. Such a die or former may be used in conjunction with several kinds of complementary dies, as the die *s*⁶ shown in Fig. 5, and formed with a single groove, *v*, and single ridge *v'*, or that shown in Fig. 6, formed with two grooves, *v*, and one ridge, *v'*. The first construction is also shown ready for operation in Fig. 7, where the upper leaf, C, is shown raised, with the sheet metal laid upon the lower leaf and on the ridge *v'*, preparatory to bending. With this construction the mere depressing of the upper leaf suffices to complete the shaping of the sheet metal with the entire reflex curve formed on the die *s*⁶, as plainly appears in Fig. 5, where the parts are shown at the close of the bending operation, with the metal *m* bent first into an upward and then into a downward curve.

In Fig. 6 the lower die, *s*⁷, is so arranged upon the leaf D as to require a partial rotation of the latter to shape the metal, the latter being first bent around the lower corner, *s*², upon the four-sided die, and finally pressed into the outer groove, *s*³.

In Fig. 3 a reversible former, *s*, is shown upon the slide C', opposed to a grooved die, *s*⁴, which is adjusted upon the leaf D to fit the projected edge of the former *s* when the leaf C is depressed. The depression of the leaf C thus effects the bending of a quarter-turn of small radius without the necessity of operating the hinged leaf at all.

It will be seen that all the dies or formers shown are arranged to operate by compressing the metal *m* between surfaces which are complements of one another, a groove on one being placed opposite to a ridge on the other, or a convex form on one being opposed to a concave on the other. I have also shown how the depression of the upper leaf may be made to operate the opposed die-surfaces, and how the treadle may be arranged and connected with the said leaf so as to depress the same with all the force that the operator can produce by the leverage of the treadle employed.

Having thus fully described my improvements, I claim the same in any kind of cornice-brake to which they may be adapted.

The outer face of the sliding plate D' corresponds in the drawings with a radial line from the center of the turning pivots, so that the inner sides of all the dies or formers in Figs. 3 to 7, inclusive, coincide with the center of the turning motion; but the slide and dies may be made of other proportions, as may be found desirable.

I am aware of United States Patent No. 83,128, which shows in a grooving-machine a square-cornered bar provided with grooves upon several of its faces to co-operate with a grooving-roller, and I do not therefore claim merely a grooved bar in the former shown herein with rounded corners s^2 and grooved sides s^3 .

Having thus set forth my invention and distinguished it from others of the same class, what I claim herein is—

1. The combination, in a cornice-bending machine of the class herein shown and described, of the fixed lower leaf, A, having attached thereto bearings D³, for the pivots D², the hinged leaf D, mounted upon such pivots, the vertically-movable leaf C, provided with an acute front corner and operated in conjunction with the lower leaf to clamp the sheet metal adjacent to the turning center for bending acute or right angles, and complementary curved formers detachably held upon the outer faces of the upper leaf, C, and the turning leaf D, and adjusted to operate upon the sheet metal projected from between the fixed leaf A and the clamping-leaf C, the leaf C being connected with a treadle and provided with a suitable locking device when closed upon the sheet metal, and the turning leaf being provided with means to turn it in the bearings D³, substantially as and for the purpose set forth.
2. In a machine for bending sheet metal, the combination, with the top leaf and a die or former thereon, of a hinged leaf provided with a suitable presser-die, and with open clips for holding the die detachably thereon.
3. In a machine for bending sheet metal, the combination, with a stationary leaf and a die or former thereon, of a hinged leaf provided with an adjustable slide having means to hold a complementary die thereon.
4. In a machine for bending sheet metal, the combination, with the top leaf, of an adjusta-

ble slide applied to its outer face and provided with means, as abutment e^4 , for holding a former in an operative position, substantially as and for the purpose set forth.

5. In a machine for bending sheet metal, the combination, with the top leaf and the hinged leaf, of adjustable slides and complementary dies applied to the adjustable slides, substantially as herein shown and described.

6. In a cornice-bending machine operated substantially as herein described, and having a fixed lower leaf, A, a movable clamping-leaf, C, and a hinged turning leaf, D, the combination, respectively, with the leaves C and D, of the detachable bar constructed with rounded corners s^2 , and grooves or channels s^3 , of various curvatures, formed in its different faces, and the die or former applied to the turning leaf and provided with ridge v' , adapted to press the sheet metal into such grooves or channels, substantially as and for the purpose set forth.

7. The combination, with an abutment upon the top leaf, of a former having grooves formed upon two or more sides and adapted to be turned into different positions in contact with the abutment and to present the different grooved sides to a complementary former upon the hinged leaf.

8. In a cornice-bending machine operated substantially as herein described, and having a fixed lower leaf, A, a movable clamping-leaf, C, and a hinged turning leaf, D, the combination, with the leaves C and D, of complementary formers attached, respectively, to said leaves, and the former upon the turning leaf being extended above the level of the adjacent leaf to bend the sheet metal when the clamping-leaves are closed, and before the hinged leaf is turned, and means for pressing the clamping-leaves together and for turning the leaf D upon its pivots, substantially as herein shown and described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

GEO. A. OHL.

Witnesses:

THOS. S. CRANE,
HENRY J. THEBERATH.