(No Model.) 2 Sheets—Sheet 1.

A. O. KITTREDGE & T. S. CRANE.

CURVED MOLDING MACHINE.

No. 414,056. Patented Oct. 29, 1889.

Fig. 1

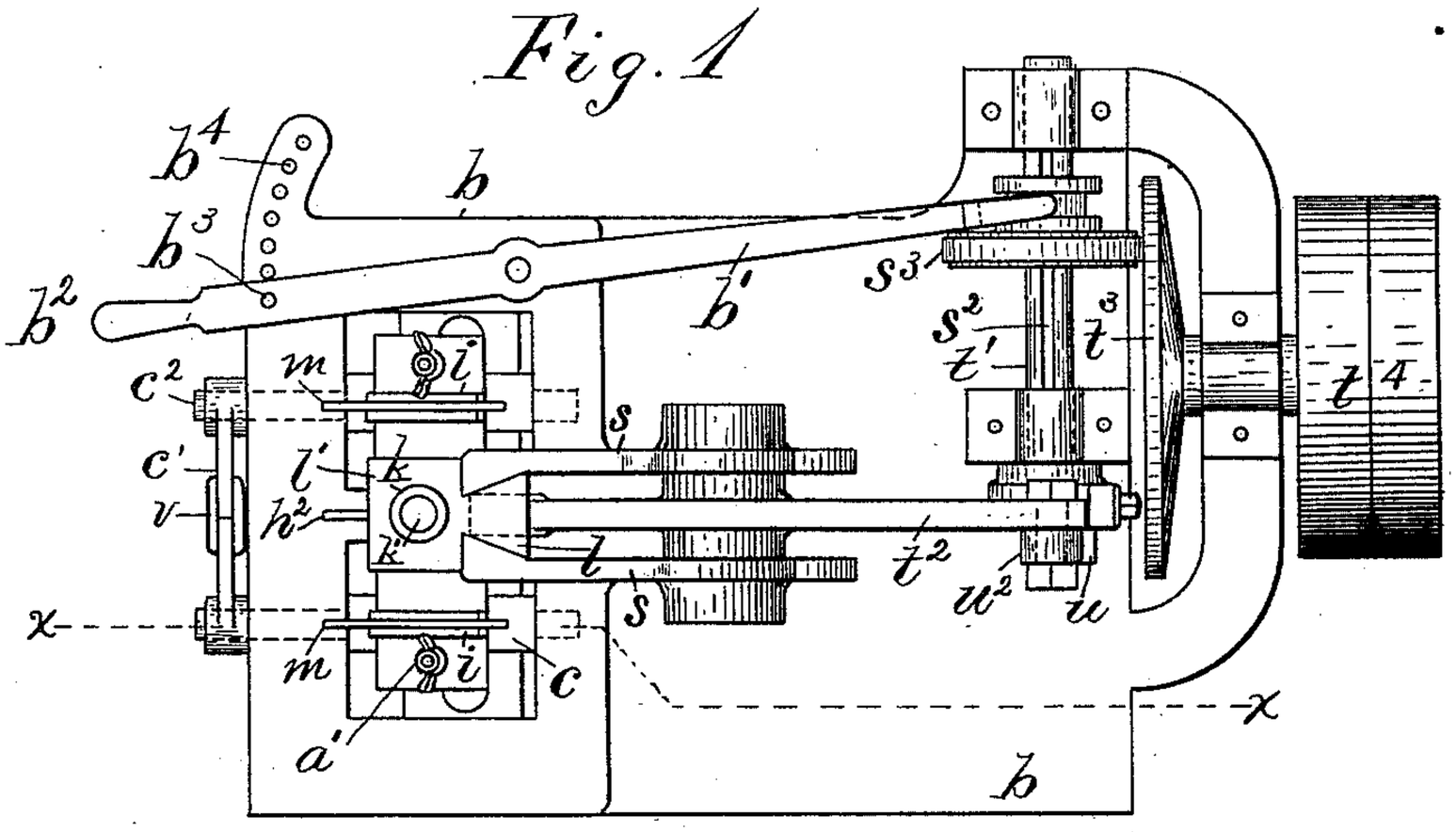
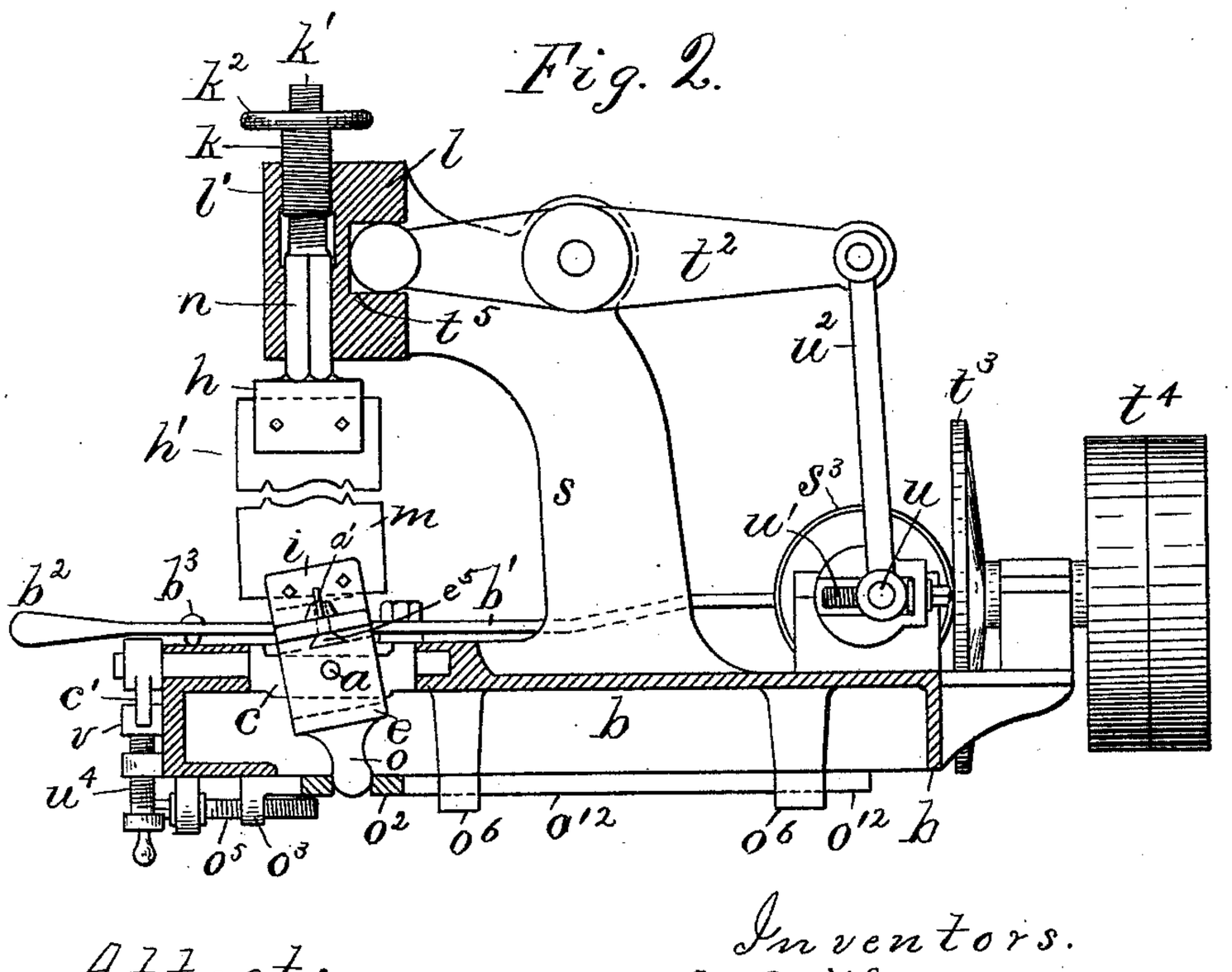


Fig. 2.



Attest:
L. Lee.
F. C. Fischer.

Inventors.
A. O. Kittredge and
Thos. S. Crane, per
Crane & Miller, Attys.

N. PETERS. Photo-Lithographer. Washington, D. C.

(No Model.) 2 Sheets—Sheet 2.

A. O. KITTREDGE & T. S. CRANE.

CURVED MOLDING MACHINE.

No. 414,056. Patented Oct. 29, 1889.

Fig. 5.

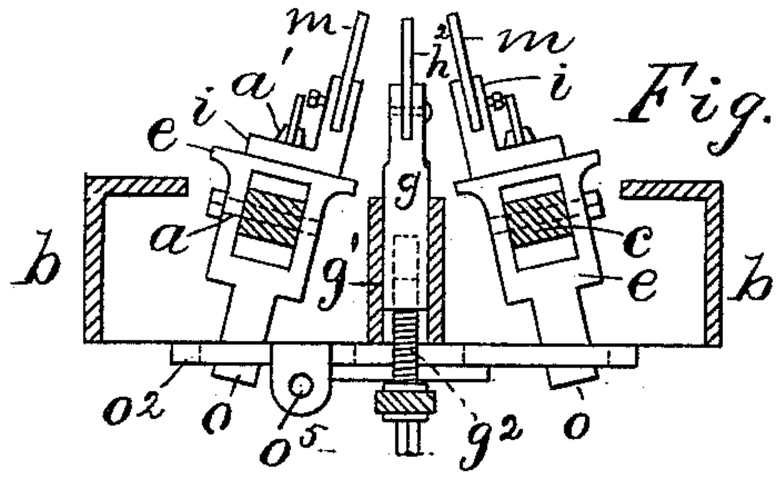


Fig. 8.

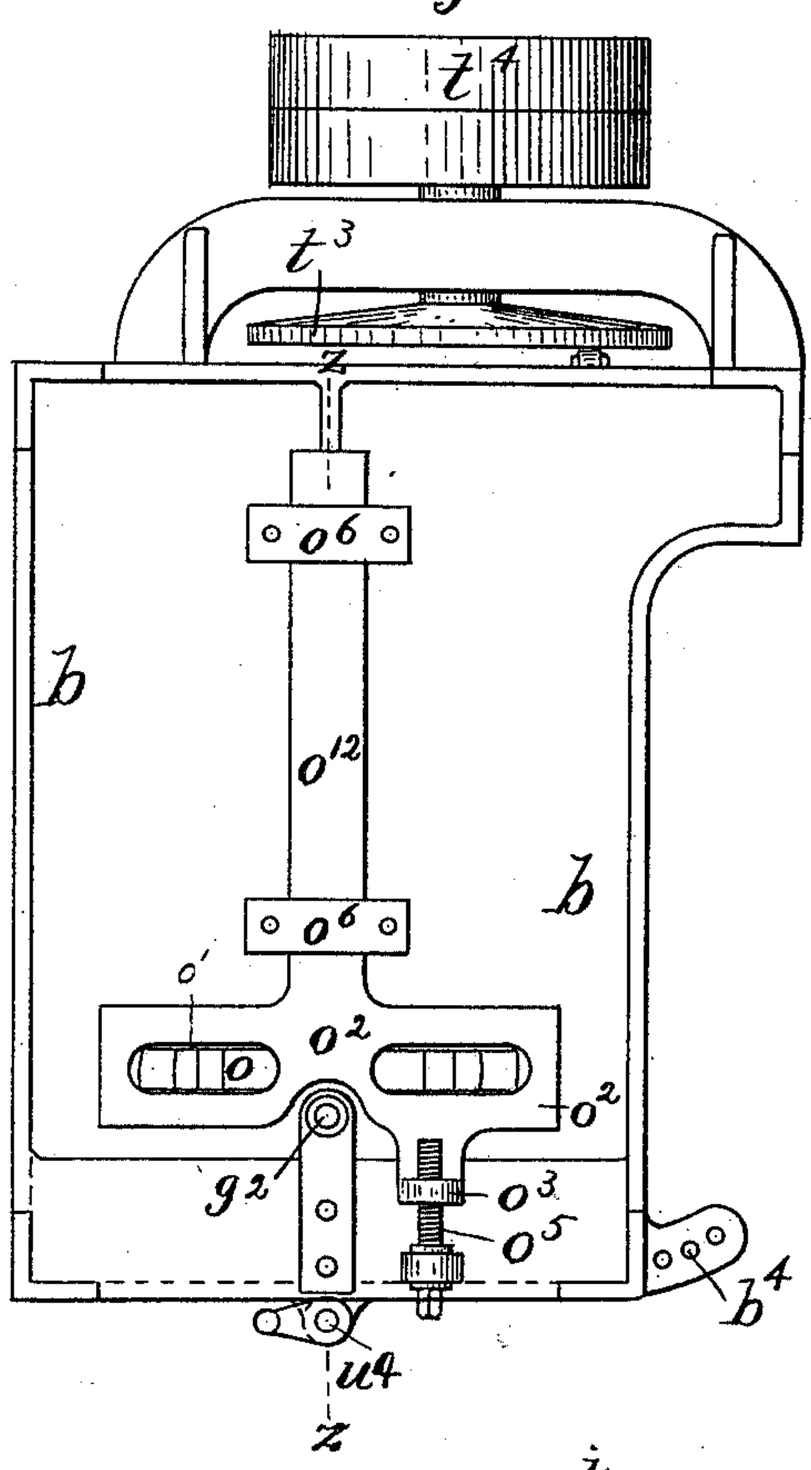


Fig. 4.

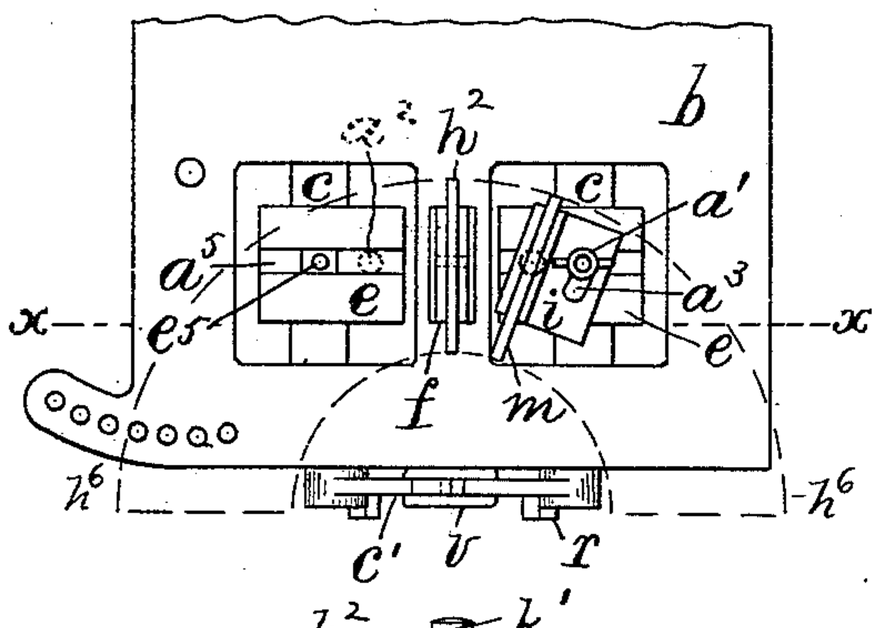


Fig. 3.

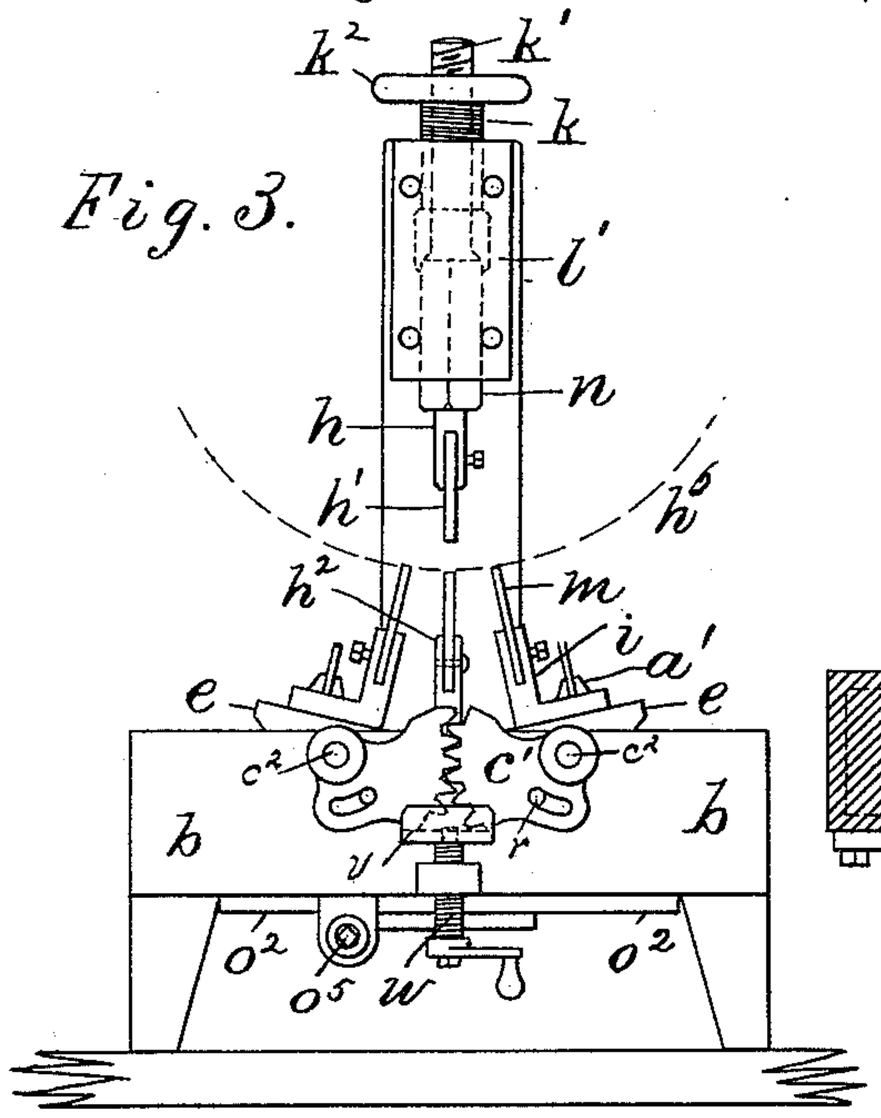


Fig. 7.

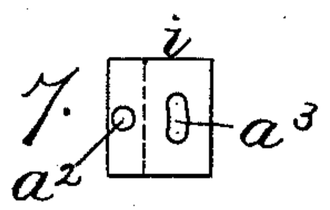
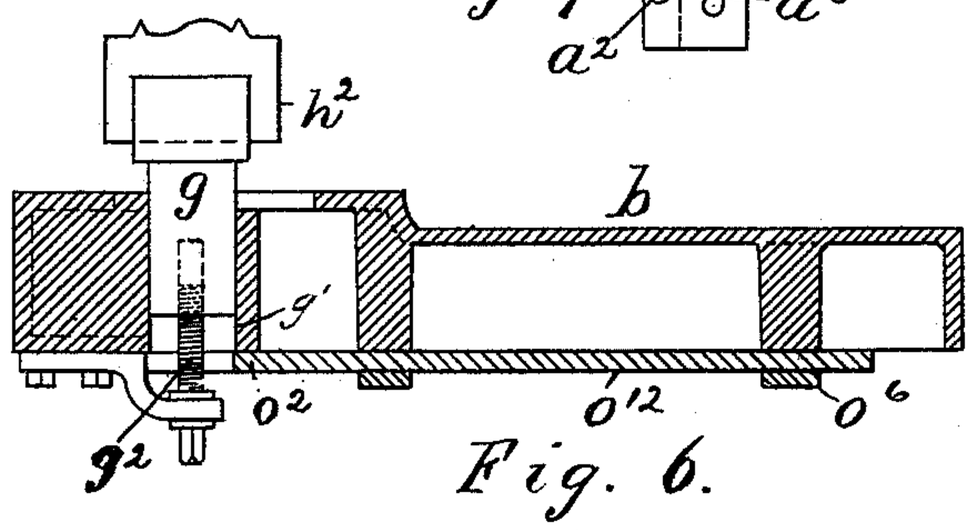


Fig. 6.



Inventors.
A. O. Kittredge and
Thos. S. Crane, per
Crane & Miller, Attys.

Attest:
L. Lee.
F. C. Fischer.

UNITED STATES PATENT OFFICE.

ANSON O. KITTREDGE, OF SLATE HILL, NEW YORK, AND THOMAS S. CRANE, OF EAST ORANGE, NEW JERSEY, ASSIGNORS TO THE VULCAN COMPANY, OF PENNSYLVANIA.

CURVED-MOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 414,056, dated October 29, 1889.

Application filed February 6, 1889. Serial No. 298,796. (No model.)

To all whom it may concern:

Be it known that we, ANSON O. KITTREDGE, of Slate Hill, Orange county, New York, and THOMAS S. CRANE, of East Orange, Essex county, New Jersey, citizens of the United States, have invented certain new and useful Improvements in Curved-Molding Machines, (sheet metal,) fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to furnish a means for adjusting forming-dies in suitable relations to a pressing-die to shape a strip of sheet metal into a curved molding of any required radius. Such moldings, being always provided with longitudinal beads or angles, require the operation of crimping-tools, while the curvature of the molding necessitates the simultaneous use of bending-tools to curve the strip of metal during the crimping operation. The forming-dies for bending and crimping such a molding therefore consist in a fixed and a movable crimping-die, with a lateral or bending die arranged at each side of the fixed die, with its operative surface sustained above the level of the fixed die at a suitable point to produce the required curvature in the metal when crimped.

Heretofore a patent, numbered 171,917, has been issued, on January 11, 1876, for the combination of two bending-dies arranged at opposite sides of the crimping-dies and adjustable vertically, so as to produce the desired curvature in the sheet metal when laid thereon; but no means has heretofore been devised for simultaneously adjusting such lateral dies in the various angles and positions necessary to produce the oblique curvatures frequently required in curved cornice-moldings.

The invention consists partly in the combination, with such lateral dies, of carriers therefor mounted upon pivots and connected together to move simultaneously, the carriers in some cases being mounted each upon two pivots, so as to rock transversely and longitudinally to the fixed die; partly in the means for connecting such carriers to move in opposite directions; partly in means for adjusting the die-holders in relation to the carriers; partly in the combination, with movable and fixed crimping-dies and lateral bending-dies connected together and adapted to be moved simultaneously, of means for varying the speed of the vibrating die when in operation, and, in some cases, of means for varying the stroke of the vibrating die and for adjusting it in relation to the fixed die, to increase or diminish the pressure upon the sheet metal; and in other details of construction hereinafter described and claimed.

In the drawings the improvements are shown applied to a machine built upon a flat bed and having the movable crimping-die sustained above the bed by a goose-neck, to introduce the sheet metal readily beneath it; but the form of the bed and the design of the machine is wholly immaterial if the adjustments be provided that are claimed herein.

Figure 1 is a plan of the machine; Fig. 2, a side elevation of the same, the carrier for the movable die being shown in section at the center line and the bed being shown in section on line $x\,x$ in Fig. 1. Fig. 3 is a front elevation of the machine; Fig. 4, a plan of the lower die-holders, with the bed adjacent thereto; Fig. 5, a transverse section of the bed and its attachments on line $x\,x$ in Fig. 4, with the parts in section where hatched. Fig. 6 is a longitudinal section of the bed and the fixed die-holder on line $z\,z$ in Fig. 8. Fig. 7 is a view of the foot of a lateral die-holder inverted, and Fig. 8 is a view of the under side of the bed.

b is the bed, having the three lower dies sustained upon its front end, the lower crimping-die h^2 being mounted in a holder g, which is fitted movably within a vertical slot g' in the bed and adjusted vertically therein by a screw with shank g^2.

c are bars pivoted in the bed parallel with the die h^2, at opposite sides of the same, the pivots c^2 being extended to the front of the bed and provided with toothed segments c' to rotate them in opposite directions.

m are the lateral dies carried in holders i,

fitted upon seats upon the top of carriers *e*, pivoted by bolts *a* upon the bars *c* and provided with tail-pieces *o*, which project below the bottom of the bed and fit within slots *o'* in a movable guide o^2.

The guide, as shown in Fig. 8, is formed upon a slide o^{12}, which is held in ways o^6, so as to be moved parallel with the bars *c* by a screw o^5, fitted to a nut o^3 upon the guide.

The feet of the holders *i*, as shown in Fig. 7, are provided each with a pin a^2, fitted to a groove a^5, formed in the seat upon the top of the carrier *e* transversely to the die h^2, and a bolt e^5 has its head fitted to such groove, as shown in Fig. 2, with a nut *a'* to clamp the holder upon the seat in the desired position. At the left side of Fig. 4 the holder is shown removed, the position of the pin a^2 in the groove indicated, and the bolt e^5 shown in the groove. The holder in the right side of such figure is shown turned upon the pin a^2 and clamped at a horizontal angle with the die h^2. It will be noticed that the rotation of one of the bars *c* is communicated by the segments *c'* to the other bar in an inverse direction, so that the setting of one of the dies *m* in any given vertical angle operates automatically to set the opposite die at a similar opposed angle, and the clamping of either of the bars operates similarly to clamp the other bar in its opposite position through the medium of the segments *c'*. A screw *w* is provided beneath the segments and connected by a swivel upon its point with a shoe *v*, which embraces the lower edges of the segments and operates to support them both simultaneously against the downward pressure upon the lateral dies, and the segments are shown provided with slots adapted to receive bolts for clamping the segments to the bed *b* when adjusted. The bolt-heads are shown in Fig. 4; but only holes (lettered *r* in Fig. 3) are shown where the slots are exhibited, as the heads of the bolts would obscure the slots if such heads were shown in Fig. 3. A set-screw may be applied to either or both of the bars in any other convenient manner. The guide o^2 is provided with a shank o^{12}, which moves in the ways o^6, parallel with the die h^2, and therefore operates to tip both the carriers *e* simultaneously at the same angle shown in Fig. 2.

The mounting of the holders *i* upon the seats on top of the carriers *e* permits of their lateral adjustment to and from the fixed die h^2, while the lateral dies are also capable of being set independently in any desired horizontal angle by turning the holders *i* upon the pin a^2 in the slot a^5, as shown at the right side of Fig. 4.

The dies are all shown in the drawings formed as flat plates clamped in the holders by set-screws, as in the holders *h* and *i*, or by a pin through the die h^2, as in Figs. 3 and 5. By the use of a set-screw or analogous device the dies may be held in different relations to the holders to bring their operative faces into the proper relation when tipped at various angles, as is indicated in Fig. 2.

The upper crimping-die *h'* is carried in a vertically-vibrating holder *h*, formed upon the end of a square shank *n*, which is adjustable by means of a screw *k* and screw-stem *k'* in a reciprocating holder *l'*. The holder is fitted by means of a tongue *l* to a dovetail in the top of a goose-neck column *s*, the base of which is attached to the bed in the rear of the dies to permit the edge of the sheet metal to project below the lower die. A crank-shaft *t'* is mounted upon the bed behind the column or goose-neck, and is provided with an adjustable crank-pin *u*, movable in a slotted crank in the ordinary manner by a screw *u'*, and serving, by means of a link u^2, to actuate a lever t^2, pivoted upon the goose-neck and fitted to a notch t^5 in the back of the tongue *l*. The rotation of the crank thus serves to oscillate the lever and reciprocate the carrier *l'* to vibrate the movable crimping-die to and from the fixed die h^2.

The square shank of the holder *h* prevents the holder from turning in the carrier, while permitting of adjustment therein, and the means for adjustment is shown as a screw-stem *k'*, fitted within a screw-sleeve *k*, which is tapped in the top of the carrier. The stem and sleeve are provided, respectively, with right and left hand threads, so that the turning of the sleeve in the carrier operates to move the shank *n* longitudinally therein. The sleeve *k* is provided with a hand-wheel k^2, by which it can be turned while in operation, as the hand can be held upon the wheel while the die is vibrating upon the sheet metal. Such means of adjustment during the crimping operation is of great value, as it avoids the use of preparatory and finishing dies and enables the operator by gradually approximating the dies to work the sheet metal gradually into the desired form, the crimping-dies being preferably set at a given distance, while the molding or sheet metal is run through from end to end at the first operation. The dies may then be approximated without stopping their vibratory movement and the sheet metal run through them again, and the operation repeated as often as is necessary until the desired form for the molding is produced. The lower crimping-die may also be adjusted during the crimping operation, if desired, by applying a crank to the screw g^2 and turning the same to move it vertically, and the angular adjustment of the lateral dies *m* may be also varied in respect to their vertical angles in two planes during the crimping operation by operating the screw *w* to move the bars *c*, or the screw o^5 to move the guide o^2.

The crank-shaft is shown driven by a friction-wheel s^3, which is mounted movably upon the shaft in contact with a driving-disk t^3, actuated by fast and loose pulleys t^4. The

friction-wheel is driven by a spline s^2 upon the crank-shaft, and may be moved while the machine is in operation by a lever b', pivoted upon the bed b, with a handle b^2 extended to the front of the bed, and provided with a pin b^3, fitted to a series of holes b^4 to retain it in any desired position. The pin b^3 may be fixed in the handle and the lever made to spring sufficiently to withdraw the pin from the holes when desired.

The operation of the machine is as follows: The lateral dies are adjusted in the desired angles to suit the required molding. The lower crimping-die is then set at the desired distance below the tops of the lateral dies, and the stroke of the vibrating die h^2 adjusted to suit the character of the molding by means of the screw u'. The holder h is then adjusted upon the vibrating carrier to make the die h' operate in the desired degree upon the sheet metal, and the metal is introduced between the dies, as shown by the dotted line h^6 in Fig. 3, which represents the curve of the finished molding. As stated above, the sheet metal may be moved back and forth between the crimping-dies, with the adjustment of such dies varied from time to time to gradually complete their operation in forming the molding, the die h^2 being raised or lowered, if required, during the crimping operation, to adjust the curvature of the molding in the required degree. Without shifting the driving-belt upon the pulleys t^4, the crimping operation may be arrested by shifting the friction-wheel s^3 to the center of the disk, and as the velocity of the crank driven by the friction-wheel increases with the distance of such wheel from the center of the disk the velocity of the crimping-die may be easily adjusted to suit the resistance of the sheet metal and the form of the dies by gradually moving the handle b^3 until the friction-wheel is properly adjusted.

It will be seen from the above description that the construction permits the adjustment of the dies in every desired position to press the sheet metal into the form of a curved molding, and that the action of the dies upon the sheet metal may be fully tested by the operator when first applying the sheet metal, and then varied in any required degree while the machine is in operation to produce the required results without the necessity of stopping the machine to change the tools. The quality and quantity of the work produced is thus greatly increased.

Two dotted curves h^6 are shown in Fig. 4, representing the opposite edges of the sheet-metal when cut into segmental shape to form an arched molding. When crimping such moldings, the lateral dies are set out of line with the center dies, which is easily effected by sliding the dies forward in their holders i, and the crimping-dies are preferably clamped in their holders with their rear edges closer together than the two corners, so as to pinch the sheet metal harder upon the convex side of the curve, and thus stretch it to compensate for the stock which is taken up in crimping.

The difference of opening between the front and rear corners of the dies is somewhat exaggerated in the drawings; but would be readily adjusted to suit the required operation of the dies if the rear corners were placed in contact.

Having thus set forth the nature of the invention, what is claimed herein is—

1. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of lateral bending-dies connected together and adapted to be moved simultaneously upon opposite sides of the crimping-dies, substantially as set forth.

2. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of lateral bending-dies provided with movable carriers, and a connection between said carriers for moving the lateral dies simultaneously, substantially as set forth.

3. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of lateral bending-dies provided with carriers supported each upon two pivots and thereby adapted to rock in two different directions, and a connection between said carriers for rocking them simultaneously, substantially as set forth.

4. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of lateral bending-dies provided with carriers supported each upon two pivots and thereby adapted to rock in two different directions, die-holders adjustable laterally upon the said carriers, and a connection between said carriers for rocking them simultaneously.

5. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of lateral bending-dies connected together and adapted to be moved simultaneously, and means, substantially as described, for adjusting the crimping-dies toward one another, as and for the purpose set forth.

6. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of lateral bending-dies connected together and adapted to be moved simultaneously, means for adjusting the crimping-dies toward one another to vary the pressure upon the sheet metal, and means for vertically adjusting the stationary crimping-die in relation to the lateral bending-dies to vary the curvature of the sheet metal, substantially as herein set forth.

7. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of lateral bending-dies connected together and adapted to be moved simultaneously, and means, substantially as described,

for adjusting the crimping-dies toward one another while in operation.

8. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of lateral bending-dies connected together and adapted to be moved simultaneously, a vibrating carrier for the movable crimping-die, and a die-holder fitted adjustably upon said carrier and movable thereon while in operation.

9. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of lateral bending-dies connected together and adapted to be moved simultaneously, a sliding carrier for the movable crimping-die, a movable die-holder fitted to a socket therein, and a screw movable with the carrier and adapted to adjust the holder and die upon the carrier, as and for the purpose set forth.

10. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of lateral bending-dies connected together and adapted to be moved simultaneously, a bed supporting the fixed dies and carrying the driving mechanism, a goose-neck column sustaining a movable carrier for the movable crimping-die, means for reciprocating the carrier upon the goose-neck, and a die-holder adjustable upon the carrier, as and for the purpose set forth.

11. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of a frame sustaining the fixed die removably, a pivoted bar mounted at each side of the fixed die, and a rocking carrier pivoted upon each bar and thereby adapted to rock longitudinally and transversely to the bar, as and for the purpose set forth.

12. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of a frame sustaining the fixed die removably, a pivoted bar mounted at each side of the fixed die, a rocking carrier pivoted upon each bar, a connection between the carriers to rock them simultaneously, and die-holders adjustable upon the carriers, substantially as set forth.

13. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of a frame sustaining the fixed die removably, a pivoted bar mounted at each side of the fixed die, a rocking carrier pivoted upon each bar, a connection between the carriers to rock them simultaneously, and a connection between the bars to rotate them in opposite directions, as and for the purpose set forth.

14. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of a frame sustaining the fixed die removably, a pivoted bar mounted at each side of the fixed die, a rocking carrier pivoted upon each bar, tail-pieces upon the carriers, an adjustable guide slotted to receive the tail-pieces, and toothed segments fitted to the pivoted bars and connected to rotate them in opposite directions, as and for the purpose set forth.

15. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of a frame sustaining the fixed die removably, a pivoted bar mounted at each side of the fixed die, a rocking carrier pivoted upon each bar, tail-pieces upon the carriers, an adjustable guide slotted to receive the tail-pieces, toothed segments fitted to the pivoted bars and connected to rotate them in opposite directions, and means for moving one or both of the segments to rock the lateral dies in opposite directions, as and for the purpose set forth.

16. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of a frame sustaining the fixed die removably, a pivoted bar mounted at each side of the fixed die, a rocking carrier pivoted upon each bar, tail-pieces upon the carriers, an adjustable guide slotted to receive the tail-pieces, toothed segments fitted to the pivoted bars and connected to rotate them in opposite directions, and means for clamping one or both of the bars when adjusted, as and for the purpose set forth.

17. In a sheet-metal-molding machine, the combination, with fixed and movable crimping-dies, of pivoted carriers arranged at opposite sides of the fixed crimping-die, and holders for lateral dies fitted to seats upon said carriers and movable to and from the crimping-die and rotary upon the said seats to set them at an angle with the crimping-die.

18. In a sheet-metal-molding machine, the combination, with fixed and movable crimping-dies, of pivoted carriers arranged at opposite sides of the fixed crimping-die, lateral die-holders provided each with a fulcrum-pin upon its under side and a slot in its foot, a groove in each carrier transverse to the fixed crimping-die to receive the fulcrum-pin, and a bolt and nut fitted to the groove and slot and operated to clamp the holder upon the carrier, as and for the purpose set forth.

19. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of lateral bending-dies connected together and adapted to be moved simultaneously, a bed supporting the fixed dies, a rotary driving-disk supported upon said bed, mechanism for vibrating the movable crimping-die, a friction-wheel for driving said mechanism, and a hand-lever for moving said friction-wheel to and from the center of the driving-disk while in operation to vary the speed of the movable die, substantially as herein set forth.

20. In a sheet-metal-molding machine, the combination, with movable and fixed crimping-dies, of lateral bending-dies connected together and adapted to be moved simultane-

ously, a bed supporting the fixed dies, a rotary driving-disk supported upon said bed, adjustable mechanism for vibrating the movable crimping-die with a variable stroke, a friction-wheel for driving said mechanism, and a hand-lever for moving said friction-wheel to and from the center of the driving-disk while in operation to vary the speed of the movable die, substantially as herein set forth.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

ANSON O. KITTREDGE.
THOS. S. CRANE.

Witnesses as to A. O. Kittredge:
FREDK. M. HILTON,
GEO. W. KITTREDGE.

Witnesses as to T. S. Crane:
L. LEE,
HENRY J. MILLER.