No. 879,415. PATENTED FEB. 18, 1908.

J. M. RUDE.

METAL SHAPING MACHINE.

APPLICATION FILED APR. 21, 1906.

2 SHEETS—SHEET 1.

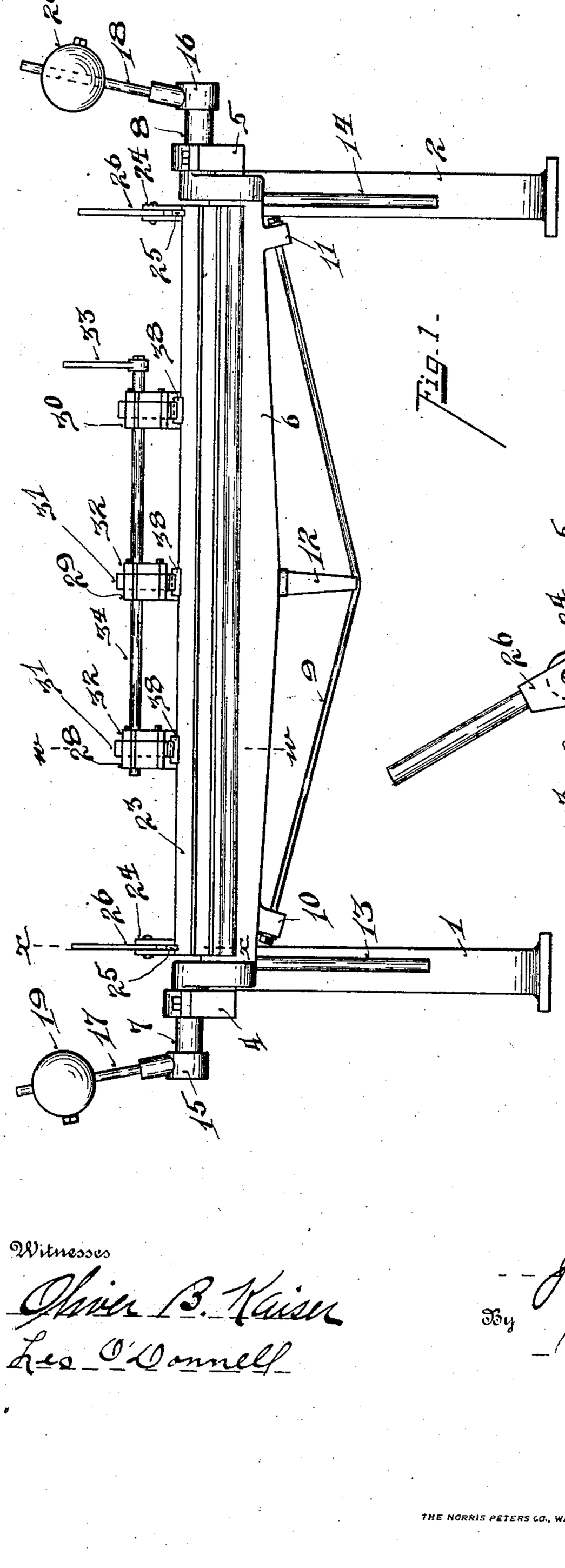

Fig. 1.

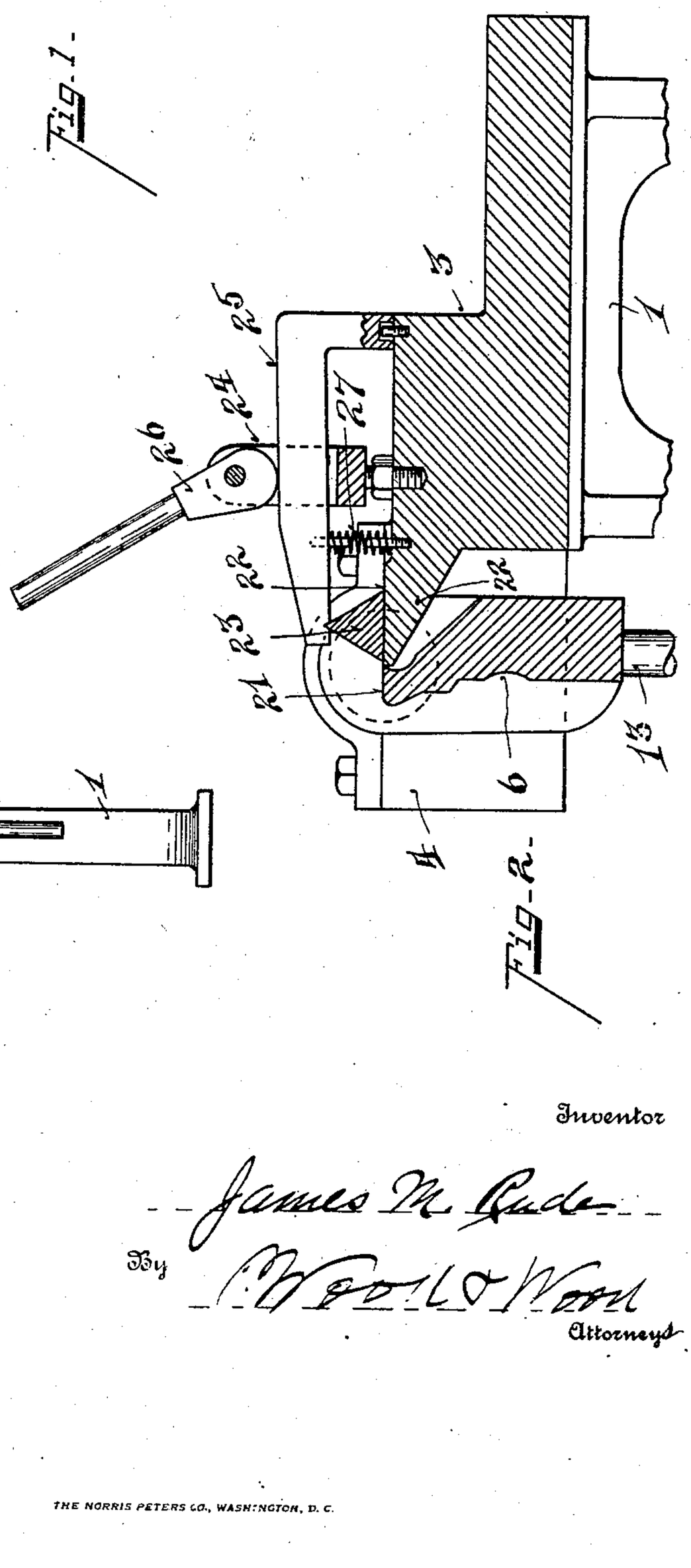

Fig. 2.

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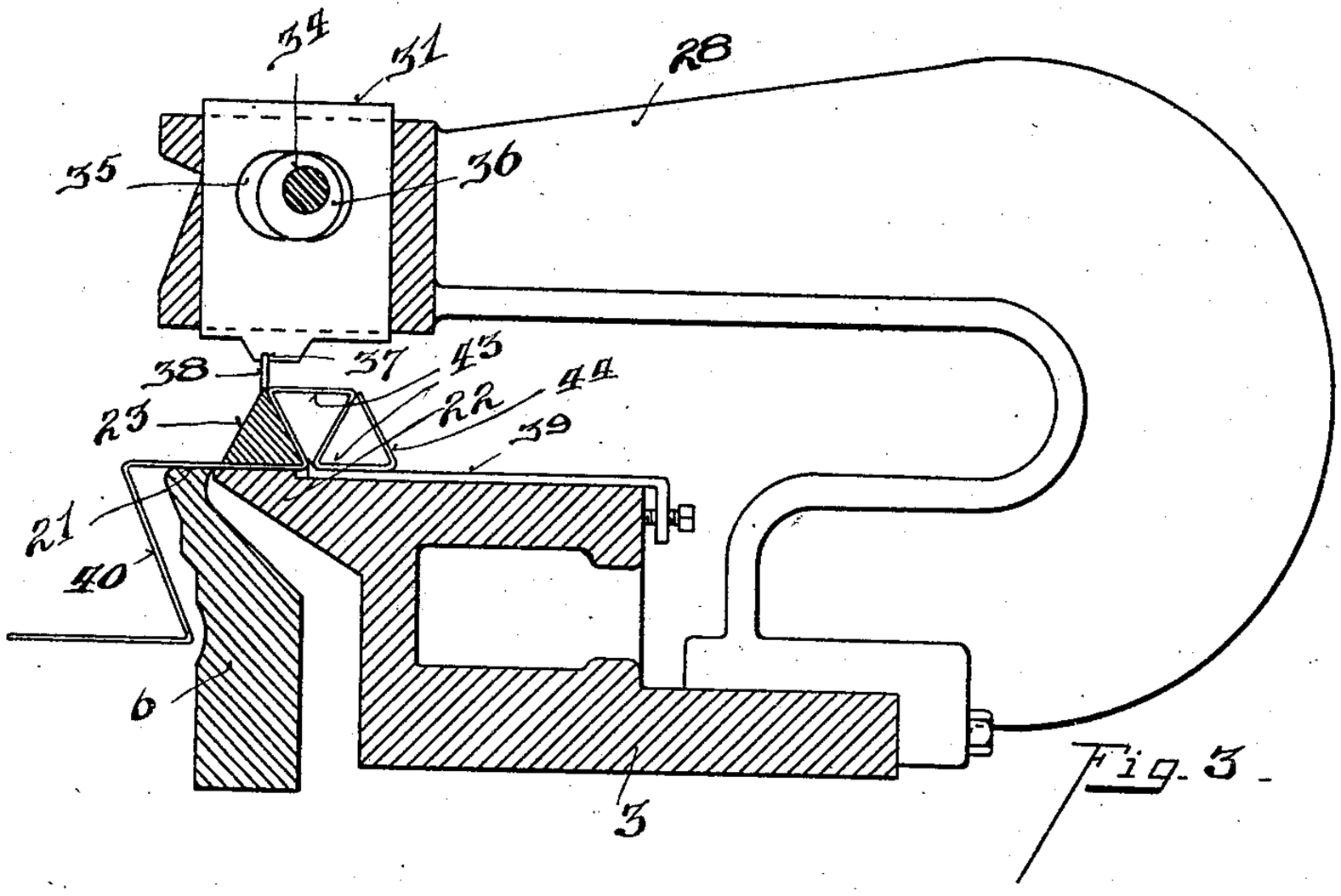

Fig. 3.

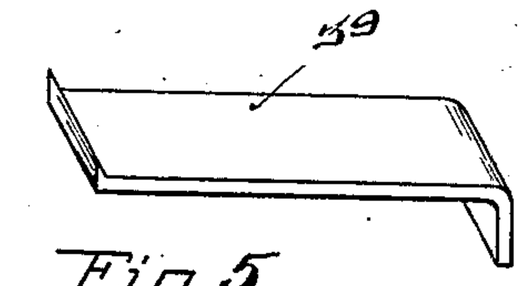

Fig. 5.

Fig. 6.

Fig. 4.

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UNITED STATES PATENT OFFICE.

JAMES M. RUDE, OF COVINGTON, KENTUCKY, ASSIGNOR TO NATIONAL CELLULAR STEEL COMPANY, OF NEW YORK, N. Y., A CORPORATION.

METAL-SHAPING MACHINE.

No. 879,415. Specification of Letters Patent. Patented Feb. 18, 1908.

Application filed April 21, 1906. Serial No. 313,018.

To all whom it may concern:

Be it known that I, JAMES M. RUDE, a citizen of the United States, residing at Covington, in the county of Kenton and State of Kentucky, have invented certain new and useful Improvements in Metal-Shaping Machines, of which the following is a specification.

My invention relates to a metal shaping machine.

The object of the invention is to provide a machine adapted to form cellular steel work constituting a structural element in fire-proof buildings. This structural element in its preferred design is illustrated in the United States patent to E. F. Baude, granted December 21, 1897, for construction of walls, partitions, ceilings, etc., of sheet metal.

A further object of my invention is to produce a machine in which the individual units or cells of the structural element may be successively formed from a continuous sheet of metal in a series of bending operations.

Further details of my invention relate to the construction and operation of the mandrel and sheet metal bender which constitute the shaping instrumentalities.

Other features of my invention will be more fully set forth in the description of the accompanying drawings, forming a part of this specification, in which:—

Figure 1 is a front elevation of the metal forming machine for forming cellular steel units. Fig. 2 is an enlarged section on line *x*, *x*, Fig. 1. Fig. 3 is an enlarged section on line *w*, *w*, Fig. 1, illustrating the head of the machine in position to effect a bend, showing several of the completed bends. Fig. 4 is a similar section to that of Fig. 3, but illustrating only so much thereof as to clearly show one completed bend. Fig. 5 is a perspective view of one of the gage plates. Fig. 6 is an enlarged perspective view of a portion of the mandrel, showing one of the mandrel anchoring lugs.

The general machine organization is best seen from Fig. 1, in which 1, 2, represent legs attached to the bed 3. The front end of the bed 3 is forwardly projected, and the under wall of this projection is rearwardly inclined, forming the ledge or table 22, upon which the work is supported during the bending operation, see Fig. 3. Upon the opposite ends of the bed are journal brackets 4, 5. 6 represents the bender provided at its opposite ends with axles 7, 8, journaled respectively in brackets 4, 5. The bender 6 is provided on its under side with lugs 10, 11, at opposite ends thereof and with the strut 12 between the lugs.

9 represents the tie-rod or brace, the ends of which are held by the lugs 10, 11, this rod being bent over the strut 12.

13, 14, represent handles for manipulating the bender 6 on its axis.

15, 16, represent collars fixed to the ends of axles 7, 8, respectively. Collar 15 carries rod 17 with a weight 19, and collar 16 carries rod 18 with a weight 20. The function of these rods and weights is to automatically return the bender to initial position after the shaping operation. In its normal position the bender 6 is suspended vertically, as shown in Fig. 2, with its bending surface 21 forming a continuation of the supporting table 22.

23 represents the mandrel, preferably triangular in cross section. The following elements are preferably employed for clamping the mandrel on the bed upon each side of the work.

24 represents a yoke adjustably secured to the bed 3, 25 a locking bar or clamping arm, preferably of bell crank shape, the forward end of which passes between the limbs of yoke 24, the rear end being loosely attached to the bed so that this clamping arm may have a slight pivotal movement. The front of this arm is V-notched to provide an engaging surface for the apex of the mandrel. 26 represents a cam lever pivoted between the limbs of yoke 24 the cam portion of which engages the clamping arm 25. 27 represents a coil spring for lifting the lock bar 25 out of engagement with the mandrel when the cam lever is released. This locking or clamping mechanism is employed at each end of the bed outside of the ends of the sheet metal to be shaped.

To centrally locate the mandrel relative to the bed, I provide the following index clamping mechanisms. 28, 29, 30 represent yoke arms, the rear ends of which are at-

tached to the rear of the bed 3. These arms thence extend rearwardly of the bed for a distance, and then describing a wide loop are projected forwardly over the bed so that their front ends overhang the table 22. It will be noted from Fig. 3, that the loop thus described extends in the horizontal plane of the table so that the shaped up metal may be fed continuously rearwardly for a given length. The front ends of these heads are each provided with the slide-way in which an indexing clamp 31 is mounted, there being an indexing notch 37 in the under surface of each sliding clamp adapted to engage an indicating lug 38, projecting from the apex of the mandrel. 32 represents a cap for closing the slide and holding the clamp 31 in place. I have shown three of these indexing clamps and mandrel lugs preferably located medially relative to the bed and to the mandrel. To operate these clamps simultaneously I provide a shaft 34 journaled in the ends of the arms 28, 29, 30, the clamps 31 being pierced to permit the passage of said shaft. Within these slots or orifices 35 of the clamps 31 are the cams 36 fixed to shaft 34. It is obvious that when this shaft is rotated the clamps 31 may be actuated to engage and disengage the mandrel lugs 38. These lugs 38 are very thin, so as not to practically interfere with the meeting of the bases of the triangular cells, the resiliency of the metal under the bending strains springing these sections together when the mandrel is removed to form a practically continuous double wall between which lie the triangular cells.

39 represents a gage adjustably secured to the bed 3 with its front end in rear of the table 23, see Figs. 3, 4, and 5.

It will be noted that the mandrel is an equilateral triangular in cross section. The sheet metal 40 is bent into zigzag sections each section being twice the width of the base of the mandrel. In operation one of the zigzag sections is placed on the table 22 with the mandrel resting on the first half of a given section. The clamps 25 are then thrown in to clamp the ends of the mandrel on the bed, the medial clamps 31 are then thrown in to engage the lugs 38 of the mandrel. As the mandrel is quite long and the bending strains are severe, the medial clamps are so placed as to best resist the bending strains on the mandrel. The bender is then turned up by hand, turning abruptly over the front corner of the table 22 and bending the sheet metal sharply around the front corner of the mandrel and laying the second half of the given section up against the front equilateral side of the mandrel. The clamps are then released, the mandrel is removed and the sheet metal is bodily turned over so as to present the other side. The sheet is further pushed in on the table and the previously bent section of the sheet metal is placed against the rear equilateral side of the mandrel, with the mandrel resting on the first half of the next succeeding zigzag section. The mandrel is again clamped down, the bender is again operated and the first triangular cell is formed. The clamps are released, the mandrel is detached endwise from the cell in which it is now contained, and the sheet of metal again turned over as before, and pushed in, the gage edge 41 being placed in the apex formed between the meeting edges of the equilateral sides of the triangle just previously formed, as shown in Fig. 3, which serves to accurately gage or lay off the metal in proper widths. And so the operation proceeds, the bending being on one side and then on the other of the sheet metal. And so a continuous sheet of metal is successively bent into a series of cells triangular in cross section, the bases 43 of which fall alternately upon opposite sides, forming two practically continuous parallel walls between which extend the equilateral sides 44 dividing the space between the walls into the cells of triangular cross section.

Having described my invention, I claim:—

1. In a metal shaping machine, a table a bodily detachable mandrel, means for clamping the ends of the mandrel upon the table, a U-shaped arm rigidly connected to the table, the loop of which is extended in the horizontal plane of the table, the upper end of said arm overhanging the table, a clamp in the end of said arm, and gaging devices between the clamp and the top of the mandrel, said clamp forming the medial brace for the mandrel, and a bender pivoted to turn sharply around the front corner of the table and mandrel when in position, substantially as described.

2. A machine for bending sheet metal into triangular cells, consisting of a table, a bender, an independent mandrel triangular in cross section, and means for detachably clamping the mandrel down upon the metal supported upon the table, whereby when the cell is formed and the clamp released the mandrel may be endwise removed from its cell, substantially as described.

3. A machine for bending sheet metal into triangular cells, consisting of a table, a bender, an independent mandrel triangular in cross section having a clamping lug on its apex, and means for detachably engaging the holding lug and clamping the mandrel down upon the work supported upon the table, whereby when the cell is formed and the clamp released the mandrel may be endwise removed from its cell, substantially as described.

4. A machine for bending sheet metal into

triangular cells, consisting of a table, a bender, a U-shaped arm over the table, an independent triangular shaped mandrel having a lug on its apex, and clamping means supported in the outer end of said U-shaped arm adapted to detachably engage said lug, whereby the said mandrel may be gaged relative to the work and clamped down upon the metal supported upon the table, substantially as described.

In testimony whereof, I have hereunto set my hand.

JAMES M. RUDE.

Witnesses:
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LUISE BECK.