

A. W. GRAY.

Machines for Corrugating Metal Plates.

No. 133,773.

Patented Dec. 10, 1872.

Fig. 1

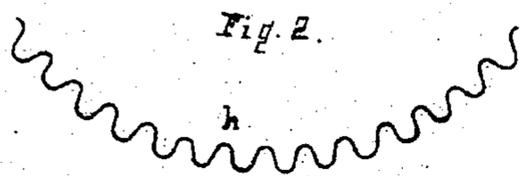
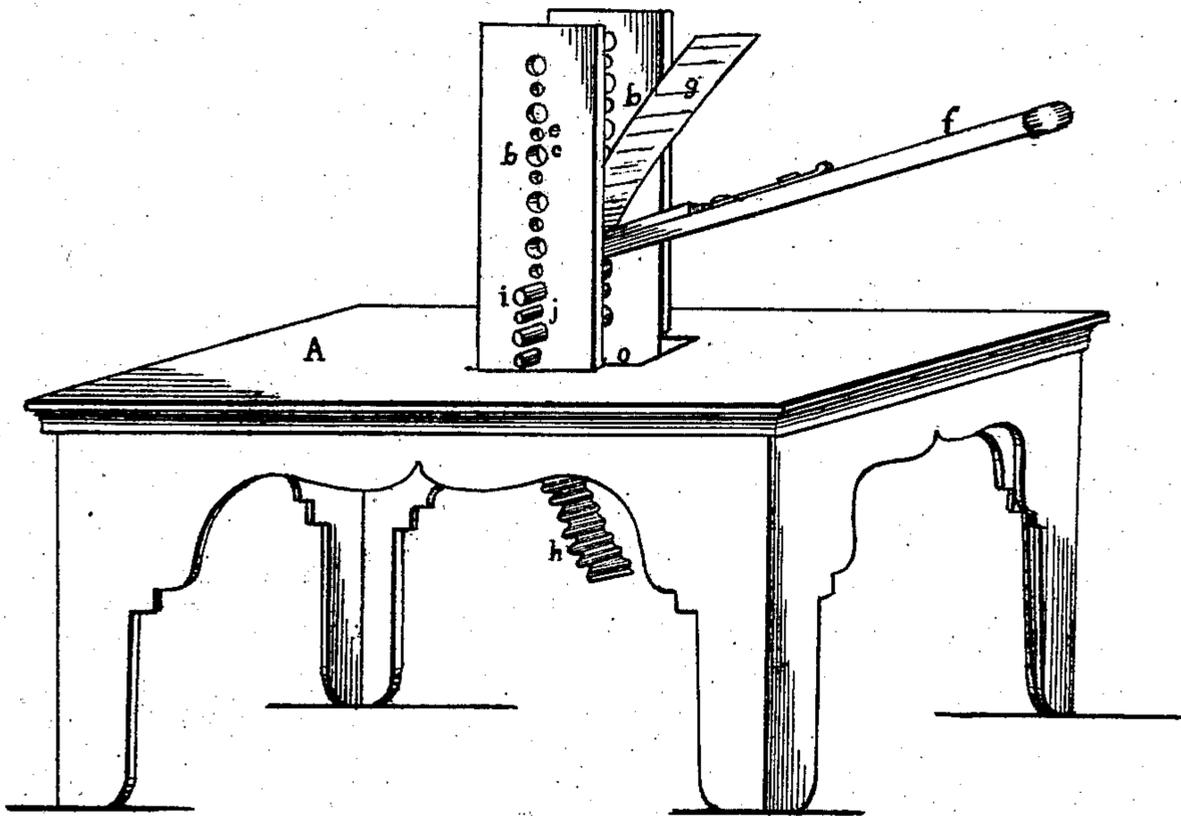


Fig. 3

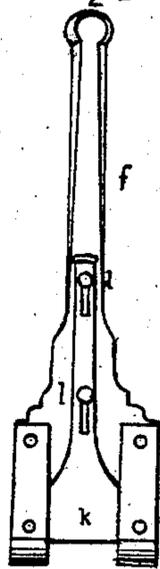


Fig. 4



Witnesses:  
*G. W. Salisbury*  
*Geo. M. Peck*

Inventor:  
*Albert W. Gray*  
By *O. S. X. Peck*  
his Attorney in fact.

# UNITED STATES PATENT OFFICE.

ALBERT W. GRAY, OF MIDDLETOWN, VERMONT, ASSIGNOR TO HIMSELF,  
LEONIDAS GRAY, AND ALBERT Y. GRAY, OF SAME PLACE.

## IMPROVEMENT IN MACHINES FOR CORRUGATING METAL PLATES.

Specification forming part of Letters Patent No. 133,773, dated December 10, 1872.

*To all whom it may concern:*

Be it known that I, ALBERT W. GRAY, of Middletown, Rutland county, Vermont, have invented certain new and useful Improvements in Bending-Machines, by which to bend thin bars of cold wrought flexible iron or other like metal into cogs to be used in other machinery; and that others skilled in the art may make and use my invention I make this full, true, and exact description thereof, and of the manner of working the same, reference being had to the drawing accompanying the same.

Figure No. 1 represents a view, in perspective, of a machine containing my invention, with the hooked hand-lever and a piece of metal in position being bent. Fig. No. 2 represents a piece of metal bent into cogs. Fig. No. 3 represents a view of a flat side of the hooked lever, and Fig. No. 4 represents a side view of such lever.

The letter A represents a cast-iron table, having a square or oblong hole, which has its opposite sides parallel and from two to four inches wide and three to six inches long, through the center part of the leaf of the table; and on each of the long sides of this hole, and riveted firmly to a lug or projection downward from said sides, is erected a strong thick bar of wrought metal of from two to three inches wide, one of which is placed exactly opposite to the other and about midway of the length of the hole *o*. These upright pieces of metal may be from eight to ten or fifteen inches high, and in the drawing they are marked *b b*; and through both these upright pieces, and exactly opposite to each other and extending from near the upper line of the leaf of the table to within an inch or two of the top of them, are series of circular holes of different diameters, the centers whereof are on different perpendicular lines, and of such diameters as shall serve to produce, in the operation of the machine, cogs of such width in cross-section and such depth and degrees of nearness to each other as the manufacturer may desire to produce. The larger circular holes in these upright pieces are marked *c c* and the smaller ones are marked *e e*; and the letter *i* represents a short, smooth, round rod of iron, which is of suitable length to extend through both said upright pieces, and of a di-

ameter to fill the larger-sized holes; and the letter *j* represents a similar rod, adapted to fill the smaller-sized holes, of a length to extend through and rest in them, and the number of these rods should correspond with the number of holes in the respective upright pieces; and the letter *g* represents a thin bar of flexible, cold wrought-iron in position as being bent into cogs by this machine; and the same bar is represented below the table, by the letter *h*, bent into cogs, and is also more perfectly represented by Fig. No. 2.

Fig. No. 3 represents the lever used with the devices before mentioned, and it has hooks on its lower end, and they are represented at the lower end of Fig. No. 4, which is a side view thereof; and on the face of the lower end of this lever, and between the hooks before mentioned, is a movable slide, which may be moved up and down thereon, and it is kept in its proper line by two studs, *l l*; and the thickness of this slide is to be such as to be equal to the difference in the diameters of the holes *e* and *c*.

Having thus set forth the apparatus constituting my invention, before proceeding to a statement of the manner of working it I think it proper to say that it is not contemplated to bend thin cold-wrought iron bars irrespective of the quality of such iron as to toughness, strength, and flexibility, for though my invention may bend such bars into cogs, yet the brittleness and inflexibility of many such bars would produce cogs of a rough surface on the bends, and would be of inferior quality and usefulness. The sort of iron best adapted to be bent into cogs is made from magnetic ores, like the Palmer ores, manufactured at Ausable Forks, in Essex county, in the State of New York, and at other places in the United States where ores of similar qualities are found, and which, when bent, produce a smooth cog, of great durability and toughness, even under constant service; and cogs may be bent from other metals, also, by my machine.

The manner of working my invention may be stated as follows: One of the round rods—as *j*, for example—is inserted into its appropriate holes in the upright pieces *b b* across the hole in the leaf of the table A, and the end of a thin bar of flexible iron, in a cold

state, is laid across it; and another of these rods, as *i*, is inserted above said bar in appropriate holes next to those in which the rod *j* is placed. The opposite and long end of the bar *g* is carried up by the hand, as seen in the drawing, sufficiently to place the hooks at the lower end of the lever on the upper side of said rod, and the handle of the lever is below or behind the long end of the bar to be bent, (the slide *k* being shoved up,) whereupon said lever is pushed forward and around the rod *i* until a cog shall have been bent, when a small rod, *j*, is inserted into its appropriate holes above the rod *i*; and the same process is pursued and repeated, the direction of the movement of the lever being alternately reversed, until all the circular holes *c* and *e* shall have been filled with their respective rods and cogs shall have been bent over them. The several rods are then removed, and the bar being bent is carried down through the hole *o* in the table, and a rod of appropriate size is inserted through its appropriate holes and through the interior of the bend for the last cog bent on the bar, when the same operation is pursued and repeated until the entire bar, or so much of it as it may be desired to bend into cogs, has been so bent and passed down through the hole *o* in the table, out of the way of the operator. When the lever *f* is used over one

of the smaller rods, as *j*, the slide *k* is pushed down to the lower end of the lever, as the thickness of the slide is equal to the difference in the diameter of the rods *j* and *i*, and thereby, as the lever *f* carries the bar *g* over the rod *j*, it produces a smooth bend and a close fit to the rod *j*.

I am aware that cogs have been made from corrugated sheet metal; but I disclaim the use of any such material for that purpose, and I prefer flexible bar-iron or other like metal; and instead of corrugating it I bend it into well-shaped cogs, in such forms and in such relations to each other as, with the greatest lightness of material, to insure the greatest capacity for long and efficient service; and

What I claim as new, and desire to secure by Letters Patent, is—

1. The table *A* with the hole *o* through its leaf, in combination with the upright pieces *b b* with the two series of circular holes *c* and *e* in them, the rods *i* and *j*, and the lever *f*, for the purpose set forth.

2. The circular holes *c* and *e*, with their centers on different vertical lines, in combination with the rods *i* and *j* and the lever *f*, for the uses and purposes set forth.

Witnesses: ALBERT W. GRAY.

OSBORNE MYRICK,  
ALBERT A. GREENE.