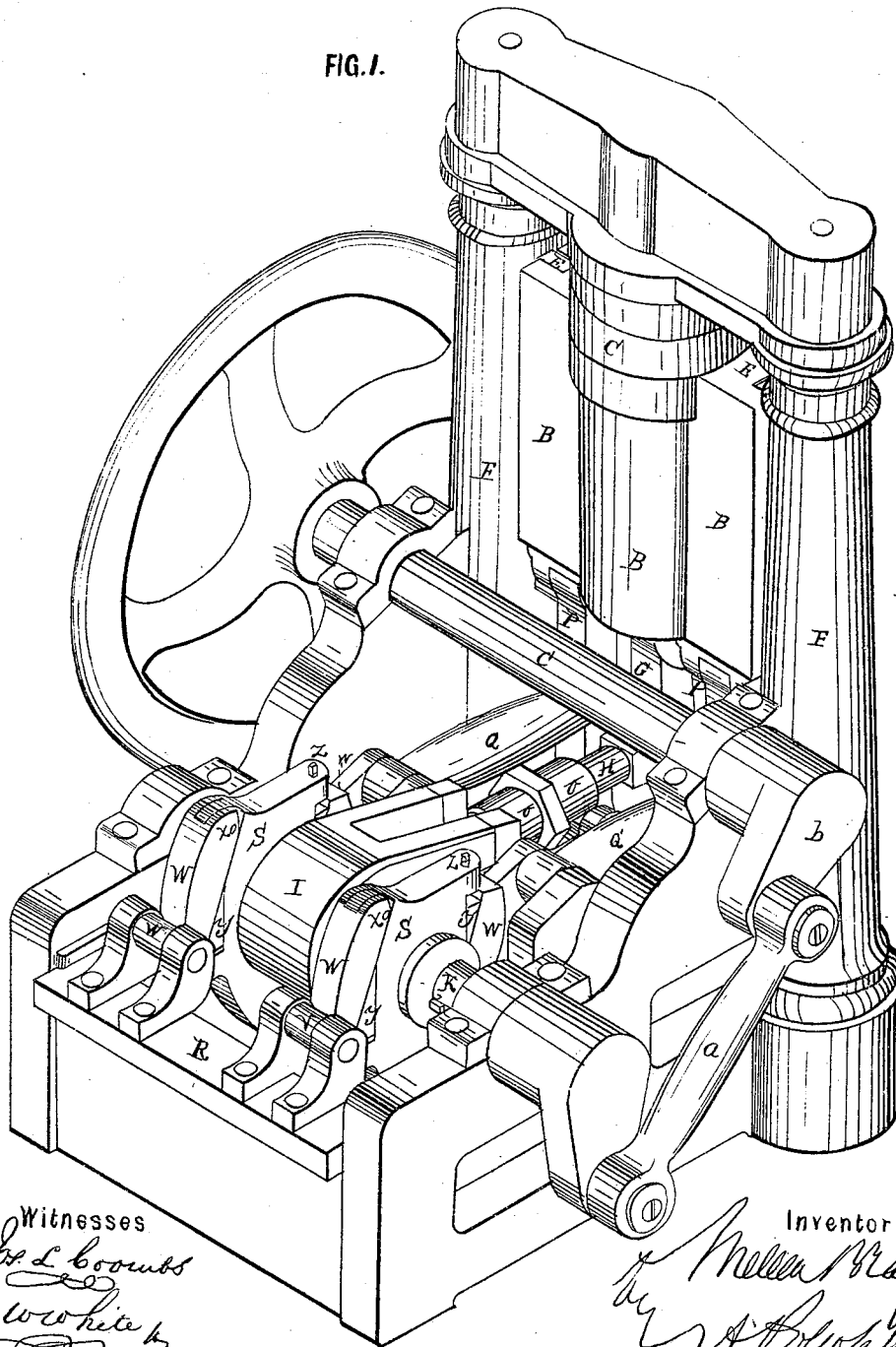


M. Bray.
Punching & Shaping Metals.
Nº 51421.
Patented Dec. 12. 1865.

FIG. 1.



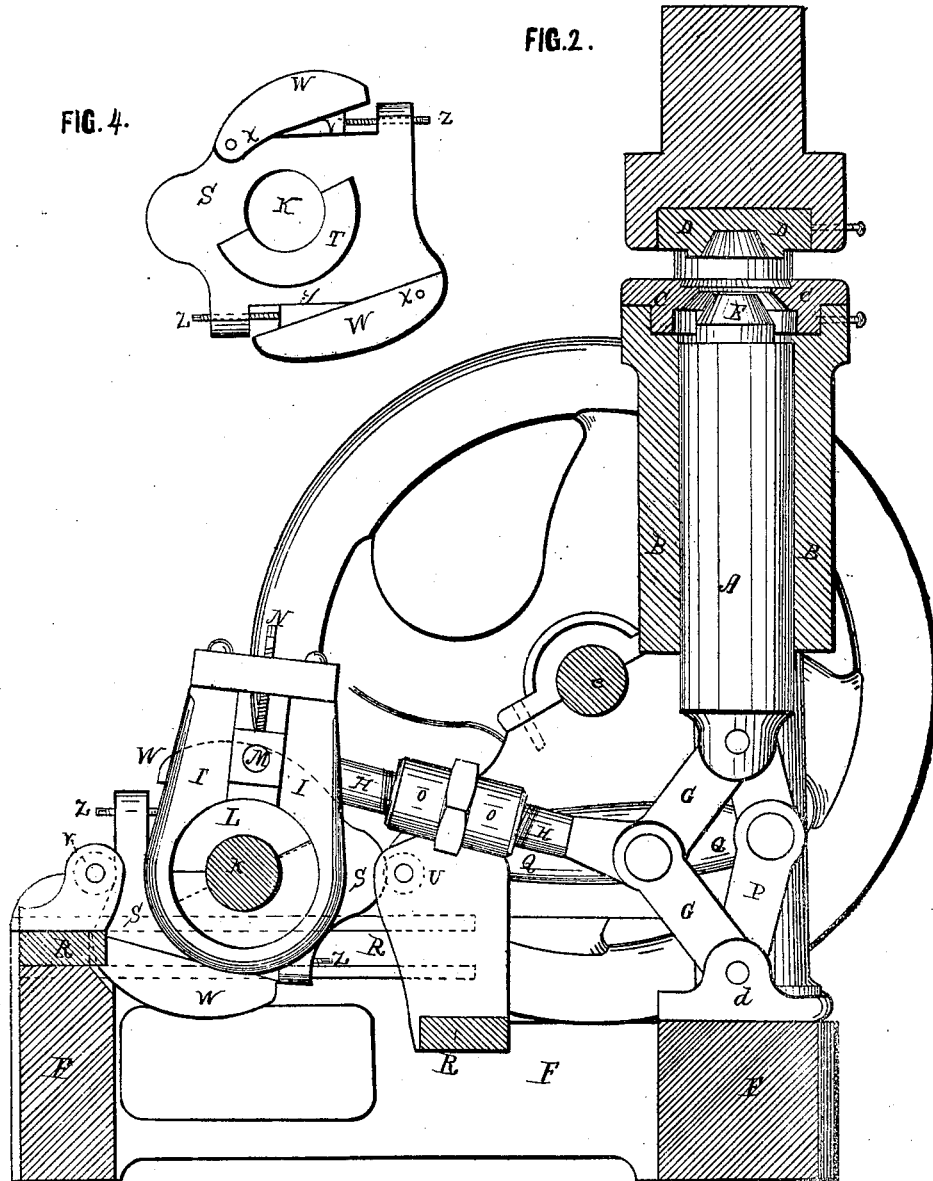
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FIG. 2.

FIG. 4.

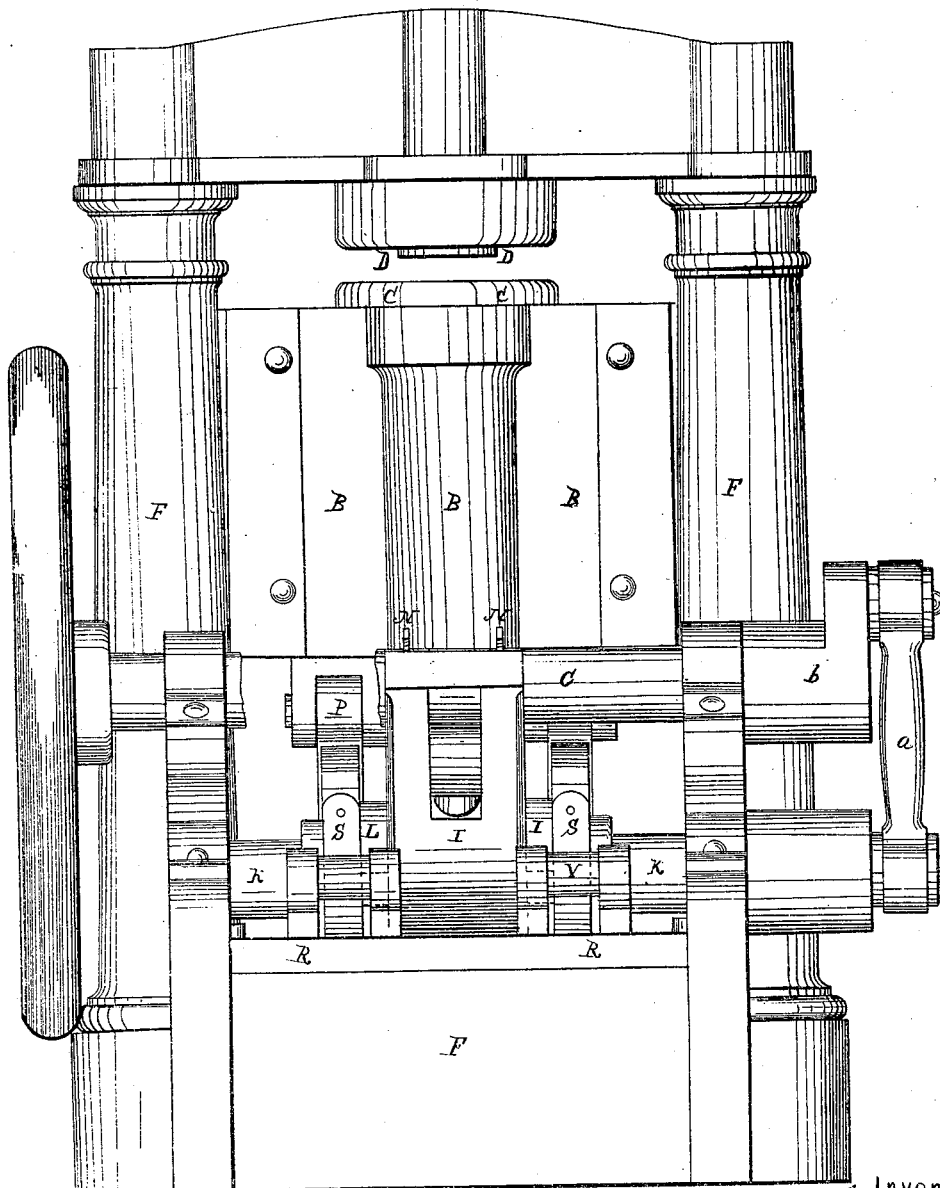


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FIG. 3.



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UNITED STATES PATENT OFFICE.

MELLEN BRAY, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN MACHINERY FOR FORMING SHEET-METAL WARE.

Specification forming part of Letters Patent No. **51,421**, dated December 12, 1865.

To all whom it may concern:

Be it known that I, MELLEN BRAY, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Machinery for Punching and Stamping or Shaping Metal; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is an isometrical perspective view of a press for cutting out of sheet metal the blanks of lemon-cake dishes and for shaping the same into their proper and ultimate form. Fig. 2 is a vertical section of the same. Fig. 3 is a rear elevation of the same, the main shaft being broken so as to exhibit one of the toggle connections with the movable shell; and Fig. 4 is a detail view, in elevation, of the cam operating the toggles.

This invention has for its object the manufacture of certain kinds of seamless tin, and other sheet-metal ware; and it consists in the machinery whereby the same may be effected in a better and more expeditious manner than this could be done by the means heretofore known.

Heretofore such articles have been manufactured by the use of what is commonly called a "drop-press." Each separate article had to be subjected to the operation of the press from four to seven times before it was completed and ready for the market. This was necessary because of the liability of the tin to wrinkle or fold over in plaits if bent and compressed beyond a certain limit at one operation.

To fully appreciate the nature of the improvement subject of this patent, I deem it necessary to refer to the mode of operation by the drop-press, which is as follows: A female die is made of cast-iron of a suitable form to give the desired shape to the article to be manufactured. A series of male dies of varying lengths are also provided, (the number depending upon the depth of the article to be struck,) the first to be used being fitted to the upper portion of the female die and entering it as far as it can without plaiting the tin. The second one enters the female die a little farther than the first, or as far as it can without causing the tin to plait, and so on to the last

die, which imparts to the article to be struck its final shape. These male dies, or "forces," as they are called, are cast from a mixture of tin and antimony, and have to be recast quite often as they will not wear a great while.

The dies being properly adjusted, the operator now places his foot in a stirrup attached to a strap which passes over a pulley and the other end of which is attached to the drop-weight, to which the male die or force is attached. By throwing his foot down and backward he raises the weight to a suitable height, when he places the tin blank (previously cut from the sheet to the proper form) in position on the face of the female die, and suddenly bringing his foot forward allows the weight to drop upon the blank and force the tin into the female die. Having run through the press the lot of articles being manufactured, he removes the male die and puts in its place another, a little longer, and repeats the same process, and this changing of male dies is repeated until the last die of a shape conforming with the interior of the dish is reached, by the use of which the dish is finally completed.

It must be evident to all that this process is a very laborious as well as expensive one, and that by a machine that would complete it at one operation, or even at two, the article might be made very much cheaper than at present and the labor of the operation made very much lighter. To gain this desirable end is the object of this my invention.

The nature of my invention consists, first, in so arranging dies and plungers in connection with automatic machinery that the sheets of tin or other metal may be fed into the machine, and at each revolution of the driving-shaft a blank will be cut from the sheet and formed into a dish; second, in holding the outer edge of the blank (after it is cut and while it is being formed into the desired shape) for the purpose of preventing it from being wrinkled so much as to form a lap or plait, and at the same time cause the plunger or male die to stretch the tin as it is forced into the female die; third, in giving to the holding-surface a relieving motion, whereby I am enabled to adjust the pressure on the edge of the blank to the strength of the tin, and thereby prevent the pressure from being increased by the increased thickness of tin occasioned by the

drawing of the tin and its tendency to wrinkle while being forced into the female die to such an extent as to tear the metal asunder.

In the said drawings, A is the plunger which carries the male forming-die E, and which has its bearings in the shell or movable cross-head B, which in its turn carries the female cutting and holding die C, and has its bearings on slides E on the frame F of the machine. The male cutting and holding die and the female forming-die D are all made in one piece, or attached firmly to the fixed cross-head. All of these dies are made of steel and tempered.

The plunger A is worked by a toggle-joint, G, operated by a connecting-rod, H, and an intermittent vibrating lever or crank, I, on the vibrating cam-shaft K, but not made fast to it. This crank has a projecting clutch-block, L, on each side of its hub, by which it is made to move in conjunction with the shaft during a certain portion of the vibration. This crank and its connecting-rod form a secondary toggle, which very much increases the power exerted upon the forming-up dies.

The crank-pin M is held in bearings which are adjustable toward or from the center of the shaft by means of screws N, and the connecting-rod is made so that its length may be varied at pleasure by means of a long nut, O, on its center and a right and left screw on the the two parts of the rod.

These provisions are made for the purpose of adjusting the movement of the plunger A to the depth of the dish to be struck, and the adjustment must be so made that when the crank is thrown down so as to bring the center line of crank and of the connecting-rod in the same plane the toggle shall be straight.

The shell or movable cross-head is moved by means of toggles P P', connected, by links Q Q', to a sliding frame, R, which in its turn is moved by two cams, S S', keyed on the vibrating shaft, and having in their inner hubs a projecting clutch-block, T, which meshes into the corresponding clutch L on the vibrating crank above described. These cams are constructed with two operating sides, one of which acts upon a roll, U, in the sliding frame placed in front of the cam, and is used for the purpose of throwing the toggles down, while the other side is used for the purpose of straightening the toggles, and thereby throwing the shell up so as to cut the tin, which it does by acting on a roll, V, attached to the sliding frame in the rear of the cam. A portion, W, of the acting surface of said cams on each side is made separate from and jointed to that portion which is keyed to the shaft by means of a hinge-joint, X, and is so arranged that it may be adjusted at a greater or less distance from the center of the shaft by means of wedges, Y, and adjusting-screws, Z, as seen in the drawings. This portion of the cam is used to give the relief to the pressure of the holding-surface on the edge of the blank as it is being formed up by the forming-die E.

The vibrating shaft is driven by means of a connecting-rod, a, and crank b on the fly-wheel shaft c.

The brackets d supporting the toggles which operate both the plunger and the movable cross-head may be made adjustable as to height by means of wedges or otherwise, so as to regulate the action of the cutting and holding dies in accordance with the thickness of the metal operated upon.

The operation of my machine is as follows: The parts being in such position that the plunger and shell are both at their extreme lowest position, with the crank-pin and connecting-rod adjusted to give the required movement to the plunger, the tin is placed on the surface of the lower cutting-die, and the fly-wheel being rotated the shell carrying the female cutting and holding die is moved up, by the action of the cams on the sliding frame and through the links upon the toggles, until the tin is cut and the surfaces of the holding-dies press upon the tin, when the motion of the shell in that direction ceases. In the meantime the clutch on the hub of the cam has come in contact with the clutch on the hub of the crank and carried it around so far as to bring the end of the male forming-die to bear on the tin. A continuation of the motion of the fly-wheel carries the male forming-die upward and forming the tin to the shape of the recess in the female die, at the same time the adjustable portion of the cams is operating upon the sliding-frame and thereby relieving the pressure from the tin, or, in other words, increasing the space between the two holding-surfaces to compensate for the constantly-increasing thickness of the tin occasioned by its being drawn toward the center of the dies. When the fly-wheel has made a half-revolution and completed the vibration of the cam-shaft in one direction and commences upon the return motion the shell is again forced up until the holding-surfaces assume the same position as when the forming-die first commenced to act upon the tin, and thereby remove any wrinkles that may have been formed in the edge of the dish. A continuation of the motion withdraws both the shell and the plunger to the original position, when the dish is removed and the sheet of tin placed in position to cut another blank.

Having thus described my invention, and the manner in which the same is or may be carried into effect, I claim—

1. The arrangement of the dies, plungers, and machinery for operating the same, all substantially as herein described, for cutting blanks from sheets of metal and shaping the same into various articles of use at one operation.

2. The method of giving to the holding-surfaces a relief motion to prevent the increasing thickness of tin, caused by being drawn in by the forming-die, from increasing the pressure of the holding-surfaces and thereby tear the tin asunder.

3. In machinery for cutting and shaping metal, operating the cutting-dies by means of levers forming toggle-joint when actuated, through the intermediary of connecting rods or links, by vibrating cams expansible, substantially as and for the purposes set forth.

4. In machinery for cutting and shaping metals, operating the forming-dies by means of levers forming toggle-joint when the same are actuated, through the intermediary of an

adjustable connecting-rod, by a vibratory crank the crank-pin of which is adjustable, substantially as and for the purposes set forth.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

MELLEN BRAY.

Witnesses:

JOHN D. LONG,
STILLMAN B. ALLEN.