(No Model.)

F. HART.

FLANGING MACHINE.

No. 498,433. Patented May 30, 1893.

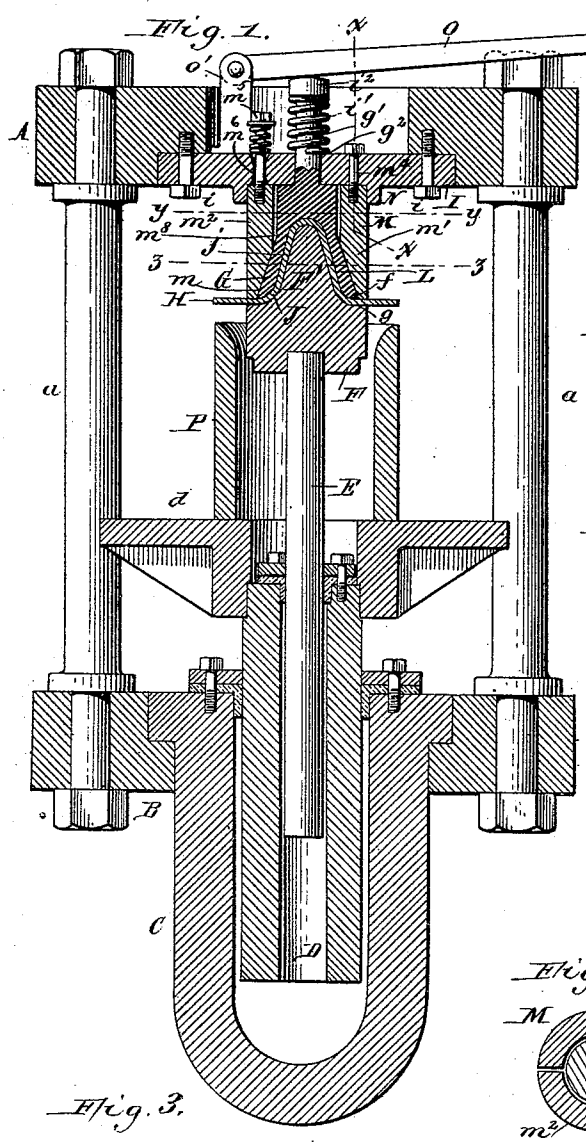

Fig. 1.

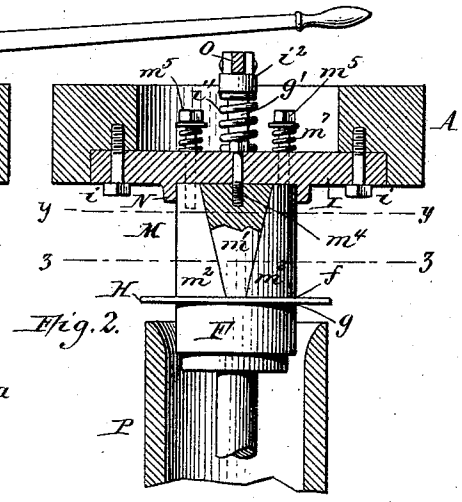

Fig. 2.

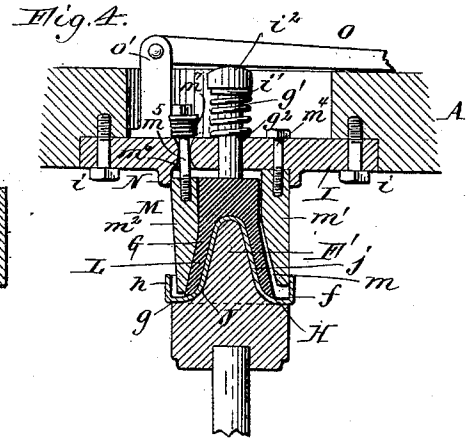

Fig. 4.

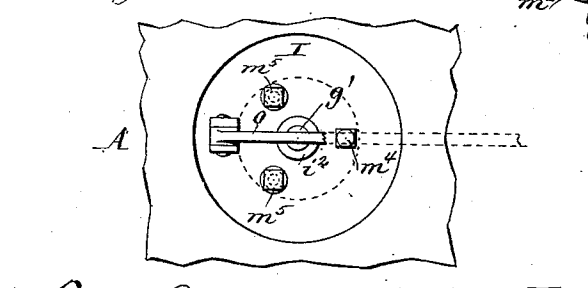

Fig. 3.

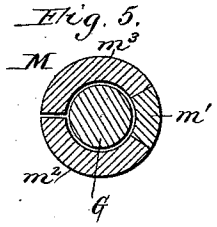

Fig. 5.

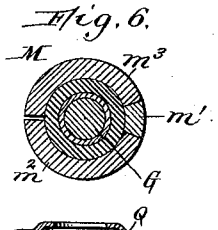

Fig. 6.

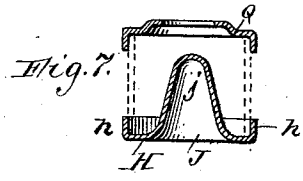

Fig. 7.

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UNITED STATES PATENT OFFICE.

FREDERICK HART, OF POUGHKEEPSIE, ASSIGNOR TO D. H. BURRELL & CO., OF LITTLE FALLS, NEW YORK.

FLANGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 498,433, dated May 30, 1893.

Application filed January 12, 1891. Serial No. 377,396. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK HART, a subject of the Queen of Great Britain, residing at Poughkeepsie, in the county of Dutchess and State of New York, have invented a new and useful Improvement in Flanging-Machines, of which the following is a specification.

This invention relates to a machine for forming upturned flanges on plates of heavy sheet metal and is specially adapted for flanging the tops and bottoms of centrifugal separators. In flanging such tops and bottoms as heretofore practiced the blank is heated and placed on a mandrel or die against which the marginal portion of the blank is bent about at right angles to form the desired flange. The metal shrinks in cooling which causes the flange to cling to the mandrel whereby the removal of the flanged plate is rendered very difficult.

The object of my invention is to overcome this difficulty and the invention consists to that end of a contractible mandrel of novel construction, as will be hereinafter more fully set forth and pointed out in the claims.

In the accompanying drawings: Figure 1 is a sectional elevation of a hydraulic press provided with my improved contractible mandrel and showing a separator bottom in position to be flanged. Fig. 2 is a fragmentary sectional elevation in line *x*—*x*, Fig. 1. Fig. 3 is a fragmentary plan view of the press. Fig. 4 is a sectional elevation of the upper portion of the press showing the mandrel contracted for releasing the flanged bottom. Figs. 5 and 6 are horizontal sections in lines *y*—*y* and *z*—*z*, Figs. 1 and 2, respectively. Fig. 7 is a vertical section of the flanged top and bottom of a centrifugal separator, showing the connecting cylindrical body in dotted lines.

Like letters of reference refer to like parts in the several figures.

A B represent the horizontal head and foot blocks of a hydraulic press, connected by vertical posts *a*.

C represents the hydraulic cylinder, and D the outer ram arranged in this cylinder and provided at its upper end with a horizontal platform *d*.

E represents an inner ram arranged to move vertically in the outer ram, both rams being actuated by the same water pressure in the hydraulic cylinder in the usual manner for operating hydraulic presses containing double rams.

F G represent supporting and holding dies, respectively between the contiguous faces *f g* of which the plate H of sheet metal is held during the operation of forming the upturned marginal flange *h* thereon. The lower supporting die F is arranged upon the upper end of the inner ram. The upper or holding die G is provided with an upwardly extending shank *g'* arranged in an opening g^2 formed in a supporting plate I which is secured to the lower side of the head block A by bolts *i i*.

i' represents a spring surrounding the shank *g'* and bearing against a collar i^2 formed on the upper end of the shank, and against the upper side of the supporting plate whereby the holding die is yieldingly held against the under side of the plate I.

The contiguous faces of the dies are made to conform to the surfaces of the article upon which it is desired to form a flange. As represented in Fig. 1, the lower die F is provided with a conical stud F' and the upper die G is provided with a correspondingly shaped recess, so that the dies are adapted to receive the bottom J of a centrifugal separator having a central conical hub *j*. The upper die is provided with a downwardly flaring bottom portion L which extends from the base of the die upwardly a short distance and serves as a conical core for the sectional mandrel M which surrounds this die. This mandrel is of cylindrical form externally and has the lower portion *m* of its cavity made conical to fit against the conical portion L of the upper die. The lower end of the mandrel bears upon the upper side of the separator bottom outside of the upper die and its outer diameter is equal to that of the lower die so that there will be a uniform bearing on both sides of the separator bottom in forming the flange thereon.

The sectional mandrel is seated with its upper end in a socket formed by an annular rib N on the lower side of the supporting plate I. The mandrel is composed of a fixed section *m'* and two movable sections m^2 m^3.

The fixed section is secured to the supporting plate I by a bolt m^4. The movable sections are attached to the plate I by bolts m^5 passing through openings m^6 in the supporting plate.

m^7 represents springs surrounding the bolts m^5 and bearing with their ends against the bolt head and the upper side of the supporting plate whereby the movable sections of the mandrel are yieldingly held in position. The openings m^6 through which the bolts m^5 pass are elongated radially and a space m^8 is formed between the mandrel sections and the upper portion of the upper die to permit of a limited lateral movement of the movable sections of the mandrel. The fixed section m' of the mandrel is tapered downwardly and the adjacent sides of the mandrel sections are correspondingly inclined so that the movable sections will be spread apart and held in their outermost position when the movable sections are raised against the plate I and in position for performing the operation of flanging. If desired the mandrel may be provided with two fixed wedge-shaped sections arranged on diametrically opposite sides of the upper die. Such a construction would be desirable for forming flanges on sheet metal blanks of very large diameter but in flanging smaller blanks or plates such as separator tops and bottoms one fixed wedge section answers all requirements.

O represents a hand lever pivoted at one end to lugs o' formed on the upper side of the supporting plate I and bearing against the upper end of the vertical shank of the upper die. When the upper die is in its normal position, as indicated in Fig. 1, the movable sections of the mandrel are held in their outermost position by the conical lower or core portion L of the holding die which spreads the sections of the mandrel apart. When the movable sections of the mandrel are forced downwardly they are permitted to move inwardly because the tapering wedge section m' of the mandrel remains stationary while the movable sections descend, thereby allowing the inclined sides of the movable sections which bear against opposite sides of the stationary section to approach each other whereby the diameter of the mandrel is reduced.

P represents a flanging cylinder or die seated upon the platform of the outer ram. The internal diameter of the flanging cylinder is such that it can ascend freely around the mandrel and swage or bend the projecting annular edge of the bottom or blank and form the upturned flange thereon. The inner edge of the upper end of the flanging cylinder is preferably chamfered so as to avoid any abrupt action of the flanging cylinder in its ascent and cause the bending of the flange to be performed gradually and evenly.

The separator bottom or other blank is first heated and then placed upon the lower or supporting die which latter is raised by means of the inner ram, until it engages with the upper holding die. The continuous water pressure on the inner ram holds the separator bottom firmly in place while the flange is being formed on the separator bottom. The separator bottom is of such diameter that its annular edge will project beyond the dies sufficiently to form a vertical flange for connecting the separator bottom or top to the body cylinder, as represented in dotted lines in Fig. 7. After the separator bottom has been clamped in position between the dies by the inner ram, the outer ram ascends with the flanging cylinder, which latter rises around the mandrel, and gradually bends or swages the projecting annular portion of the separator bottom upwardly until it is bent at right angles to its former position and forms a vertical flange, adapted to secure the bottom or top to the cylindrical body of the separator.

In order to remove the flanged separator bottom, the rams are lowered and the upper die is depressed by the hand lever O whereby the flanged separator bottom is moved downwardly. If the flange has shrunk to such an extent as to prevent the ready removal of the flange from the mandrel the movable sections of the latter will be carried downwardly with the flange in its descent. This vertical movement of the movable mandrel sections is permitted by their yielding supports. As the movable sections descend the tapering fixed section of the mandrel allows them to approach each other or move inwardly thereby contracting the mandrel and permitting the cooled flange to disengage itself therefrom.

It is obvious that separator tops Q, like that shown in Fig. 6, or blanks of other forms can be flanged upon the same machine by changing the dies to conform to the shape of the blank.

The machine is preferably arranged vertically, as shown, but it may be arranged horizontally without departing from my invention.

I claim as my invention—

1. The combination with the upper holding die and a contractible mandrel surrounding said die, of a lower holding die, an annular flanging die surrounding the lower die, and mechanism whereby the lower holding die and the flanging die are separately moved toward the upper die and mandrel, substantially as set forth.

2. The combination with the upper holding die provided in its under side with a cavity for the reception of the raised portion of the plate to be flanged, and a contractible mandrel surrounding said die, of a lower holding die provided with a raised portion adapted to enter the cavity of the upper holding die, and an annular flanging die surrounding the lower die, substantially as set forth.

3. The combination with the lower die and the flanging die surrounding it, of the upper die provided with a conical enlargement and capable of movement toward and from the lower die, and a contractible mandrel sur-

rounding the upper die and composed of a fixed section and sections which are movable toward and from the lower die, substantially as set forth.

4. The combination with the upper die or core, of a contractible mandrel surrounding the core and composed of a tapering fixed section and longitudinally movable sections having inclined sides bearing against said tapering section, substantially as set forth.

5. The combination with the upper die or core, of a contractible mandrel surrounding said core and composed of a tapering fixed section and longitudinally movable sections having inclined sides and yielding supports, substantially as set forth.

6. The combination with a mandrel having a fixed section provided with tapering sides and two movable sections engaging with the tapering sides of the fixed section, of a movable tapering core engaging with said mandrel sections, substantially as set forth.

7. The combination with the mandrel having a fixed section provided with tapering sides and two sections capable of lateral and longitudinal movement and engaging with the tapering sides of the fixed section, of a movable tapering core whereby the movable sections are actuated laterally, substantially as set forth.

8. The combination with the mandrel composed of a fixed section and two movable sections, of a longitudinally movable tapering core engaging with said mandrel sections, a supporting plate to which the fixed section is secured, and springs which support the movable sections yieldingly on said plate, substantially as set forth.

9. The combination with a supporting plate, a mandrel composed of a yielding section and a fixed section supported on said plate, of a movable tapering core bearing against the mandrel sections and having a shank extending through said plate, a spring surrounding said shank whereby the core is raised, and a lever bearing upon the shank whereby the core is lowered, substantially as set forth.

Witness my hand this 25th day of October, 1890.

FREDERICK HART.

Witnesses:
J. S. VAN CLEEF,
MARY E. CROUSE.