J. D. ARTZ.

FORMING PRESS.

APPLICATION FILED MAR. 25, 1918.

1,315,937.

Patented Sept. 16, 1919.

2 SHEETS—SHEET 1.

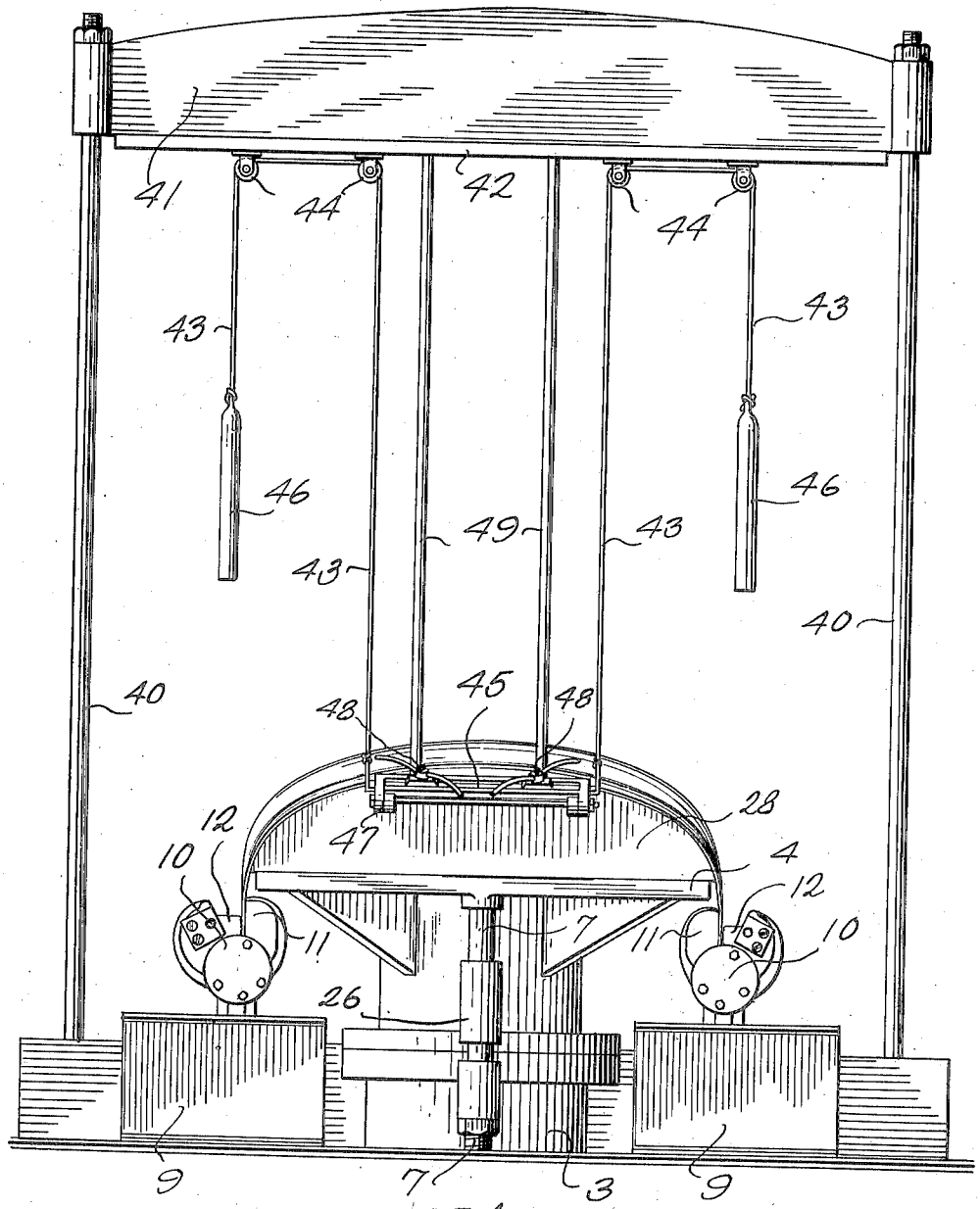



Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

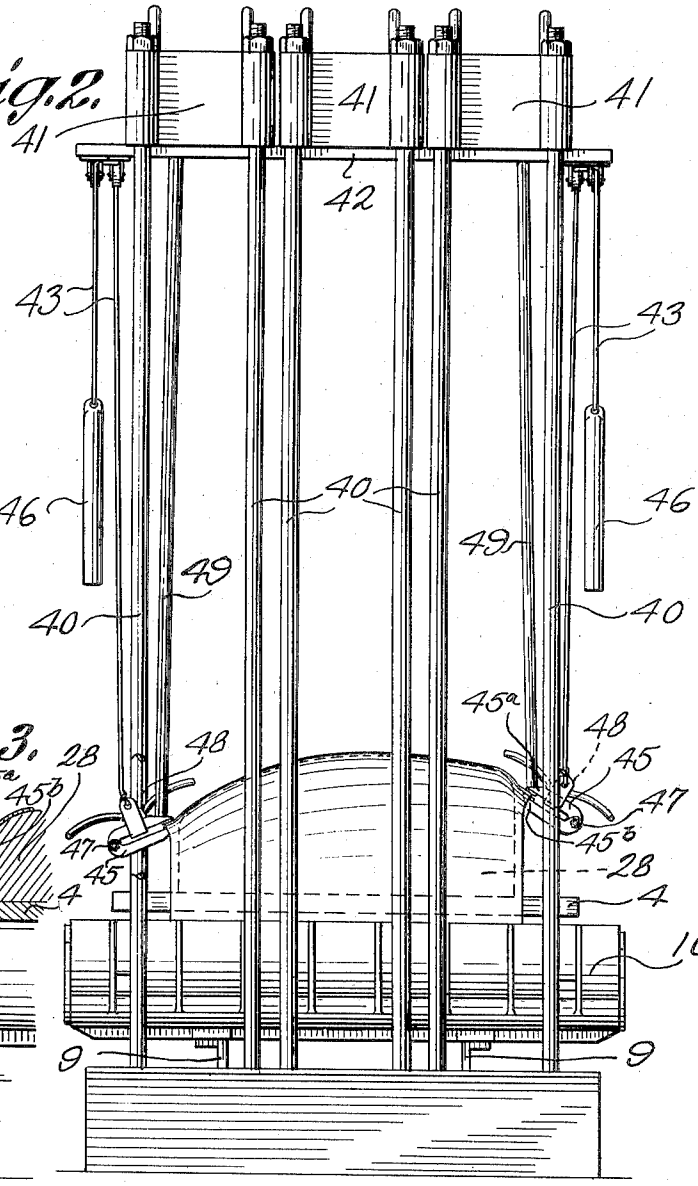
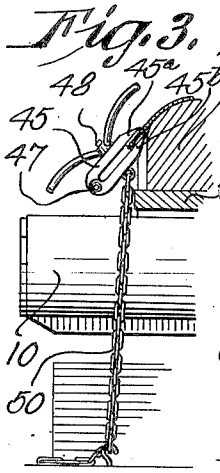



Fig. 3.



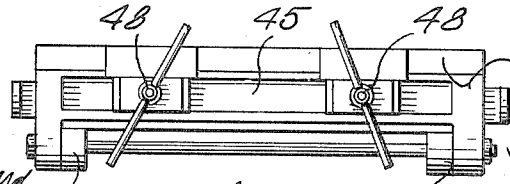




Fig. 4.

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# UNITED STATES PATENT OFFICE.

JOHN DUDLEY ARTZ, OF DAYTON, OHIO.

## FORMING-PRESS.

1,315,937. Specification of Letters Patent. Patented Sept. 16, 1919.

Application filed March 25, 1918. Serial No. 224,533.

*To all whom it may concern:*

Be it known that I, JOHN DUDLEY ARTZ, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Forming-Presses, of which the following is a specification.

My invention relates to improvements in apparatus for forming sheet metal articles, and more particularly to an improvement upon and an amplification of the apparatus set forth and described in Letters Patent of the United States, 1,164,698, issued to me under date of December 21, 1915.

The object of the invention is to simplify the structure as well as the means and mode of operation of such apparatus whereby it will not only be cheapened in construction, but will be more efficient in use, capable of being easily and quickly operated, economical in operation, and unlikely to get out of repair.

A further object of the invention is to produce an improved means for forming sheet metal articles or giving to bodies of sheet metal or similar material a predetermined contour without the use of a die.

With the above primary and other incidental objects in view, as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof, or their equivalents, as hereinafter described and set forth in the claims.

Referring to the drawings, Figure 1 is a side elevation of the assembled apparatus forming the subject matter hereof in its preferred form. Fig. 2 is an end elevation thereof. Fig. 3 is a detail view of a modification of the clamp arresting or limiting means. Fig. 4 is a detail top plan view of the auxiliary clamp.

Like parts are indicated by similar characters of reference throughout the several views.

Heretofore in forming various articles from sheet metal it has been customary to employ in conjunction with the punch or ram which conforms to the interior shape of the article, a die or matrix conforming to the exterior contour thereof. In the forming operation as commonly practised it is the custom to press or stamp the material into the die or matrix by projecting the punch or ram thereinto upon the interposed sheet of material. The making of punches and dies for the method heretofore employed is a highly skilled art and dies for sheet metal articles of comparatively large size are exceedingly expensive.

The apparatus herein described is especially adapted for forming comparatively large bodies such as automobile tonneaus, backs, cowls, hoods, fenders, and similar articles such as are usually constructed from sheet metal, without the use of a die or matrix.

In carrying out the herein described mode of producing sheet metal articles without the use of a die or matrix, there is employed a high power press which may be of any suitable or desired type or construction but which has been shown in the drawing as comprising a hydraulic press of ordinary construction embodying a cylinder or chamber 3 within which reciprocates a stem or plunger carrying upon its upper end a head or table 4. This press may be of any desired size or proportion in accordance with the character of the work to be performed.

Located at opposite sides of the press are ways or guides 9 upon which are slidingly mounted transversely arranged gripper jaw frames 10. These gripper jaw frames are provided on their upper sides with longitudinally disposed grooves or recesses at one side of which is located a stationary gripper bar 11 and at the opposite side an oscillatory gripper bar 12 coacting one with the other to hold a section of sheet metal inserted therebetween.

It will be understood that these gripper jaw frames are so connected and engaged with their guides or ways and with the supporting frame of the apparatus that they are free to move laterally but are firmly held against vertical movement under the influence of the press when acting against a strip of sheet metal engaged in said jaws.

In operation of the apparatus, a forming head or ram 28 is mounted upon the head or table 4 of the press. This forming head or ram 28 may be of metal or may be constructed of wood with metal reinforcements at such points as may be necessary. A section of sheet metal or other material to be operated upon is extended across and about the ram or forming head 28 and the opposite ends of the section of sheet metal are engaged in the gripper jaws 11 and 12 at

the opposite sides of the press. It will be understood that the gripper jaw frames 10 have been first adjusted substantially into alinement with the sides of the ram head 28. The actuating medium is then admitted to the chamber 3 and the table 4 and ram 28 are forced upward against the section of sheet metal, the opposite sides of which are held by the gripper jaws thus placing the sheet metal under tension.

As thus far described the apparatus and operation are substantially the same as those disclosed in Letters Patent No. 1,164,698 before referred to and form no part *per se* of this invention. For this reason the apparatus has not been here described in detail but reference is had to the drawing and description contained in the aforementioned Letters Patent for a full and complete description. To this end, the reference characters herein employed agree with those designating like parts shown and described in the aforementioned Letters Patent.

While the construction disclosed in the aforementioned Letters Patent has been found quite efficient and economical in the manufacture of parts or pieces of certain usual types and shapes, it has been found in the formation of sections of extreme shape or those having abrupt curvatures in transverse directions or otherwise irregular in form that the sheet metal would fail to conform accurately to the forming head or ram unless subjected to undue pressure. In some instances and in operating upon forms of certain shapes it was found that the metal would not stretch uniformly or that it would tend to raise in "blisters." To overcome this difficulty and to enable the formation of extreme shapes and of articles having irregular contour in transverse directions, the herein described improvement and addition has been made to the structure and apparatus set forth in the aforementioned Letters Patent.

To this end there is constructed over the press construction and sheet metal stretching apparatus a frame comprising uprights 40 supporting at their upper ends transverse beams 41 to the under sides of which is attached a deck or ceiling 42. Supported from this deck or ceiling 42 upon cables 43 passing over suitable pulleys 44 secured to the deck or ceiling, are adjustable or independently movable material engaging clamps 45. To the opposite ends of the cables 43 are preferably attached counterbalance weights 46 which facilitate the raising of the clamps 45 to the desired height and tend to maintain them in adjusted position while being engaged with the material. The clamps 45 each comprise two jaw members $45^a$ and $45^b$ hinged together at 47. These jaws are contracted upon the edge of the sheet of material by means of clamp bolts 48.

These clamp members 45 are auxiliary to the main clamp members 10 and are located at opposite sides of the form or ram head 28 and preferably, although not necessarily, at substantially right angles to the main clamping members 10. Suitable means is provided for limiting the movement of the auxiliary clamping members 45 in unison with the movement of the head and ram. In the drawings there have been shown struts 49 interposed between the auxiliary clamps 45 and the deck or ceiling 42 of the frame. In the modification, Fig. 3, there is shown a chain 50 which may be employed in lieu of the struts or braces 49. This chain 50 is suitably connected to the under side of the auxiliary clamp 45 and at its lower end engages a hook or other attachment member upon the base or supporting structure of the apparatus. It will be understood that when this modified form of clamp limiting means is employed the abutment frame consisting of the uprights 40 and beams 41 with the deck 42 may be omitted and the auxiliary clamps 45 may be suspended from any suitable overhead structure or the ceiling of the room in which the apparatus is operated.

In employing this improved form of apparatus or auxiliary apparatus in conjunction with the main forming mechanism it is customary to extend the sheet of material to be operated upon across the form or ram 28 and engage the opposite end in the clamping members 10 and then apply a limited amount of pressure exactly as instructed in the aforementioned Letters Patent. When, however, the material has been given its preliminary stretching operation and "blisters" begin to appear or when the stretching in the initial direction has been substantially commensurate with the variation of degree of necessary stretch as compared with that required in a transverse direction, the auxiliary clamping members 45 are applied to the opposite edges of the sheet material as shown more particularly in Fig. 2. Pressure is again applied through the press and the auxiliary clamps will move with the head or form 28 a slight distance until arrested by the interposed struts 49 or the stop chains 50 after which the head or table and ram will continue to advance independent of these auxiliary clamps causing the sheet material to be stretched transversely simultaneously with its longitudinal stretching operation due to the engagement of the opposite ends of the sheet in the clamp members 10.

While but two forms of limiting stops have been shown, namely the struts 49 and the chains 50, it will be obvious that various forms of limiting stops may be devised or employed to arrest the movement of the adjustable or auxiliary clamps 45. While in the drawing there has been shown a body of substantially rectangular outline but arcuate or concaved in transverse direction

under process of formation, which has necessitated the use of but two auxiliary clamps 45 it will be understood that for other shapes any number of such auxiliary clamps may be employed and that by their use hexagonal, octagonal or circular formations may be effected.

From the above description it will be apparent that there is thus provided a device of the character described, possessing the particular features of advantage before enumerated as desirable but which obviously is susceptible of modification in its form, proportion, detail construction or arrangement of parts, without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statutes, the invention has been described in language more or less specific as to certain structural features, it is to be understood that the invention is not limited to any specific details, but that the means and construction herein described comprise but one mode of putting the invention into effect, and the invention is therefore claimed broadly in any of its possible forms or modifications within the scope of the appended claims.

Having thus described my invention, I claim:—

1. In an apparatus for forming sheet material articles, without a matrix, a forming head, a plurality of material holding members, said head and holding members being relatively movable, and means for initiating the relative movement of different holding members and the head at different stages in the operation of said parts.

2. In an apparatus for forming sheet material articles without a matrix, a forming head, a plurality of material engaging members, said head and engaging members being relatively movable, said engaging members being successively brought into operative play by the relative movement of said forming head and engaging members.

3. In an apparatus for forming sheet material articles without a matrix, a forming head, material holding members at opposite sides of the forming head, said material holding members and head being relatively movable, and additional material holding members brought into operative play at different stages of the relative movement of the forming head and first mentioned material holding members.

4. In an apparatus for forming sheet material articles without a matrix, a forming head, material engaging members at opposite sides of the forming head, said material engaging members and head being relatively movable, and additional material engaging members adjustable in the direction of the relative movement of the forming head and first mentioned engaging members, and limiting stops for said adjustable material engaging members.

5. In an apparatus for forming sheet material articles without a matrix, a forming head, material engaging members at opposite sides of the forming head, said material engaging members and head being relatively movable, and additional material engaging members capable of movement in unison with the aforementioned relative movement of the forming head and first mentioned engaging members and stop means for the last mentioned engaging members limiting their travel to predetermined distances.

6. In an apparatus for forming sheet material articles without a matrix, a forming head, a pair of material engaging members at opposite sides of the forming head, and independent material engaging members disposed in spaced relation with the aforementioned engaging members, said forming head and material engaging members being relatively movable, substantially as specified.

7. In an apparatus for forming sheet material articles without a matrix, a forming head, a pair of material engaging members at opposite sides of the forming head, and additional material engaging members angularly disposed in relation with the aforementioned engaging members, one set of such angularly disposed engaging members being adjustable in relation with the other set of engaging members, the said head and all of the engaging members being relatively movable.

8. In an apparatus for forming sheet material articles without a matrix, a forming head, material engaging means coacting therewith, means for relatively moving the forming head and material engaging means for stretching the material operated upon in one direction, and independent material engaging means whereby the relative movement of the forming head and said independent engaging means will stretch the material in a transverse direction.

9. In an apparatus for forming sheet material articles without a matrix, a forming head, material engaging means, means for relatively moving said forming head and material engaging means to initially stretch the material in one direction and by further relative movement of said parts to subsequently relatively stretch the material in a different direction.

10. In an apparatus for forming sheet material articles without a matrix, a forming head, material engaging means, means for relatively moving said forming head and material engaging means to successively stretch the material acted upon in transverse directions.

11. In an apparatus for forming sheet

material articles without a matrix, a forming head, and material engaging means, both movable in parallel paths of travel, and means for limiting the movement of one of said parts in relation with the movement of the other part at variable points in its path of travel substantially as specified.

12. In an apparatus for forming sheet material articles without a matrix, a forming head, material engaging means, means to relatively move the forming head and material engaging means, an abutment structure overhanging the forming head and material engaging means, and additional material engaging means abutting upon said overhead structure.

13. In an apparatus for forming sheet material articles without a matrix, a forming head, material engaging means, means to relatively move the forming head and material engaging means, an overhanging support, additional material engaging means adjustably suspended upon the overhead support, and means for limiting the movement of the suspended engaging means.

14. In an apparatus for forming sheet material articles without a matrix, a forming head, vertically adjustable material engaging means located at opposite sides of the forming head, said material engaging means being adjustable in a direction substantially parallel with the path of movement of the head, and means for relatively moving the forming head and material engaging means to stretch the engaged material over said head.

15. In an apparatus of the character described, a forming head into conformity with which the material to be operated upon is to be stretched, a plurality of material engaging members, said head and material engaging members being relatively movable, said material engaging members being so located and arranged in relation with the head and with each other that the pull or strain of the material incidental to stretching it into conformity with the head will be initiated through different lines of stress at different stages in the relative movement of the head and engaging members.

16. In an apparatus of the character described, a forming head, and a series of material gripping members coacting therewith, said head and gripping members being relatively movable to stretch the sheet of material operated upon into comformity with the head, the relative movement of the head and different gripping members occurring at successive intervals during the period of operation.

17. In an apparatus of the character described, a forming head, a plurality of independent material gripping members coacting therewith, said head and gripping members being relatively movable to stretch the material operated upon into conformity with the head, said independent material gripping members being so located and arranged in relation with said head and one with another that the stretching of said material will be exerted in different directions.

In testimony whereof, I have hereunto set my hand this 4th day of March, A. D. 1917.

JOHN DUDLEY ARTZ.

Witnesses:
JOHN DINEEN,
ESTHER GIFFORD.