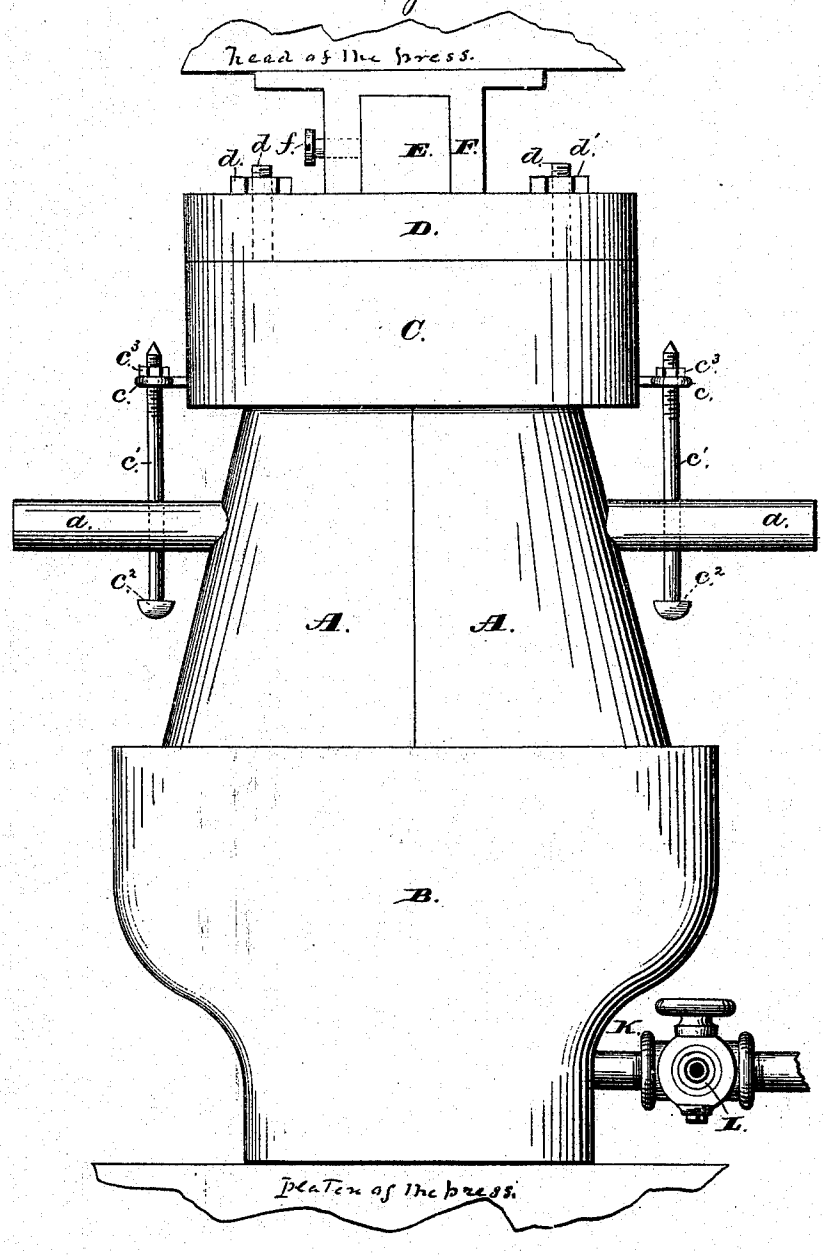
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H. A. CHAMBERLAIN & W. L. MARTIN.

APPARATUS FOR DIE SHAPING.

No. 291,681. Patented Jan. 8, 1884.

Fig. 1.



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) Model.)

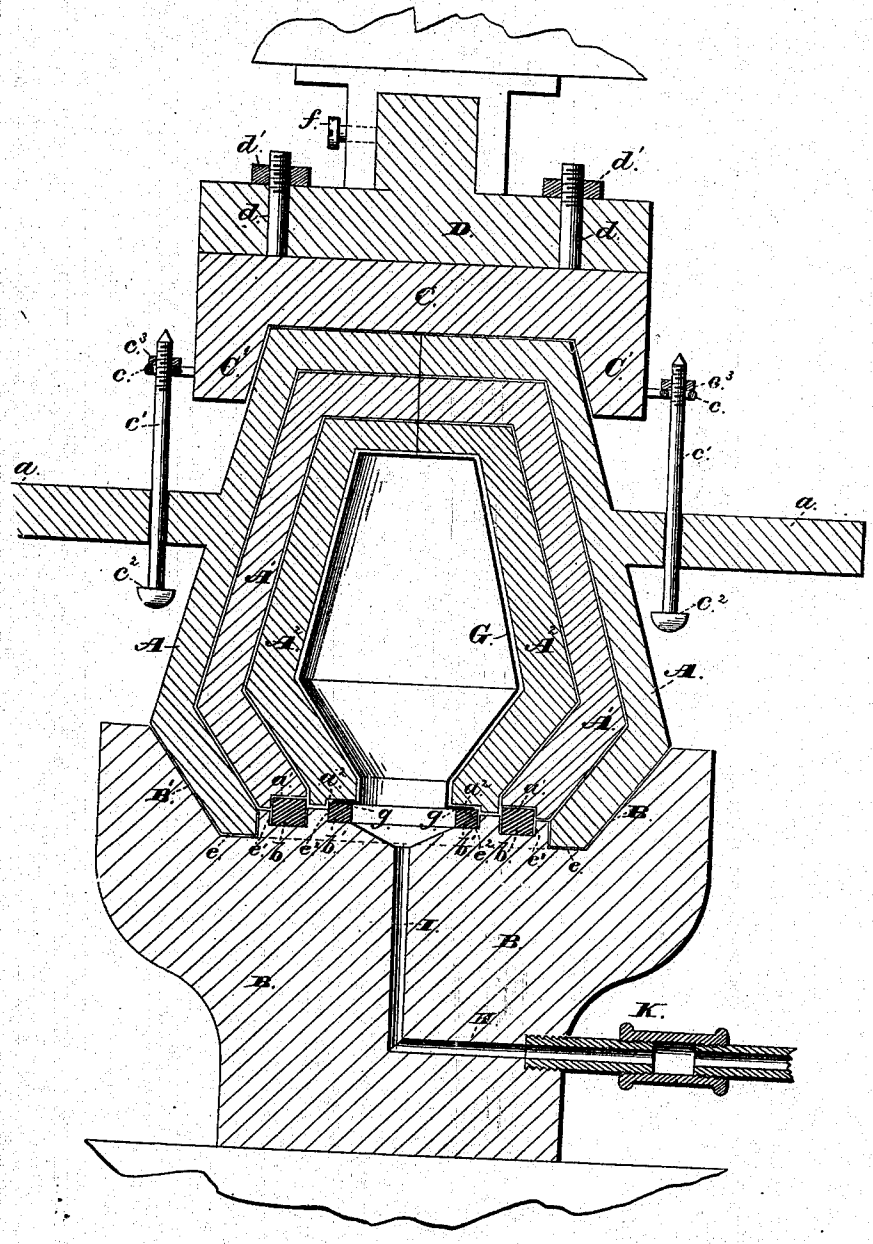
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Fig. 2.



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Fig. 3.

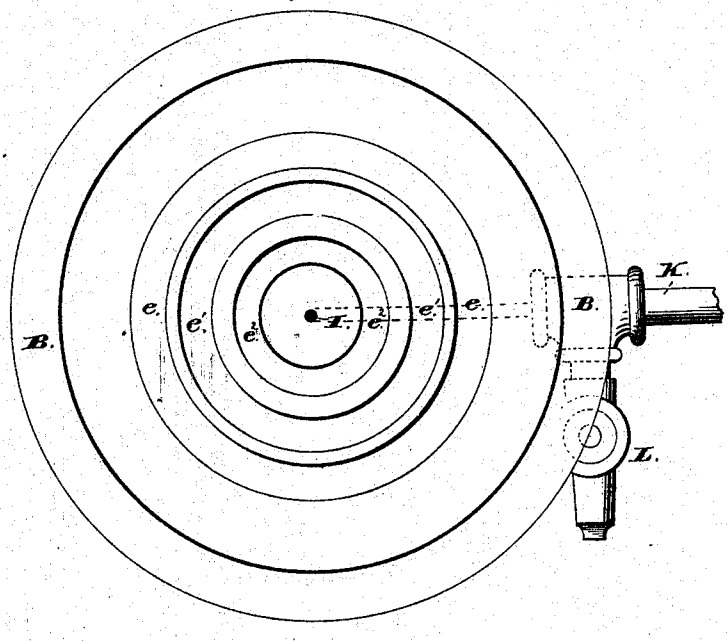
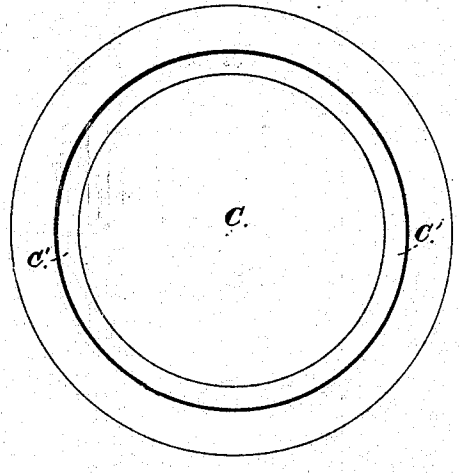


Fig. 4.



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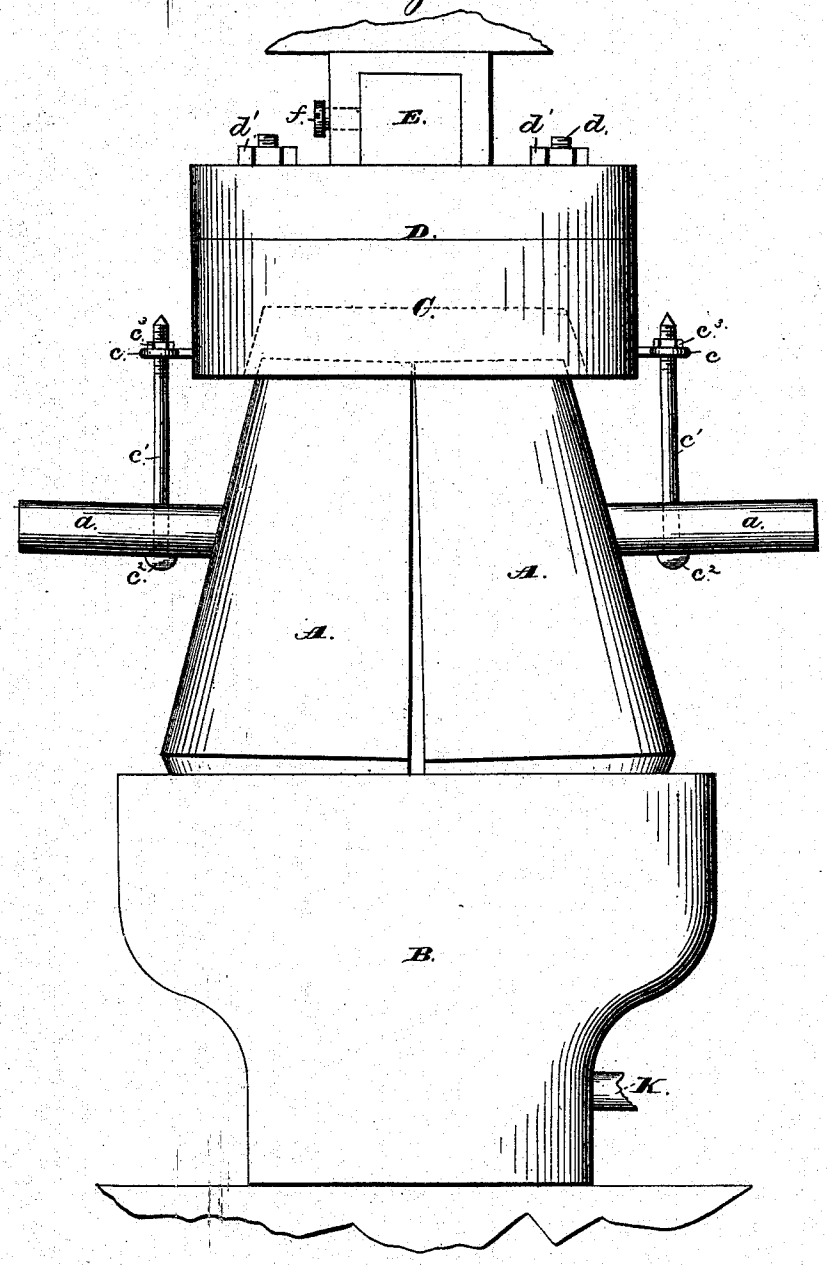
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Fig. 5.



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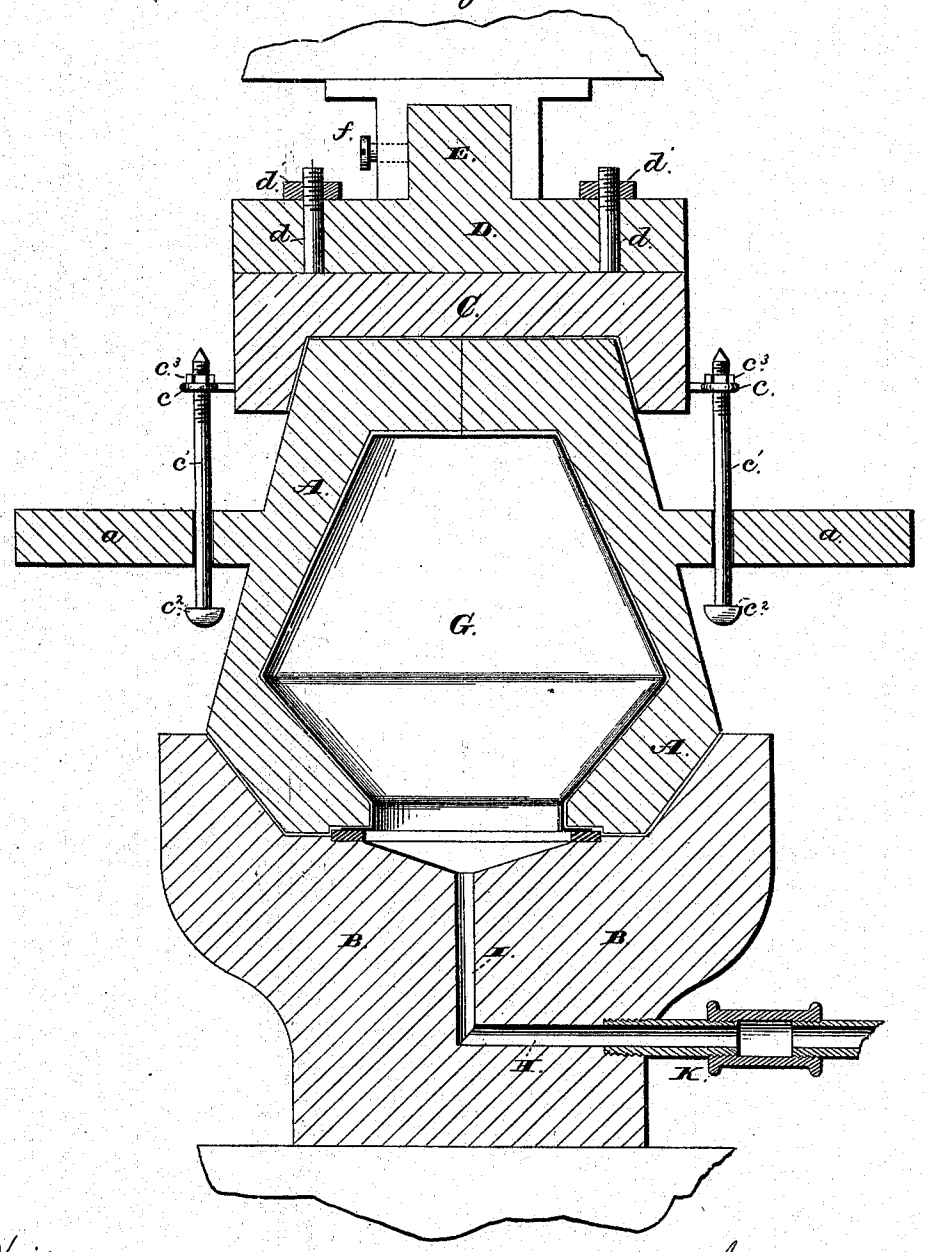
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Fig. 6.



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UNITED STATES PATENT OFFICE.

HENRY A. CHAMBERLAIN AND WILLIAM L. MARTIN, OF MIDDLETOWN, CONNECTICUT.

APPARATUS FOR DIE-SHAPING.

SPECIFICATION forming part of Letters Patent No. 291,681, dated January 8, 1884.

Application filed September 7, 1883. (No model.)

To all whom it may concern:

Be it known that we, HENRY A. CHAMBERLAIN and WILLIAM L. MARTIN, of Middletown, in the county of Middlesex, and in the State of Connecticut, have invented an Improvement in Apparatus for Die-Shaping; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 shows in elevation our improved die-shaping apparatus in place upon a press. Fig. 2 is a vertical central section of the same. Fig. 3 is a plan view of the base of said apparatus. Fig. 4 is a like view of the lower side of the cap thereof. Fig. 5 is a front elevation of our apparatus, showing the position of the parts when the cap is raised either before or after the apparatus has been used; and Fig. 6 is a vertical central section of a modified form of said apparatus.

Letters of like name and kind refer to like parts in each of the figures.

The object of our invention is to provide an improvement in apparatus for die-shaping; and to this end it consists in the construction, arrangement, and combination of parts, as hereinafter described, and more specifically pointed out in the claims.

In the drawings, A designates the outside shell or casing of the matrix, and A′ and A^2 the internal shells or reducers contained therein. The innermost shell, A^2, is provided on its internal surface with the ornamentations and configurations desired to be taken by the hollow blank or form when subjected to the operation to be described hereinafter. All these shells or casings are to be divided into two equal parts vertically, as shown. Whenever it is found necessary to suit any particular case, they can of course be divided into any desired number of sections without departing from our invention.

The base B is, as shown, bowl-shaped, the sides B′ of the depression in its upper surface being made flaring outward in straight lines to fit accurately over the lower beveled end of the outer matrix-casing. The bottom of the depression is, as shown, provided with a series of concentric circular recesses, *e e′* e^2. The outer wall of recess, *e*, forms a continuation of the inclined surface of the wall B′, while its inner wall is vertical. The extreme lower end of the casing A is formed so as to fit closely within this recess. In the recesses *e′* and e^2 are placed washers or gaskets *b* and *b′*, of rubber or other elastic material. The walls of these recesses are vertical, so as to confine the washers and prevent them from spreading too much when great pressure is brought to bear upon them. The lower end of the inner casing or reducer, A′, is provided with a circular recess, *a′*, corresponding in size with recess *e′*, but preferably not quite so deep. Within the circular groove formed by these two recesses the gasket or packing is securely confined from spreading. The lower end of the innermost casing, or matrix proper, is provided with a similar recess, a^2, corresponding with recess *b′*, and serving a similar purpose with reference to gasket *b′*.

The reducer A′ and the matrix proper, A^2, are shown as of the same shape externally as the exterior of the casing A; but such conformity in shape is of course not necessary.

The cap C is formed with a large recess or depression in its lower face, formed with flaring sides C′ C′ to fit closely over the tapering sides of the upper end of the matrix-casing. The bottom of the recess is a plane horizontal surface to correspond with the flat top of the matrix-casing, so that when pressure is brought to bear to force the cap down the bottom of the depression will come squarely and firmly against said top. The cap is attached, by means of bolts *d* and nuts *d′*, to a plate, D, provided with the upward projection or tongue E. This tongue fits within the hollow downwardly-projecting piece F, attached to the vertically-moving head of a screw or other desirable kind of press, capable of exerting considerable pressure upon cap C. The tongue E is fastened within the piece F by means of the set-screw *f*, so that when the press head or plate is raised the cap will be raised with it. From the sides of the cap, and at right angles to the plane of division of the matrix-casing, are eyebolts *c*, through which pass loosely the rods *c′*, provided at their lower ends with heads c^2, and having screw-threaded upper ends to receive nuts c^3.

To the matrix-casing are attached arms *a a*,

diametrically opposite each other, and extending horizontally outward, and also at right angles to the plane of division of the casing. The rods *c'* pass loosely through these arms, as shown. The distance between the nuts and heads on the rods is considerably greater than that between the upper and lower faces of the arms *a a* and eyebolts *c c*, so that when the cap is raised it moves some distance and releases the upper ends of the matrix-sections before such sections begin to be raised. When the cap is raised to or near the limit of its movement, as will be seen in Fig. 5, said sections will hang so as to be apart from each other at their lower ends, and will be capable of being freely swung farther apart to admit of the insertion of a blank or form of vessel to be shaped and ornamented, or the removal of the finished vessel after the blank has been operated upon. The arms *a a*, as will be seen, also form convenient handles for manipulation of the matrix-sections.

The base B is provided with a horizontal passage, H, extending from its exterior to its center, and connecting with the central vertical passage, I, opening at its top into the bottom of the bowl-shaped depression in said base. Into passage H is inserted and properly fastened the end of pipe K, which is to be connected with any desired means or mechanism by which air, water, steam, or other fluid can be supplied under great pressure. For such connection the outer end of pipe K is screw-threaded to receive the necessary coupling. Said pipe is also provided with a let-off cock, L, at one side, to let off the compressed fluid from the interior of the vessel in the matrix and from the pipe and passages when the shaping operation has been finished and the pressure upon the fluid from the source of supply has been shut off, all as will be described hereinafter.

The blank or form G, which is to be of britannia, white-metal, or any soft alloy or metal, is spun or otherwise shaped so as to fit loosely within the matrix proper, A^2, the interior of which is shaped or ornamented as desired. The blank is preferably to be of the general form of the interior of the matrix or die, as near to that as it can be made by spinning. Even where, as in the modification shown in Fig. 6, the interior of the matrix is angular in shape, it is not necessary to give the blank, before being operated upon, such angular shape, but it is sufficient to make it only as near the general conformation of the matrix as it can be got by spinning. Wherever it is found desirable, the blank can of course be shaped by any other of the well-known means before being placed in the matrix. A flange, *g*, is to be left or formed around the mouth of the blank. This flange, as shown in Fig. 2, overlaps the edge of the opening in the lower end of the matrix and sits within the circular recess therein, so that when the parts of the matrix are forced down into position said flange rests upon the rubber gasket or washer and compresses it, so as to make a water or air tight joint between the base and the blank.

In the modified form of my apparatus shown in Fig. 6 no reducers are used and the matrix and its casing are made in one piece, preferably of brass, but not necessarily so. Any metal can be used. In this case the matrix should be an inch, at least, in thickness around the internal cavity. The cap of the modification can, if desired, be attached to the press in the same way as the cap already described, with the same connections between the cap and matrix-sections. In the modification the interior of the matrix is shown as being angular. Where the reducers are used, the outer casing of course can safely be of considerably less thickness than that given for the modification. We prefer the form of apparatus adapted to allow the use of the reducers, because we are enabled easily to make several different sizes of vessels of the same or other shape and ornamentation, and because there is a great saving of expense and material, as the matrix proper, being contained within an inclosing shell or shells, does not need to be made as thick or heavy as with the other form of apparatus. The outer casing or shell remains the same for all.

The rubber washers or gaskets not only serve to make a water-tight joint, but also by their yielding allow the matrix or die casing to descend far enough into the base to be firmly seated in the depression therein, and to be tightly held by the flaring sides of the latter. If any wear should take place between the beveled face of the lower ends of the casing-sections and the flaring walls of the base, the sections forming the casing will be allowed, by the yielding of the washers, to descend farther into said base, so as to be seated as firmly and closely therein as before.

As indicated above, where the reducers are used, it is only intended that the innermost shell shall be of brass, which can most easily be shaped and ornamented as desired. The other shells and the casing can be made of cheaper metal, as iron.

With the arrangement as shown in Fig. 2, the outer casing, A, and the inner one, A', are preferably of iron, while the inside shell, A^2, is of brass. Where a larger-sized vessel is to be formed, A' and A^2 are to be removed, and a matrix fitting just within A, or within a thin shell inside thereof, is to be used.

The arrangement and material of the reducing-shells and matrices can be varied in a number of ways to suit particular cases without departing from the spirit of our invention, as such variation is only a question of mechanical or artistic skill. Where the matrix is used fitting just within the casing and without a reducer, the flange of the contained blank will rest upon and compress the outer elastic washer.

As all workers in britannia, white-metal, or other soft metals and alloys used for the blanks or forms of vessels or utensils understand, such

metals or alloys are much more easily and better worked when heated than when cold, for they are then rendered softer or more pliable and less liable to crack. We therefore subject the blank to heat while the fluid is being forced into it under pressure. This we can do by heating the fluid which is forced in, or by heating the matrix itself, and so heating the blank. If desired, steam can be used; but we have found that hot water, while being safer, can be made sufficiently hot as to make the metal of the blank so soft and pliable as to take perfectly and with great clearness the shape and ornamentations of the die or matrix.

The manner of using and the operation of our apparatus are as follows: The cap C is raised independently of the die-casing until the heads c^2 of the rod c' strike against the arms *a a*, when, by its continued motion, the die or matrix sections are also lifted clear of the depression in the base B. They will then hang swung apart, as shown in the drawings. The divided die or matrix is then introduced in place within the casing. A blank of britannia, white-metal, or soft alloy, shaped as nearly as possible to the general conformation of the die, but somewhat smaller than the interior thereof, is inserted within said die. The cap and sections of the die-casing are then lowered, so that their lower ends enter the depression in the base. Pressure is then brought to bear by the press upon the cap, and the die-casing is forced firmly down into place. By the action of the flaring sides of the depressions or recesses in both cap and base, in connection with the beveled or tapered ends of the casing, the sections of the latter will be forced firmly and tightly together and locked there against opening under pressure from within. The flange of the blank or form rests upon and compresses the rubber packing or gasket within its recess. When sufficient pressure has been brought to bear upon the cap and die-sections to force them into and hold them in place together, sufficient water or other fluid is forced into the blank under pressure through pipe K and passages H and I. The metal of the blank is meanwhile subjected to heat either by heating the matrix or die or the water or other fluid being forced into the blank. Under the action of the fluid-pressure from within, said blank is expanded with equal pressure in all directions, and being softened and made pliable by the heat, it takes the shape, size, and ornamentations of the interior of the die perfectly, with the greatest clearness and precision, and without cracking or wrinkling. The pressure from the source of supply is then shut off and the let-off cock L is opened, so as to release the pressure from the vessel and passages. The pressure upon the cap is then removed, said cap and the die-casing sections swung apart, and the formed and ornamented vessel taken out.

We do not herein intend to cover or claim our improved process of die-shaping, as such is fully described and claimed in another application to be filed by us as a division of this case. The claims in this case are to be confined to the apparatus used.

Having thus fully set forth the nature and merits of our invention, what we claim is—

1. The die or matrix casing, divided into sections vertically and made tapering at each end, in combination with the cap and base, both provided with depressions having flaring sides to fit closely upon the tapering ends of the casing, and means for pressing the cap upon the casing and holding it there, substantially as and for the purpose set forth.

2. The casing divided into sections longitudinally, adapted to receive and hold within it a matrix or an inner reducing-casing and matrix, and formed tapering at each end, in combination with a cap and base adapted to fit closely over and confine the ends of the casing, substantially as and for the purpose set forth.

3. The base formed with a bowl-shaped depression having flaring sides, and provided with a circular recess, in combination with a die-casing divided vertically into sections, and adapted at its lower end to fit within the depression and the circular recess, and the cap formed to fit the tapering upper end of the casing, substantially as and for the purpose set forth.

4. In combination with the base provided with a recess around its central portion, the matrix provided with a corresponding recess adapted to receive the flange of the blank or form to be shaped or ornamented, the elastic washer or gasket in the recess in the base, means for pressing and holding the matrix down upon the base, so that the flange of blank shall rest upon and compress the washer, and suitable connecting-passages opening into the center of the upper face of the base, so as to admit fluid to the interior of the blank, substantially as shown and described.

5. The matrix divided into sections longitudinally, and provided at its lower end to receive the flange of the contained form or blank, in combination with the base having a corresponding recess in its upper face, the elastic packing in this recess, suitable passages in the base opening upward within the line of the recess, and means for forcing and holding the matrix-sections together and down upon the base, so that the flange of the blank shall rest upon and compress the elastic washer or packing and form a tight joint, substantially as shown and described.

6. The base provided with a bowl-shaped depression having flaring sides, and a series of concentric recesses in its bottom, the outer one adapted to receive the lower end of the divided matrix-casing, made tapering at its lower end to fit in the base, and the others adapted to receive and hold elastic washers, the divided reducing-shell within the casing, having a recess in its lower end to receive the upper portion of the outer washer, the divided matrix fitting within the shell, and also pro-

vided with a recess corresponding with the inner recess in the base, and adapted to receive the flange of the blank, the passages in the base opening in the upper face thereof within the inner recess, and the cap fitting over the end of the casing, all combined and operating substantially as and for the purpose described.

7. The die-casing divided into two sections vertically, the cap fitting upon the upper end thereof, the eyebolts on the cap, the arms attached to the casing-sections, and the headed rods provided with screw-nuts and passing through eyebolts and arms, all combined and operating substantially as and for the purpose set forth.

8. The press, the cap connected with the press head or plate, the die-casing, made in sections, and loose connections between the cap and sections, which will allow the cap to be raised clear of the sections before the latter are moved, and then will cause the sections to be raised by the further movement of the cap, all in combination, substantially as and for the purpose set forth.

9. The combination of pipe K, connected with a suitable source of supply of fluid under pressure, the base B, provided with passages H and I, and having the bowl-shaped depression with flaring sides, the divided casing having its lower end correspondingly shaped to fit within this depression, and being adapted to receive and hold a divided die or matrix, the cap fitting over the tapering top of the casing, and suitable means for pressing the cap downward upon the end of casing, substantially as and for the purpose described.

In testimony that we claim the foregoing we have hereunto set our hands this 22d day of August, 1883.

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WILLIAM L. MARTIN.

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