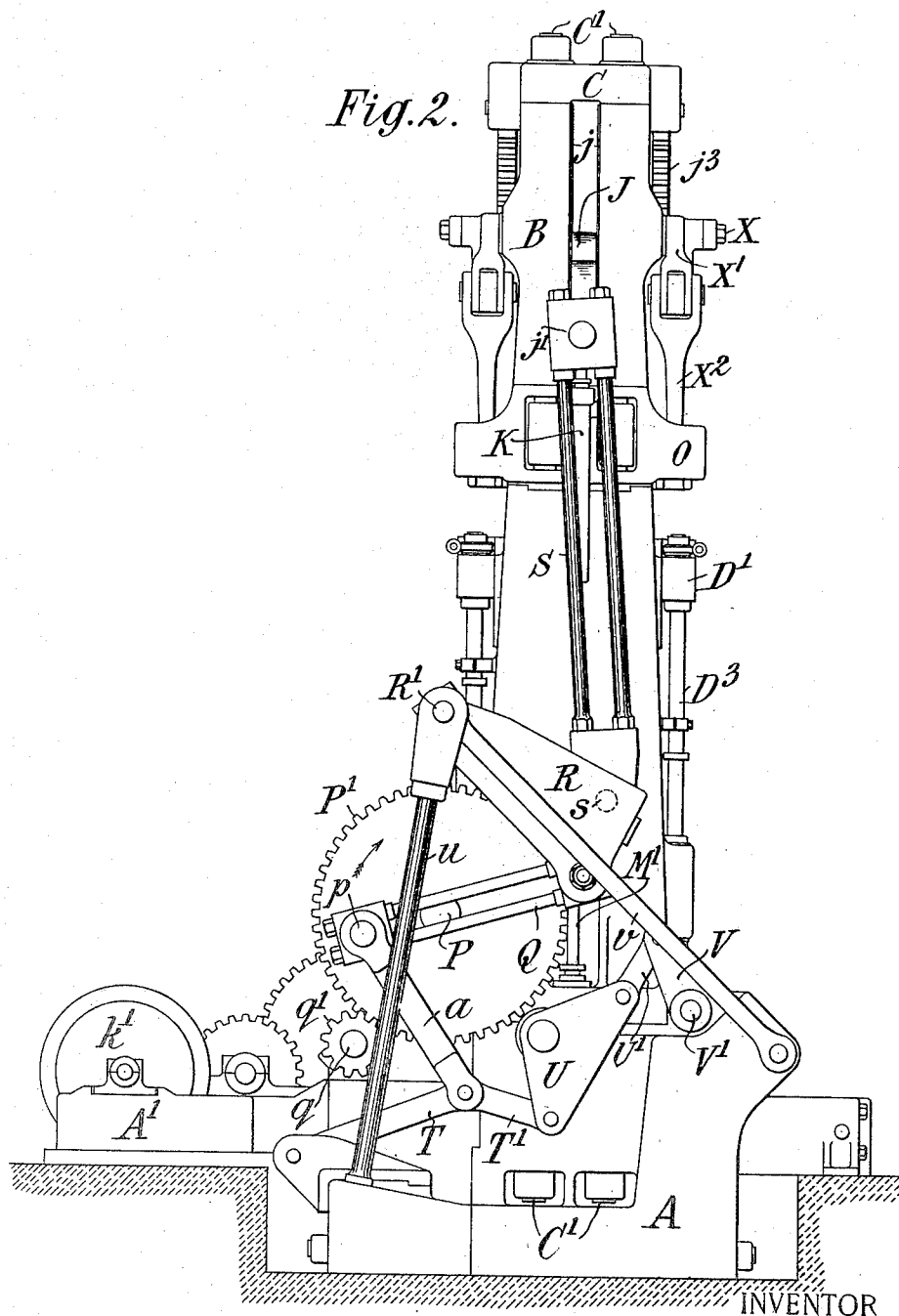


1,025,154.

F. ORTON.
DRAWING PRESS.
APPLICATION FILED DEC. 9, 1911.

Patented May 7, 1912.

6 SHEETS-SHEET 2.



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6 SHEETS-SHEET 3.

Fig. 3.

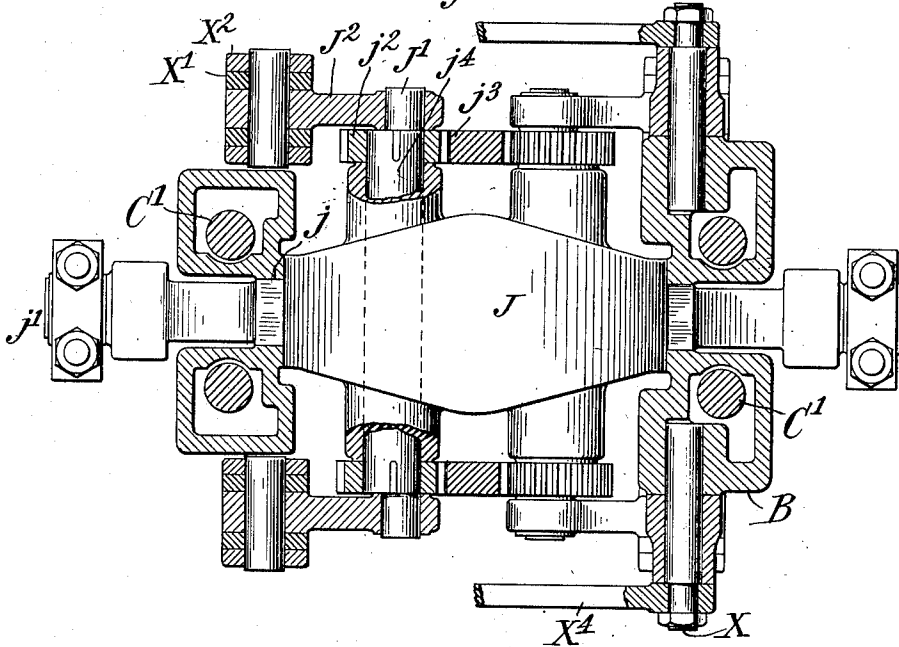
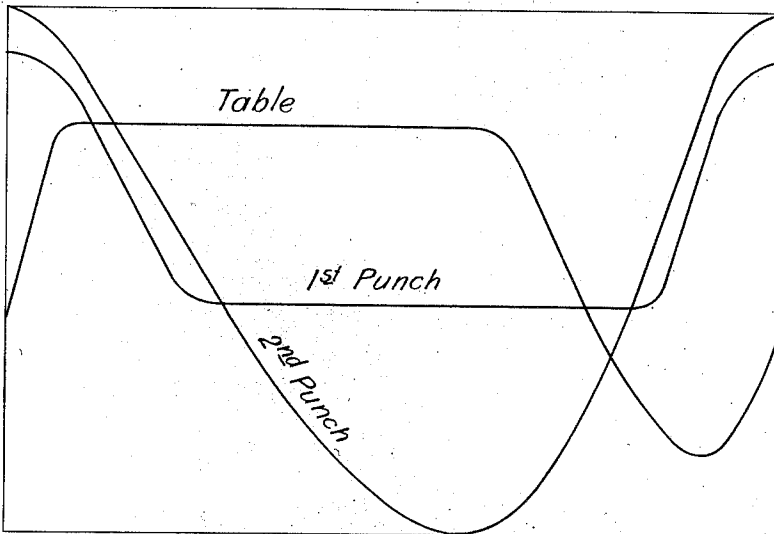


Fig. 8.



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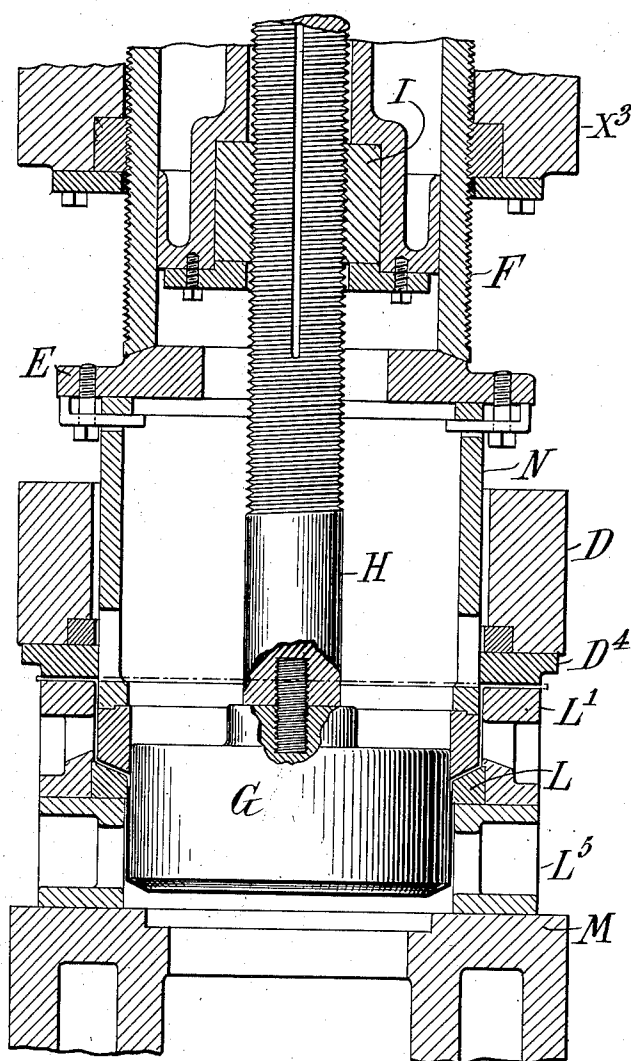
Fraser, Turk & Myers

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6 SHEETS—SHEET 4.

Fig. 4



WITNESSES:
René Guine
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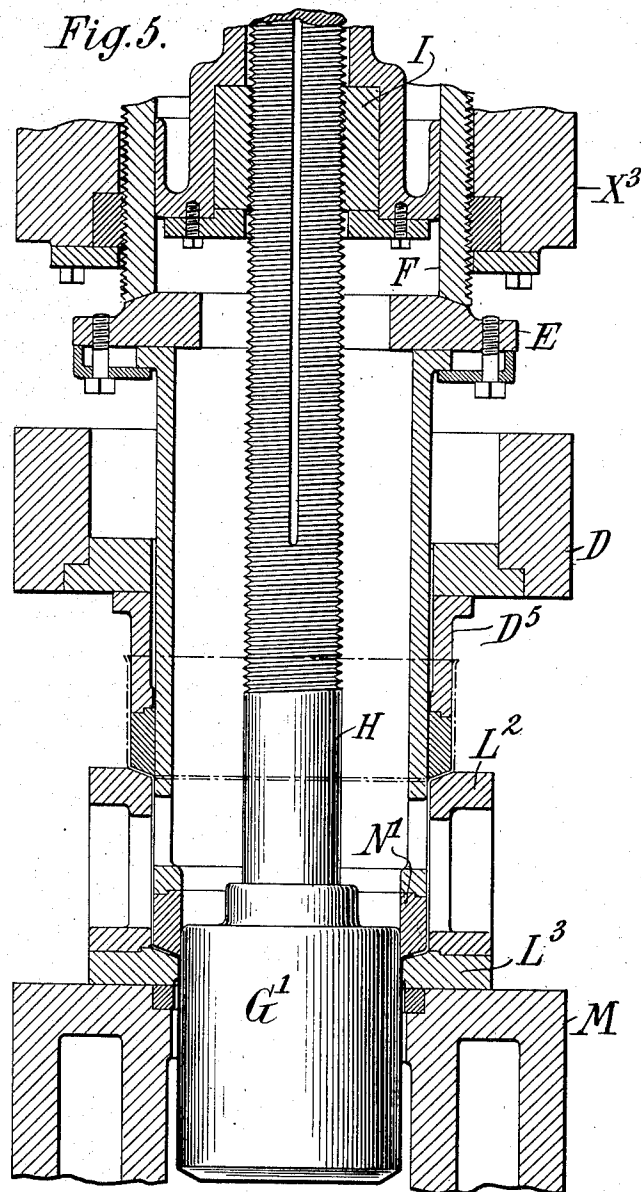
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6 SHEETS—SHEET 5.



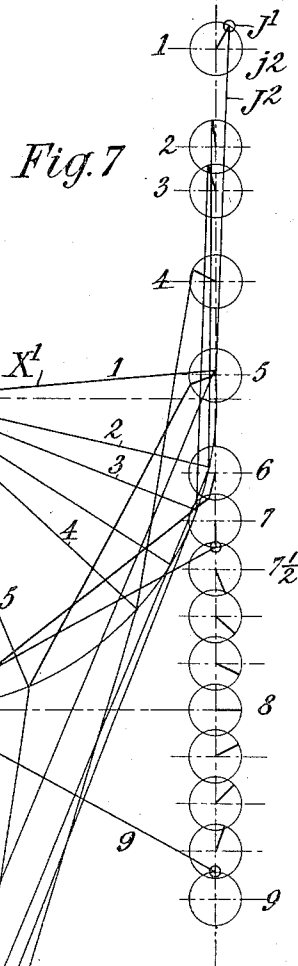
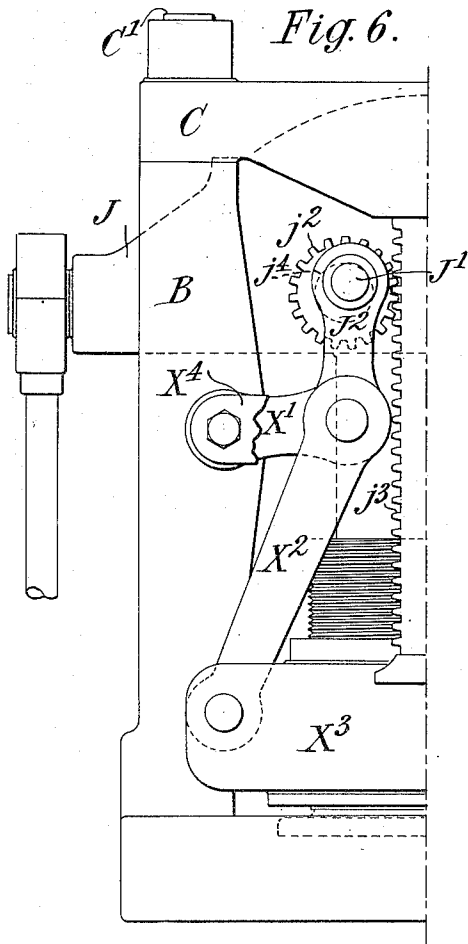
WITNESSES:
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1,025,154.

Patented May 7, 1912.

6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

FREDERICK ORTON, OF GLENDALE, NEW YORK, ASSIGNOR TO E. W. BLISS COMPANY,
OF BROOKLYN, NEW YORK, A CORPORATION OF WEST VIRGINIA.

DRAWING-PRESS.

1,025,154.

Specification of Letters Patent.

Patented May 7, 1912.

Application filed December 9, 1911. Serial No. 664,723.

To all whom it may concern:

Be it known that I, FREDERICK ORTON, a citizen of the United States, residing in Glendale, in the borough and county of Queens, city and State of New York, have invented certain new and useful Improvements in Drawing-Presses, of which the following is a specification.

This invention relates to a double drawing press and is applicable to different types of such press. It is shown in connection with a drawing press of the general construction illustrated in Letters Patent 998,969, dated July 25, 1911, to Klocke and Orton. The type of drawing press illustrated in the said patent employs a toggle-operated table wherein the table and punch shall each have a variable stroke and the punch a quick return stroke.

Although otherwise useful the invention is particularly well adapted to large and heavy presses of the type illustrated in the said patent, such as are used for drawing steel cups or shells of large size, say, for example, of a length approximating three feet, and a diameter approximating two feet. For drawing such shells from a flat bed it is necessary to resort to several successive drawing operations. Of these the first is of large diameter and short stroke, the following operations being successively of smaller diameter and longer stroke until the final operation of maximum stroke and minimum diameter produces a finished cup or shell. As the expense of such heavy presses is considerable it is desirable to be able to utilize one machine for each of the successive drawing operations required to produce such a shell, as well as for other or analogous operations. The requirements of such a press and the advantage of the particular construction there illustrated are fully explained in the said patent and it is not thought necessary to repeat them here.

The present invention is directed to the production of means whereby the presses such as are illustrated in the said patent, and other presses, may be adapted for double drawing operations in drawing deep shells.

In double drawing presses it is customary for the first drawing punch to act in connection with its die as the blank holder for the second drawing punch, and the present invention consists in the production of

means whereby the dwell of the first drawing punch may be perfected during the operation of the second drawing punch while drawing large and deep shells without increasing the size of the parts.

An embodiment of my said invention in connection with a press of the character referred to is illustrated in the accompanying drawings, wherein,

Figure 1 is a front elevation of said press; Fig. 2 is a side elevation thereof viewed from the left; Fig. 3 is a section on the line 3-3 in Fig. 1; Fig. 4 is a detail sectional view showing the punches, blank holders and their operating parts in the act of drawing a shell; Fig. 5 is a similar view of the said parts in the later drawing operations; Fig. 6 is a detail view on a somewhat larger scale of the means for operating the first drawing punch and second drawing blank holder. Fig. 7 is a diagrammatic representation of the movement imparted to the said first drawing punch and second drawing blank holder and its operating means. Fig. 8 is a diagram or time chart showing the relative movement of the punches and table.

In the particular construction shown in the drawings the fixed framework of the machine comprises a massive base or bed A, parallel, upright side frames B B with a cross-frame C uniting them above, the said frame, base and cross-head being tied together by tension stays C¹ and having a surrounding intermediate bracing frame O. The base A has a rearward extension A¹ forming a frame for the speed-changing gearing. A fixed cross-head D¹ is tied to projections D² of the base A by tie-rods D², and carries the stationary blank holder frame D for the first draw. For clearness of illustration of the parts the said blank holder frame D is omitted from Fig. 1, but is illustrated in Figs. 4 and 5. The first drawing punch and second drawing blank holder N are mounted against the usual equalizing ring E carried at the lower end of a frame F which is fixedly and adjustably mounted in a movable slide X³, which depends from toggles X¹, X² supported on each side of the frame at X, and which are braced by a cross-piece X⁴. The said blank holder frame F may be adjusted relatively to the slide X³ and clamped in position therein by means fully illustrated

in said Patent 998,969. The punch G, Fig. 4, is carried upon the plunger H which is vertically adjustable in the lower member I of the sliding cross-head J, which is vertically movable in guideways *j j* formed in the upright frames B, a part or all of its weight being carried by the hydraulic rams or buffers K K as usual. The die L, Fig. 4, is carried by a table or movable bed M which slides on vertical guideways *m m* between the upright frame B B. Part or all of its weight, as shown, may be carried by hydraulic rams or buffers M¹.

Both the first drawing punch and second drawing blank holder, and the second drawing punch and table, derive motion from the crank shaft P through cranks, levers, links and connecting rods, as will be described. The means whereby such motion is communicated to the punch G and to the bed or table M, will be described briefly as follows:—The crank shaft P is driven through suitable gearing, preferably through reduction gearing as shown. The said shaft is mounted in bearings in rearward extensions of the side frames B B, and carries on opposite sides cranks *p p* which are conveniently formed as studs fixed in gear wheels P¹ P¹ keyed upon opposite ends of the shaft and through which means the shaft is driven. For driving the punch G the cranks *p p* connect through links Q Q with rock levers R R on opposite sides of the press, which levers in turn connect through rods or links S S to the pivotal ends *j'* of the cross-head J. The connection between the levers R and rods S is made by means of pivotal pins *s* which are adjustable toward or from fulcrum pivots R¹ of the levers for the purpose of imparting a variable stroke to the punch. The details of construction for permitting this adjustment may be greatly varied and are not illustrated herein, as the same form no part of the present invention.

The movements of the table M are imparted from one or both of the cranks *p* through a succession of connecting links and toggles coöperating to impart to the table in its elevated or blank-holding position, the prolonged dwell which is necessary for gripping the blank and holding it during the drawing operation. The crank stud *p*, as shown, connects by a link *a* with a pair of links T T¹ constituting a toggle joint, their outer ends being jointed respectively with the fixed frame A¹ and to one arm of a rock lever U. To the opposite arm of this lever U is jointed a link U¹, this arm and link constituting a second pair of toggles. The opposite end of this link U¹ is connected to a crank arm V fixed on a transverse shaft V¹ which has bearings in the base frame A and to which is keyed the prolonged hub W¹ of a lever arm W, this arm

being preferably adjustable in length to vary the movements of the bed. The said arm W is connected through a pair of links *t* and intermediate toggles, not shown, to a rock lever Y¹ upon a rock shaft Y which is formed with two arms Z Z projecting from it, each of which is jointed to a toggle link Z¹, the opposite end of which link is jointed to the table M. Each arm Z and link Z¹ constitute a pair of toggles. In order to support the table firmly, four pairs of toggles Z Z¹ are provided, arranged symmetrically so as to support the table near the four corners thereof. Two of the said toggle arms Z¹ Z¹ are illustrated, the other two being situated to the rear thereof. By the arrangement of these toggles the prolonged dwell of the table in the blank-holding position is attained. The extent of such dwell, and the movement of the bed and of the punches, are shown in the diagram or time chart, Fig. 8, where the heavy full lines show the movements of the table and first and second punches respectively when adjusted to their maximum movements.

The foregoing is occupied mainly with a brief description of the construction of the press as the same is illustrated in said Patent 998,969, and is greatly abbreviated, and a large part thereof is omitted, as it does not form part of the present invention.

The present invention relates to the means whereby the first drawing punch and second drawing blank holder is operated from the operating means for the second drawing punch, and to the construction which permits the first drawing punch to complete its working stroke prior to the working stroke of the second drawing punch, and which insures that the dwell of the first drawing punch shall be perfected so that it shall hold the blank firmly during the entire operation of the second drawing punch in drawing the deep shells for which the machine is adapted.

The type of machine to which the invention is applied in the drawings, is selected for convenience, and not because the invention is limited in its uses to such machine, as it may equally well be applied to other types of presses.

According to my invention the first drawing punch, during the performance of its drawing operation, is caused to descend upon the blank, and at the termination of the said drawing stroke, and throughout the continued descent of the cross-head J, when the punch G is performing its drawing function, the head F carrying the first drawing punch, is held stationary, and with the corresponding die holds the drawn blank firmly for the operation of the second drawing punch. The means for imparting this variable movement to the first drawing punch, as illustrated, consist of crank pins

J¹ mounted to oscillate upon the head J and connected by link J² with the knuckle of the toggle arms X¹ X². Means are provided for oscillating the said crank pins J¹, which as
 5 illustrated comprise oscillating gears j² connected to turn the crank pins and meshing in a stationary rack j³. By preference the construction of toggles X¹ X², links J², cranks J¹ and gear and rack j² j³ are duplicated upon the front and rear of the machine and also on both sides thereof, in order that a symmetrical pressure upon the slide X³ may thereby be attained. As illustrated in Fig. 3, the oscillating gears j² are keyed
 10 upon shafts j⁴, which have bearings in the cross-head J and extend from front to rear thereof, each of said shafts having formed on its opposite ends the two oppositely-disposed crank pins J¹.
 20 The oscillating connection between the link J² and the cross-head J tends to accelerate the motion of the first drawing punch during the performance of its drawing function and to give the same a slightly
 25 greater motion than would be the case if the link J² had a pivotal connection with the said cross-head, due to the increase in the effective length of the link J². But at the completion of the said drawing operation, and during the time the said first drawing punch acts as a blank holder for the second drawing punch, the said oscillating connection serves to hold the said first drawing punch substantially stationary
 30 while the second drawing punch is performing its function. During such period of time the movement imparted by the descent of the cross-head J to the knuckle of the toggles X¹ X² produces a negligible vibration thereof or one which does not affect the position of the punch. This will be clearly understood by reference to the diagrammatic illustration, Fig. 7. Here the parts are represented in the uppermost position as at 1, in which position the arm X² and link J² are substantially aligned, giving a substantially direct thrust at the beginning of the movement of the cross-head J upon the slide X³. The drawing period of the first drawing punch occurs during the passing of the cross-head J and slide X³ from the position 1 to the position 7, and the intermediate positions 2 to 6 show the positions of the parts during such drawing
 45 period. During the passage of the cross-head from 7 to 9, the first drawing punch has a dwell on the work and acts as a blank holder for the second drawing punch, which is then re-drawing the drawn shell. At position 7 the slide X³ is at the bottom of its stroke and the crank is substantially at the lower part of its oscillating carrier. The first drawing punch is then holding the blank for the second drawing punch and
 50 during the performance of this function,

and while the cross-head J is moving from the position 7 to 9, which is the bottom of its stroke, the knuckles are vibrated to the extent indicated in Fig. 7 on each side of the dotted center line, which vibration is insufficient to affect the position of the first drawing punch.

The negligible character of the vibrations of the toggles is caused by the oscillating crank, whereby the effective length of the link J² is gradually diminished as the said link approaches its position where it produces the extreme outward divergence of the toggles. Thus in position 8 the link J² is perpendicular to the aligned toggles, and in a position where such extreme outward divergence of the toggles from their center position is produced. Here the crank has oscillated on its carrier to its position most remote laterally from the center line of the toggles, and has consequently decreased the effective length of the link, and has thereby decreased the vibrations of the toggles and rendered them ineffective upon the first drawing punch in the performance of its blank holding function. By the provision, therefore, of the said oscillating carrier for the link, I provide a construction wherein, as illustrated in position 8 the extreme divergence of the toggles from the aligned position during the dwell of the first punch is represented, which is negligible. In case a simple pivotal connection between the link J² and the cross-head J were employed, such extreme divergence of the toggle would be increased by the radius of the crank carrier. By reason therefore of the provision of the said oscillating connection between the said link and cross-head, I am enabled to perfect the dwell attained by the first drawing punch upon its blank during the operation of the second drawing punch in drawing the deep shells for which the punch is adapted. This is represented in the diagram, Fig. 8, where the long dwell attained by the first punch is represented, and it is shown that it continues till the completion of the movement of the second punch.

The fixed blank holder frame, first drawing punch and second blank holder and second drawing punch, and their dies, will have any proportions necessitated by the work being done. In Fig. 4 the first drawing punch N is supported upon the adjustable blank holder frame F through equalizing ring E, as stated, and the blank which is illustrated as flat, in dotted lines in Fig. 4, is held between the first draw blank holder D⁴ and the first draw die L¹, which in turn is supported through a bolster L⁵ in the usual manner upon the bed M. The blank is drawn down by the said punch and die until it assumes a shape corresponding to the punch N and dies L L¹, in which shape it is held between the hollow punch N

and the said dies, which then serve as a blank holder. The punch G then descends through the hollow punch N and re-draws the said blank against die L to the position shown in full lines in Fig. 4.

In Fig. 5 the parts are illustrated in a subsequent operation in the same machine, wherein the blank as drawn by the dies of Fig. 4 is re-drawn to its eventual shape. The said blank is here mounted (see dotted lines) upon a blank holder D⁶ carried by the frame D and is re-drawn by the first drawing punch N¹ acting against die L² and is held between punch N¹ and dies L² L³. The second drawing punch G¹ then descends through the hollow punch N¹ and re-draws the shell against die L³ to its final shape.

A stationary knock-out is shown at g, Fig. 1, which is vertically adjustable upon the column g¹ which is detachably connected to the frame in a manner not shown, and by means of said knock-out the shell may be removed in the usual manner from the upper face of the table. When it is desired to remove the drawn shell from beneath the table it is necessary to detach and take out the knock-out. The said press is preferably driven by a variable speed gear which is fully illustrated and described in Patent 998,969, but the illustration and description of which have been omitted here for clearness of understanding of the remaining parts. The particular press illustrated is designed to sustain a blank-holding pressure amounting to 600 tons, and a drawing or punch pressure of 600 tons, making a total die pressure carried by the table of 1,200 tons. These figures are given only as illustrative, as the machine, particularly the machine illustrated, is adapted to a wide range of sizes and pressures.

The particular invention forming the subject matter of this application is not necessarily limited in its application to the type of machine described and shown. It may, however, very advantageously be employed in connection with such machine, nor do I consider my invention as necessarily limited to the particular embodiment thereof illustrated in the accompanying drawings, as changes may be made therein and equivalent devices substituted within the limits of the appended claims.

What I claim is:—

1. In a double-drawing press comprising a fixed frame, a blank-holder carried thereby, a movable bed carrying first and second blank-holding and drawing dies, a hollow first drawing and blank-holding punch, a second drawing punch, a reciprocating head carrying the latter, and a reciprocating slide carrying the former punch; means for moving said slide from said head comprising toggles connecting said frame and slide, an operating link, and a connection between

said link and head carried by the head and adapted to vary the effective length of the link during its oscillation to impart the blank-holding dwell to said slide, to thereby diminish the throw of the toggles to either side of their aligned position.

2. In a double-drawing press comprising a fixed frame, a blank-holder carried thereby, a movable bed carrying first and second blank-holding and drawing dies, a hollow first drawing and blank-holding punch, a second drawing punch, a reciprocating slide carrying the former punch; a reciprocating head carrying the latter, means for moving said slide from said head comprising toggles connecting said frame and slide, an operating link, and an oscillatory connection between said link and head adapted to vary the effective length of the link during its oscillation to impart the blank-holding dwell to said slide, to thereby diminish the throw of the toggles to either side of their aligned position.

3. In a double-drawing press comprising a fixed frame, a blank-holder carried thereby, a movable bed carrying first and second blank-holding and drawing dies, a hollow first drawing and blank-holding punch, a second drawing punch, a reciprocating head carrying the latter, and a reciprocating slide carrying the former punch; means for moving said slide from said head comprising toggles connecting said frame and slide, an operating link, and an eccentric connecting said link and head, adapted to vary the effective length of the link during its oscillation to impart the blank-holding dwell to said slide, to thereby diminish the throw of the toggles to either side of their aligned positions.

4. A two-step drawing press having an outer punch, an inner punch, a reciprocating head operating said inner punch directly and toggle mechanism for operating the outer punch from said head, an operating link connected to said toggle mechanism and said head, and means for varying the effective length of said link with the reciprocation of said head, carried by said head whereby said outer punch after its drawing operation acts as a blank-holder for the inner punch and has a dwell on the work during the operation of the inner punch.

5. A two-step drawing press having an outer punch, an inner punch, a reciprocating head operating said inner punch directly and toggle mechanism for operating the outer punch, an operating link connected to said toggle mechanism and said head, and means for varying the effective length of said link with the reciprocation of said head, comprising an oscillating support upon said head, a crank connection therefrom to said link, and means for oscillating said support as the cross-head reciprocates.

6. A two-step drawing press having an outer punch, an inner punch, a reciprocating head operating said inner punch directly and toggle mechanism for operating the outer punch from said head, an operating link connected to said toggle mechanism and said head, and means for varying the effective length of said link with the reciprocation of said head comprising an oscillating pinion upon said head, a crank connection therefrom to said link, and a fixed rack adapted to oscillate said pinion as the cross-head reciprocates.

7. In a double drawing press, a movable table, a fixed blank holder, a first punch and second blank holder, and a reciprocating slide carrying the same, a second punch and a reciprocating head carrying the same, means for reciprocating said head, and means for reciprocating the slide, comprising toggles connected to the frame and said slide and a link connected to said toggles and having an oscillating connection to said head whereby the effective length of the link is varied during the reciprocation of said head.

8. In a double drawing press, a movable table, a fixed blank holder, a first punch and second blank holder, and a reciprocating slide carrying the same, a second punch and a reciprocating head carrying the same, means for reciprocating said head, and means for reciprocating the slide, comprising toggles connected to the frame and to said slide, and disposed when alined parallel with the line of movement of said head, and a link connected to said toggles and having an oscillating connection to said head whereby the effective length of the link is varied during the reciprocation of said head.

9. In a double-drawing press comprising a fixed frame, a blank-holder carried thereby, a movable bed carrying first and second blank-holding and drawing dies, a hollow first drawing and blank-holding punch, a second drawing punch, a reciprocating head carrying the latter, and a reciprocating slide carrying the former punch; means for moving said slide from said head comprising toggles connecting said frame and slide, an operating link and a connection between said link and head comprising a rotary crank carrier upon said head, a crank thereon connected to said link, and means for rotating said crank carrier as the head reciprocates, whereby the effective length of the link is varied during the oscillation of said crank connection to thereby diminish the throw of

the toggles to either side of their alined position to impart the blank-holding dwell to said slide.

10. In a double-drawing press comprising a fixed frame, a blank-holder carried thereby, a movable bed carrying first and second blank-holding and drawing dies, a hollow first drawing and blank-holding punch, a second drawing punch, a reciprocating head carrying the latter, and a reciprocating slide carrying the former punch; means for moving said slide from said head comprising toggles connecting said frame and slide, an operating link and a connection between said link and head comprising a rotary crank carrier upon said head, a crank thereon connected to said link, and means for rotating said crank carrier as the head reciprocates, comprising a fixed rack and a pinion fixed to oscillate with said crank carrier and meshing with said rack, whereby the effective length of the link is varied during the oscillation of said crank connection to thereby diminish the throw of the toggles to either side of their alined position to impart the blank-holding dwell to said slide.

11. In a double-drawing press comprising a fixed frame, a blank-holder carried thereby, a movable bed carrying first and second blank-holding and drawing dies, a hollow first drawing and blank-holding punch, a second drawing punch, a reciprocating head carrying the latter, and a reciprocating slide carrying the former punch; means for moving said slide from said head comprising toggles connecting said frame and slide, a pair of such toggles being employed disposed upon opposite sides of the machine, an operating link connected to each toggle, a shaft carried by the head and free to turn therein, a crank pin on each end of said shaft, each link being connected to one of said crank pins, and means for turning said shaft as the head reciprocates, whereby the effective length of the links is varied during the oscillation of said crank connection to thereby diminish the throw of the toggles to either side of their alined position to impart the blank-holding dwell to said slide.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

FREDERICK ORTON.

Witnesses:

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FRANK MULLER.