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DRAWING PRESS.

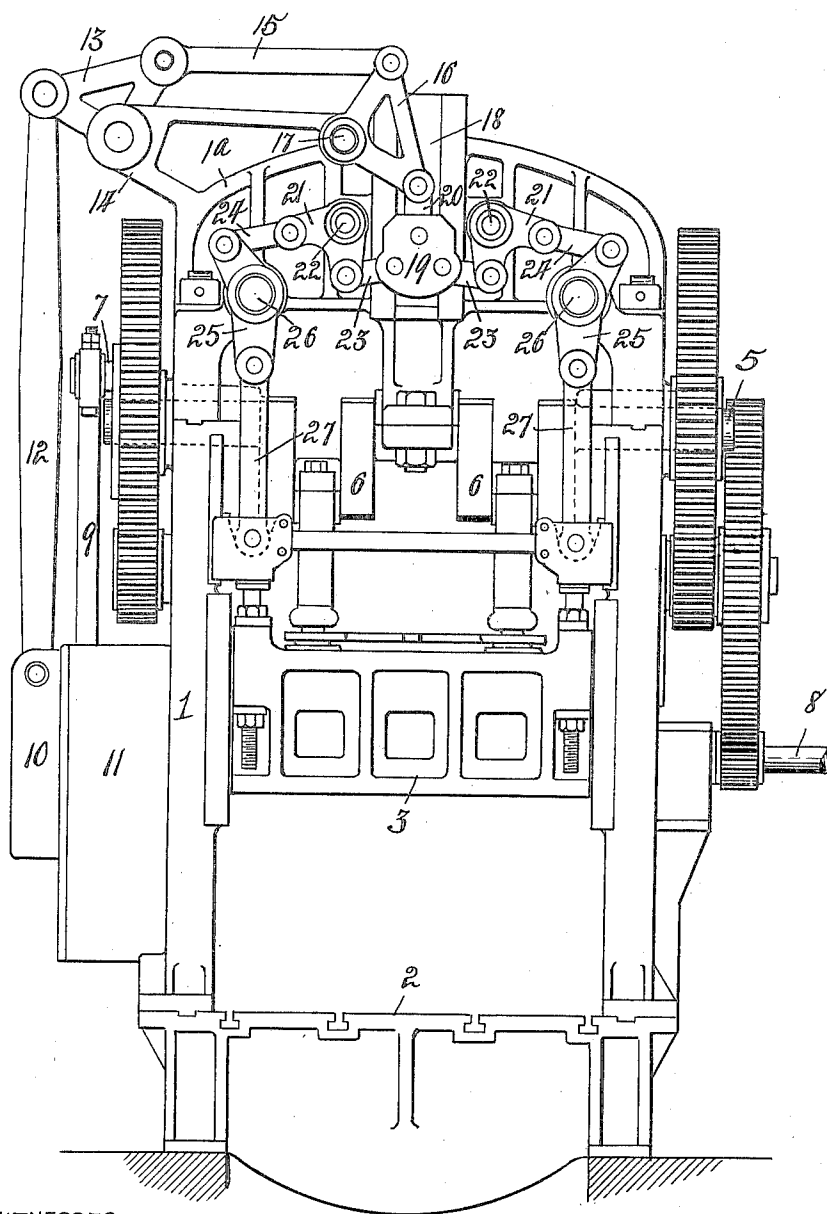
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4 SHEETS—SHEET 1.

Fig. 1.



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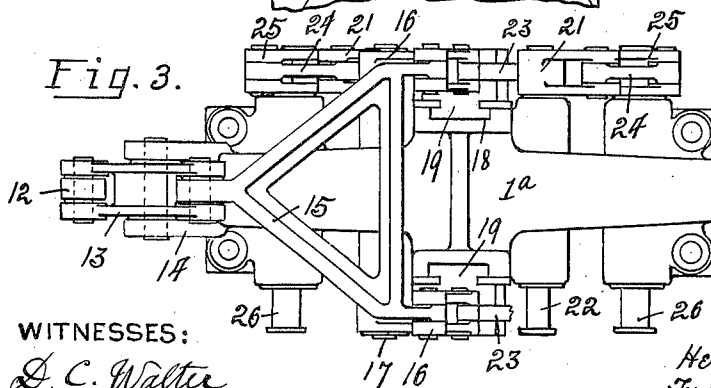
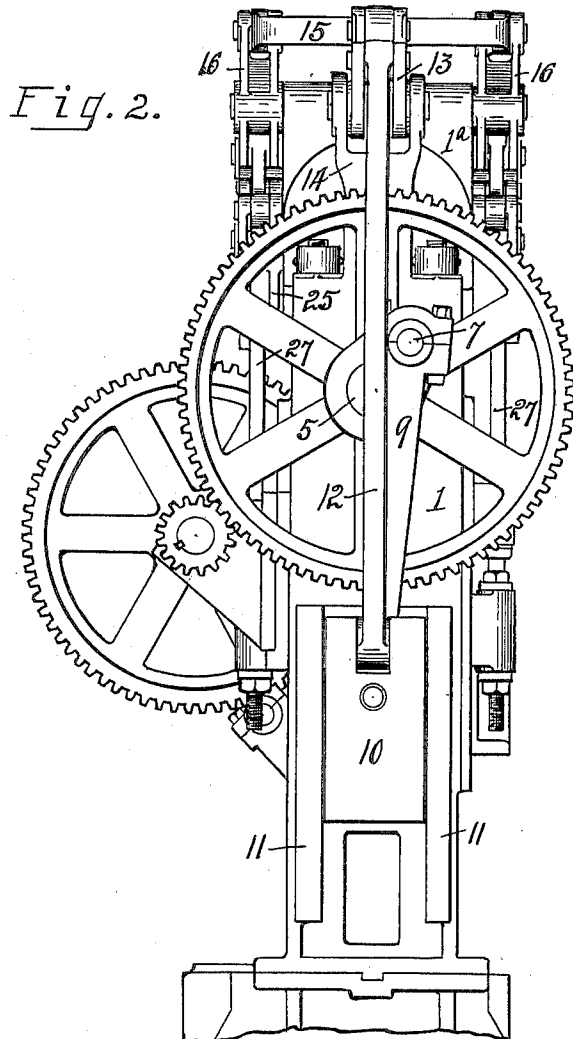
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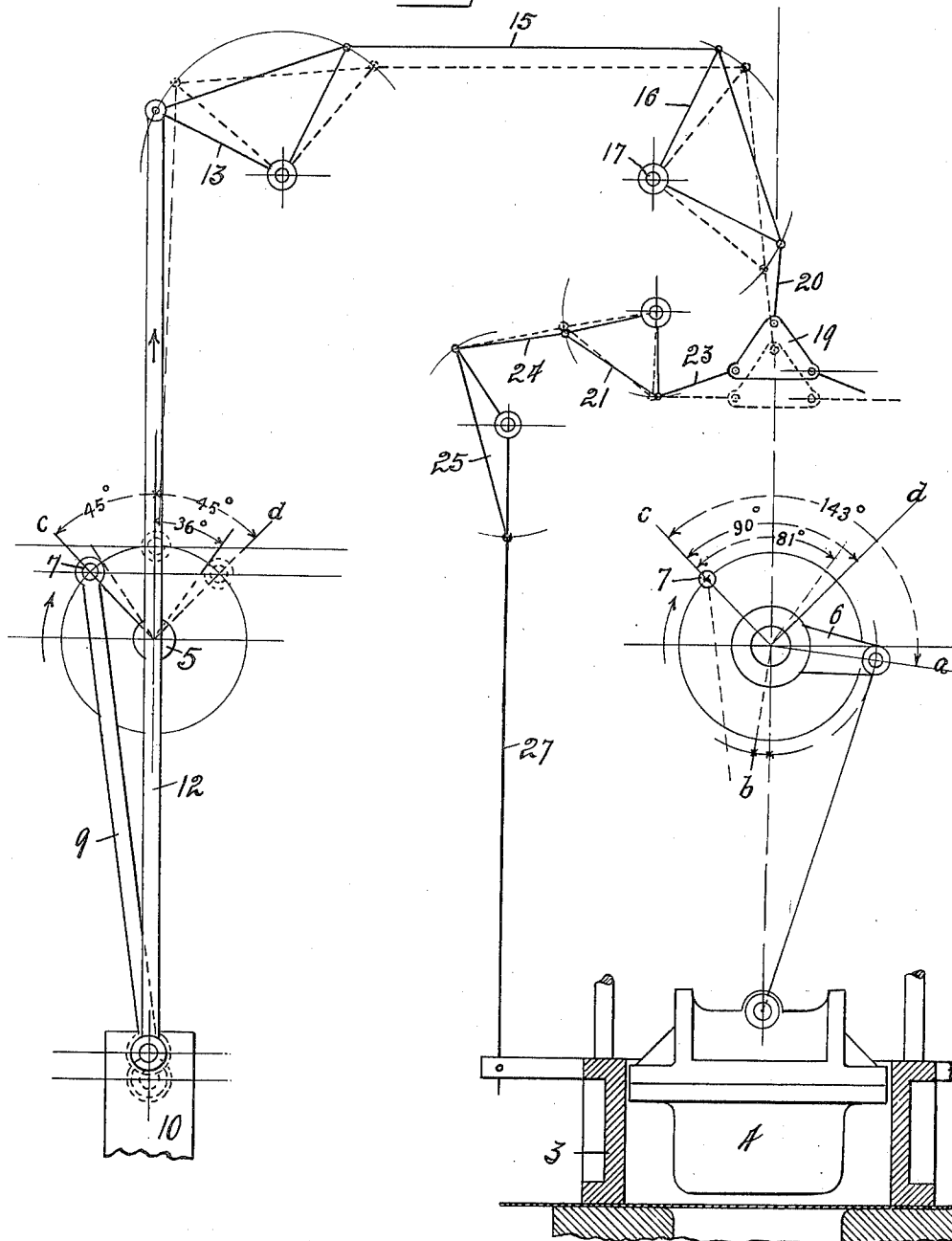
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Fig. 4.



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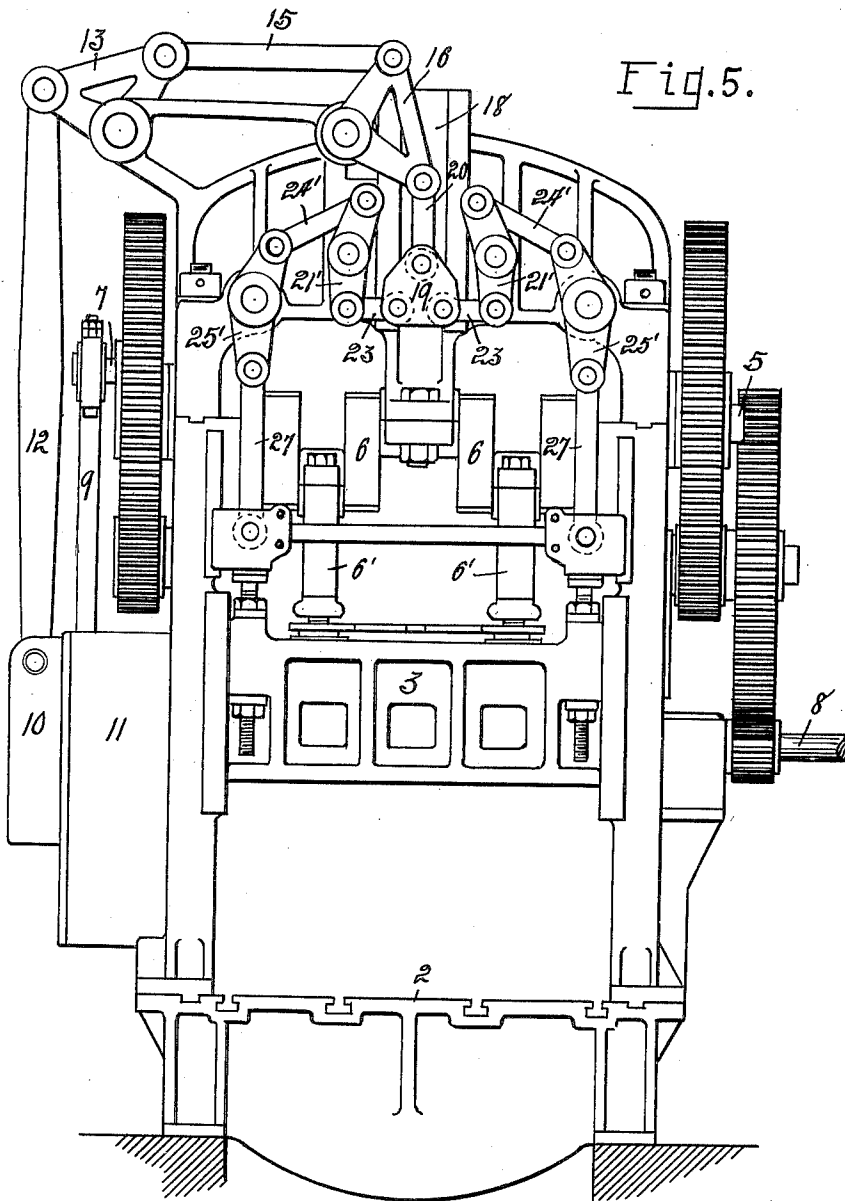
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

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DRAWING-PRESS.

1,089,558.

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To all whom it may concern:

Be it known that we, HENRY J. HINDE, FREDERIC ORTON, and BROR J. LINDGREN, citizens of the United States, and residents of Toledo, in the county of Lucas and State of Ohio, have invented a certain new and useful Drawing-Press; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to drawing or toggle presses and particularly to the mechanism employed for communicating the requisite movements and dwell to the blank-holder from the customary crank-shaft or other operating means.

The object of our invention is the provision of an improved mechanism of this class which will permit a prolonged absolute dwell or rest of the blank-holder in work-blank holding position during the work drawing or forming movements of the press plunger, thus enabling the performance of deep drawing or stamping, and materially enhancing the practicability and commercial value of presses of this character.

Further objects and advantages of the invention will be apparent from the following detailed description thereof.

The invention is fully described in the following specification, and while, in its broader aspect, it is capable of embodiment in numerous forms, a preferred and one slightly modified embodiment thereof are illustrated in the accompanying drawings, in which,—

Figure 1 is a front elevation of a press embodying the invention with the blank-holder and plunger at the limits of their down-strokes, Fig. 2 is a side elevation thereof, Fig. 3 is a reduced top plan view of the frame and upper portion of the blank-holder moving mechanism with parts removed, Fig. 4 is a diagrammatical view of the mechanism embodying the invention, illustrating the movements thereof during the dwell of the blank-holder, and Fig. 5 is a front elevation of a machine embodying a slightly modified form of the invention.

Referring to the drawings, 1 designates

the body or frame of the press; 2 the die bed upon which the matrix (not shown) is placed; 3 the blank-holder; 4 the press plunger having a forming head or die suitable to the matrix; 5 the crank-shaft having the inner double cranks 6 operatively connected to the press plunger by pitmen 6', said shaft having a crank 7 at one end thereof without the frame and also having its ends geared without the frame, in the present instance, in a suitable manner to a drive shaft 8.

The crank 7 of the crank-shaft is connected by a pitman or bar 9 to a subjacent slide-block 10, which is mounted for vertical reciprocatory movements between suitable guides 11 on the associated side of the press frame. The block 10 is in turn connected by a bar or link member 12 to the outwardly projecting arm of a superposed bell-crank lever 13, which is fulcrumed in a bracket-arm 14 projecting outwardly from the upper portion of the frame head 1^a transversely thereof, the rocking movements of the lever being transverse to the frame. The other arm of the lever 13, in the present instance, projects upward from its fulcrum and is connected by a triangular link member 15 to the upwardly projecting arm of each of a pair of bell-crank levers 16, which are mounted at the front and back sides of the frame head on studs 17 projecting therefrom near its vertical center.

A vertical centrally-disposed guide-way 10 is provided in each of the front and rear sides of the frame head 1^a, and working in each is a slide-block 19, which is connected by a link 20 to the other arm of the adjacent bell-crank lever 16 from that to which the link member 15 is connected. Bell-crank levers 21 are disposed at opposite sides of each block 19, being mounted on studs 22 projecting from the respective sides of the frame head, and each has a vertically-disposed arm connected by a link 23 to the adjacent block 19, and has its other arm, which, in the present instance, projects outwardly from the lever fulcrum or away from the block 19, connected by an outwardly extending link 24 to the upwardly and rearwardly extending arm of a lever 25, one of which levers is disposed above each corner portion of the blank-holder 3 on a stud or other suitable bearing part 26 projecting from the head portion of the frame. The down-

wardly projecting arm of each lever 25 co-operates with a link 27 to provide a toggle connection with the subjacent portion of the blank-holder, whereby a rocking of the levers 25 will effect a raising and lowering of the blank-holder.

It is evident from the above described arrangement of links, levers and sliding blocks that an upstroke of the block 10 will communicate a downstroke to the center blocks 19, which in turn effect a straightening of the toggle connections between the levers 25 and blank-holder, and a consequent downstroke of the blank-holder, and vice versa.

From the diagram shown in Fig. 4 it will be noted that with the present arrangement the crank-shaft arms 6, which are connected to the plunger, stand at *a*, or slightly below the horizontal center of their downstrokes when the crank-pin 7, which is connected to the slide-block 10, stands at *c*, or at approximately 45 degrees short of the vertical center of its upstroke, and that during the approximate 90 degree movement *a-b* of the crank 6 and *c-d* of the crank 7 the blank-holder will stand at absolute dwell or rest, the distance of movement of the different parts during such dwell period being indicated by the full and dotted lines. It will be apparent from this that while the blank-holder is at absolute dwell or rest during approximately a 90 degree movement of the crank-shaft, the dwell, in reality, is of greater duration than this, as there is no appreciable movement of the blank-holder during the final or initial portions of the straightening and breaking movements, respectively, of the toggle connection between the levers 25 and blank-holder.

It is evident with the arrangement shown that the axes of the different levers extend from front to rear of the press instead of cross-wise thereof, as is customarily the case, and that the movements of the center blocks 19 are substantially equal to the movement of the slide-block 10, and that therefore, the loss of movement which occurs between the crank-shaft and blank-holder takes place mainly or wholly between the slide-blocks 19 and the levers 25.

In Fig. 5 the construction is the same as that above described except that the form of the levers between the center blocks 19 and toggle links 27 is slightly changed. In this form the levers to which the center-block links 23 connect are designated 21' and are connected by links 24' to the levers 25' mounted on the studs 26. The levers 21', instead of being of bell-crank form, are substantially straight and, when the blocks 19 are at the limits of their down strokes, stand in upright positions, while the upper arms of the levers 25' are inclined inwardly instead of outwardly, as in the case of the levers 25. This change in the forms of the

levers does not change the period of dwell of the blank-holder at each revolution of the crank-shaft, and is illustrated to show that the forms of the levers can be changed to a greater or less extent without changing the resultant action of the blank-holder.

We wish it understood that our invention is not limited to any specific form, construction, or arrangement of the parts, except in so far as such limitations are specified in the claims.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is,—

1. In a drawing press, a blank-holder, a crank, a member reciprocally movable by the crank in the plane of movement of the blank-holder and in vertically spaced relation thereto, means operable by a turning of the crank to reciprocate said member, and mechanism connecting said member and blank-holder for controlling the movement of the latter and causing it to dwell during a portion of each revolution of the crank.

2. In a drawing press, two vertically spaced members reciprocally movable in a common plane, a crank, means operable by a turning of the crank to reciprocate one of said members, and means connecting said members for imparting differential movements from one to the other thereof when the crank is revolved.

3. In a drawing press, two members reciprocally movable in a common plane and being in permanent vertically spaced relation, a crank, means operable by a turning of the crank to reciprocate one of said members, and lever and link connection between said members for imparting differential movements from one to the other thereof and for causing one to dwell during a portion of the movement of the other.

4. In a drawing press, two members reciprocally movable in a common plane and being in permanent vertically spaced relation, a crank, a pair of link connected levers interposed between said members one lever having link connection with one member and the other lever having link connection with the other member whereby one member is caused to dwell during a portion of the movement of the other member.

5. In a drawing press, a blank-holder, a crank, two reciprocally movable members one movable at a side of and one above the blank-holder, means operable by a turning of the crank to reciprocate one of said members, means for communicating reciprocating movements from one to the other of said members, and means connecting the member, which is driven by the crank-driven member, to the blank-holder for causing the blank-holder to dwell during a portion of the revolution of the crank.

6. In a drawing press, a blank-holder, a

crank, a reciprocally movable member disposed in the plane of movement of the blank-holder, means for communicating reciprocatory movement to said member from a revolution of the crank, and multiple connection between said member and blank-holder and located above the blank-holder for moving the member and causing it to dwell during different portions of a revolution of the crank.

7. In a drawing press, a frame, a blank-holder working therein, a crank, a member reciprocally movable in the head portion of the frame over the blank-holder, means for imparting reciprocatory movements to said member from a revolution of the crank, and means connecting said member and blank-holder for moving the latter and causing it to dwell during different portions of a revolution of the crank.

8. In a drawing press, a frame, a blank-holder movable therein, a member mounted for reciprocatory movements in the center portion of the frame in vertically spaced relation to and in the plane of movement of the blank-holder, means for communicating reciprocatory movements to said member from a revolution of the crank, and lever and link connection between said member and blank-holder for moving the blank-holder during one portion and causing it to dwell during another portion of a revolution of the crank.

9. In a drawing press, a frame having a head portion, a blank-holder movable in the frame, a slide block reciprocally movable in the head portion of the frame, means for imparting reciprocatory movements to said block from a revolution of the crank, and multiple connection between said block and blank-holder and located above the blank-holder for moving the blank-holder during one portion and causing it to dwell during another portion of a revolution of the crank.

10. In a drawing press, a frame, a blank-holder movable therein, a crank, a block mounted for vertical reciprocatory movements in the center of the head portion of the frame, means for communicating reciprocatory movements to said block from a revolution of the crank, and a plurality of lever and link connections between said block and blank-holder and located above the blank-holder for causing the blank to dwell during portions of the movement of said block and to move during other portions of the movement of the block.

11. In a drawing press, a frame, a blank-holder movable therein, a crank, a slide block disposed at one side of the frame and having reciprocatory movements communicated thereto from said frame, a second slide block movable in the head portion of the frame, means connecting said blocks for communicating reciprocatory movements from one to

the other thereof, and means connecting said second block and blank-holder and located above the blank-holder for communicating reciprocatory movements from one to the other thereof and causing the blank-holder to dwell during a portion of a revolution of said crank.

12. In a drawing press, a frame, a blank-holder movable therein, a crank, a block mounted for reciprocatory movements at a side of the frame, driving connection between said crank and block, a second block mounted for reciprocatory movements in the head portion of the frame, lever and link connection between said blocks for communicating reciprocatory movements from one to the other thereof, and a plurality of connections between said second block and blank-holder located above the blank-holder for imparting movements to the blank-holder from said second block, and causing it to dwell during a portion of a revolution of said crank.

13. In a drawing press, a frame, a blank-holder movable therein, a crank, a plurality of blocks reciprocally movable in the head portion of the frame, means for communicating reciprocatory movements to said blocks from a revolution of the crank, and separate means connecting said blocks and blank-holder for causing the blank-holder to move during a portion of a revolution of the crank and to dwell during another portion of a revolution of the crank.

14. In a drawing press, a frame, a member reciprocally movable therein, a crank, a block mounted for reciprocatory movements in each of opposite sides of the head portion of said frame, means for communicating reciprocatory movements in unison to said blocks from a revolution of said crank, and means connecting each block with said member to communicate reciprocatory movements thereto from said blocks and to cause it to dwell during a portion of the movements of said blocks.

15. In a drawing press, a frame, a member reciprocally movable therein, a crank, a plurality of blocks mounted for reciprocatory movements in the upper portion of said frame, a lever fulcrumed to the upper part of the frame, connection between said lever and crank for communicating movement from one to the other thereof, connection between said lever and blocks for communicating reciprocatory movements in unison to the blocks when the lever is rocked and connection between said blocks and member to cause the member to move during a portion of the movements of said blocks and to cause it to stand at rest during other portions of the movements of said blocks.

16. In a drawing press, a frame, a blank-holder reciprocally movable in said frame, a crank, a block mounted for reciprocatory

movements in the upper portion of said frame, means for communicating reciprocatory movements to said block from a revolution of the crank, a lever at one side of said block, a lever having link connection with said first lever and with the blank-holder, said levers being actuated by the movements of said block to move said blank-holder during portions of the block movements and to cause the blank-holder to stand at rest during another portion of the movement of said block.

17. In a press of the character described, a frame, a blank-holder movable therein, a crank, a block reciprocally movable in the upper portion of said frame, means for communicating reciprocatory movements to said block from a revolution of the crank, and multiple lever and link connection between said block and blank-holder for moving the blank-holder during a portion of the revolution of said crank and causing it to stand at rest during another portion of a revolution of the crank, said levers having their axes extending from front to rear of the frame.

18. In combination, a press frame, a blank-holder movable therein, a crank-shaft, a plunger movable by a revolution of said shaft, a member mounted for reciprocatory movements in the upper portion of said frame, means operable to communicate reciprocatory movements to said member from said plunger, and multiple lever and link means located above the blank-holder and connecting said member and blank-holder and operable by reciprocatory movements of the member to impart movements to the blank-holder which are differential to the crank-shaft actuated movements of the plunger and to cause the blank-holder to stand at rest during a portion of the movements of the plunger.

19. In combination, a press frame, a blank-holder vertically movable therein, a crank, a reciprocally movable member located above the blank-holder in the upper portion of the frame, means connecting said crank and member for communicating reciprocatory movements to the member from a revolution of the crank, a pair of levers located at one side of said member, one lever having vertically and horizontally disposed arms and the other lever having upright arms, connection between the vertical arms, connection between the vertical arm of the first mentioned lever and said member, connection between the horizontal arm of the first mentioned lever and the upper arm of the other lever and connection between the lower arm of the other lever and the blank-holder whereby the blank-holder is permitted to dwell during a portion of the reciprocatory movements of said member.

20. In a press of the character described, a frame, a blank-holder movable therein, a crank, a block reciprocally movable in the upper portion of the frame above the blank-holder, means for communicating reciprocatory movements to the block from a revolution of the crank, and means extending right and left from said block and connecting it with the blank-holder for permitting the blank-holder to dwell during a portion of the movements of said block.

21. In a press of the character described, a frame, a blank-holder movable therein, a crank, a block reciprocally movable in a vertical plane at a side of the blank-holder, connection between said crank and block for imparting movements from one to the other thereof, a member reciprocally movable in the upper portion of the frame above the blank-holder, separate lever and link connecting means extending right and left from said member to the blank for communicating reciprocatory movements to the blank-holder from said member and permitting the blank-holder to dwell during a portion of the movements of said member.

22. In a press of the character described, a frame, a blank-holder, a crank, a reciprocally movable member mounted above the blank-holder, means for communicating reciprocatory movements to said member from a revolution of said crank, and separate means extending in opposite directions from and connecting said member to different portions of the blank-holder for communicating differential reciprocatory movements from one to the other thereof, said separate means each having levers forming parts thereof with their axes extending from front to rear of the press.

23. In a press of the class described, a frame, a blank-holder movable in the frame, a crank, a plurality of members mounted for reciprocatory movements in the frame above the blank-holder, means for imparting like reciprocatory movements in unison to said members from a revolution of the crank, and lever and link connections extending in opposite directions from each of said members and connecting it to the blank-holder for communicating reciprocatory movements from said members to the blank-holder and causing the blank-holder to dwell during a portion of the movements of said members.

24. In combination in a press of the class described, a frame, a blank-holder reciprocally movable in said frame, a crank, a slide block vertically movable in a part of the frame at a side of the blank-holder, connection between said crank and block for imparting respective movements from one to the other thereof, a plurality of members mounted for vertical reciprocatory movements in the upper portion of the frame

above the blank-holder, link and lever means
connecting said block and members for com-
municating reciprocatory movements from
the block to the members, and right and
5 left link and lever connections extending
from each of said members to different por-
tions of the blank-holder for imparting re-
ciprocatory movements from the members
to the blank-holder and causing the blank-
10 holder to dwell during a portion of the
movements of said members, the axes of

the levers of said connections extending
from front to rear of the frame.

In testimony whereof, we have hereunto
signed our names to this specification in the 15
presence of two subscribing witnesses.

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FREDERIC ORTON.

BROR J. LINDGREN.

Witnesses:

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ESTHER M. SHERRIFF.