Dec. 15, 1942. R. L. WILCOX 2,305,049

UPSETTING MECHANISM

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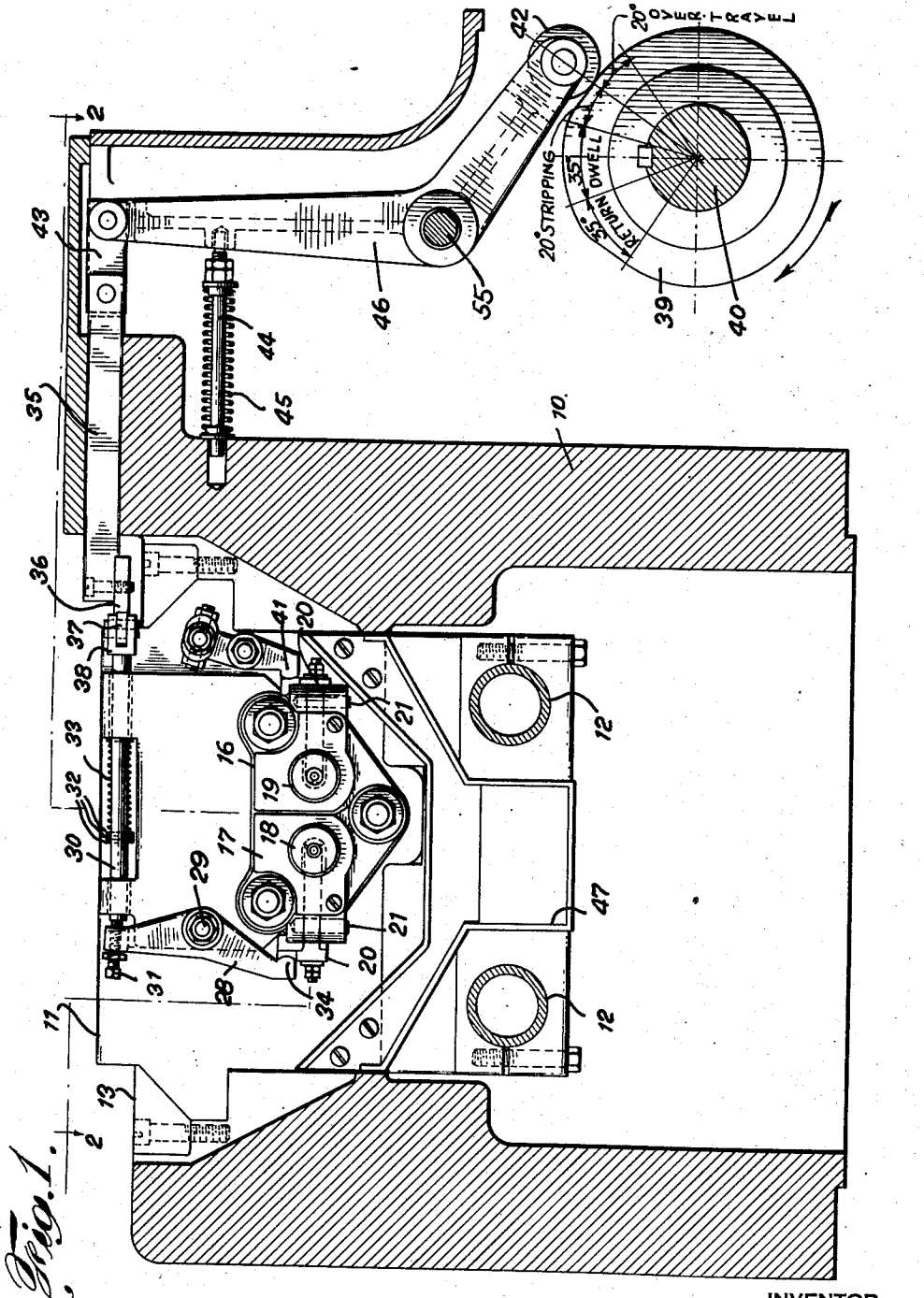



Fig. 1.

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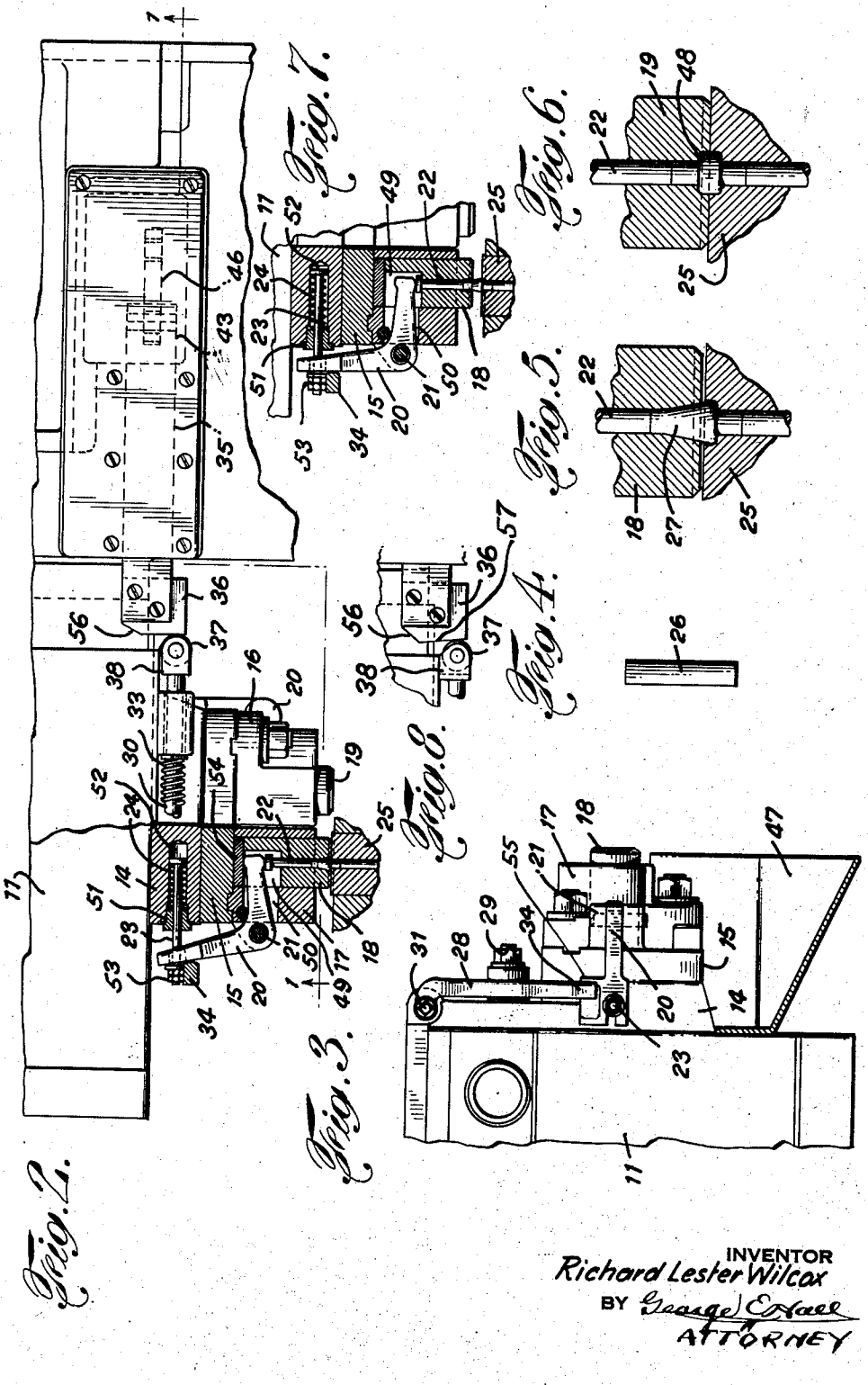


Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

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## UPSETTING MECHANISM

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Application December 8, 1941, Serial No. 422,024

22 Claims. (Cl. 10—12)

This invention relates to new and useful improvements in upsetting mechanism, and more particularly to such portion of said mechanism as is associated with upsetting tools, or the like.

In mechanism of this character, where a plurality of punches are utilized to complete the upsetting operations, the workpiece will upon occasion remain in one of the tools when it should in fact remain in the other of the tools. Such action may, among other things, result in damage to the tools, jamming of the machine so that the same will either stop or cease to function. A jammed workpiece is removed with difficulty, either being forced out under pressure or drilled out. The machine stands idle while this is being done and new tools, if necessary, are substituted for those that have been broken. It is an object of this invention to positively prevent such abnormal action of the workpiece and thus avoid the objectionable results hereinbefore referred to. This is accomplished by applying constant and unyielding pressure to the workpiece while the tools are functioning and until after the tools have separated a sufficient distance to insure the workpiece remaining in the proper tool and not being withdrawn with the other tool.

Other objects of the invention will be apparent from the description herein and the accompanying drawings, which illustrate a preferred embodiment of the invention, although not necessarily limited thereto.

Referring to the drawings, in which like numerals of reference indicate like parts in the several figures:

Figure 1 is a transverse sectional view of the body or frame of an upsetting machine, header or the like, and a face view of the gate and associated parts;

Figure 2 is a fragmentary plan view of Figure 1, the gate being in its substantially forward position, and the parts in section being taken generally upon line 2—2 of Figure 1;

Figure 3 is a side elevation of a portion of the gate with the associated parts as viewed from the left of Figure 1;

Figure 4 is a view of a workpiece as presented to the tools;

Figures 5 and 6 are fragmentary views of the tools, and the workpiece as shaped thereby in successive operations;

Figure 7 is a view of the first or coning punch with the parts of the associated mechanism in their relative positions when the gate has moved rearwardly a portion of its stroke; and

Figure 8 is a fragmentary view of a portion of a modified form of cam mechanism and some adjacent parts.

This invention is applied to upsetting machines, headers or the like of the same general type as is disclosed in the application of the applicant, and designated by the Serial Number 413,447.

In the drawings the numeral 10 designates the body or frame of an upsetting machine, header or the like; 11 the gate; 12 the rods which are slidably mounted in the frame and to which the gate is secured; and 13 the gibs secured to the frame.

The carrier slide 14 has a reciprocatory movement across the face of the gate. Adjustably mounted thereon are backing plates 15, to which are adjustably secured the punch holders 16 and 17. These punch holders are alike, except that punch holder 16 is a right hand holder and 17 a left hand holder. In the punch holder 16 is preferably secured, by any preferred means, a punch 19, and likewise a punch 18 is fixed in the punch holder 17. The punch 18 first upsets the workpiece 26 and cones the end thereof substantially as shown at 27 in Figure 5, and the punch 19 is the finishing punch. It applies pressure to the coned portion 27 of the workpiece and forms an annular or collar portion 48 between the ends thereof. The shapes, as illustrated in Figures 5 and 6, are merely for illustration, as the number of shapes that may be produced by upsetting tools is almost unlimited.

The area of the surface of the coned portion 27 on the workpiece against the wall of the orifice or opening in the punch 18, is greater than the area of the shank of the workpiece in the orifice or opening in the die 25. Therefore, there is a tendency for the blank to remain within the punch and be withdrawn from the die 25, owing to such increased frictional area. If the workpiece is in fact withdrawn with the punch 18, obviously there is no workpiece within the die 25 to be subjected to the action of the punch 19. If the workpiece remains in the punch 18, the next time the punch approaches the die 25, it will strike against a fixed part, with the results hereinbefore referred to, that is, breakage of tools, jamming the machine, etc. With this invention such a result will not obtain, as the workpiece is positively held in the die. The mechanism for producing this result comprises pins 22, one slidably mounted in each of the punches 18 and 19. The pin in the punch 18 projects into the conical orifice or opening in the punch

when there is no workpiece therein, its forward position being limited by engagement of the head of pin 22 with a wall of an opening 49 in the punch, which opening registers with an opening 50 in the punch holder. Pivotally connected with each of the holders by the pintle 21 is a rock lever 20, one arm of which projects through the openings 50 and 49 and is in engagement with the head of the pin 22 (Fig. 2).

In each of the opposite ends of the carrier slide 14 is a hole 52 that is closed by a hollow nut 51 threaded therein. A spring pin 23 projects through the nut and has a head thereon slidably mounted within the hole 52, between which and the nut 51 is a spring 24. The outer end of the spring rod projects through the slotted end of one arm of the lever 20, and upon the outside of which there are lock nuts 53, the adjustment of which varies the tension of the spring 24. The tension of the spring 24 upon the lever 20, is such that the pin 22 is always held in its forward position under a constant yielding pressure. When a workpiece engages the outer end of the pin 22 the latter is moved rearwardly until the end of the lever engages the backing disk 54 in the rear of the punch. If perchance this spring should break or become weakened, or for any reason is ineffective, the workpiece might remain in the punch and be withdrawn from the die 25. To insure a positive unyielding pressure upon the pin 22, and through it to the workpiece, the mechanism herein described has been provided. This consists in part of a rod 30 slidably mounted within the carrier slide 14, and having a head-piece 38 at one end, in which is mounted a cam roll 37. A spring 33 surrounds the rod 30 between one wall of the carrier slide and collar 32 adjustable on the rod 30. The action of the spring 33 tends to move the rod 30 to the left, as shown in Figures 1 and 2. Journaled on a stud 29, fixed in the carrier slide, is a rock lever 28, the end 34 of which is in engagement with a wall of the lever 20 adjacent to the lock nuts 53, and the opposite end carries a screw 31, with lock nuts thereon, which impinges against the end of rod 30.

Movably mounted in the frame 10 is a slide 35, having a plate 36 fixed on the inner end thereof which engages the roll 37 when the gate is in its forward or near forward position. Journaled upon a stud 55 in the frame, or other part, is a rock lever 46, connected at one end with the slide 35 by the link 43, and carrying a cam roll 42 at its lower end that rides against the face of cam 39 fixed on the side shaft 40. A push rod 44, surrounded by a spring 45, exerts a pressure against the rock lever 46 that will constantly hold the cam roll 42 in contact with the cam 39.

In Figure 2 the gate 11, and the punches 18 and 19 connected therewith, are shown in their extreme forward position and ready to be withdrawn. The first punch 18 is in alignment with the die 25 and the workpiece therein has been upset or coned by the action of the tools.

The plate 36 between the actions thereof is positioned so that as the gate 11 moves forward the roll 37 is spaced a limited distance therefrom. The cam 39 is timed so that at the instant of the beginning of the return of the gate the plate 36 is moved toward the center of the machine, that is, to the left in Figures 1 and 2, and applies pressure to the rod 30 and through the rock levers 28 and 20 to the pin 22 and the workpiece. This positive pressure upon the pin 22 holds the workpiece against movement relative to the die 25, while the punch 18 is being withdrawn. This pressure is maintained for the first portion of the return stroke of the gate 11 and for a period sufficiently long to insure the workpiece being freed or stripped from the punch 18. The cam 39 is so shaped as to maintain this pressure upon the pin 22 while the pivot pin 21 is moving rearwardly and upon which the rock lever 20 is fulcrumed. As the rock lever 20 rotates upon its fulcrum no movement is applied to that end thereof in contact with the pin 22. Thereafter, the rear end of the lever 20, under the pressure of lever 28, moves toward the center of the machine to the position substantially shown in Figure 7. During this time pressure is maintained against the workpiece. After the gate has moved rearwardly a sufficient distance for the roll 37 to be disengaged from the straight face of the plate 36, the underside of the head of the pin 22 has engaged a wall of the punch and is then withdrawn with the rearwardly moving punch, and the lever 20 has moved about its fulcrum so as to be in a position substantially as shown in Figure 3. While not essential to utilize the rod 23 and spring 24, it is advantageous, because the spring 24 applies pressure directly to the lever 20 and the spring 33 to the rock lever 28. The spring 45 now actuates the lever 46 and withdraws the slide 35 and the plate 36 out of the path of the roll 37 for the next forward stroke of the gate 11. In the meantime, the punches have shifted their positions with respect to the die 25 and the punch 19 completes the upset blank. Should the finished blank pull out of the die 25 and remain in the punch 19 on its travel away from the die, it will be stripped therefrom through the bell crank lever 20 contacting the stop lever 41 as hereinbefore described. It is possible that instead of depending upon the exact timing of the cam 39 to advance the slide 35, to provide a cam surface on the plate 36, which will advance the pin 22 at just the return travel speed of the punch 18, in which case it would only require an advance on the slide 35 when the gate has reached its forward position. It would then dwell, depending upon the proper cam face 56 for advancing the pin 22 at the correct timing, or it may be a combination of both the cam 39 and the face of the plate 36 to actuate the advance of pin 22 in exactly the correct timing to hold the workpiece in the die 25 as the punch returns.

In Figure 1 the cam roll 42 is in contact with a portion of the face of the cam 39, having a small radius after a 20° overtravel. During this 20° travel the slide 35, with the plate 36, is advanced toward the center of the machine a distance sufficient to bring the plate 36 in contact with the roll 37. This action occurs at the last portion of the forward stroke of the gate 11 and while the crank shaft is passing over dead centers. As the gate starts its return stroke, the plate 36 advances the roll 37, following the gate for the next 20°, which is sufficient to hold the workpiece in the die and strip it from the punch. During the next 35° of rotation there is a dwell of motion of the lever 46, and during the next 35° of rotation the roll 42 returns to the small radius of the cam and the plate 36 is moved to its extreme out position. A cam constructed as shown and described will initiate necessary motions of the several parts, but a cam of another shape and varying degrees that will produce the same result will function equally as well. If the timing of the cam 39, that initiates

movement of the slide **35** toward the center of the machine, and through the plate **36** holds the blank rigid in the die **25** as the punch **18** travels away therefrom, should not happen to be correct, such situation may be corrected by making the face of the plate **36** on an angle, as at **57** in Figure 8, instead of straight and parallel with the movement of the gate **11** (Fig. 2) and thus maintain a constant pressure upon the pin **22** while the pivot pin **21** is traveling away from the die **25**. As a matter of abundant precaution the plate **36** may be made with a beveled face **56** (Fig. 8), so that in the event of an abnormal action of any of the parts, such as the spring **45** breaking, leaving the slide **35** in an advanced position, the roll **37** would strike the beveled face and push the slide **35** away from the center of the machine and thus avoid breakage of any of the parts.

Holding the blank in the die **25** makes possible the fabricating of work not heretofore possible, an illustration of which is a workpiece with an exceedingly short shank and for extruding an equal amount of wire on both ends of a workpiece, where it is liable to remain in the punch as in the die.

The mechanism described can be applied equally as well to the punch **19** as to the punch **18**. It is preferable, however, that it be applied as shown, because there is a greater probability of the workpiece being withdrawn from the die by punch **18** than with the punch **19**. Again, if the workpiece is in fact withdrawn from the die by the punch **19**, it will be stripped therefrom by the positive mechanism hereinbefore referred to. After the workpiece has been completed and is ejected from the die **25** it drops by gravity onto the pan **47** and slides therefrom into a receptacle conveniently placed to receive it.

Within the scope of the appended claims, changes and alterations may be made in the details of the invention as herein disclosed.

What is claimed is:

1. In mechanism of the character described; cooperating tools for upsetting a workpiece, wherein one tool moves toward and away from the other tool; and positive means for holding the workpiece immovable in one tool during the first portion of the withdrawal of the other tool therefrom said means being movable with and relatively to the withdrawing tool.

2. In mechanism of the character described; cooperating tools for upsetting a workpiece, wherein one tool moves toward and away from the other tool; and positive means for holding the workpiece immovable in one tool during the first portion of the withdrawal of the other tool therefrom, comprising in part a member in the movable tool having endwise engagement with the workpiece and maintaining such engagement during the first portion of the withdrawal of the tool and independently actuated means on the movable tool applying pressure to said member while the same is in engagement with the workpiece.

3. In mechanism of the character described; cooperating tools for upsetting a workpiece, wherein one tool moves toward and away from the other tool; means for holding the workpiece immovable in one tool during the first portion of the withdrawal of the other tool therefrom, comprising in part a member in the movable tool having engagement with the workpiece and maintaining such engagement during the first portion of the withdrawal of the tool; and an element journaled with respect to the movable tool, and movable therewith, having engagement with said member.

4. In mechanism of the character described; cooperating tools for upsetting a workpiece, wherein one tool moves toward and away from the other tool; means for holding the workpiece immovable in one tool during the withdrawal of the other tool therefrom, comprising in part a member in the movable tool having engagement with the workpiece and maintaining such engagement during withdrawal of the tool; an element journaled with respect to the movable tool, and movable therewith, having engagement with said member; and means for actuating said element whereby it will have independent movement with respect to the movable tool during the withdrawal thereof.

5. In mechanism of the character described; cooperating tools for upsetting a workpiece, wherein one tool moves toward and away from the other tool; means for holding the workpiece immovable in one tool during the withdrawal of the other tool therefrom, comprising in part a member in the movable tool having engagement with the workpiece and maintaining such engagement during withdrawal of the tool; an element journaled with respect to the movable tool, and movable therewith, having engagement with said member; and positive means for imparting movement to the element during a portion of the withdrawal movement of the tool.

6. In mechanism of the character described; a die; a tool holder movable toward and away from the die; a punch fixed in the tool holder; a pin within the punch; and positive means in part movably connected with the tool holder, for holding the pin in a rigid position during a portion of the movement of the punch away from the die.

7. In mechanism of the character described; cooperating tools for upsetting a workpiece, wherein one tool moves toward and away from the other tool; means for holding the workpiece immovable in one tool during the withdrawal of the other tool therefrom, comprising in part a pin within the movable tool; a rock member movable with the withdrawing tool having engagement with the pin; and positive means for actuating the rock member whereby it will apply pressure to the pin and workpiece.

8. In mechanism of the character described; a movable gate; a punch movable therewith; a fixed tool; a pin within the punch; a rock member having engagement with the pin and movable with the gate; and cooperating mechanism for actuating the rock member, in part, one movable with the gate and the other in part, independent thereof.

9. In mechanism of the character described; a movable gate; a punch movable therewith; a fixed tool; a pin within the punch; a rock member having engagement with the pin and movable with the gate; and cooperating mechanism for actuating the rock member, in part, one movable with the gate and the other in part independent thereof, the independent mechanism being cam actuated and timed to function during a portion of the stroke of the gate.

10. In mechanism of the character described; a movable gate; a punch movable therewith; a fixed tool; a pin within the punch; a rock member having engagement with the pin; a second rock member movable with the gate, having engagement with the first mentioned rock member;

and means independent of the gate for actuating the second rock member, and through it the first mentioned rock member during a portion of the travel of the gate.

11. In mechanism of the character described; a movable gate; a punch movable therewith; a fixed tool; a pin within the punch; a rock member having engagement with the pin; a second rock member movable with the gate, having engagement with the first mentioned rock member, the axis of rotation of the rock members being perpendicular to each other; and means independent of the gate for actuating the second rock member, and through it the first mentioned rock member during a portion of the travel of the gate.

12. In mechanism of the character described; a movable gate; a punch movable therewith; a fixed tool; a pin within the punch; a rock member having engagement with the pin; a second rock member movable with the gate, having engagement with the first mentioned rock member; means independent of the gate for actuating the second rock member, and through it the first mentioned rock member during a portion of the travel of the gate; spring actuated mechanism for applying pressure to the first mentioned rock member; and other spring mechanism for applying pressure to the second rock member.

13. In mechanism of the character described; a movable gate; a punch movable therewith; a fixed tool; a pin within the punch; a rock member having engagement with the pin; and mechanism for actuating the rock member, in part movable with the gate and in part independent thereof, the independent mechanism reciprocating in a path substantially perpendicular to that of the gate, during a portion of the stroke of the gate.

14. In mechanism of the character described; a frame; a movably mounted gate therein; a member movable on the frame; a punch associated with the gate; a die fixed with respect to the frame; a pin within the punch; a rock member having engagement with the pin; and mechanism for actuating the rock member, comprising in part a movable element that registers with and is actuated by the member movably mounted on the frame when in register therewith.

15. In mechanism of the character described; a frame; a reciprocating member mounted thereon; a movable gate; a punch associated with the gate; a fixed die; a pin within the punch a member having engagement with the pin; and mechanism for actuating the member, comprising in part a reciprocating element movable with the gate and into and out of the path of the member on the frame.

16. In mechanism of the character described; a frame; a reciprocating member mounted thereon; a movable gate; means for actuating the reciprocating member in timed relation with the gate; a punch associated with the gate; a fixed die; a pin within the punch; a member having engagement with the pin; and mechanism for actuating the member, comprising in part a reciprocating element movable with the gate and into and out of the path of the member on the frame.

17. In mechanism of the character described; a frame; a slide thereon; a movable gate; means for actuating the slide in timed relation with the gate; a punch associated with the gate; a fixed die; a pin within the punch; a movably mounted member having engagement with the pin; and mechanism associated with the gate for actuating the member, the action of which is initiated by the slide when the gate is in a predetermined position with respect thereto.

18. In mechanism of the character described; a frame; a slide thereon; a cam; a lever between the cam and slide, whereby movement is imparted thereto; a movable gate; means for actuating the slide in timed relation with the gate; a punch associated with the gate; a fixed die; a pin within the punch; a movably mounted member having engagement with the pin; and mechanism associated with the gate for actuating the member, the action of which is initiated by the slide when the gate is in a predetermined position with respect thereto.

19. In mechanism of the character described; a frame; a slide thereon; a cam; a lever between the cam and slide, whereby movement is imparted thereto in one direction; other means for moving the slide in the opposite direction; a movable gate; means for actuating the slide in timed relation with the gate; a punch associated with the gate; a fixed die; a pin within the punch; a movably mounted member having engagement with the pin; and mechanism associated with the gate for actuating the member, the action of which is initiated by the slide when the gate is in a predetermined position with respect thereto.

20. In mechanism of the character described; a frame; a slide thereon; a cam; a lever between the cam and slide, whereby movement is imparted thereto; a movable gate; means for actuating the slide in timed relation with the gate; a punch associated with the gate; a fixed die; a pin within the punch; a movably mounted member having engagement with the pin; mechanism associated with the gate for actuating the member, the action of which is initiated by the slide when the gate is in a predetermined position with respect thereto; and positive means, whereby the slide will be returned to its out position, if through failure of operating parts it remains at its in position.

21. In mechanism of the character described; a frame; a slide thereon; a cam; a lever between the cam and slide, whereby movement is imparted thereto; a movable gate; means for actuating the slide in timed relation with the gate; a punch associated with the gate; a fixed die; a pin within the punch; a movably mounted member having engagement with the pin; mechanism associated with the gate for actuating the member, the action of which is initiated by the slide when the gate is in a predetermined position with respect thereto; and positive means, whereby the slide will return to its out position, if through failure of operating parts it is at its in position.

22. In mechanism of the character described; a frame; a slide thereon having a plate fixed thereto; a cam; a lever between the cam and slide whereby movement is transmitted thereto; a gate; means for actuating the slide in timed relation to the gate; a punch associated with the gate; a fixed die; a pin within the punch; a movably mounted member having engagement with the pin; mechanism associated with the gate for actuating the member, the action of which is initiated by the said plate when the gate is in a predetermined position with respect thereto; positive means whereby the slide and plate will be returned to their out positions if through failure of operating parts they remain at their in positions.

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