

July 4, 1933.

W. E. EHINGER

1,916,608

APPARATUS FOR HANDLING FORGINGS

Filed Aug. 2, 1929

3 Sheets-Sheet 1

Fig. 1.

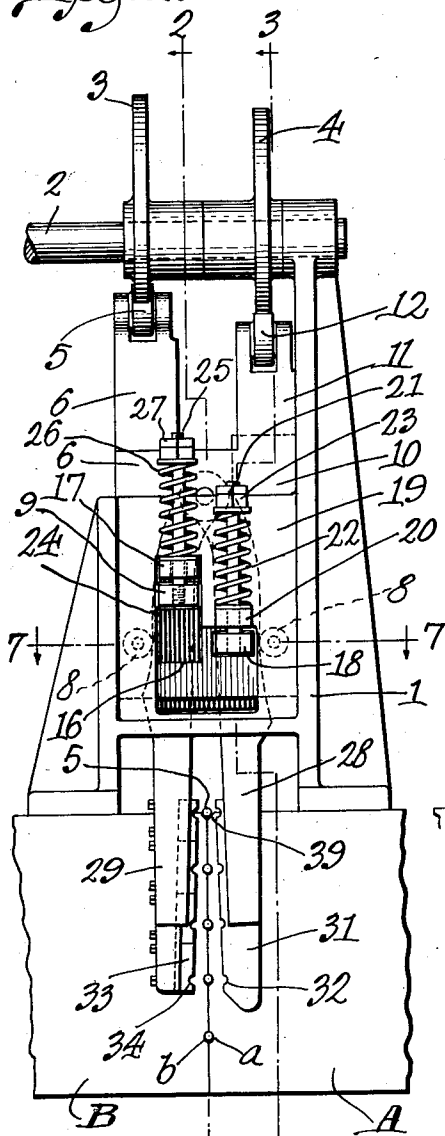


Fig. 2.

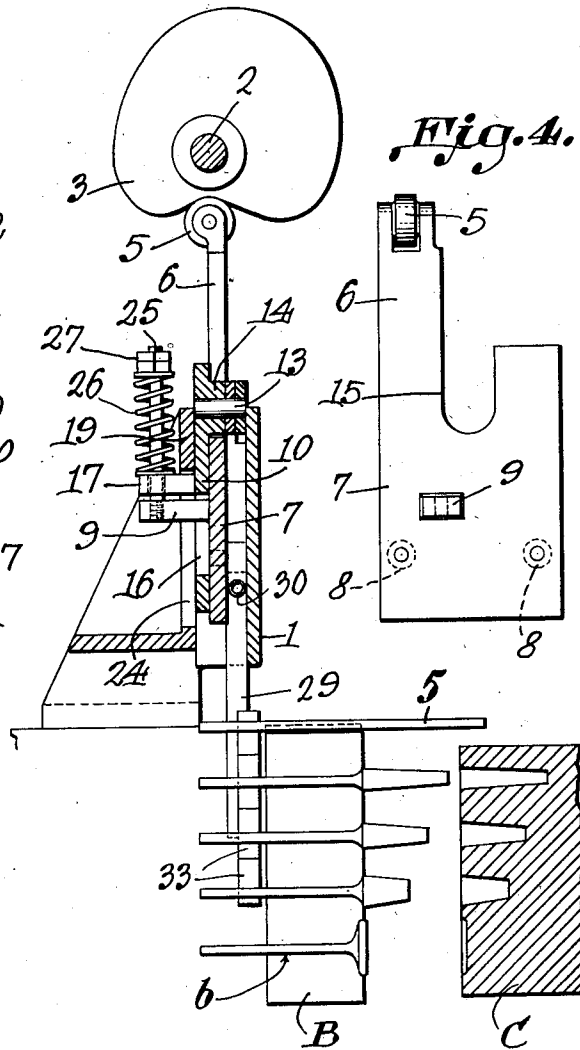
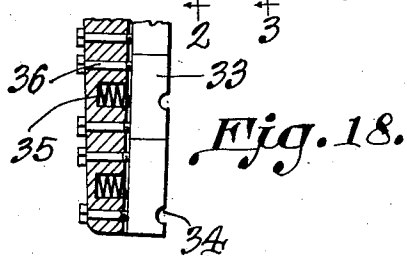
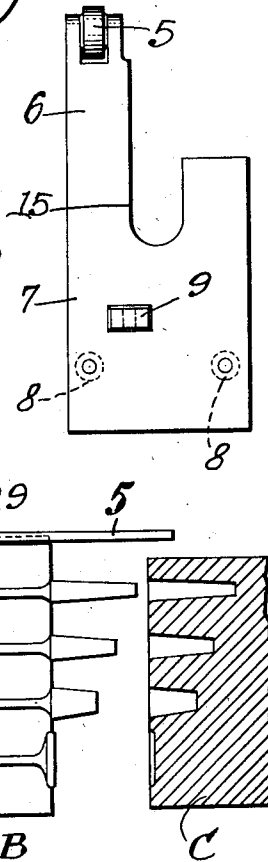


Fig. 4.



William E. Ehinger Inventor

By *Calhoun & Co.*
Attorneys

July 4, 1933.

W. E. EHINGER

1,916,608

APPARATUS FOR HANDLING FORGINGS

Filed Aug. 2, 1929

3 Sheets-Sheet 2

Fig. 3.

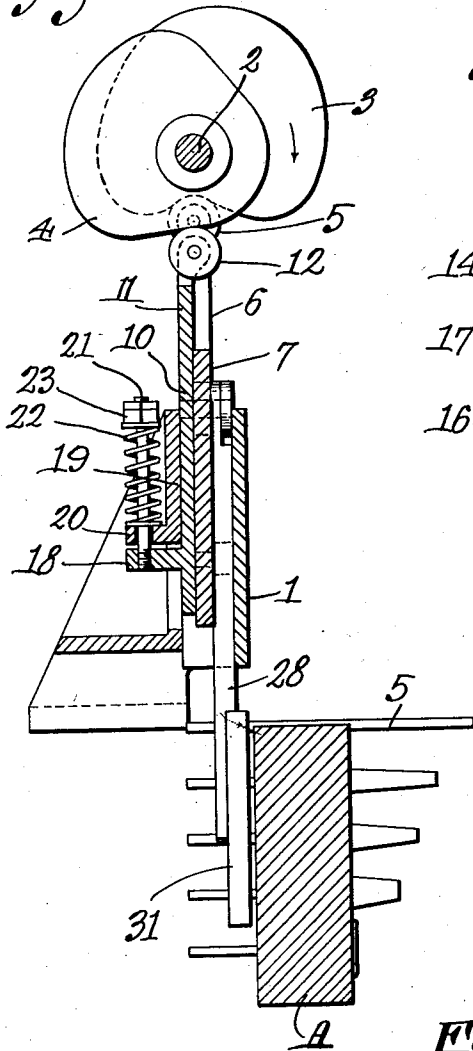


Fig. 5.

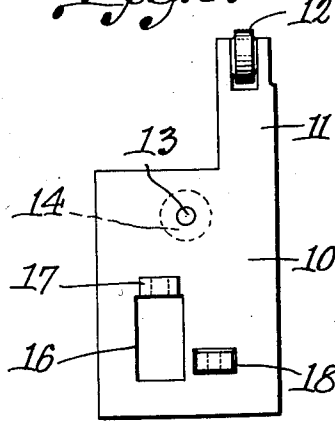


Fig. 6.

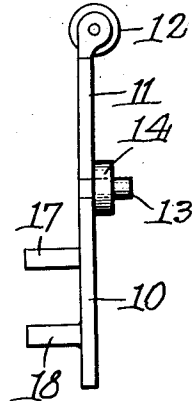


Fig. 9.

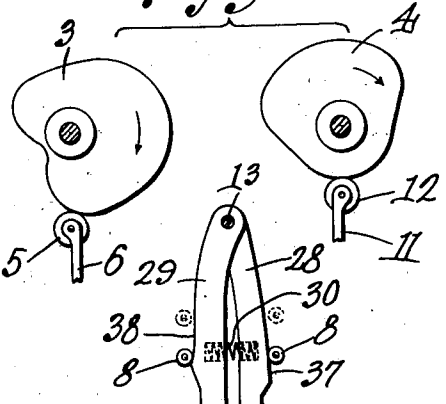


Fig. 7.

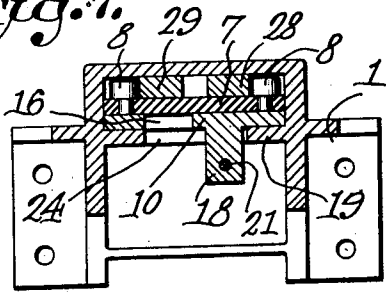
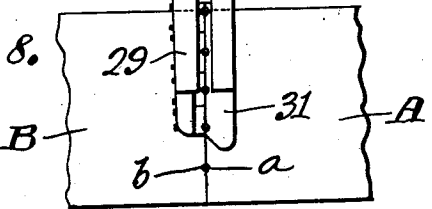


Fig. 8.



William E. Ehinger Inventor

Ca. 1933
Attorneys

July 4, 1933.

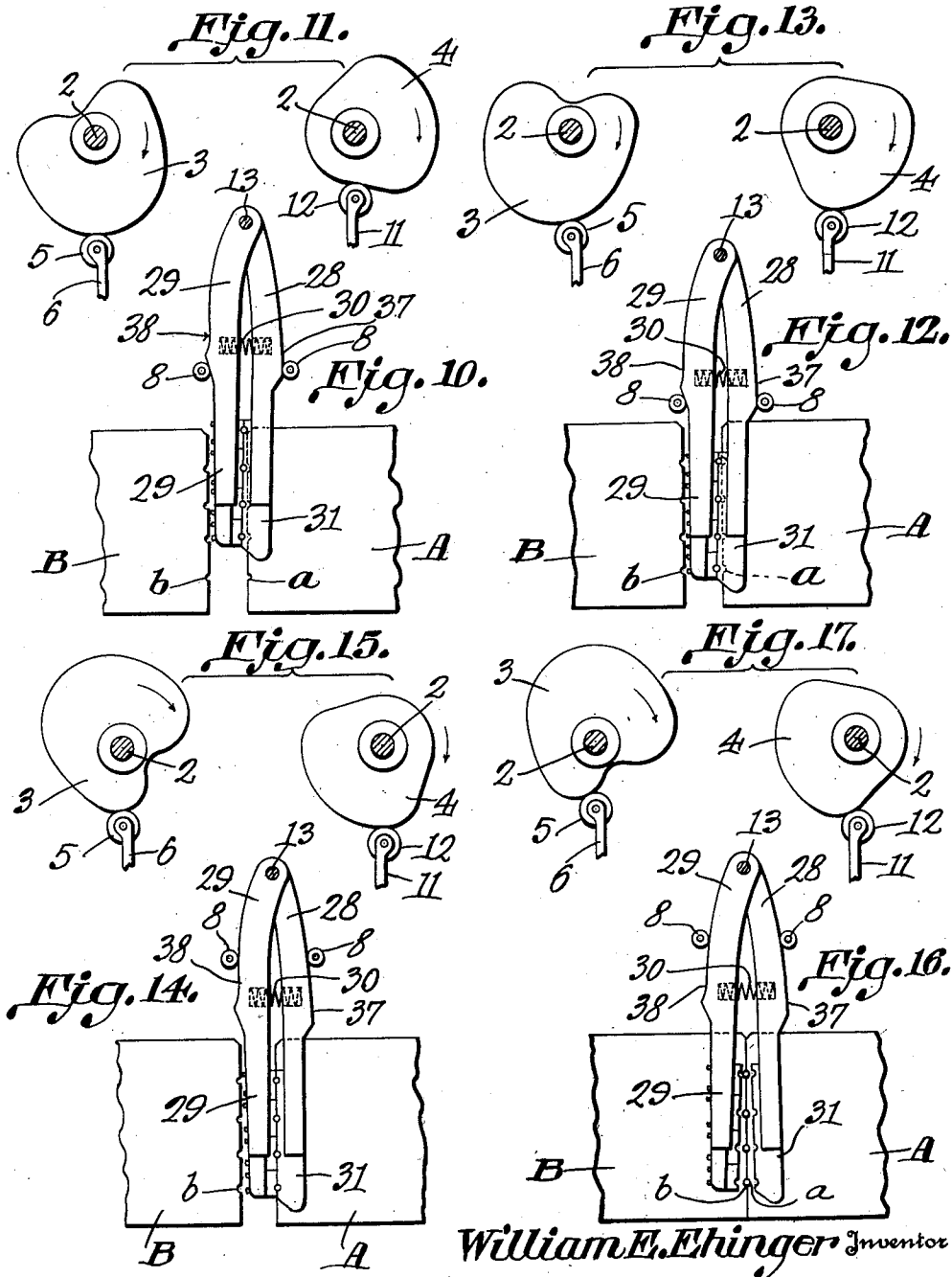
W. E. EHINGER

1,916,608

APPARATUS FOR HANDLING FORGINGS

Filed Aug. 2, 1929

3 Sheets-Sheet 3



William E. Ehinger, Inventor

334 C. A. Snow & Co.
Attorneys

UNITED STATES PATENT OFFICE

WILLIAM E. EHINGER, OF TIFFIN, OHIO, ASSIGNOR TO THE NATIONAL MACHINERY CO., OF TIFFIN, OHIO

APPARATUS FOR HANDLING FORGINGS

Application filed August 2, 1929. Serial No. 382,974.

This invention relates to a method of and apparatus for handling forgings during the operation of a heading or forging machine.

As is well known to those skilled in the art, it is customary, when making upset forgings requiring a number of operations, to manually feed one blank at a time from one impression to another. Consequently where, for example, it is necessary to feed the blank to four different dies or impressions, one finished forging is produced after every four cycles of the machine.

It is an object of the present invention to provide means whereby a finished forging will be produced at the completion of every cycle of the machine and not after a lapse of one or more cycles, thereby greatly increasing the capacity of the machine and, consequently, effecting a considerable saving in the cost of production.

A further object is to provide simple and efficient mechanism whereby the stock can be fed successively to the different impressions or dies during successive cycles of the machine, thereby to deliver a completed article after each cycle.

Another object is to utilize a method of and apparatus for handling the stock which, while particularly useful in connection with heading and forging machines, can be employed effectively with other types of metal working machines wherein the stock must be subjected to successive operations.

With the foregoing and other objects in view the invention consists of certain steps in the method of handling stock and in certain novel details of construction and combinations of parts which will be hereinafter more fully described and pointed out in the claims, it being understood that various changes may be made within the scope of the claims without departing from the spirit of the invention.

In the accompanying drawings there has been illustrated a mechanism constituting the present invention and by means of which the method referred to can be carried on rapidly and efficiently.

In said drawings,

Figure 1 is an elevation of a portion of a forging machine and a feed mechanism combined therewith.

Figure 2 is a section on line 2—2, Figure 1.

Figure 3 is a section on line 3—3, Figure 1.

Figure 4 is an elevation of one of the slides.

Figure 5 is an elevation of the other slide.

Figure 6 is a side view of the slide shown in Figure 5.

Figure 7 is a section on line 7—7, Figure 1.

Figure 8 is an elevation showing the relative positions of the feeding jaws and the gripping dies at the second stage of the feeding operation.

Figure 9 is a view showing in diagram, the positions of the two slide operating cams when the jaws are located as in Figure 3.

Figure 10 is a view in elevation showing the relative locations of the gripping dies and the feeding jaws at the third position of the feeding operation.

Figure 11 is a view, in diagram, showing the relative positions of the slide operating cams when the feeding jaws are positioned as in Figure 10.

Figure 12 is an elevation showing the relative locations of the feeding jaws and gripping dies at the fourth position of the feeding operation.

Figure 13 is a view in diagram showing the relative positions of the slide operating cams when the feeding jaws are located as in Figure 12.

Figure 14 is an elevation of the feeding jaws and portions of the gripping dies showing the relative locations thereof at the fifth position of the feeding operation.

Figure 15 is a view showing, in diagram, the relative positions of the slide operating cams when the feeding jaws are located as in Figure 14.

Figure 16 is a view showing the feeding jaws and portions of the gripping dies in their relative locations at the sixth position of the feeding operation.

Figure 17 shows, in diagram, the relative positions of the slide operating cams when the parts are located as in Figure 16, immediately prior to returning to the first position illustrated in Figure 1.

Figure 18 is a section through a portion of one of the feeding jaws showing one way in which the gripping blocks thereof can be yieldingly mounted.

Referring to the figures by characters of reference the structure illustrated, but which is merely one of many forms that might be used in carrying out the method, includes a bracket 1 adapted to be secured to the top of

the forging, heading, or other type of metal working machine where it will extend over the die box or that portion of machine where-in are located, in the present instance, a stationary gripping die A and the movable gripping die B. These dies, in the structure illustrated, are provided with opposed series of impressions indicated at *a* and *b* respectively, the impressions *a* being adapted to register with the corresponding impressions *b* when the dies A and B are brought into contact. A heading or upsetting die C or similar device may be arranged for acting on stock gripped between the dies A and B and is arranged for movement relative to said dies. The construction and operation of the dies A, B and C constitute, in themselves, no part of the present invention and it is not deemed necessary to illustrate or describe the mechanism employed for operating these parts. It need only be stated that the die B is adapted to move against the die A once during each cycle of the machine and during this same cycle the die B will move toward and away from the dies A and B while they are in contact.

The bracket 1 has a shaft 2 journaled thereon carrying cams 3 and 4 preferably shaped substantially as shown, for example, in the drawings. The peripheral portion of cam 3 engages an anti-friction roller 5 carried by an arm 6 extending upwardly from a slide 7. Journaled upon the back face of this slide near the lower end thereof are spaced rollers 8 while extending from the front of the slide is a lug 9. Another slide 10 is movably mounted on the front face of the slide 7 and has an upwardly extending arm 11 provided with an anti-friction roller 12 adapted to engage the periphery of the cam 4. A pivot pin 13 is extended backwardly from the slide 11 and has a spacing collar 14 designed to work within a recess 15 formed in the upper end of the slide 7. A slot 16 is provided in the slide 10 and projecting forwardly from the slide at the upper end of this slot is a lug 17. Another lug 18 is extended forwardly from the slide 10 at one side of the lower portion of the slot 16.

The slides 7 and 10 are mounted for reciprocation within a guideway 19 formed within the bracket 1 and extending perpendicularly above the space in front of the dies A and B. An ear 20 is extended forwardly from this bracket and slidably mounted therein is a rod 21 secured to and extending upwardly from the ear 18. This rod has a spring 22 thereon, the spring bearing downwardly on the ear 20 and upwardly against an adjustable head 23 on the rod. Thus the spring acts normally to support the slide 10 in raised position with its roller 12 in contact with the periphery of the cam 4. The ear 17 on this slide 10 projects through a slot 24 in the front of the bracket and is located above the

ear 9 on slide 5 which extends through the slot 16 in slide 10. A rod 25 is secured to and extends upwardly from the ear 9 and is slidable within the ear 17. On this rod is mounted a spring 26 which bears downwardly against the ear 17 and upwardly against the adjustable head 27 of the rod. Thus it will be seen that while spring 22 yieldingly supports the slide 10 and holds the roller 12 against the cam 4, spring 26 yieldingly supports the slide 7 from the slide 10 to hold its roller 5 against the periphery of the cam 3.

Pivotaly mounted on the pin 13 between the collar 14 and the back wall of the guideway in bracket 1 are downwardly extended arms 28 and 29 which extend between the rollers 8 and are normally pressed thereagainst in any suitable manner, as by means of an interposed spring 30. The arms 28 and 29 have their lower ends extended downwardly in front of the dies A and B. The lower portion of the arm 28 is provided with an elongated jaw 31 in which are formed stock receiving recesses 32 spaced apart the same distances as the impressions *a*. The other arm 29 is preferably provided with independently movable jaws 33 disposed in superposed relation, each jaw having a stock receiving recess 34. These recesses in the several jaws 33 are spaced apart distances equal to the distances between the impressions *b*. Any suitable means may be employed for permitting the jaws 33 to yield slightly when brought into contact with the jaw 31. For example each jaw 33 may be provided with one or more springs 35 operating normally to thrust the jaws away from the arm 29, the jaws being guided by means of pins 36 or in any other suitable manner so as to be held against displacement. By having jaws 33 yieldingly mounted they will operate to grip stock engaging the jaw 31 even though there should be variations in the size of the stock, as frequently occurs in quantity production of upset forgings and the like. The outer sides of the upper portions of arms 28 and 29 constitute cams indicated at 37 and 38 respectively. These cams cooperate with the rollers 8 during the movement of the rollers relative to the arms for the purpose of producing properly timed operations as herein-after explained.

With reference to the cam 4 which actuates the slide 10 carrying pivot pin 13 it might be stated that the movement of the slide produced by one rotation of cam 4 will be equal to the distance between two adjoining depressions *a* and when the roller 12 is in contact with that portion of the cam 4 nearest the shaft 2 the arms 28 and 29 will be supported in their uppermost positions with the uppermost recesses 32 and 34 disposed at opposite sides of a receiving channel 39 formed by the beveled upper corner portions of the meeting faces of the dies A and B.

The remaining recesses 32 and 34 will be at opposite sides of the uppermost impressions *a* and *b*. These relative positions of the parts have been illustrated in Figure 1 and constitute the first position of the series assumed by the parts during the feeding operation. It might also be stated that when slide 10 is thus supported in its uppermost position with the jaws 31 and 33 spread apart and raised, the roller 5 is also in its uppermost position in engagement with cam 3 as shown in Figure 1. Consequently the shifting rollers 8 are located above the lower portions of the cam faces 37 and 38 as shown in Figure 1. With the parts located as illustrated in Figure 1 a length of stock indicated at S is placed in the recess 39 at the upper end of the meeting faces of the gripping dies A and B. The placing of this stock can be effected either by hand or automatically as may be desired. The rotation of shaft 2 is preferably timed with the reciprocation of the die C and one complete rotation of this shaft will take place during each cycle of movement of the die C.

As the cams rotate in the direction indicated by the arrows from the positions shown in Figures, 1, 2 and 3 (which is the first position) a concentric portion of cam 4 will move over the roller 12 so that the slide 10 will not be thrust downwardly. Instead it will be maintained at its uppermost position. While being thus held, however, cam 3 will thrust downwardly on the roller 5 and cause slide 7 to push the rollers 8 downwardly along the cam faces or edges 37 and 38 of the arms 28 and 29. Consequently the two arms will be swung toward each other from the positions shown in Figure 1 to the positions shown in Figure 8 at which time the cams will be located substantially as shown in Figure 9. Thus the stock supported in the recess 39 will be gripped between the recesses 32 and 34 at the upper ends of the jaws and, if any stock previously fed to the machine is located in the impressions *a* and *b* of the gripping dies A and B, said articles will at the same time be gripped between the jaws so as to be held within the other recesses 32 and 34. Following the completion of the operation illustrated in Figure 8 the cam 3 continues to press downwardly on the roller 5 and the slide 7 so as to thrust one of the rollers 8 off of the cam 38 while the other roller 8 continues downwardly in engagement with the cam 37. Consequently the two arms 28 and 29 will be swung laterally so that the stock engaged by the jaws will be swung out of the impressions *a*. This movement is permitted because prior to this action the movable gripping die B has shifted away from the stationary die A. During this further movement of the slide 7 under the action of the cam 3 the cam 4 continues to maintain the roller 12 and the slide 10 in their upper-

most positions. This second step is the operation, which is illustrated in Figures 10 and 11, is followed by the third step wherein the jaws while held together in engagement with the work are moved downwardly to transfer the work from the levels at which the jaws gripped the same in Figure 8 to the next lowest level. Thus the stock that had been fed to the recess 39 in the first stage of the operation is carried downwardly to position between the uppermost impressions *a* and *b*. This operation takes place because the two cams 3 and 4 at this time thrust downwardly simultaneously upon the two rollers 5 and 12 until the slides are brought to their lowermost positions with the rollers 8 maintaining substantially the same positions relative to the cams 37 and 38 that had been occupied by them in the preceeding step shown in Figure 10. With the parts in the positions shown in Figures 12 and 13 the slide 7 starts moving upwardly, so as to carry the rollers 8 along the cam faces 37 and 38 which are so shaped as to maintain the jaws close together in gripping engagement with the work. This is illustrated in Figures 14 and 15. Shortly thereafter the moving die B comes against the die A so that the work is gripped between the dies and immediately thereafter the rollers 8 travel upwardly sufficient distances to allow the jaws 31 and 33 to move apart so as to release the work and leave it in engagement with the dies. Said jaws are then carried upwardly by the springs 22 and 26 which lift arms 28 and 29 to maintain the rollers of the slides in contact with the respective cams and, obviously, the opened jaws are finally brought back to the first position illustrated in Figure 1. It might be stated that as the dies A and B grip the work the heading or upsetting die C comes against the work and shapes the projecting portions thereof. The several steps of feeding the work downwardly from one position to another and the return of the jaws to the first position all take place during one cycle of movement of the die C. Where several shaping operations take place in converting rough stock to a finished article, the die C can be formed with different impression for successively receiving and shaping the stock. In the structure illustrated four of these impressions are provided and, consequently, four pieces of the stock can be in operative engagement with the machine simultaneously, namely the initial length of the stock in the upper recess 39, the stock in the upper impressions *a* and *b* which has been subjected to the first upsetting operation, the stock in the next lowest impressions *a* and *b* which has been subjected to the second upsetting operation, the stock in the third lowest impressions *a* and *b* which has been subjected to the third upsetting operation and the completed article in the low-

ermost impressions *a* and *b* which has received the final or finishing upset. In Figure 2 these five pieces of the stock have been shown in their proper positions immediately following the withdrawal of the upsetting die C from engagement therewith and after a new piece of stock has been placed in the recess 39. Obviously, therefore, when the gripping die B is moved away from the gripping die A following the gripping action of the jaws 31 and 33 as shown in Figure 10, the lowermost article which is not gripped by the jaws and has been completed, will fall by gravity out of the lowermost impressions *a* and *b* while the remaining four articles gripped by the jaws 31 and 33 will be carried downwardly one stage by the operations heretofore described. Thus during each cycle of the machine during which the die C moves toward and from the dies A and B, one article will be delivered complete from the machine, thereby saving considerable time and labor over machines which produce a completed article only following a number of cycles of movement corresponding with the number of forging or upsetting operations required to produce the article.

In addition to the operation as described it might be stated that when the jaws move from the position shown in Figure 12 to the position shown in Figure 14 they swing laterally to bring the stock into the impressions *a*, this movement being produced by the upward movement of one of the rollers 8 relative to the cam face 38.

As heretofore explained the resiliently backed jaws 33 will compensate for any slight variations in the sizes of the stock which may occur.

What is claimed is:

1. A machine of the class described including gripping and forming dies mounted for relative movement, in combination with feeding mechanism including relatively movable slides, arms pivotally connected to one of the slides, opposed work gripping jaws carried by the arms, means upon the other slide for cooperation with the arms to close the jaws during a portion of the relative movement of the slides and means for actuating the respective slides in timed relation to swing the jaws laterally while closed, lower the closed jaws, open the jaws, and finally return them to their initial position.

2. In a machine of the class described the combination with gripping and forming dies, of feeding mechanism including relatively movable slides, means for yieldingly holding the slides normally in one extreme position, arms pivotally connected to one of the slides, jaws carried by the arms for gripping work, means carried by the other slide for engaging the arms, and separate means cooperating with the slides and with the

yielding supports therefor for successively closing the jaws upon the work, swinging the jaws laterally to disengage the work from a die, carry the work to a new position, release the work, and return the jaws to their initial positions.

3. In a metal forming machine the combination with gripping dies and a forming die, of feeding mechanism including yieldingly restrained relatively movable slides, jaws mounted to swing relative to and carried by one of the slides, means on the other slide for closing the jaws when the slides are moved in one direction relative to each other, and means for successively closing the jaws upon work therebetween, shifting the jaws to convey the work to a new position, opening the jaws, and finally returning the jaws to their initial positions.

4. In a metal forming machine a work feed including relatively movable slides, yielding means for holding the slides normally in one position, arms pivotally connected to one of the slides, work gripping jaws carried by the arms, and means for actuating the slides relative to each other in timed relation for successively shifting the jaws to grip the work, moving the jaws bodily to shift the work, releasing the jaws from the work, and restoring the jaws to their initial positions.

5. In a metal working machine relatively movable yieldingly restrained slides, arms pivotally connected to one of the slides, a jaw carried by one of the arms, a jaw carried by the other arm, equalizing means for compensating for variations in the diameter of the work to be gripped between the jaws, and means for operating the slides in properly timed relation to clamp the jaws upon the work, shift the jaws to convey the work to a new position, open the jaws, and return the jaws to their points of starting.

6. In a metal forming machine the combination with gripping dies and a forming die movable toward and from each other during one cycle of movement of the machine, of work feeding mechanism including a yieldingly restrained relatively movable slide, arms pivotally connected to one of the slides, jaws carried by the arms, means upon the other slide cooperating with the arms for closing the jaws, and means for operating the slide in timed relation during one cycle of movement of the machine for moving the jaws to work-gripping position, shifting the jaws to convey the work to a new position, opening the jaws to release the work, and returning the jaws to their points of starting.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature.

WILLIAM E. EHINGER.