

Nov. 19, 1946.

A. R. WALPOLE

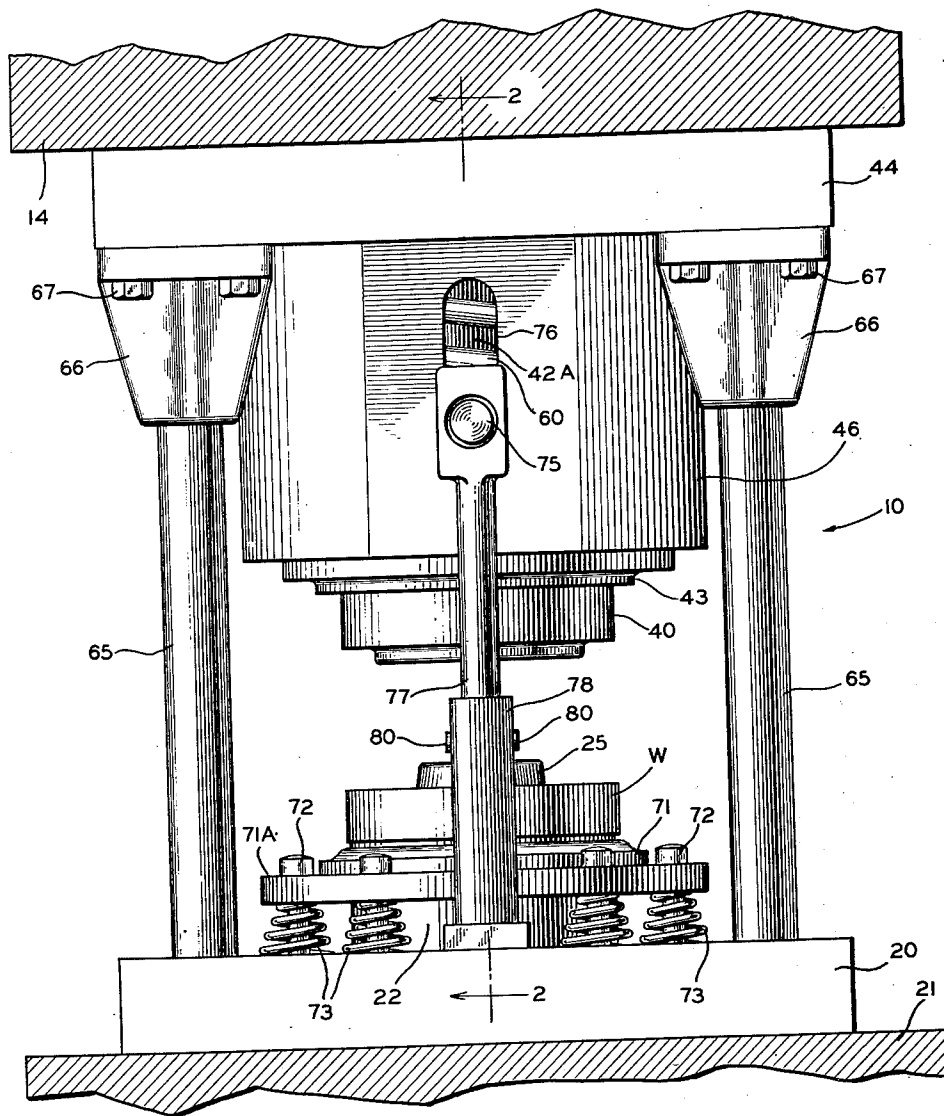
2,411,399

APPARATUS FOR FINISHING FORGINGS

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4 Sheets-Sheet 1

FIG. 1



INVENTOR.  
ALFRED R WALPOLE  
BY *Wallace and Cannon*

ATTORNEYS

Nov. 19, 1946.

A. R. WALPOLE

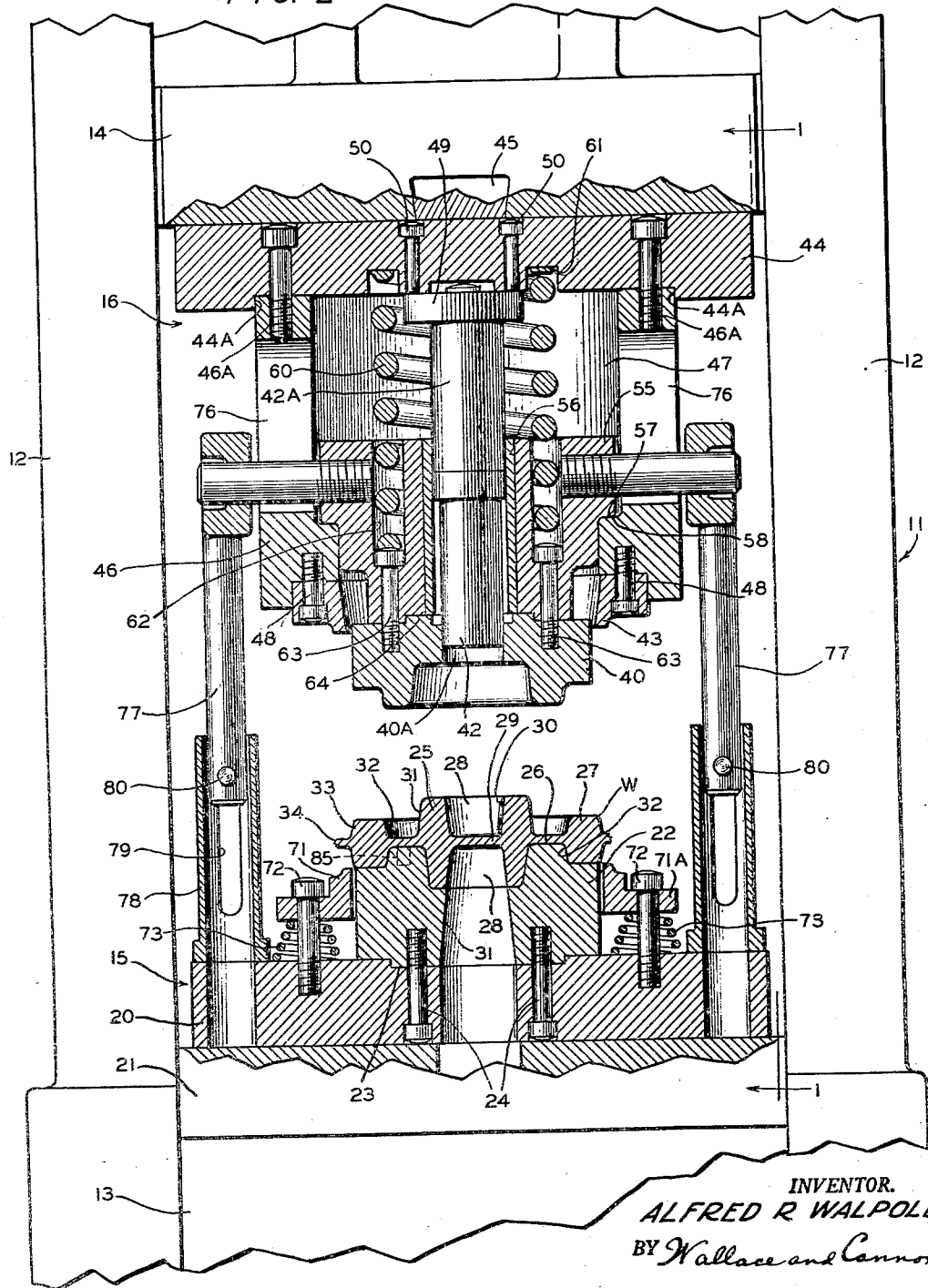
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4 Sheets-Sheet 2

FIG. 2



INVENTOR.  
ALFRED R WALPOLE  
BY *Wallace and Cannon*

ATTORNEYS.

**2,411,399**

4 Sheets-Sheet 3

FIG. 3

INVENTOR.  
ALFRED R WALPOLLE  
BY Wallace and Cannon

INVENTOR.  
ALFRED R WALPOLE  
BY *Wallace and Cannon*  
ATTORNEYS

Nov. 19, 1946.

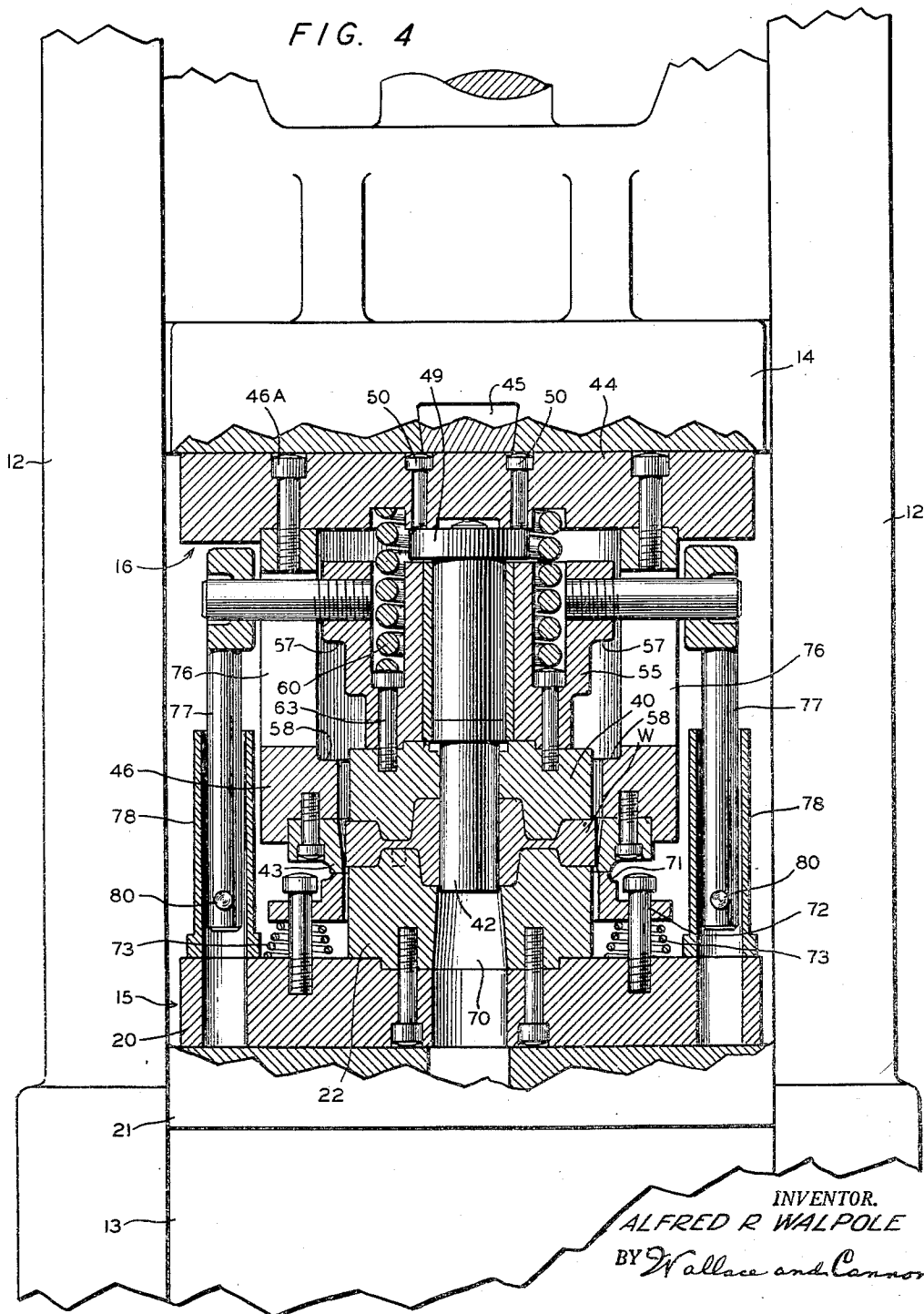
A. R. WALPOLE

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APPARATUS FOR FINISHING FORGINGS

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4 Sheets-Sheet 4



## UNITED STATES PATENT OFFICE

2,411,399

## APPARATUS FOR FINISHING FORGINGS

Alfred R. Walpole, Chicago, Ill., assignor to  
American Brake Shoe Company, New York,  
N. Y., a corporation of Delaware

Application January 20, 1945, Serial No. 573,776

6 Claims. (Cl. 164—118)

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This invention relates to forging of metal parts and it relates particularly to the punching and/or trimming of such forging after the usual forging operations have been performed.

In the production of metal forgings, it is of course necessary that the provision be made in the forging dies for sufficient draft to allow ready separation of the dies from the forging as the forging operation progresses or is completed. Ordinarily, the draft or sloping surfaces thus formed by the dies on the forgings is unobjectionable as to many sides or surfaces of the forging, but in respect to those sides or surfaces that are to serve in a functional sense for purposes of mounting, bearing, power transmission or the like, such draft on the forging must be removed, and to enable this to be done in a simple and expeditious manner is an important object of this invention.

In accordance with usual practice it is customary to trim the flash from the edges of a forging, and it is customary to punch out slugs that divide the aligned recesses where a bore is to be thereafter formed in a forging, but these operations are customarily so performed that the draft on the forging is allowed to remain in place. Trimming of such flash, and the punching of such slugs from a forging in accordance with prior practice has required relatively careful handling of the forging so as to be sure that the form of the work piece that has been attained in the forging operation will not be destroyed or distorted in the course of the trimming and the punching operation, and it is a further object of the present invention to simplify and expedite the trimming and punching of forgings that the desired form of the forging will invariably be maintained. A further and related object of the invention is to enable the critical surfaces of a forging to be held and supported in the desired form while the forging is trimmed and punched, and to enable such trimming and punching operations to be so performed that the flash and the slug as well as the draft will be removed. More specifically, it is an object to so perform the trimming operations on a forging that the draft on the critical surfaces thereof will be removed and such critical surfaces will be so formed as to materially simplify further metal working or machining operations that are to be performed on the forgings.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration,

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show a preferred embodiment and the principle thereof and what I now consider to be the best mode in which I have contemplated applying that principle. Other embodiments of the invention embodying the same or equivalent principle may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

Fig. 1 is a side elevational view of a punching and trimming apparatus constructed in accordance with the present invention, such view being taken substantially along the line 1—1 of Fig. 2;

Fig. 2 is a vertical sectional view, taken substantially along the line 2—2 of Fig. 1, and showing the elements of the punching and trimming apparatus in their separated or rest positions, and with a work piece in position on the lower die element of the apparatus;

Fig. 3 is a view similar to Fig. 2 and showing the elements of the punching and trimming apparatus after the forging or work piece has been clamped in position and prior to the start of the punching and trimming operations; and

Fig. 4 is a view similar to Figs. 2 and 3 and illustrating the elements of the punching and trimming apparatus after completion of the punching and trimming operation and before the elements of the apparatus have started their relative separating movement.

In the form chosen for disclosure herein, the invention is embodied in a cutting and trimming apparatus 10 that is shown in elevation in Fig. 1 of the drawings. This cutting and trimming apparatus being adapted for mounting in conventional press equipment, and as herein shown the cutting and trimming apparatus 10 is illustrated as mounted in a conventional punch press 11 having spaced vertical columns 12 with a bed 13 between the columns 12 near their lower ends and having a ram or head 14 disposed upwardly from the bed 13 and mounted for vertical reciprocation between the columns 12.

The punching and trimming apparatus of the present invention includes a stationarily mounted lower portion 15 and a movable upper portion 16 that is in the present case carried on the ram 14 of the press. The lower or stationary portion 15 of the apparatus includes a lower die shoe 20 secured in a conventional manner upon the bolster plate 21 of the press, such bolster plate 21 being disposed upon the bed 13. The die shoe 20 is in the form of a relatively thick flat plate and serves as a mounting for a lower die 22 upon which the

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work piece such as a forging W is rested and supported during the punching and trimming operation. As will be evident in Fig. 2 of the drawings, the lower die 22 has a projection 23 on its lower face that fits into a complemental recess in the die shoe 20, and the die 22 is held in place by cap screws 24 extended upwardly through the die shoe 20 and threaded into the lower die 22. In the present instance the apparatus 10 is fitted particularly for the punching and trimming of a wheel-like work piece W having a hub 25, an annular web 26 and an outer rim 27, as indicated in Fig. 2 of the drawings. In the final form of the work piece W that is herein shown, there is to be a central bore formed therein, as shown in Fig. 4 of the drawings, and in order that this bore may readily be formed in the work piece W, the forging operation is arranged to afford aligned recesses 28 that are disposed on the axis of the hub 25 and that are divided or separated by a web or slug 29. It will be evident in Fig. 2 of the drawings that each of the recesses 28 has walls tapered as at 30 so as to afford the draft required for the forging tools or dies in the course of the forging operation. Similarly the outer surfaces of the hub 25 are of a sloping form as indicated at 31 in Fig. 2, while corresponding draft is provided at 32 on the inner face of the rim 27. The outer faces of the rim 27 also have a sloping surface 33 that afford the necessary draft, and these surfaces 33 ordinarily merge into the flash 34 that is formed along the parting line of the forging dies used in forging operation.

It will be recognized that in different kinds and with different forms of work piece W, there will be considerable variation in the surfaces that are considered to be critical and which are to be used in mounting or in the transmission of power by the work piece or for other functional purposes, but in the present instance, the outer periphery of the rim 27 of the work piece may be intended for further machining operations for the purpose of forming gear teeth thereon, or may be intended to serve as a rolling surface in the event that the work piece is to be utilized as a roller. Furthermore, the central bore of the work piece W herein shown is considered to be a critical surface that will in most instances be subjected to further machining operations, and in accordance with the present invention the punching and trimming apparatus is constructed and arranged to trim the flash 34 and the draft 33 from the outer periphery of the rim 27 and to punch the draft 30 and the slug 29 from the hub 25 thereby to provide a cylindrical outer surface on the rim 27 and a concentric cylindrical central bore in the hub 25.

In order that such punching and trimming operations may be performed while maintaining the desired form of the elements of the forging W, the lower die 22 and an upper die 40 are arranged to embrace the work piece W so as to maintain the form of the work piece W while the punching and trimming operations are performed. To this end, the upper face of the lower die 22 is formed so as to accurately engage the lower end surface of the hub 25, the draft surface 31, lower half of the hub 25, the lower face of the web 26, the draft surface 32 of the rim 27 and the lower side face of the rim 27. In practice, the work piece W is placed in a position of the lower die 22, as shown in Fig. 2, while the ram 14 and the upper die 40 are in the upper or retracted position of Figs. 1 and 2, and this is done immediately after the completion of the forging operation so that the

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work piece W is still at substantially the same temperature as it was when the forging operation was completed. After the forging W has been placed in position on the lower die 22, the upper die 40 is brought down into engagement with the upper surface of the work piece W, as shown in Fig. 3, after which the punching and trimming operations are performed while the work piece W is firmly held between the lower and upper dies 22 and 40.

In order that the upper die 40 may be moved into its active position of Fig. 3 and may yet be carried upon the upper head 14 of the press, the mounting of the upper die 40 is related to the cutting tools that perform the desired punching and trimming operations in such a manner that relative movement may take place between the cutting tools and the upper die 40. Where a work piece of the form herein shown is to be punched and trimmed, a punch 42 and a trimming ring 43 are employed, and these cutting tools are supported on the punch holder 44 that is fixed by means including dovetail member 45 upon the lower face of the head of ram 14 of the press. The mounting of the trimming ring 43 and the punch 42 is, in accordance with the present invention, such as to cooperate in affording supporting and guiding means for the upper die 40. Thus the trimming ring 43 is secured upon the lower end of a supporting member 46, this supporting member in the present case being generally cylindrical in both its inner and outer form and having two opposite sides flattened for clearance purposes as will hereinafter appear. The supporting member 46 has its upper end recessed into the punch support 44 at 44A, and is secured in position by cap screws 46A. The trimming ring 43 is in the present instance secured in a position in a locating groove in the lower face of the supporting member 46 by cap screws 48 as shown in Fig. 2 of the drawings. The punch 42 is, in the present case, sectional in character so as to enable the lower end portion thereof to be readily replaced, and where this arrangement is employed, the upper or mounting portion of the punch has a head 49 that is disposed against the lower face of the punch holder 44 and secured in this position by cap screws 50.

The punch 42 serves as guiding means for locating the upper die 40 in proper position for engagement with the upper surfaces of the forging W, and in attaining such guiding action, the upper die 40 is mounted on an upper die holder 55 that is disposed within the mounting member 46. The upper die holder 55 has a longitudinal opening therein that surrounds the punch 42, and a bearing sleeve 56 fixed within this central opening is arranged to have bearing engagement with the upper enlarged portion 42A of the punch 42. When the head or ram 14 of the press is in its upper position of Fig. 2, the upper die holder 55 is located in its most lower position with respect to the punch 42 and the mounting member 46, this position being determined by a downwardly facing annular shoulder 57 formed on the die holder 55 and engaged at this time with an inwardly projected annular flange or shoulder 58 formed on the mounting member 46. The upper die holder 55 is urged downwardly toward this position by an expansive coil spring 60 that has its upper end rested in an annular groove 61 in the lower face of the punch holder 44 and which has its lower end extended into a relatively deep annular groove 62 extended into the upper face of the die holder 55. In the pres-

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ent case, the upper die 40 is held in position on the lower end of the die holder 55 by cap screws 63 that are extended downwardly from the bottom of the annular groove 62 and are threaded into the die 40. The die 40 is positioned in a lateral sense by a projection 64 that is seated in a complemental recess in the lower face of the upper die holder 55.

When the ram 14 is in its upper position, the die holder 55 is in the relative position determined by the shoulder 58, and the lower end portion of the punch 42 is disposed in a central bore 40A formed in the die 40, while the trimming ring 43 is disposed considerably above the lower or effective surfaces of the die 40, as will be evident in Fig. 2 of the drawings. It will also be observed that the lower surfaces of the upper die 40 are formed so as to be complemental with the upper end surfaces of the hub 25 of the work piece, the draft surface 31 of the hub, the upper surface of the web 26, and the upper side surface of the rim 27, and when a punching and trimming operation is to be performed these complemental surfaces of the upper die 40 are brought into engagement with the upper surfaces of the forging W before the punching and trimming operations are performed, thereby to maintain the forging in the proper form while the punching and trimming operations are performed. Thus, as will be evident by comparison of Figs. 2 and 3 of the drawings, the downward movement of the ram 14 first acts to cause such engagement of the upper die 40 with the forging W. In order that the die 40 may accurately match in every instance with the forging W located on the lower die 22, the downward movement of the upper portion of the apparatus is accurately guided with respect to the lower portion 15 of the apparatus. Such guiding action is in the present instance accomplished through the provision of a plurality of guide or leader pins 65 as shown in Fig. 1 of the drawings, such leader pins being extended upwardly from each of the four corners of the die shoe 20 in a perpendicular and rigid relation thereto. Each leader pin 65 is extended into a guiding bushing 66 that is bolted at 67 to the corresponding corner of the lower face of the punch holder 44, and with this construction the downward movement of the ram 14 and the punch holder 44 causes the guide bushings to ride downwardly in accurately guided relationship along the leader pins 65. In the course of such downward movement, the upper die 40 is engaged with the upper surface of the forging W, and as the downward movement of the ram 14 further progresses, the spring 60 is compressed so as to apply substantial clamping and positioning forces to the die 40. In the course of such further downward movement, the punch 42 and the trimming ring 43 move downwardly and into the operative relationship to the forging W, the arrangement in the present instance being such that the punch 42 first enters upon its punching operation prior to the engagement of the trimming ring 43 with the forging. With this arrangement the punching and trimming operations are completed at substantially the same time.

The punch 42 acts, as will be evident from a comparison of Figs. 3 and 4, to punch the draft 30 as well as the slug 29 from the hub 25 of the forging, and the slug and the associated material are discharged downwardly through a disposal opening 70 formed in the lower die 22 and in the die shoe 20 and the bolster plate and bed

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of the press. The trimming ring 43 serves to trim the draft 33 as well as the flash 34 from the periphery of the rim 27 of the forging, and this material is in the form of a ring that may cling to the outer surfaces of the lower die 22. For this reason, an annular stripper ring 71 is disposed in surrounding relation to the lower die 22, this stripper ring being guided for vertical movement on guide studs 72 that extend through a flange 71A of the stripper ring and are threaded into the die shoe 20. An expansive coil spring 73 surrounds each of the guide studs 72 so as to urge the stripper ring 71 in an upward direction when the trimmer ring 43 is withdrawn. The springs 73 are, of course, compressed by any material that may be disposed between the trimmer ring 43 and the stripper plate 71, and it may be here observed that the flash and other material cut from the work piece W have not been shown in Fig. 4 of the drawings, although such material would, in fact, be present at the stage of operation that is illustrated in Fig. 4. Upon completion of the punching and trimming operation, the ram 14 is withdrawn in an upward direction, and as such withdrawal movement progresses from the relationship shown in Fig. 4 to the relationship shown in Fig. 3, the spring 60 gradually expands so as to maintain an upper die in engagement with the forging W. When the ram has reached the position shown in Fig. 3, the flange 58 engages the shoulder 57 upon the upper die holder 55, thereby to move the die holder 55 with the supporting member 46 in the continued upward or withdrawing movement of the ram, and at the completion of the upward stroke of the ram, the parts attain the position shown in Fig. 2 of the drawings.

Under some circumstances the trimming ring 43 may not strip properly along or with respect to the sides of the forging W, or the punch 42 may not strip properly in an upward direction from the central bore of the forging W, and in such a situation, the forces acting between the trimming ring 43 and the forging, or between the punch 42 and the forging, may be of such a magnitude that the spring 60 will be unable to maintain the die 40 in its lower position while the ram 14 is being withdrawn to the position of Fig. 3. When this occurs it is desirable to have a positive stripping force applied so as to strip the completed forging W from the punch 42 and from the trimming ring 43. In accordance with the present invention, therefore, a lost motion connecting means is provided between the upper die holder 55 and the lower die shoe 20 in such a way that positive stripping forces are applied in the event that the spring 60 does not attain the desired stripping action. As herein shown, this lost motion connection includes a pair of pins 75 extended in opposite directions outwardly from the upper die holder 55 and through slots 76 formed in the mounting member 46 so as to open through the opposite outer flat surfaces. Each of these pins 75 has a link 77 pivotally supported thereon to depend therefrom along the adjacent outer flat surfaces of the mounting member 46, and the lower ends of these links are arranged to ride in a slidable relation within upstanding sleeves 78 that are secured rigidly on the die shoe 20. The sleeves 78 have slots 79 formed in their opposite sides, such slots terminating short of the upper ends of the sleeves 78, and each link 77 has a transverse pin 80 in its lower end that extends in opposite directions outwardly through the slots 79 of the related sleeve 78. The relationship of the slots

79 and the pins 80 is such that when the upper die holder 55 has reached the height at which it is located in Fig. 2, the pins 80 will engage the upper ends of the slots 79. Thus, it will be clear that if the forging W does not strip from the trimming ring 43 and thereby causes the upper die holder 55 to remain in the position shown in Fig. 4 with respect to the mounting member 46, then as the upward or withdrawing stroke of the ram 14 progresses, the die holder 55 will reach the upper position of Fig. 2 prior to the time when the punch 42 and trimming ring 43 have reached end upper portions, and under such circumstances the links 77 will restrain the die holder 55 against further upward movement and hence, further upward withdrawal of the ram 14 will forcibly withdraw the trimming ring 43 and the punch 42 upwardly so as to effect the stripping of the forging from the cutting tools.

In the use of the punching and trimming apparatus of this invention, it will be observed that the surfaces of the forging are firmly supported at all times except where the punching or trimming operations are to be performed, and as will be evident in Fig. 4 of the drawings, the upper surfaces of the lower die 22 where such surfaces border the opening 70 are arranged to support the lower surface of the hub 25 relatively close to the border of a central bore that is to be punched by the punch 42, and hence, the action of the lower die 22 at this point prevents distortion of the lower surface of the hub 25. The corresponding upper surface of the hub 25 is of course held in the proper form by the portions of the upper die 40 that surround and define the central opening 40A of the upper die, while the other surface of the upper and lower dies engage the surfaces of the work piece so as to prevent distortion of the portions of the forging in the course of the punching and trimming operations. With respect to the outer edge portions of the rim 27 of the forging, it will be observed that the edge surfaces of the rim are engaged by the upper and lower dies substantially to the outer periphery of the rim that is to be defined by the trimming operation, and thus the rim is held accurately in the desired form as the trimming operation progresses.

Since the forging W is clamped between the upper and lower die with a substantial force afforded by the spring 60, such clamping action may be advantageously utilized to effect stamping of identification numbers and the like in the surfaces of the forging, and as indicated in desired outline, in Fig. 2 of the drawings, a stamping die 85 may be mounted in the lower die 22 so as to form an impression in a portion of the forging when the forging is forced downwardly by the action of the upper die 40. Thus the usual operation of manually applying such marking or other identification to the forging may be eliminated where the punching and trimming apparatus of the present invention is employed.

From the foregoing description it will be evident that the present invention enables forgings to be punched and trimmed in a simple and expeditious manner, and this is accomplished in such a way that the form of the forging is maintained at all times. Moreover, the punching and trimming apparatus of the present invention, by engaging and supporting all of the surfaces of the forging except those that are to be punched or trimmed, enables relatively large amounts of material in such punching and trimming operations. Because of this advantageous arrangement, it is possible to remove not only the slug and the flash from the

forgings but also to remove the draft from the critical surfaces of the forging, and because of this, the further machining or other finishing of such critical surfaces of the forging is materially simple. The punching and trimming apparatus at the present invention is rugged in character, and the arrangement is such that proper stripping action is obtained in every instance.

Thus, while I have described the preferred embodiment of my invention, it is to be understood that these are capable of variation and modification and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. In a trimming apparatus for trimming a forging, a die holder and an upper holder plate, means guiding said holder plate for movement along a predetermined path toward and away from said die holder, a lower die mounted on said die holder in a fixed position and having surfaces thereon complementary to those lower surfaces of a forging that are to be maintained in proper form during trimming of the forging, an upper die having lower surfaces complementary to those upper surfaces of a forging that are to be maintained in proper form during trimming of the forging, an upper die holder upon which said upper die is secured, a mounting member having an enlarged central chamber therein in which said upper die holder is disposed, means securing the upper end of said mounting member on said upper holder plate, cooperating shoulders on said upper die holder and on said mounting member to limit downward movement of said upper die holder relative to said mounting member, means acting yieldingly between said upper holder plate and said upper die holder to urge said upper die holder in a downward direction, and cutting means mounted in fixed relation to said upper holder plate and extended downwardly therefrom for trimming a predetermined surface of clamped and supported forging in the course of downward movement of said upper holder with respect to said lower die holder.

2. In a combination punching and trimming apparatus for trimming the draft from the rim of a forging and for removing the slug and the draft from an opening that is to be formed in the forging, a die holder and an upper holder plate, leader pins and bushings guiding said holder plate for movement along a predetermined path toward and away from said die holder, a lower die mounted on said die holder in a fixed position and having surfaces thereon complementary to those lower surfaces of a forging that are to be maintained in proper form during punching and trimming of the forging, an upper die having lower surfaces complementary to those upper surfaces of a forging that are to be maintained in proper form during punching and trimming of the forging, an upper die holder upon which said upper die is secured, a mounting member having an enlarged central chamber therein in which said upper die holder is disposed, means securing the upper end of said mounting member on said upper holder plate, cooperating shoulders on said upper die holder plate, cooperating shoulders on said upper die holder and on said mounting member to limit downward movement of said upper die holder relative to said mounting member, expansive coil spring means acting between said upper holder plate and said upper die holder to urge said upper die holder in a downward

direction, said upper die and said upper die holder having aligned vertical bores therein, a punch fixed on said upper holder plate and extended downwardly through said upper die holder and into the opening in said upper die, and a cutter ring secured to a lower end of said mounting member for removing the draft from the outer surface of the rim of a forging in the course of downward movement of said upper holder with respect to said lower die holder.

3. In a combination punching and trimming apparatus for trimming the draft from the rim of a forging and for removing the slug and the draft from an opening that is to be formed in the forging, a die holder and an upper holder plate, leader pins and bushings guiding said holder plate for movement along a predetermined path toward and away from said die holder, a lower die mounted on said die holder in a fixed position and having surfaces thereon complementary to those lower surfaces of a forging that are to be maintained in proper form during punching and trimming of the forging, an upper die having lower surfaces complementary to those upper surfaces of a forging that are to be maintained in proper form during punching and trimming of the forging, an upper die holder upon which said upper die is secured, a mounting member having an enlarged central chamber therein in which said upper die holder is disposed, means securing the upper end of said mounting member on said upper holder plate, cooperating shoulders on said upper die holder and on said mounting member to limit downward movement of said upper die holder relative to said mounting member, expansive coil spring means acting between said upper holder plate and said upper die holder to urge said upper die holder in a downward direction, said upper die and said upper die holder having aligned vertical bores therein, a punch fixed on said upper holder plate and extended downwardly through said upper die holder and into the opening in said upper die, a cutter ring secured to a lower end of said mounting member for removing the draft from the outer surface of the rim of a forging in the course of downward movement of said upper holder with respect to said lower die holder, and means acting between said upper die holder and said lower die holder to limit separating movement thereof to an amount that is less than the stroke of said punch.

4. In a combination punching and trimming apparatus for trimming the draft from the rim of a forging and for removing the slug and the draft from an opening that is to be formed in the forging, a die holder and an upper holder plate, leader pins and bushings guiding said holder plate for movement along a predetermined path toward and away from said die holder, a lower die mounted on said die holder in a fixed position and having surfaces thereon complementary to those lower surfaces of a forging that are to be maintained in proper form during punching and trimming of the forging, an upper die having lower surfaces complementary to those upper surfaces of a forging that are to be maintained in proper form during punching and trimming of the forging, an upper die holder upon which said upper die is secured, a mounting member having an enlarged central chamber therein in which said upper die holder is disposed, means securing the upper end of said mounting member on said upper holder plate, cooperating shoulders on said upper die holder and on said mounting member

to limit downward movement of said upper die holder relative to said mounting member, expansive coil spring means acting between said upper holder plate and said upper die holder to urge said upper die holder in a downward direction, said upper die and said upper die holder having aligned vertical bores therein, a punch fixed on said upper holder plate and extended downwardly through said upper die holder and into the opening in said upper die, a pair of slots formed in opposite sides of said mounting member and extended parallel to said punch, a pair of pins extended outwardly from said upper die holder through said slots on opposite sides of said upper die holder, and means affording a lost motion connection between said pins and said lower die holder to limit upward withdrawing movement of said upper die holder so as to thereby insure stripping of a forging from said punch as an incident to upward separating movement of said upper holder plate with respect to said lower die holder.

5. In a combination punching and trimming apparatus for trimming the draft from the rim of a forging and for removing the slug and the draft from an opening that is to be formed in the forging, a die holder and an upper holder plate, leader pins and bushings guiding said holder plate for movement along a predetermined path toward and away from said die holder, a lower die mounted on said die holder in a fixed position and having surfaces thereon complementary to those lower surfaces of a forging that are to be maintained in proper form during punching and trimming of the forging, an upper die having lower surfaces complementary to those upper surfaces of a forging that are to be maintained in proper form during punching and trimming of the forging, an upper die holder upon which said upper die is secured, a mounting member having an enlarged central chamber therein in which said upper die holder is disposed, means securing the upper end of said mounting member on said upper holder plate, cooperating shoulders on said upper die holder and on said mounting member to limit downward movement of said upper die holder relative to said mounting member, expansive coil spring means acting between said upper holder plate and said upper die holder to urge said upper die holder in a downward direction, said upper die and said upper die holder having aligned vertical bores therein, a punch fixed on said upper holder plate and extended downwardly through said upper die holder and into the opening in said upper die, a yieldably mounted separating ring mounted on said lower die holder in surrounding relation to said lower die for stripping material from said lower die, and means affording a lost motion connection between said upper die holder and said lower die holder to insure stripping of a forging from said punch as an incident to upward withdrawing movement of said upper holder plate.

6. In a combination punching and trimming apparatus for trimming the draft from the rim of a forging and for removing the slug and the draft from an opening that is to be formed in the forging, a die holder and an upper holder plate, leader pins and bushings guiding said holder plate for movement along a predetermined path toward and away from said die holder, a lower die mounted on said die holder in a fixed position and having surfaces thereon complementary to those lower surfaces of a forging that are to be maintained in proper form during punching and trimming of the forging, an upper die having

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lower surfaces complementary to those upper surfaces of a forging that are to be maintained in proper form during punching and trimming of the forging, an upper die holder upon which said upper die is secured, a mounting member having an enlarged central chamber therein in which said upper die holder is disposed, means securing the upper end of said mounting member on said upper holder plate, cooperating shoulders on said upper die holder and on said mounting member to limit downward movement of said upper holder relative to said mounting member, expansive coil spring means acting between said upper holder plate and said upper die holder to urge said upper die holder in a downward direction, said upper die and said upper die holder having aligned vertical bores therein, a punch fixed on said upper holder plate and extended downwardly through said upper die holder and into the opening in said upper

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die, a pair of slots formed in opposite sides of said mounting member and extended parallel to said punch, a pair of pins extended outwardly from said upper die holder through said slots on opposite sides of said upper die holder, a pair of links one of which is suspended from each of said pins, a pair of sleeves fixed on said lower die holder in alignment with said depending links and surrounding said links so that said links may move vertically therein, each of said sleeves having at least one vertical slot formed therein, and each of said links having a transverse pin therein extended outwardly through the slot in the sleeve in which the link is positioned, said slots and said pins being so related as to permit free downward movement of said upper die holder, but to limit upward movement of said upper die to thereby insure stripping of a forging from said punch.

ALFRED R. WALPOLE.