No. 692,587. Patented Feb. 4, 1902.

E. P. ALEXANDER.

PRESS FOR FORGING AXES, &c.

(Application filed July 22, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

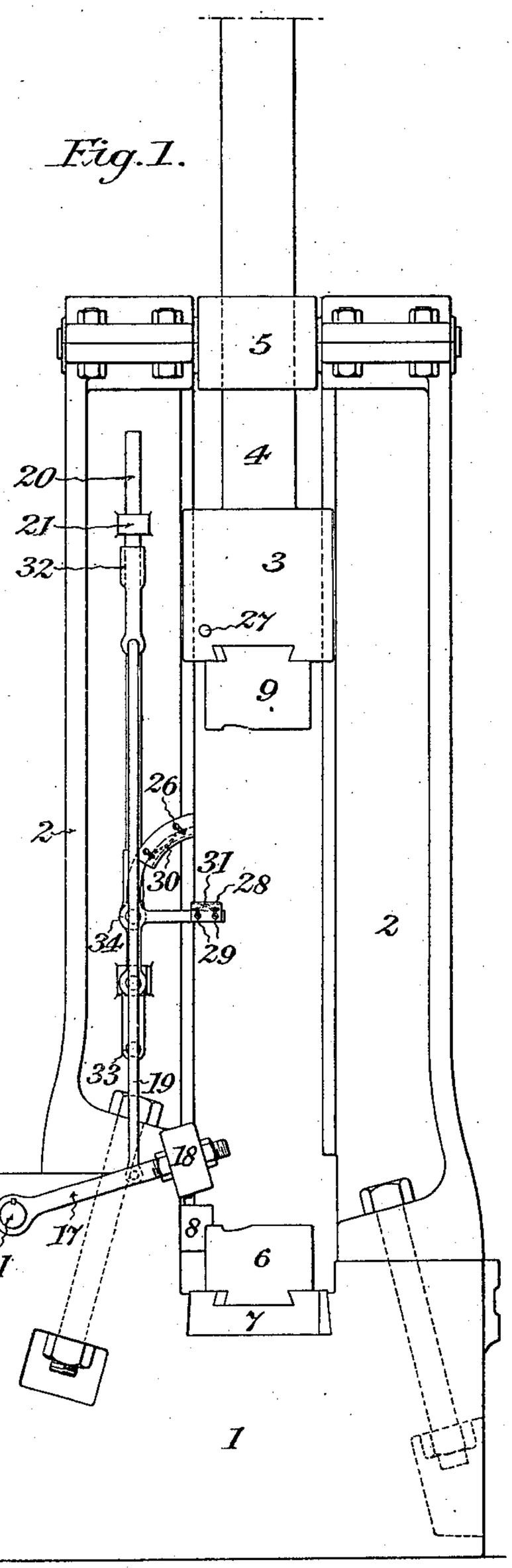
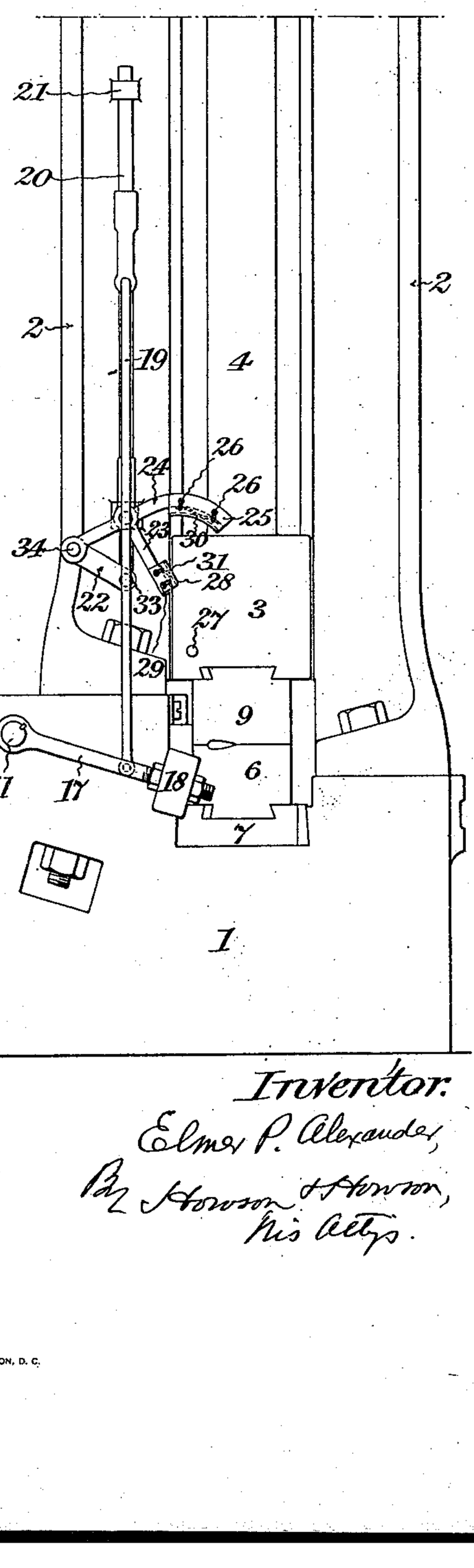


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

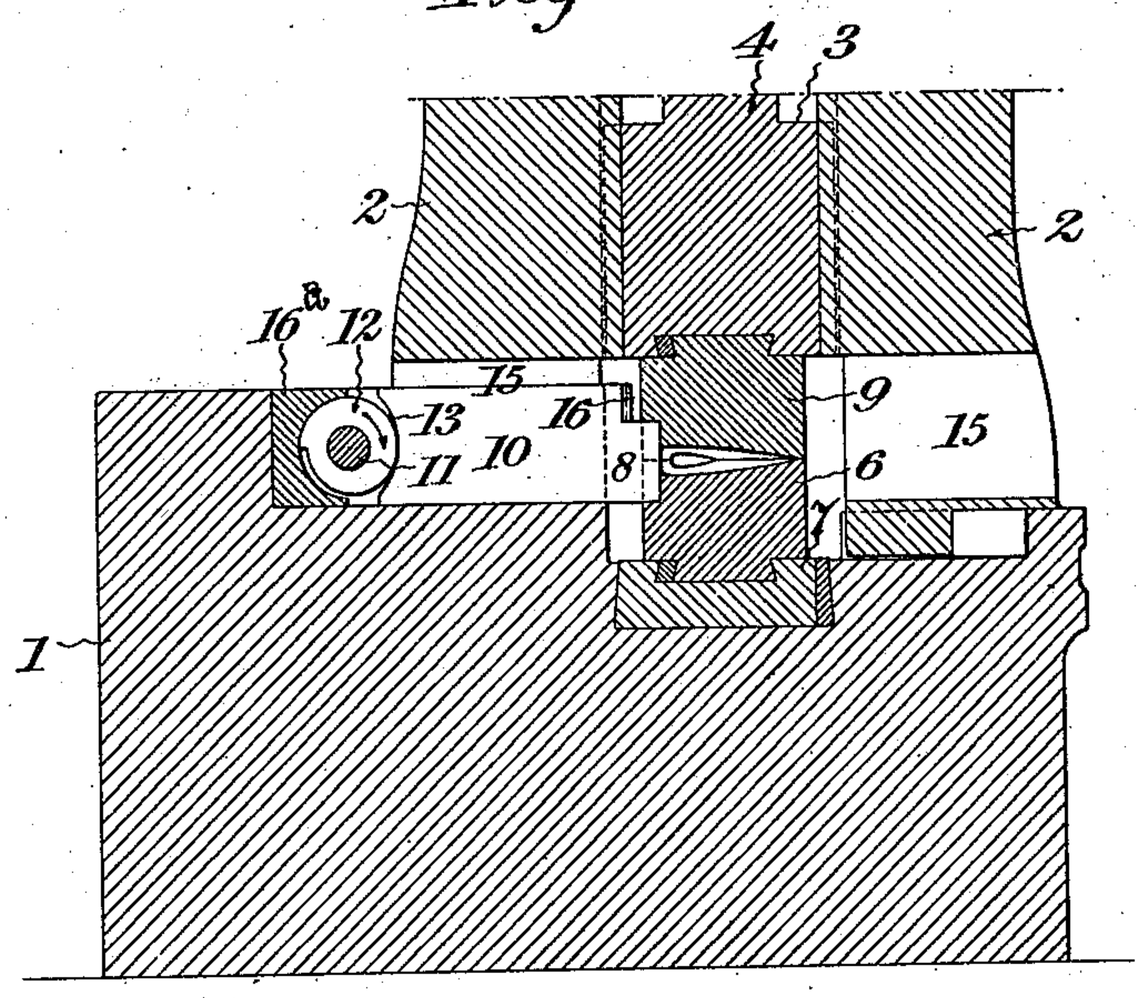


Fig. 5.

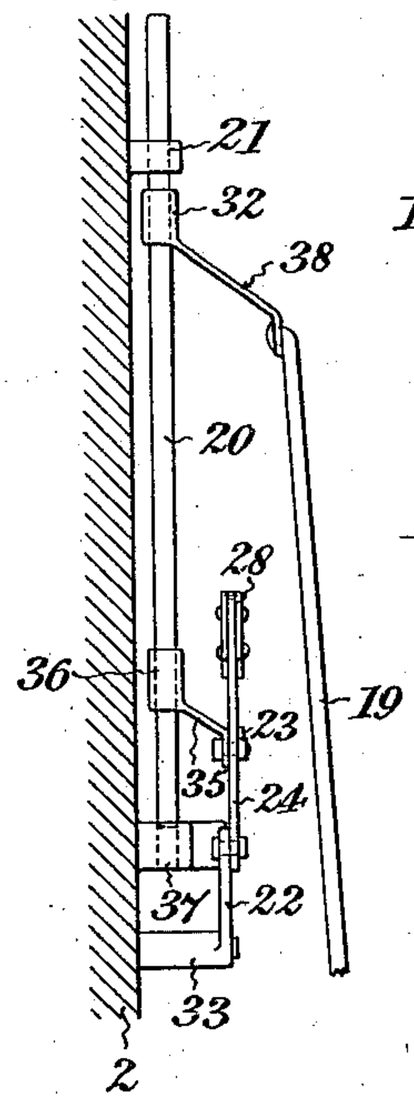
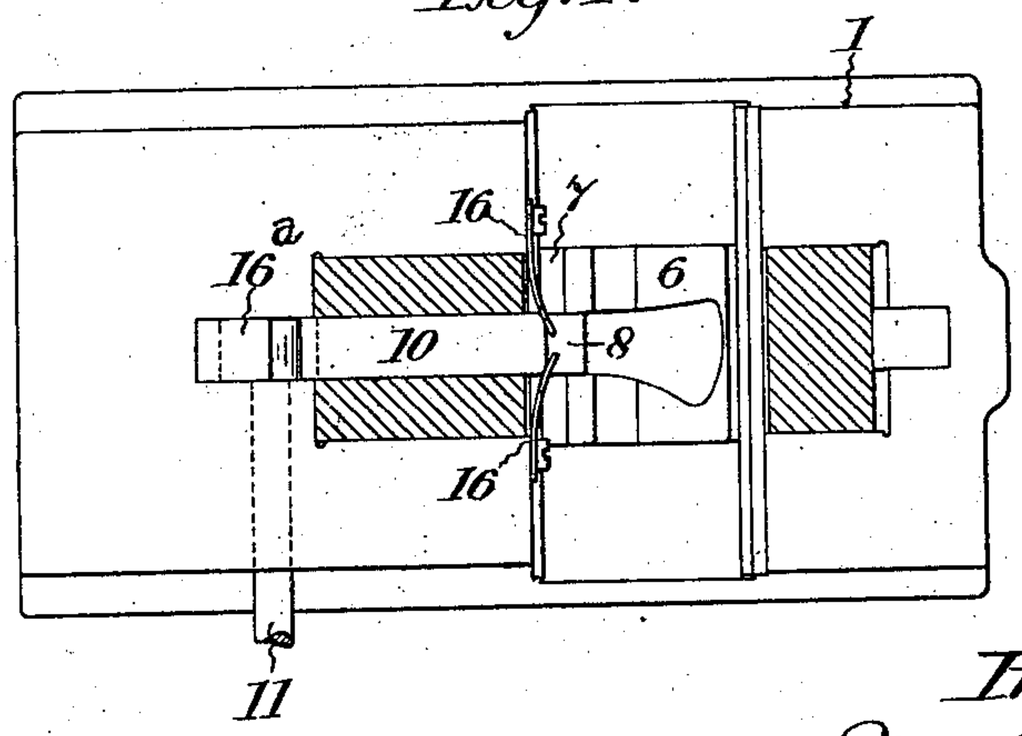


Fig. 4.



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UNITED STATES PATENT OFFICE.

ELMER P. ALEXANDER, OF YEAGERTOWN, PENNSYLVANIA.

PRESS FOR FORGING AXES, &c.

SPECIFICATION forming part of Letters Patent No. 692,587, dated February 4, 1902.

Application filed July 22, 1901. Serial No. 69,246. (No model.)

To all whom it may concern:

Be it known that I, ELMER P. ALEXANDER, a citizen of the United States, residing at Yeagertown, county of Mifflin, State of Pennsylvania, have invented certain Improvements in Presses for Forging Axes, &c., of which the following is a specification.

My invention relates to improvements in forging-presses used in the manufacture of axes and other like edged tools, and more particularly to that type of such presses which is designed to forge the tool complete at one blow, although my present improvements are applicable, it will be understood, to any form of press used for the purpose indicated, whether the article is to be forged by a blow delivered through the medium of a drop-hammer, known as "drop-forge" presses, or whether that operation be effected by means of a hammer controlled by connections intermediate of a rotating shaft or other driving means and the hammer.

While, therefore, I have illustrated my present improvements in the accompanying drawings as applied to a drop-forge press and preferably of the type described and claimed in my prior patent, No. 678,291, dated July 9, 1901, and I shall describe them in connection with such type of press, it is to be understood that I am not limited to any particular form of press, and when I use the terms "hammer," "drop-forge," and "drop-hammer" in this description and the claims it is to be understood that I include thereunder presses of the several types now known in the art for forging axes and the like in a die-cavity formed by two dies which are brought into contact by suitable means to effect the forging of a blank held therein.

In the modern practice of forging axes and other like edged tools by means of a forging-press in which a hammer carrying a die is employed to operate in connection with an anvil supporting a corresponding die serious difficulties have been encountered prior to the date of my patent above mentioned, arising out of the inability to secure a perfect forging of the tool by one blow. These difficulties have been largely due to the fact that it is a practical impossibility to square the head of the tool, owing to the variations, however slight they may be, in the quantity of metal in the blank operated upon, and consequently in some cases the heads are imperfectly formed, because of the lack of a sufficient amount of material, on the one hand, and, on the other hand, an excess of metal causes the formation of fins of greater or less extent and bulk around the head of the ax, and, moreover, frequently causes breakage of the parts of the press. Again, it is extremely difficult and frequently impossible to cause the metal of the blank to completely fill every part of the die-cavity, and particularly the thin space forming the bit end of the same, and especially is this true when the blank contains slightly less than the average quantity of metal. In either case it is necessary to perform the finishing operation at a considerable expenditure of time and labor, thereby increasing the cost of production, and in that case in which excess of metal occurs the fins in the operation of presses heretofore devised, owing to the relation between the head-block and the dies, have been concentrated to a large extent around the head.

Prior to the invention covered by my Patent No. 678,291, dated July 9, 1901, efforts had been made to obviate the objection incident to the presence of an excess of metal in the blank by the use of what are known as "yielding abutments," against which the header-arm or head-block used in closing the head of the die is arranged to act with a yielding pressure, such yielding pressure tending to continuously force the header-arm into the die; but the objections to such a form are apparent and well understood in the art, and therefore in order to overcome or mitigate such objections it was proposed to provide a comparatively rigid abutment to take the place of the yielding abutment. In the form of presses embodying this idea the header-arm was designed to contact against some part or parts separately formed from, but fixed to, the base or standards of the press; but in such cases it became apparent that the enormous strains to which the parts are subjected during the forging operation would and do in a very short time so rack parts of the press as to loosen the same, and thus destroy, in effect, the intended rigidity of the abutment. As an improvement on this latter type of press my inven-

tion covered by my aforesaid patent, through the employment of a seat for the header-arm contained within and forming an integral part of the mass of metal constituting the base of the press, overcame the defects incident to the employment of the so-called "rigid" abutment separate from, but fixedly attached to, the base or standards of the press and provided a permanently-rigid abutment to receive the thrust of the head-block.

In my present improvements, therefore, I have combined the advantages of my prior invention with other advantages arising out of the employment of mechanism for so operating the header-arm or head-block as not only to provide a permanently-rigid abutment against which the thrust due to the expanding metal in the die may act, but to cause the head-block to advance at a certain predetermined time in the operation of the machine to receive the thrust of the metal in the die, and thereby effect the forging of a square head on the tool, and likewise a distribution of the fins formed in forging a blank having a slight excess of metal above the average around a greater extent of surface than heretofore, thus reducing the size of the fins by distribution thereof over a wider area. Furthermore, the complete filling of the cavity with the metal is insured at all times, because said metal is forced into every part of the die-cavity, and particularly the bit end. By this means I am enabled to insure the perfect formation of the tool at a single blow and to effect this for all of the various sizes of blanks of any particular run; and with this purpose and result in view my invention may be said to consist, broadly, in the provision of mechanism for advancing the head-block to receive the thrust about the time the blow is delivered by a hammer or other like device; and it further consists in certain details of construction hereinafter described with reference to the accompanying drawings, in which—

Figure 1 is a front elevation of a press with so much of the operative mechanism as is necessary to show the application of my invention thereto. Fig. 2 is a front elevation of part of such press with my invention applied thereto, the parts being shown in a different position from that in Fig. 1. Fig. 3 is a transverse sectional view of the lower part of the press with certain parts in elevation. Fig. 4 is a top plan sectional detail view, and Fig. 5 is a detail side view of the lever mechanism for operating the header-arm and block.

Referring now to the drawings, in which the same reference characters relate to the same or corresponding parts in all the views, the numeral 1 indicates the base of a drop-forge press—such, for example, as that shown in my prior patent above mentioned—from which base rise the standards 2, provided at the upper end with a suitable bearing 5, in which operates the rod 4, carrying the hammer 3 at its lower end. The standards may have slots 15, through one of which the header-arm 10 operates, as described below.

Attached to the hammer by suitable means is an upper die 9, which operates in conjunction with the lower die 6, suitably secured to the anvil-block 7, to forge the ax or other like tool, such dies having die-cavities formed therein in the manner suitable to the form and shape of the tool to be made.

The dies 6 and 9 when in contact form a die-cavity closed on three sides and open on the fourth or head side, in which opening the head-block 8, carried by a header-arm 10, operating in slot 15, is adapted to operate to close the same. The header-arm may terminate in an integral head-block or in one fixed thereto and is normally held away from the dies by means of suitable springs, such as leaf-springs 16, arranged in a manner similar to that shown in my prior patent, and said springs tend to keep the head-arm 10 in contact with the cam or eccentric device 12, mounted on the shaft 11, suitably journaled in the base. The rear or outer end of the header-arm is preferably recessed, as shown at 13, and a bearing-block 16^a, similarly recessed, is seated in the base on the opposite side of the shaft 11 to the recess 13 in the header-arm, the recess of said bearing-block being semicircular in cross-section, so as to accurately fit that portion of the cam 12 which is concentric with the shaft and which contacts therewith to the limited extent of movement of said cam.

The cam 12 has a cam-surface so made that it will give, as the cam is rotated in the direction of the arrow, Fig. 3, a slight inward movement to the header-arm 10, the cam and operating parts being shown in the extreme inward position at the time the blow has been delivered. The extent of this movement will depend upon the average run of the blanks, and in practice it would be a very small fraction of an inch, which is all that is necessary to effect the purpose. I do not, however, wish to limit myself to any particular extent of this movement, as the essential object is to have it of sufficient extent to effect the objects desired. In order to effect this movement of the header-arm at the proper time, I provide on the outer end of the shaft 11 an arm 17, to which is pivotally connected a rod 19. The arm 17 is preferably provided with an adjustable weight 18, which assists in the operative movement of the cam. Attached to the upper end of the rod 19 is a guide-rod 20, slidably mounted in lugs 21 and 37, fixed to one of the standards 2. The rod 19 may be attached to the guide-rod 20 by suitable means, such as a sleeve 32, having a projecting arm 38, to which the rod 19 is pivotally secured.

Fulcrumed on the standard, in line with the guide-rod 20, is a lever 22, having a sleeve 33, providing a bearing adapted to oscillate upon the fulcrum-pin fixed to the said standard. Pivotally connected with the upper end of said lever 22 is a second lever 24, having

its end terminating in a curved arm, as shown. This lever 24 is hinged by a pivotal connection 34 between its fulcrum and curved end to an arm 35, carried by a sleeve 36, fixed to the guide-rod 20, and projecting laterally from the said lever 24 at the hinged joint is an arm 23. This arrangement of levers constitutes, in effect, a toggle-lever mechanism, of which two members are the levers 22 and 24. Carried by the hammer is a pin 27, which in its vertical movement is adapted to strike the lever-arm 23 or 24, as hereinafter particularly described.

In order to lessen the shock to the parts due to the concussion between the pin 27 and the arms with which it contacts, I preferably mount upon the end of each of the arms a spring-buffer of suitable construction—such, for example, as that shown in the drawings, wherein the numeral 28 indicates a sleeve adapted to the arm 23, to which said sleeve is secured by a pin-and-slot connection 29, permitting limited play, and confined between one of the inner walls of said sleeve and the arm is a spring 31, preferably of the leaf type, thus affording a yielding buffer between the pin 27 and the arm 23. If desired, a similar buffer may be mounted on the arm 24, that shown in the drawings being similar to the one on the lever 23 and consisting of a sleeve 25, mounted on the lever by a pivoted slot connection 26 and provided with a spring 30.

With the parts arranged as shown in Fig. 1, the hammer being elevated, it will be observed that the levers 22 and 24 are in line with the guide-rod 20, the fulcra of said levers being in a straight line, whereby the parts are practically locked in the position shown. In this position the curved arm of the lever 24 extends to a point slightly out of range of the pin 27, while the lateral arm 23 of said lever extends laterally within range of the pin 27, so that as the hammer descends the pin 27, engaging the said lateral arm, quickly throws the fulcra of the two levers out of alinement, and in this movement the lever 24, being fixedly mounted on the guide-rod 20, causes the latter to be pulled forcibly downward, thus giving quick downward movement to the rod 19, which, through its connection with the arm 17, oscillates the shaft 11, thereby causing the cam 12 to advance the header-arm 10 to close the head-opening in the die-cavity and to receive the thrust of the expanding metal within the die about the time the blow is delivered.

From the foregoing description it will appear that to insure the squaring of the head of the tool at all times the movement of the head-block is so timed and of such extent that it will always enter sufficiently within the die-cavity to receive the thrust of the expanding metal and will be so placed with respect to that metal at the proper time that a blank of even the minimum amount of metal will still provide a perfect formation of the head. In brief, the head-block is so moved within the head-opening of the die-cavity at the proper time to make that cavity slightly less in capacity than the bulk of metal in the blank, whereby the excess of metal is caused to flow around the head and sides of the ax or tool, forming thin fins, which, as before indicated, being distributed over a wider area than heretofore can be the more readily removed. When the metal in the blank is in excess of the die-cavity at the time the blow is delivered, it will simply flow to the edges in slightly larger fins than in the average blank.

I claim as my invention—

1. In a press for forging axes and other like tools, the combination with the dies open at one side, when in contact, to form the die-cavity, means for moving the dies into contact to forge a blank within the die-cavity, a head-block for closing the opening in the die-cavity, and mechanism operated by a moving part of the press to advance the head-block to receive the thrust of expanding metal during the adverse movement of said head-block, substantially as described.

2. In a press for forging axes and like tools, the combination with the dies forming a die-cavity open at one side, means for forcing the dies into contact to forge a blank held therein, of a head-block adapted to close the open side of the die, and mechanism for advancing the head-block to receive the thrust of expanding metal during the advance movement of said head-block, substantially as described.

3. In a drop-forge press for forging axes and the like, the combination with the lower die fixed to the base structure, a hammer carrying an upper die, said dies forming a die-cavity open on the head end, of a head-block adapted to close said opening; and connections between the hammer and said block for causing the said block to advance to receive the thrust of expanding metal in the die-cavity, during the advance movement of the head-block, whereby the head of the tool is squared, substantially as described.

4. In a drop-forge press for forging axes and the like, the combination with the lower die fixed to the base structure, a hammer carrying an upper die, said dies forming a die-cavity open at the head, when in contact, of a header-arm terminating in a head-block operating to close the head-opening in the die-cavity, a cam engaging said header-arm, and connections between said cam and hammer for causing the arm to advance to receive the thrust of expanding metal in the die, during the advance movement of the head-block, substantially as described.

5. In a drop-forge press for forging axes and the like, the combination with the dies forming a die-cavity open at the head, and operating parts for forcing the dies together, of a head-block adapted to close the opening in the die-cavity, and mechanism operated by a

moving part of the press to advance the head-block to receive the thrust of expanding metal in the die-cavity, during the advance movement of the head-block, substantially as described.

6. In a drop-forge press for forging axes and the like, the combination with the dies, forming a die-cavity open at the head, a hammer carrying one of the dies, and a header-arm terminating in a head-block for closing said head-opening, of means controlled by the movement of the hammer for advancing the head-block to receive the thrust of expanding metal in the die-cavity, during the advance movement of the head-block, substantially as described.

7. In a drop-forge press for forging axes and the like, the combination with the dies, forming a die-cavity open at the head, a hammer carrying one of the dies, a header-arm terminating in a head-block adapted to close the said head-opening, of a cam engaging the header-arm, and lever mechanism between the cam and hammer controlled by the movements of the hammer to cause said cam to advance the head-block to receive the thrust of metal in the die-cavity, as the hammer forces its die into contact with the other die, substantially as described.

8. In a drop-forge press for forging axes and the like, the combination with the dies, forming a die cavity open at the head, a hammer carrying one of the dies, a header-arm terminating in a head-block adapted to close the said head-opening, of a cam rotatably mounted in the base structure and engaging the header-arm, a guide-rod slidably mounted on the press structure, connections between said rod and the cam, and mechanism connected to the rod and adapted to be operated by the hammer as the latter delivers its blow, whereby the head-block is advanced to receive the thrust of metal in the die-cavity, substantially as described.

9. In a drop-forge press for forging axes and the like, the combination with the dies, forming a die-cavity open at the head, a hammer carrying one of the dies, a header-arm terminating in a head-block adapted to close the said head-opening, of a shaft journaled in the base structure, a cam on said shaft engaging the header-arm, an arm on the shaft, a guide-rod slidably mounted in the press structure, a link connecting the cam-shaft arm and the guide-rod, a toggle-lever having one member fulcrumed on the press and the other member connected to the guide-arm, and extensions from said toggle-lever mechanism, and a pin on the hammer adapted to engage one of said extensions, as the hammer delivers its blow, and to engage the other extension, as the hammer is withdrawn, substantially as described.

10. In a drop-forge press for forging axes and the like, the combination with the dies, forming a die-cavity open at the head, a hammer carrying one of the dies, a header-arm terminating in a head-block adapted to close the said head-opening, of a cam engaging the header-arm, a guide-rod slidably mounted in the press structure, and connections between the cam and guide-rod, a toggle-lever having one of its members fulcrumed on the press structure, and its other member pivotally connected with the guide-rod, a pin on the hammer, and an arm laterally projecting from the latter member of the toggle-lever into the path of the pin on the hammer in its descent, and a curved arm normally out of range of said pin when the hammer is raised, but in the path of said pin after the hammer delivers its blow, substantially as described.

11. In a drop-forge press for forging axes and the like, the combination with the dies, forming a die-cavity open at the head, a head-block for closing said opening, and a hammer for closing the dies together, of mechanism for advancing the head-block to receive the thrust of metal in the die, as the blow is delivered, operated intermittently by said hammer, and a buffer between the hammer and the said head-block-advancing mechanism, substantially as described.

12. In a drop-forge press for forging axes and the like, the combination with the dies, forming a die-cavity open at the head, a head-block for closing the said opening, of mechanism having a part adapted to be engaged by the hammer in its descent to cause the head-block to advance into the die-cavity, when the blow is delivered, and a spring-buffer on said part with which the hammer engages, substantially as described.

13. In a drop-forge press for forging axes and the like, the combination of the dies, forming a die-cavity open at the head, a hammer having a projection thereon, a head-block adapted to close the head-opening, a lever mechanism, for advancing the head-block into the die-cavity as the blow is delivered, interposed between the hammer and the head-block, and having an arm extending into the path of the projection on the hammer and provided with a buffer for receiving the shock of contact, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ELMER P. ALEXANDER.

Witnesses:
S. P. WARNER,
J. H. CAMPBELL.