Oct. 13, 1942. W. W. CRILEY 2,298,467

FORGING MACHINE

Filed July 3, 1940 2 Sheets-Sheet 1

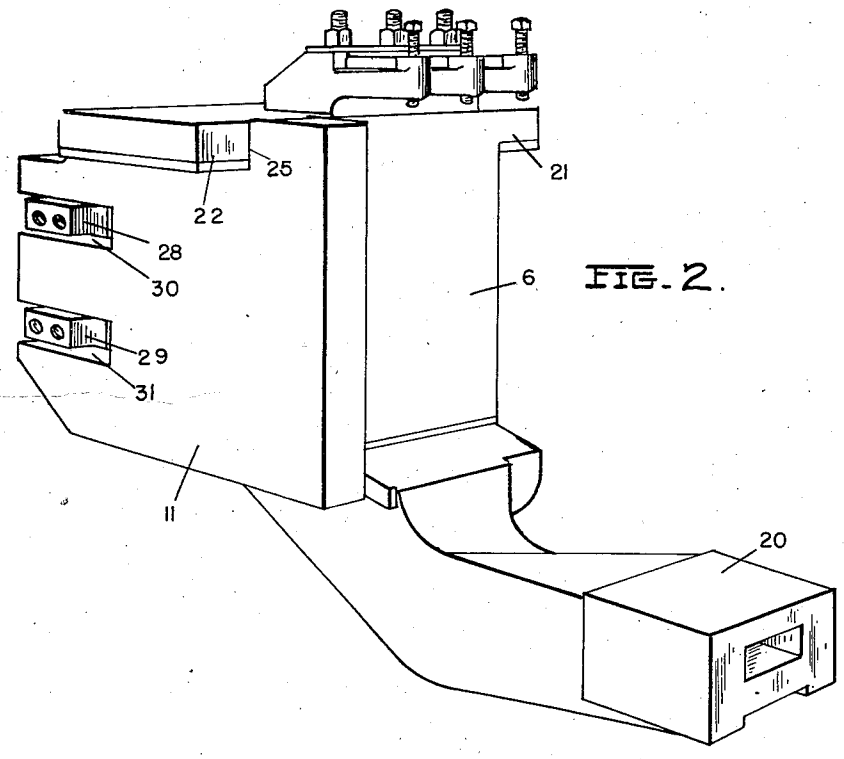


FIG. 2.

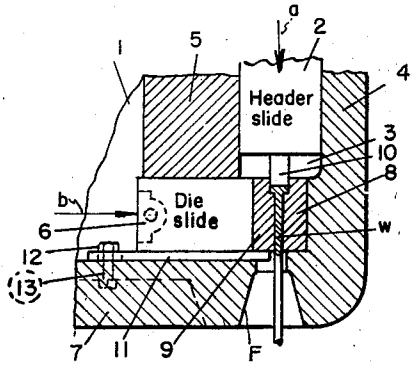


FIG. 1

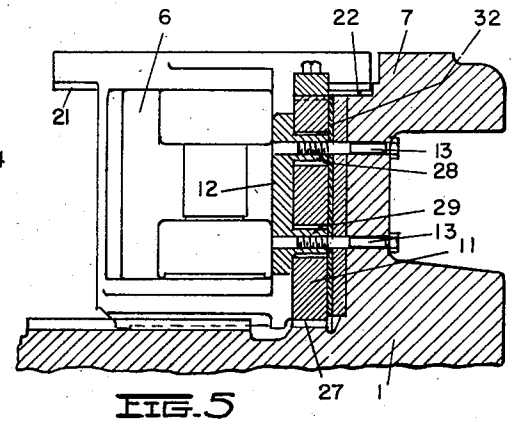


FIG. 5

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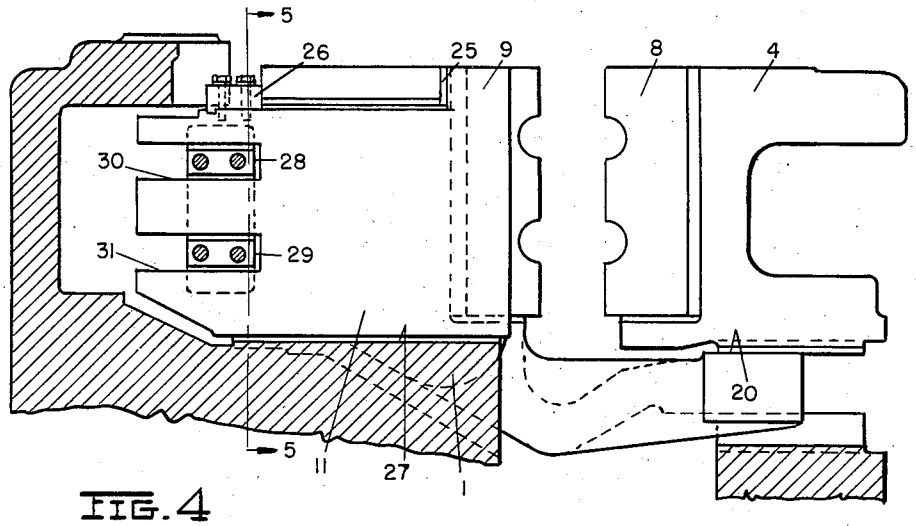


FIG. 4

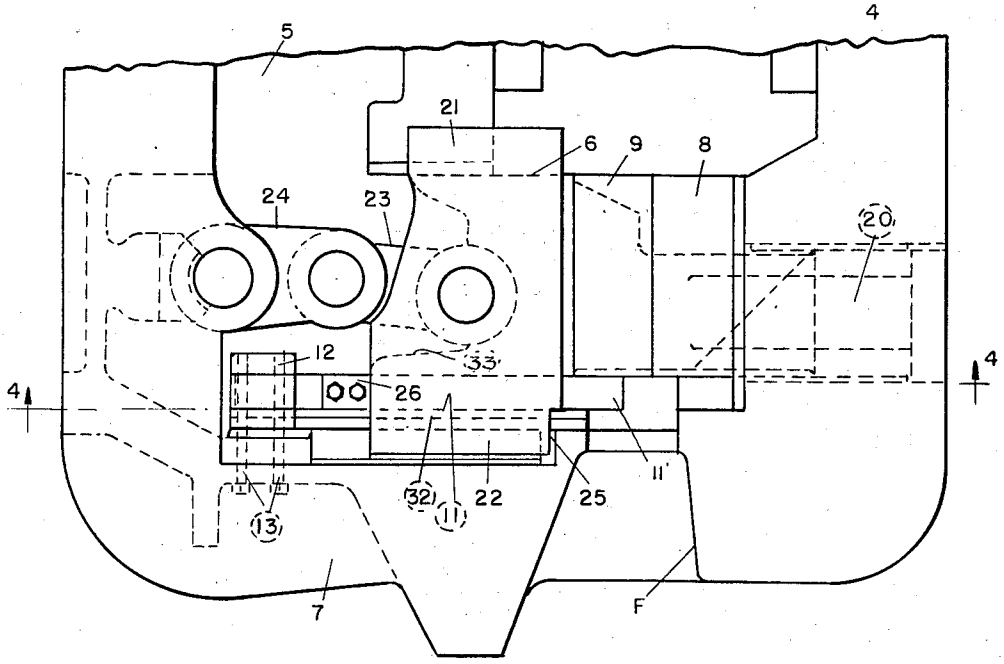


FIG. 3.

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FORGING MACHINE

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Application July 3, 1940, Serial No. 343,785

12 Claims. (Cl. 78—17)

The present invention relates to an improvement in a metal working machine, particularly a forging machine, wherein the work is held in a pair of dies and is deformed or forged to the desired shape by means of a tool moved against the metal held in the dies. Dies, which hold or grip the work, are customarily in the form of a stationary die mounted on the frame of the machine and a movable die carried by a gripping or die slide. The tool, in turn, is mounted upon a header slide. The header slide and the die slide reciprocate in paths transverse, or at right angles, to each other.

Heretofore, the difficulty has been encountered in the operation of the gripping or die slide in such a machine, in that when it is extended to its full gripping or closed die position, it overhangs its frame support where it is cut away for the feed gap, and the forces exerted upon it have produced a rocking or "cocking" action. This cocking action tends to throw the moving die and the die slide out of proper alignment, as well as to exert an uneven and deteriorating pressure upon the bearing surfaces which guide it in its reciprocal travel. This cocking action obviously results in a concentration of heavy pressures at the surface adjacent the feed gap, with incident substantial bearing surface depreciation and wear. As a direct result of these disadvantages heretofore incident in the operation and action of the die slide, there occurs a misalignment of the gripping dies so that the forged metal product of the machine is of imperfect shape and dimensions and fails to respond to required specifications.

Previous efforts to overcome these stated disadvantages have been of a more or less makeshift and unsuccessful nature. One type of construction, exemplary of such an effort in the prior art, has provided an integral abutment between the die slide and the moving die for the purpose of preventing any misalignment between the two; but such construction still begs the major problem involved in the cocking action of the die slide and the die in the slide-way and around the corner of the feed gap. In another exemplary type of construction, a small bearing plate, overlying the line of juncture between the die slide and the moving die has been provided. This latter expedient has proven unsatisfactory, in that the small bearing plate itself tends to cock or rock around the edge of the feed gap when the die slide is in closed position, resulting in a forcing of the die slide laterally against the slide-way bearing on the side of the slide opposite to the small bearing plate. Both of these prior art efforts to solve the problem at hand have still failed to eliminate the disadvantages of cocking of the die slide, misalignment of the dies and slide-way guide bearing wear and depreciation.

It is the general object and nature of my present invention to provide means to cure the above-stated disadvantages. Briefly outlined, this means comprises the provision of a backing or bearing plate mounted between the die slide which carries the moving die and the frame of the machine in such a manner that the slide and moving die are held against any lateral or cocking movement with respect to the frame of the machine itself. This backing or bearing plate, in turn, has an independent cover plate or bearing plate which prevents it from hinging around the supporting corner of the bed at the feed gap.

To the accomplishment of the foregoing and related ends, said invention, then consists of the means hereinafter fully described and particularly pointed out in the claims. The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings—

Fig. 1 is a simplified, more or less diagrammatic view, illustrating the parts of the forging machine involved in the principle of my invention; Fig. 2 is a perspective view of the die slide with the backing or bearing plate assembled thereon; Fig. 3 is a top, plan view of the front end or die slide portion of a forging machine, constructed according to the principle of my invention and with the dies in closed position; Fig. 4 is a sectional view taken upon a plane transverse to that of Fig. 3 and substantially along line 4—4 thereof but showing the dies in open position; and Fig. 5 is a detailed, sectional view taken substantially along line 5—5 of Fig. 4.

Now referring more particularly to Fig. 1 of the drawings, there is shown therein a portion of a forging machine comprising a bed frame 1 in which the header slide 2 is adapted to reciprocate in the channel 3 formed by the side frame 4 and central frame portion 5. The gripping or die slide 6 reciprocates at right angles to the header slide 2 and in another channel adjacent the front side frame 7 of the machine. A stationary gripping die 8 is fixed to the side frame 4 of the machine and a movable gripping die 9 is carried by the die slide 6. A work bar W is introduced between the dies through the feed gap F. As shown

in Fig. 1, the moving die 9 is in the closed position and overhangs the bed support at the left of the feed gap F and the work W is gripped between the dies 8 and 9 and deformed by the tool 10 carried by the end of the header slide. It is at this point of the metal working operation that the maximum forces are exerted upon the header slide 2 and the die slide 6. Thus, the arrows *a* and *b* represent the respective forces applied to the header slide 2 and to the die slide 6. The header slide force *a* has a tendency to rock or cock the die slide 6 in its guide channel in the machine, forcing the moving die end away from the header slide and at the same time rocking the opposite or inner end of the die slide toward the header slide against the opposite side of the die slide-way on the frame portion 5. Heretofore, not only would bearings at these points of contact become seriously deteriorated and worn, but the maintenance of the alignment of the die slide and of the gripping dies 8 and 9 would necessarily depend upon the closeness of the fit of these bearings.

In order to overcome the disadvantages of this cocking action, I have provided a backing or bearing plate 11, which shuttles back and forth with the die slide and is mounted between the die slide 6 and the side frame 7. This backing plate 11 extends along the length of the die slide and has a rearward projecting portion which is engaged and held in transverse alignment with respect to the side frame 7 by means of the guide plate 12 fastened to the side frame 3 by means of the bolts 13.

Now directing attention to Figs. 2, 3 and 4, it will be seen that the die slide 6 has an outboard bearing 20 and the lateral top flange portions 21 and 22, which have horizontal bearing surfaces contacting the top of the machine frame and supporting the majority of the weight of the die slide 6. The toggle links 23 and 24 connect the slide 6 to the machine frame and to a connecting rod (not shown), and through the medium of which, the reciprocal forces and movement are imparted to the slide 6.

The backing plate 11 has a shoulder 25 serving as an abutment bearing against one side of the lateral flange 22. An abutment block 26 is fastened to the rear end of the backing plate 11 and abuts against the opposite side of the flange 22. In this manner, reciprocal movement of the die slide 6 is imparted to the backing plate 11.

A horizontal supporting bearing plate 27 is mounted on the bed frame 1 of the machine and contacts with the bottom side of the backing plate 11 to slidably support the weight of the latter. The forward or "feed gap" end of the backing plate 11 provides an abutting support for the die 9 and extends beyond the edge of the feed gap F when the dies are in closed position, as is indicated at 11' in Fig. 3.

The rear end of the backing plate 11 extends beyond the rear end of the die slide 6 and is held against lateral movement with respect to the side frame 7, by means of the guide plate 12, which has spacing lugs or bosses 28 and 29 extending through the slots 30 and 31, respectively, in the backing plate 11. A fixed wear or bearing plate 32 is, of course, mounted on the side frame 7 and serves to protect the frame proper from direct wear caused by the reciprocating movement of the backing plate 11.

Thus, it will be seen that the backing plate 11 is prevented from rocking with respect to the side frame 7, by reason of its anchorage by the guide plate 12, and therefore, always maintains a constant, straight line position in its path of reciprocal travel, and in turn, serves as a guide and reinforcement member, maintaining the die slide 6 against the forces which tend to rock or cock the latter, and the moving die 9 against misalignment with respect to the slide upon which it is carried and with respect to the stationary die 8.

In certain sizes and designs of forging machines, it has, of course, been found feasible to have the backing plate 11 carried and supported directly by the die slide 6. In such instances, the above-described construction may be modified, as will be readily apparent to anyone skilled in the art, by bolting or attaching the backing plate directly to the portion 33 of the die slide. This latter modification, of course, eliminates the horizontal bearing plate 27 and the horizontal floating mounting of the backing plate.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I, therefore, particularly point out and distinctly claim as my invention:

1. In a metal working machine, a bed frame and movable die-carrying member adapted to be reciprocated in a channel in said frame and to be subjected to forces tending to displace said member from straight line movement, a backing plate mounted between said member and a side of said channel, said backing plate completely overlying the side of said die-carrying member, means connecting said backing plate to said die-carrying member whereby it is reciprocable therewith and means holding said backing plate against lateral movement on said bed frame.

2. In a metal working machine, a bed frame, a movable die-carrying member adapted to be reciprocated in a channel in said frame, a die mounted on the end of said member, said member and die being subjected to forces tending to displace them from straight line movement and alignment, and a backing plate mounted between said member and a side of said channel, said backing plate being of greater longitudinal extent than said member and longitudinally movable but laterally immovable with respect to said bed frame.

3. In a metal working machine, a bed frame and a movable die-carrying member adapted to be reciprocated in a channel in said frame and to be subjected to forces tending to displace said member from straight line movement, a backing plate mounted between said member and a side of said channel, abutment means between said backing plate and said die-carrying member for imparting such reciprocal movement to said backing plate, and means for holding said backing plate against lateral movement with respect to said bed frame.

4. In a forging machine, the combination of a horizontally reciprocable die slide, a movable die carried on the end of said die slide, and a backing plate mounted between the vertical side of said slide and the side frame of said machine, said backing plate being reciprocable with said slide, said backing plate extending longitudinally from a point beyond the rear end of said slide to

a point beyond the opposite die-carrying end thereof.

5. In a forging machine, the combination of a horizontally reciprocable die slide, a movable die carried on the end of said die slide, a backing plate mounted between the vertical side of said slide and the side frame of said machine, said backing plate being reciprocable with said slide, said backing plate extending longitudinally from a point beyond the rear end of said slide to a point beyond the opposite die-carrying end thereof, and means contacting such rearwardly extending portion of said backing plate for holding it against lateral movement with respect to said side frame.

6. In a forging machine including a header slide, and a feed gap opening through the frame of the machine at a point opposite said header slide, the combination of a horizontally reciprocable die slide, a movable die carried on the end of said slide, said slide and die being adapted to be moved to a closed die position wherein they overhang the edge of said feed gap opening, and in such position being subjected to lateral pressure from said header slide, a backing plate mounted between the vertical side of said slide and the side frame of said machine, said backing plate being reciprocable with said slide and of such longitudinal extent as to extend beyond said edge of said feed gap while said die and slide are in such closed die position, and means holding said backing plate against said side frame to prevent it from being rocked around said edge of said feed gap under such lateral pressure from said header slide.

7. In a forging machine, the combination of a horizontally reciprocable die slide, a die carried on the end of said slide and a backing plate mounted between the vertical side of said slide and die and the side frame of said machine, said backing plate being reciprocable with said slide and of greater longitudinal extent than the latter, and a bearing plate horizontally disposed and fixed to the bed frame of said machine for slidably and horizontally supporting said backing plate.

8. In a forging machine, the combination of a horizontally reciprocable die slide, a die carried on the end of said slide and a backing plate mounted between the vertical side of said slide and die and the side frame of said machine, said backing plate being of greater longitudinal extent than that of said die slide, abutment means between said backing plate and said die slide for imparting such reciprocal movement to said backing plate, guide means for holding said backing plate against lateral movement with respect to said side frame, a bearing plate horizontally disposed and fixed to the bed frame of said machine for slidably and horizontally supporting said backing plate.

9. In a forging machine, the combination of a horizontally reciprocable die slide and a backing plate mounted between the vertical side of said slide and the side frame of said machine, a portion of said backing plate extending beyond said slide, said backing plate being reciprocable with said slide, and a guide bearing plate overlying said extending portion of said backing plate, said guide bearing plate being fixedly mounted on said side frame.

10. In a forging machine, the combination of a horizontally reciprocable die slide and a backing plate mounted between the vertical side of said slide and the side frame of said machine, a portion of said backing plate extending beyond said slide, said backing plate being reciprocable with said slide, a guide bearing plate overlying said extending portion of said first bearing plate on the side thereof opposite to that contiguous to said side frame, and mounting means for said guide bearing plate extending through elongated slots in said backing plate and attached to said side frame.

11. In a forging machine, the combination of a horizontally reciprocable die slide and a backing plate mounted between the vertical side of said slide and the side frame of said machine, said backing plate being laterally floating with respect to the reciprocal movement of said die slide, abutment means between said backing plate and said die slide for imparting such reciprocal movement to said backing plate, guide means for holding said backing plate against movement with respect to said side frame, a portion of said backing plate extending beyond said slide, and a guide bearing plate overlying said extending portion of said backing plate, said guide bearing plate being fixedly mounted on said side frame.

12. In a forging machine, the combination of a horizontally reciprocable die slide and a backing plate mounted between the vertical side of said slide and the side frame of said machine, said backing plate being reciprocable with said slide but laterally and vertically floating with respect thereto, a bearing plate horizontally disposed and fixed to the bed frame of said machine for slidably and horizontally supporting said backing plate, a portion of said backing plate extending beyond said slide, and a guide bearing plate overlying said extending portion of said backing plate, said guide bearing plate being fixedly mounted on said side frame.

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