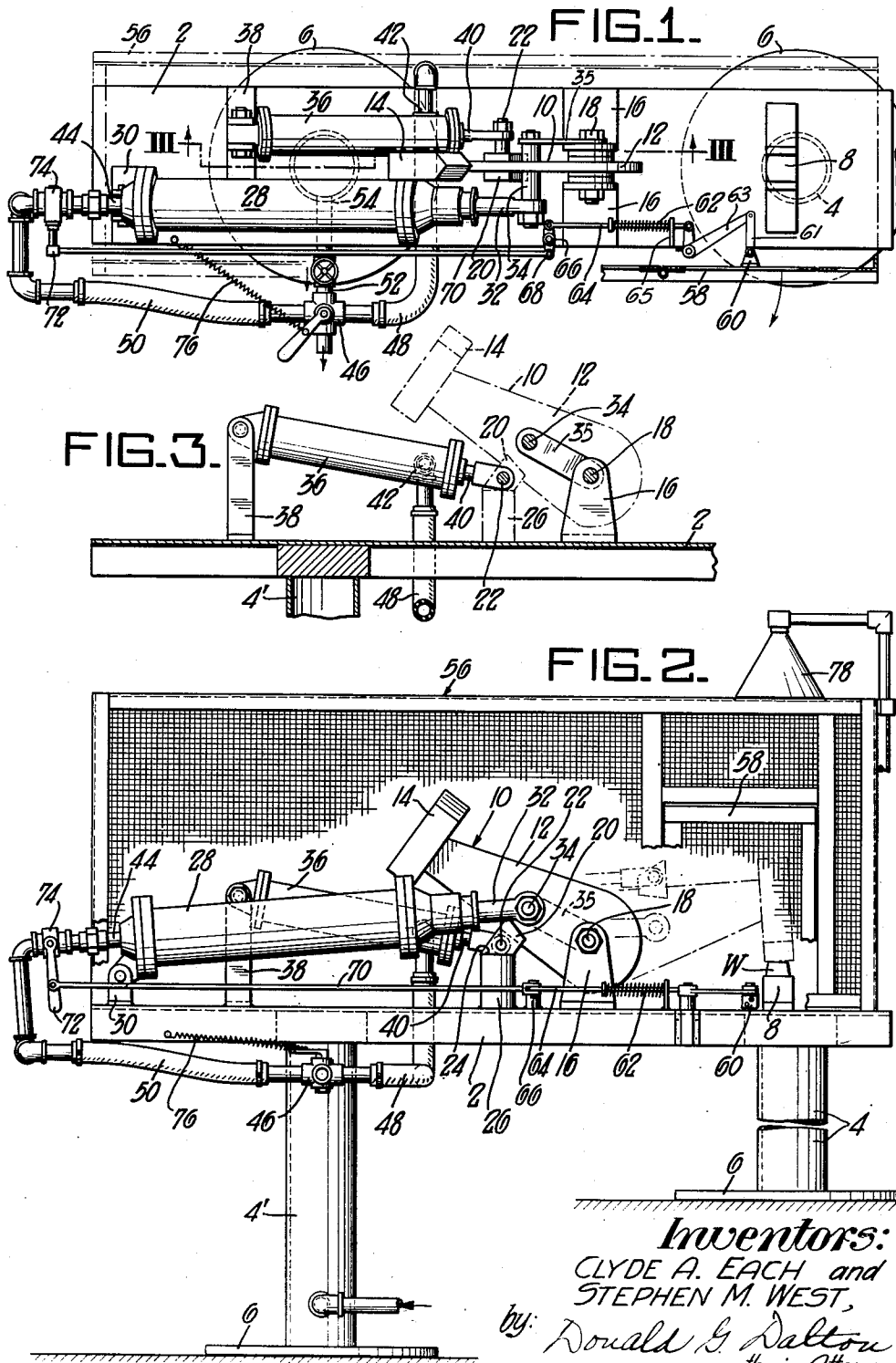


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FLUID OPERATED POWER HAMMER

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## UNITED STATES PATENT OFFICE

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## FLUID OPERATED POWER HAMMER

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1

The present invention relates to an improved power hammer and more particularly to a fluid operated hammer apparatus especially suitable for fracturing a specimen of metal in order that its grain structure may be visually examined.

In its manufacture it is necessary to check the carbon content of low carbon steel frequently during processing. This is ordinarily done by pouring a sample of the molten metal into a small mold, allowing it to cool and solidify and then fracturing the hardened metal to exposure the grain structure. The melter can then roughly determine the carbon content of the steel by visually examining the exposed grain structure at the fracture. In order that the carbon reading be as accurate as possible it is essential that the fracture in the sample be free of any shearing effect which would distort the natural grain structure of the material. Prior to our invention it was customary to fracture the sample by striking it manually with a sledge hammer. This method was not altogether satisfactory since the sample was not always struck squarely which resulted in fractures which showed shear effects. When this happened it was necessary to process another sample. This, of course, wasted time and frequently jeopardized the quality of the steel being made by affecting its treatment.

It is accordingly an object of our invention to provide a sample breaking apparatus which is fluid operated and which functions to produce a cleanly fractured specimen, free of any shear effect.

Another object of our invention is to provide a sample breaker which is rugged in construction and inexpensive to manufacture and operate.

It is a further object of our invention to provide a test breaker which has safety features incorporated therein which protect the workman from injury while in operation.

These and other objects will become more apparent after referring to the following specification and attached drawings, in which:

Figure 1 is a top plan view;

Figure 2 is a side elevational view; and

Figure 3 is a side elevational view partly in section taken on the line III-III of Figure 1.

Referring more particularly to the drawings, reference numeral 2 indicates an elongated platform which may be supported by a pair of vertical supports 4 and 4' which in turn may rest on a pair of base plates 6. A V-notched sample-supporting anvil 8 is attached to the upper surface of the platform adjacent its one end. A hammer 10, having a lever arm portion 12 and a

2

striking head 14, is pivotally mounted in brackets 16 intermediate the ends of the platform 2 by means of a pin 18. A bracket 20, having a stud 22 projecting therefrom, is welded or otherwise attached to one edge of the lever arm intermediate the striking head and the brackets 16. One outer edge 24 of the bracket 20 is shaped to provide a flush contact with a stop member 26 when the hammer is in normal resting position as shown in Figure 2. The stop member 26 is attached to and projects upwardly from the upper surface of the platform 2 adjacent the brackets 16.

The center distance between the brackets 16 and the anvil 8 is such that when the hammer swings about its pivot pin 18 the striking head 14 strikes the anvil. The bracket 20 is positioned along the edge of the lever arm 12 so that it will contact the stop member when the hammer is brought back to initial resting position.

A fluid cylinder 28, which may be air operated, is pivotally supported at its rear end in a bracket 30, which is attached to the surface of the platform 2 adjacent the end thereof remote from the anvil 8. The piston rod 32 of fluid cylinder 28 is pivotally connected at its free end with a pin 34 which is fitted through the body of the lever arm 12. A link 35, which is attached at one end to the portion of pin 34 remote from the rod 32 and at its other end to the pivot pin 18, is provided to eliminate any distortion in the movement of the hammer due to unequal side strain.

Another fluid cylinder 36, which may be smaller than the fluid cylinder 28, is disposed adjacent the cylinder 28 with its rearward end pivotally supported in a bracket 38. The piston rod 40 of a cylinder 36 is pivotally connected with the stud 22 which projects from the bracket 20. The cylinder 36 is provided with an air inlet 42 above its piston adjacent its upper end while the cylinder 28 has an air inlet 44 at its lower end below its piston. Flexible air hoses 48 and 50 are attached to the air inlets 42 and 44 respectively and lead therefrom to a common four-way valve 46. An air supply line 52 is also connected with the valve 46. Support 4' is bored, as shown in Figures 2 and 3, in order to function as an air reservoir to which the air supply line 52 is connected as at 54 in order to maintain a constant volume of air in the system.

A metal mesh cage 56, having a door 58 at one end adjacent the anvil 8, projects upwardly from the platform 2 to enclose the entire apparatus. A bracket 60 is provided on the lower part of the door 58 and is positioned to engage a compression spring 62 which is attached to a rod 64 which

passes through a vertically slotted bracket 65. The rod 64 is one element of a toggle assembly 66 which consists of a toggle lever 68 attached to one end of the rod 64 and another rod 70 which is attached to the toggle lever 68 on the end thereof opposite the rod 64. The opposite end of the rod 70 is operatively attached to the handle 72 of a quick acting valve 74 which is disposed in the air hose 50 to control the air being admitted to the cylinder 28.

In operation, when it is desired to fracture a sample W the operator opens the door 58 of the cage and places the sample in the V notch of the anvil 8. The opening of the door causes compression of the spring 62 by moving the rod 64 to the right, as viewed in Figure 1, by means of the bracket 60, a link 61 and a bell crank 63. Movement of the rod 64 to the right causes the toggle lever 68 to pull rod 70 to the left to turn the handle 72 of the valve 74 to closed position to prevent any air from being admitted to the cylinder. Thus the toggle assembly together with the bracket 60, link 61 and bell crank 63 constitutes a safety device to safeguard against movement of the hammer toward the anvil while the operator is placing a sample thereon. Closing of the door causes movement of the rod 64 to the left and movement of the rod 70 to the right to reopen the valve 74.

After the sample has been placed the door of the cage is closed and the four-way valve 45 is manipulated to admit air to the cylinder 28 and at the same time exhaust the cylinder 36. Introducing air into the cylinder 28 causes the piston rod 32 to be thrust forward thereby swinging the hammer 10 so that the striking head 14 travels in an arcuate path to forcefully strike the sample W resting on the anvil and fracture it. After the sample or specimen has been fractured the four-way valve is again manipulated to simultaneously exhaust the air from the cylinder 28 and introduce air into the cylinder 36. The introduction of air into the inlet 42 of the cylinder 36 causes the piston rod 40 to withdraw into the cylinder thus swinging the hammer 10 back to its initial resting position with bracket 20 resting on stop member 26, after which the four-way valve is returned to neutral or off position.

A spring 76, which is attached at one end to the handle of the four-way valve and at its other end to the platform 2, is provided to maintain the four-way valve in neutral position except when being manually operated.

A light 78 may be provided above the cage 56 as shown in Figure 2 to illuminate the anvil 8.

While one embodiment of our invention has been shown and described it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

We claim:

1. Apparatus for fracturing a specimen of metal or the like comprising a pivotally mounted hammer having a striking head, an anvil adjacent said hammer for supporting said specimen in the path of said striking head, a fluid cylinder adjacent said hammer, a piston slidably disposed in said cylinder, a piston rod attached to said piston and projecting therefrom outwardly of said cylinder, said piston rod being connected to said hammer at its projecting end, a fluid supply line connected with said fluid cylinder, control means for actuating said fluid cylinder to

thereby rotate said hammer about its pivot mounting to strike the specimen supported on said anvil, a cage surrounding said hammer and anvil, a door in said cage adjacent said anvil, a valve having a handle lever connected in said fluid supply line adjacent said fluid cylinder for shutting off the fluid supply thereto, and means connecting said door and said handle lever whereby said valve is operated to maintain said fluid cylinder inoperative when said door is opened.

2. Apparatus for fracturing a specimen of metal or the like comprising an elongated platform, a hammer having a striking head pivotally mounted on said platform intermediate the ends thereof, an anvil on said platform adjacent one end thereof adapted to support said specimen, said anvil being disposed in the path of the striking head of said hammer, a first fluid cylinder having a piston rod projecting therefrom pivotally mounted on said platform adjacent said hammer with said piston rod pivotally connected with the hammer, a second fluid cylinder having a piston rod projecting therefrom pivotally mounted on said platform adjacent said first named cylinder, the piston rod of said second cylinder being pivotally connected with said hammer, and means connected with said cylinder for actuating the same, said means including a fluid supply line connected with a pressure fluid source, the end of said supply line remote from said pressure fluid source being divided into a first branch and a second branch, said first branch being connected with the bottom of said first cylinder and said second branch being connected with the upper portion of said second cylinder, and a four-way valve disposed in said fluid supply line at the junction of said branches for simultaneously directing fluid into one cylinder and exhausting fluid from the other to actuate said hammer.

3. Apparatus for fracturing a specimen of metal or the like as defined in claim 2 including a pair of spaced vertical supports for said platform, one of said supports being hollow to constitute a fluid reservoir, a fluid inlet in said support connected with a pressure fluid supply source, and an outlet on said hollow support connected with said flexible fluid supply line.

4. Apparatus for fracturing a specimen of metal or the like as defined in claim 2 characterized by a cage surrounding said hammer and anvil, a door in said cage adjacent said anvil, a valve having a handle lever connected in said fluid supply line adjacent the bottom of said first named fluid cylinder for shutting off the fluid supply thereto, and toggle means connecting said door and said handle lever whereby said valve is operated to maintain said fluid cylinder inoperative when said door is opened.

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