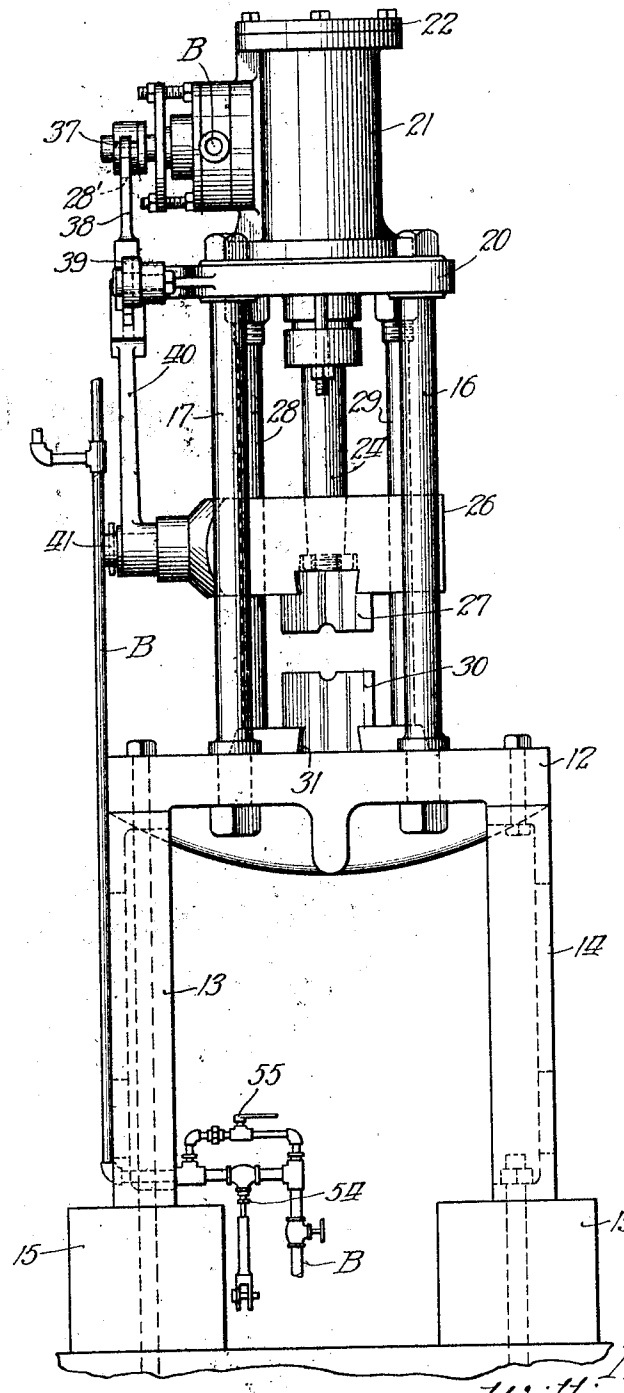
Sept. 10, 1929. W. BAIRD 1,727,322

PNEUMATIC HAMMER

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Fig. 1.



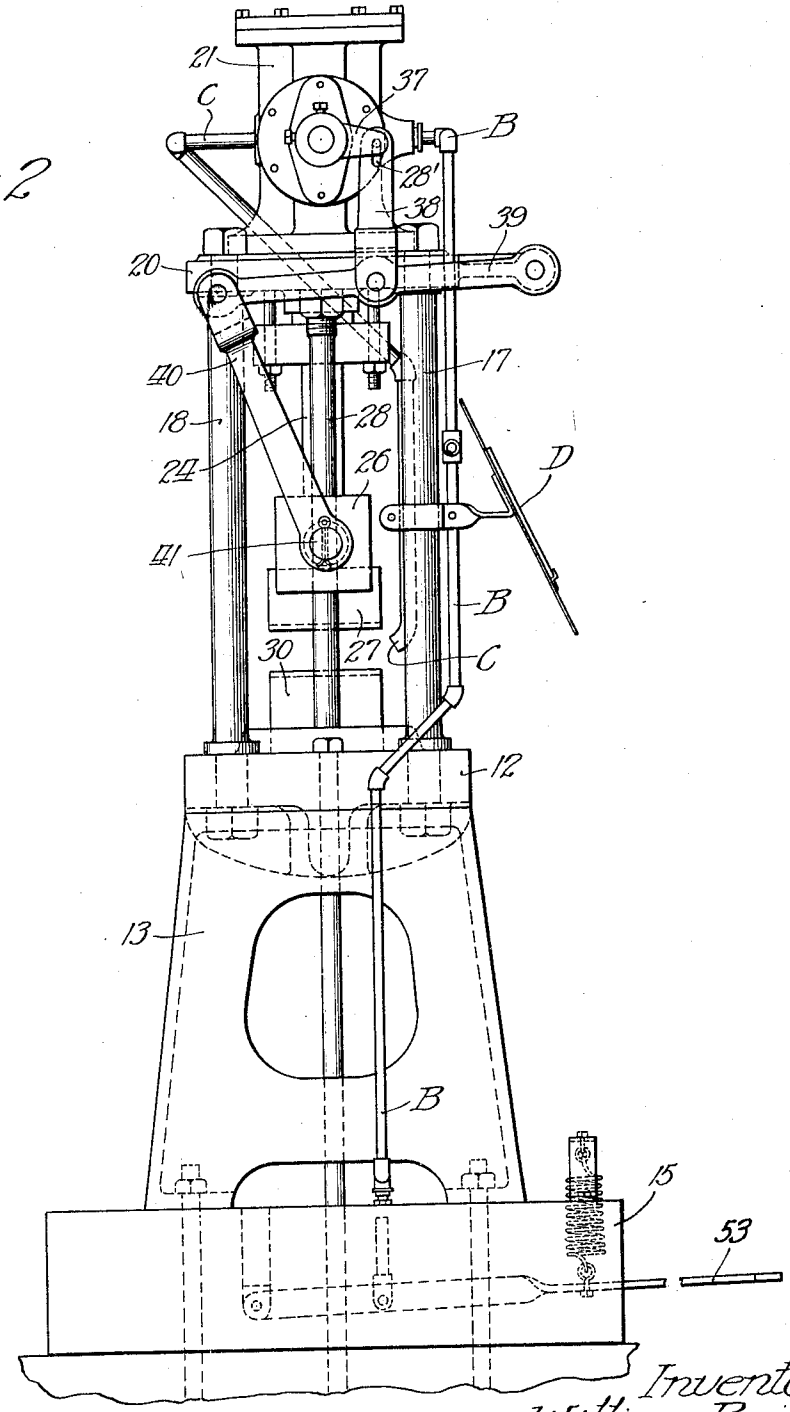
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Fig. 2



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Fig. 3.

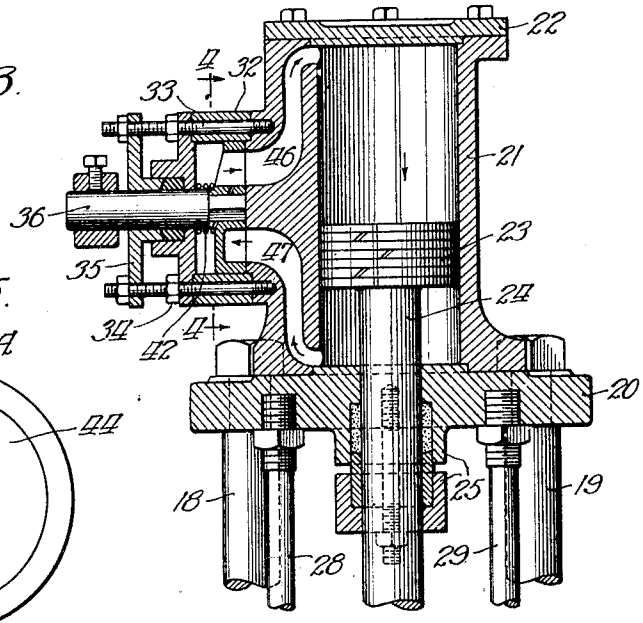


Fig. 5.

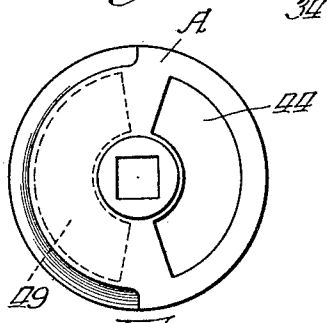


Fig. 6

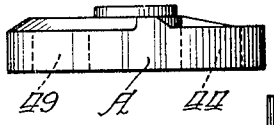
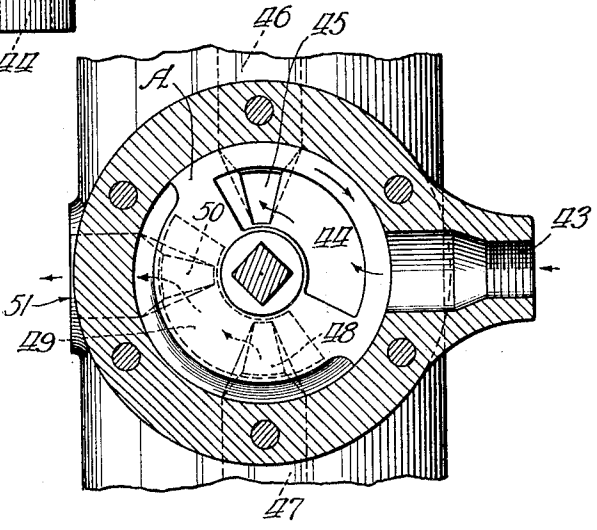


Fig. 4.



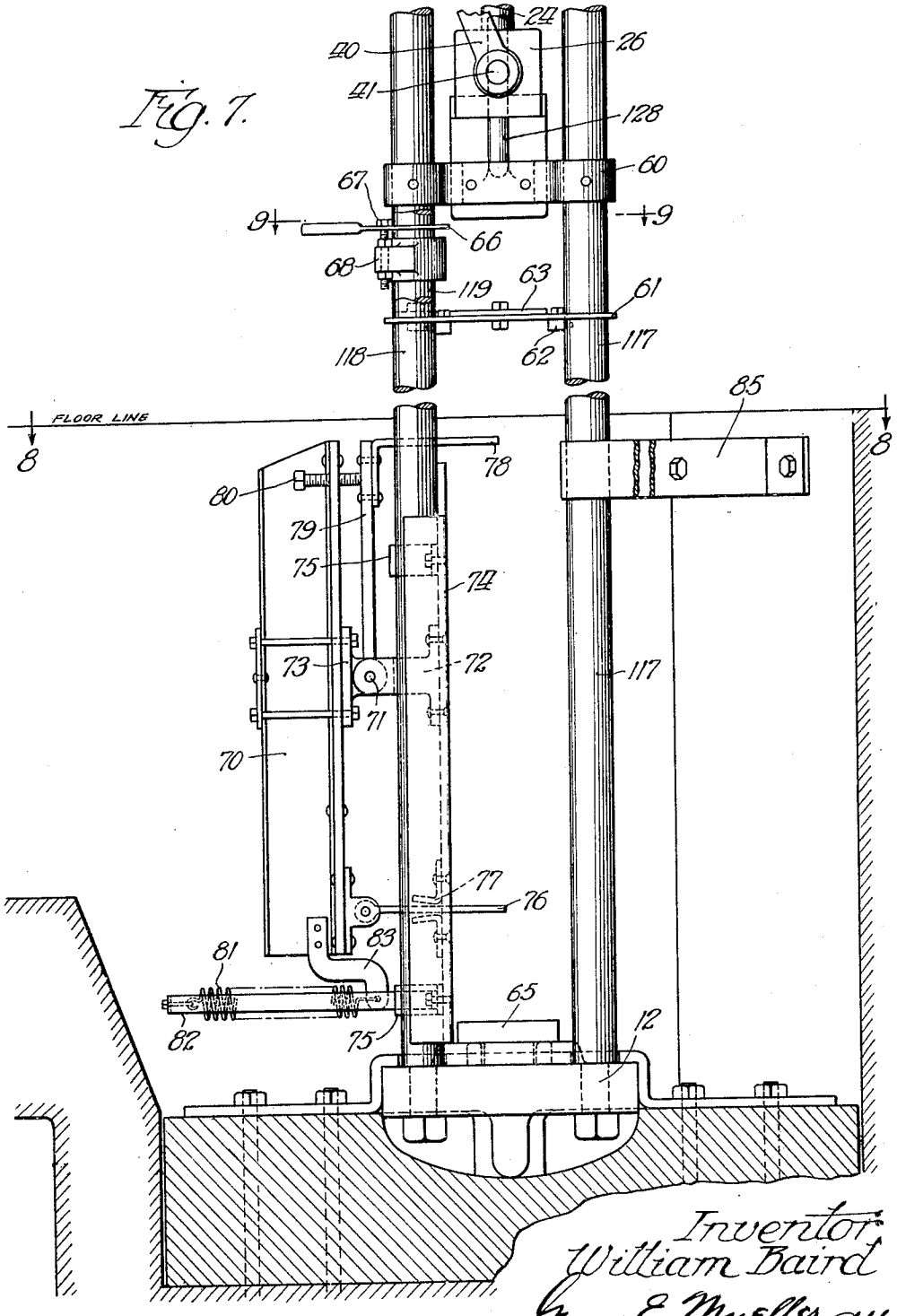
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Fig. 7.



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Fig. 8.

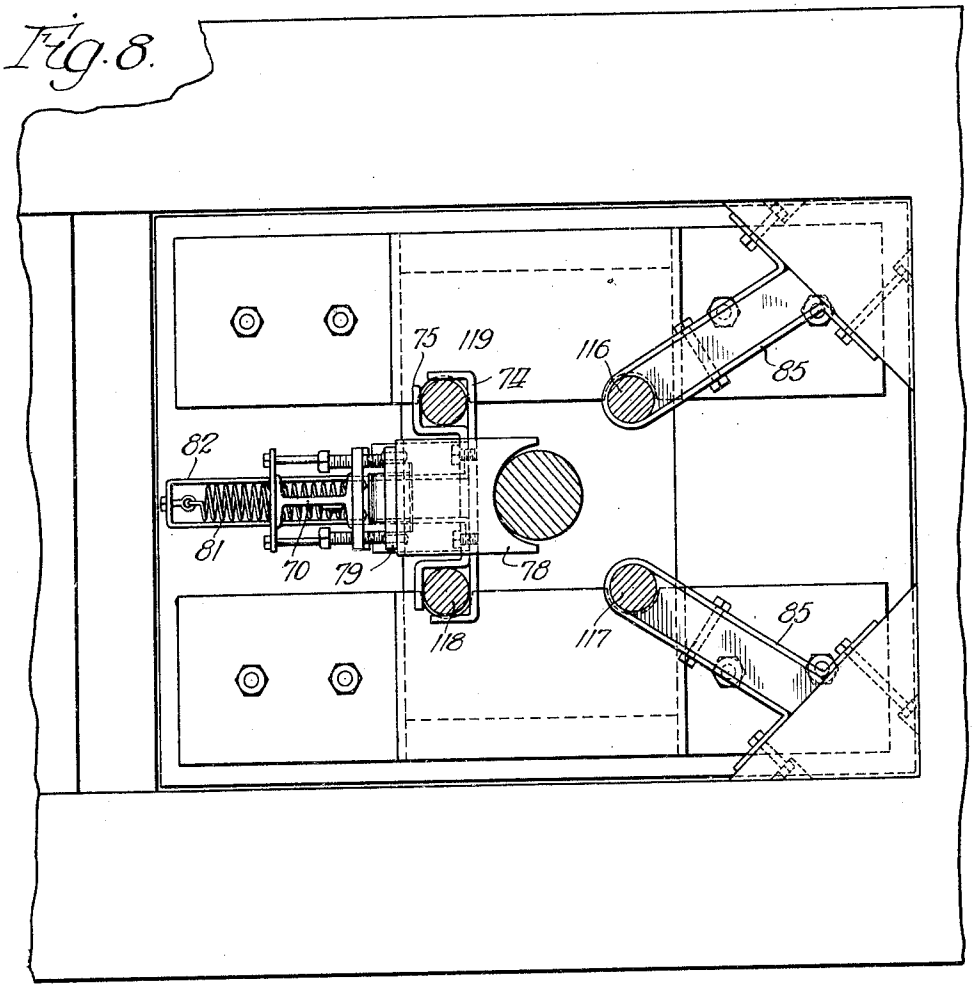
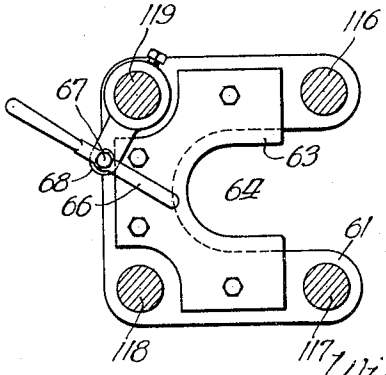


Fig. 9.



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Patented Sept. 10, 1929. 1,727,322

UNITED STATES PATENT OFFICE.

WILLIAM BAIRD, OF PLATTSMOUTH, NEBRASKA.

PNEUMATIC HAMMER.

Application filed May 10, 1926. Serial No. 107,873.

My invention relates to pneumatic hammers and has to do more particularly with hammers of the above character which are of the self-sustained or permanently fixed type as distinguished from portable hammers, one of the objects being to provide an improved and simplified operating mechanism for air hammers of the above character and adapted to be applied to machines for straightening and welding bolts and rods and upsetting car axles, etc. There are various features to my invention which will be hereinafter more particularly pointed out in the ensuing part of the specification and appended claims.

For a better understanding of my invention reference is to be had to the accompanying drawings, in which—

Fig. 1 is a front elevation of one form of pneumatic hammer including my improved operating mechanism and adapted more particularly for straightening and welding bolts, rods, etc.;

Fig. 2 is a left side elevation of the hammer of Fig. 1;

Fig. 3 is a vertical cross section through the cylinder and valve mechanism of my improved operating mechanism;

Fig. 4 is an enlarged face view of the valve along the line 4—4 of Fig. 3 with the valve chest head removed;

Fig. 5 is a face view of the valve;

Fig. 6 is an end elevation of Fig. 5;

Fig. 7 shows the air hammer when used as an axle upsetting machine;

Fig. 8 is a sectional view along the floor line 8—8 of Fig. 7, looking down into the pit; and

Fig. 9 is a sectional view along the line 9—9 of Fig. 7 illustrating more particularly the axle centering device and axle length determining gauge.

Referring now more in detail to the form of my invention as shown in Figs. 1 to 6 and which is more particularly useful for straightening and welding bolts, rods, etc., I provide a suitable bed plate 12 for supporting the die block and hammer mechanism, said bed plate being carried upon legs 13—14 supported upon suitable blocks 15 preferably of wood.

Now as to the mechanism supported by the bed plate, I provide a suitable number of supporting posts, preferably four, such posts 16—17—18—19 being secured to the bed plate and supporting the cylinder by the lower cylinder head 20. The cylinder 21 is secured to the cylinder head 20 and has its top head 22 bolted thereto. A suitable piston 23 is provided having a stem 24 extending through the stuffing box 25 and carrying a suitable hammer head 26 which carries the particular die 27 which is to be used for the work to be operated upon. The hammer head 26 is supported against rotary movement by guide rods 28—29 which extend through the hammer head 26 so that said head may reciprocate thereon, said rods being suspended from the cylinder head and also fastened at the bottom. A component die block or anvil 30 is supported upon the bed plate 12, preferably readily removable and held by a wedge 31. The upper die block 27 is similarly held in the hammer head. Thus both die blocks may be readily removed and be interchanged, according to the operation desired.

Referring now to the valve mechanism for controlling the piston, a rotary valve A is provided enclosed in a valve chest including the annular ring 32 and valve chest head 33 clamped together by the studs 34. The upper and lower ones of these studs 34 extend outwardly to take the valve stem gland 35, which may be adjusted to compress the stuffing box around the valve stem 36. This valve stem has a square shank extending into the rotary valve to which it is pinned, as illustrated.

The valve stem 36 is connected by suitable operating mechanism so as to effect an automatic actuation thereof, and to this end said stem 36 carries an operating crank 37 connected by a link 38 to a lever 39 which is connected by a main link 40 to a shaft 41 extending out from the hammer cross head 26.

The hammer is preferably of a comparatively long stroke type and the rotary valve is preferably of a reciprocating type, and in order to use a minimum stroke of valve the

connections between the cross head and valve are such as to reduce the movement. This is done by having the intermediate link 38 connected intermediate the lever 39. Also this intermediate link 38 is connected to the valve crank 37 by a lost motion connection 38' which will be more particularly referred to in connection with the valve action.

The rotary valve A seats against the face on the cylinder body of the valve chest and a coil spring 42 encircles the valve stem to normally press the valve against the control or port face of the air chest or valve chamber. The valve is illustrated in Figs. 3 and 4 in substantially the position it occupies with the hammer head approaching the lower end of its stroke, and as indicated by the piston in Fig. 3. With the piston traveling downwardly the valve of Fig. 4 is rotating in a clockwise direction as indicated by the arrow on the rim thereof. At this time air is being admitted from the intake connection 43, then passing over the outer face of the valve through chamber 44 therein and port 45 in the valve chest face and through upper passage 46 to the upper end of the cylinder. At the same time the exhaust from the lower end of the cylinder flows through the lower passage 47, port 48, chamber 49 in the rear of the valve port 50 to the exhaust outlet 51. This inlet and exhaust continues with the valve being advanced in a clockwise direction until the inlet port 45 is closed by reason of valve chamber 44 passing beyond the port 45. At this time the exhaust or rear chamber 49 in the valve has passed beyond the outlet port 48 closing it to further exhaust. Therefore we have both ports closed. However, the excess pressure in the upper end of the cylinder, together with the momentum of the piston and its parts, carries the hammer downwardly to the finish of its stroke during which time the air in the lower part of the cylinder acts to cushion the piston. During this continuing movement of the mechanism the valve rotates so that inlet port 44 in the valve opens onto the cylinder port 48 and simultaneously the exhaust chamber 49 in the valve opens onto the port 45 for the upper end of the cylinder. Therefore the piston is now moved upwardly continuing a short distance without affecting the valve by reason of the lost motion connection 28' at the link 38 (Fig. 2). The piston now moving on its upward travel lifts the cross head and hammer and as the lost motion of the link is taken up, starts the rear or reverse clockwise rotation of the valve A. This movement continues until the piston reaches the upward end of its travel, during which time the valve A by its reverse rotation closes both ports and then opens the upper port to the entry of air and opens the lower port for exhaust.

Thus so long as pressure is connected to the inlet connection 43, the piston and hammer are reciprocated.

For feeding pressure to the hammer cylinder I show the feed pipe B which may be controlled by a foot treadle 53 and valve 54, or by a by-pass valve 55. That is, for short or momentary operations of the hammer the foot valve may be used, or if a sustained operation is desired the by-pass valve 55 may be opened.

In order to keep the die blocks clean I connect the exhaust pipe C so that the exhaust blows over the die blocks as shown in Fig. 2.

The hammer here illustrated is useful for welding, and as a protection from the light and heat rays I provide a heavy protecting glass D secured to the upright posts and of a size so that the operator may be able to look through the glass window and watch the operation of the hammer.

In the operation of the hammer of Figs. 1 and 2 for straightening bolts, the bolts are laid in between the die blocks which are shaped according to the size of the rod to be straightened. Likewise, in straightening long rods of various kinds they are laid in between the hammers. For welding rods together the heated ends are laid together in the die blocks, one being shoved in from the rear and the other from the front, and the hammer operated until the parts are welded and properly rounded or shaped.

Referring now to the axle upsetting machine shown in Figs. 7 to 9, as previously stated only the lower portion of the hammer mechanism is shown, as that of Figs. 1 to 6 is used in this machine the same as in the bolt straightening machine already referred to.

The axle upsetting machine because of operating upon long axles such as are used on freight and passenger cars, locomotives, etc., is preferably set into a concrete pit illustrated in outline in Figs. 7 and 8, the floor line being indicated along 8—8 in Fig. 7.

This machine includes a bed plate 12 from which four posts 116—117—118 and 119 extend and fasten at their upper ends in the lower cylinder head 20. The hammer cross head in this machine is supported by the piston rod 24 and connects to the link 40 of the valve operating mechanism. The cross head 26 is slidingly guided by rods 128 similar to the guide rods of the other machine, but in the axle upsetting machine instead of running these guide rods 128 down to the base plate 12, they are rigidly secured to bridge pieces 60, one such bridge piece being secured to each side pair of posts as 117—118 and 116—119.

Further down along the upright posts I fasten a post stiffener plate 61 supported upon studs 62 extending from the posts. On top of this stiffener plate 61 I fasten a centering plate 63 having an opening 64 to fit the axle

journal. Plates 63 of various sizes are provided, these being interchangeable upon the backing or stiffening plate 61 and having openings therein of various sizes to fit around the various axles. Thus the top part of the axle is centered directly beneath the center of the hammer head.

In the bed plate I provide a socket for receiving the anvil or lower block 65 upon which the lower end of the axle rests. Blocks 65 of various thicknesses are provided so as to take care of differences in lengths of various axles and for the upsetting of the opposite ends, as will be more particularly pointed out.

In order to determine the proper amount of upsetting to be given each end of the axle, I provide a gauge arm 66 pivotally and adjustably carried by the screw 67 and attached to a collar 68 adjustably fastened to one of the uprights of the frame. This gauge arm 66 may be swung in when to be used, so as to meet the hammer head and so that the operator can tell when the axle has been upset sufficiently.

A centering device for automatically centering and vertically aligning the axis is also shown at the lower end of the hammer in the form of a vertically disposed I-beam 70 pivotally supported at 71 upon the hinge members 72—73, which are also pivotally hinged together on the pin or rod 71. This hinge is secured to a channel member 74 which fits over the rear upright posts of the frame and held thereto by clamping members 75.

A pair of gauge plates are carried by this centering device, including the lower gauge plate 76 which is pivotally attached to the lower end of the I-beam 70 and passes between guiding angle irons 77 to the center of the hammer and cut out in its end face similar to the upper gauge plate 78 as shown in Fig. 8. The upper gauge 78 is secured to the pivotally supported arm 79 adjustable by means of adjusting screws 80 so that the two centering plates 76—78 may be brought into proper adjustment with the center line of the machine.

At the lower end of the supporting frame or I-beam 70 I fasten a spring 81 secured at its outer end to the bridge piece 82 and at its inner end to an extension 83, thus pulling the lower end of the gauge frame outwardly. However, when the axle is lowered down into the machine to rest upon the anvil 75 and then pushed back into the machine, the axle engages the rounded parts in the plates 76—78 and as it is pushed back the gauge assumes its vertical adjustment.

The axle upsetting machine is preferably set upon oak blocks and fastened to the wall by straps 85 which pass around the posts of the hammer frame and then are fastened to the wall of the pit.

In the use of axles such as are employed on freight and passenger cars, locomotives, etc., the journal ends are recessed into the axle with an outer flange or head in which the journal boxes set. In time these recessed journals in the axles are worn away on the inner faces of the heads or end flanges, thereby lengthening the journal or bearing surface and permitting undesirable end play.

These axles are large and expensive, and in order to overcome the above objections of undesirable end play in the journals without replacing the old axles with new ones, the ends of the axles have been heated and upset to shorten the recessed bearing so that it may be turned again to its proper length. Heretofore such upsetting has been rather expensive and by my improved machine I have simplified the operation and cut down the expense of the work.

In the operation of the axle upsetting machine, the proper anvil block 65 is first set into the base plate of the machine and the gauge 66 adjusted so that it will first take up half of the amount that the axle will be shortened by the upsetting of both ends. One end of the axle is now heated over the journal portion and then lowered into the pit, set upon the base or anvil block 65 and moved back into the centering device so that the upper end will rest directly beneath the center of the hammer. The hammer is now operated until the face of the hammer comes down to the gauge 66 which has been set as already described. This operation is such that the journal end of the axle is contracted, that is so that the end faces of the cut-in portion are drawn together so that the journal may be re-turned to its proper size.

The axle is now taken out of the machine and the other end heated, after which it is lowered into the machine again. However, before lowering the axle into the machine for the second upsetting, the anvil block 65 and gauge 66 are adjusted so that the other end of the axle may be upset the same as the first end. That is, the latter end of the axle is upset sufficiently so that its journal may be re-turned.

In the use of the machine and where a number of axles are to be operated upon, it is desirable to set the machine to operate upon one end of all of the axles and then re-set the machine to operate upon the other end, thereby avoiding adjustment of the machine for each axle.

I have referred to the hammer as a pneumatic hammer and preferably employ compressed air for its operation, but it is to be understood that the machine is not limited to operation by air, as steam may also be used. Also, the hammer being self-contained, it may be moved around or installed vertically, horizontally or at any angle.

Although I have shown certain features of my invention applied to machines for

straightening bolts, welding bars and upsetting axles, I contemplate using such features in other ways than herein illustrated and therefore do not desire to be limited to the exact forms shown and described, but aim to cover all that which comes within the spirit and scope of the appended claims.

What I claim as new and desire to secure by United States Letters Patent is:—

1. A pneumatic hammer mechanism for upsetting car axles including a self-contained hammer and valve mechanism constituting a single unit and adapted to be secured over a pit, a bed plate in the pit, a plurality of columns connected to the bed plate and supporting the hammer and valve unit, means cooperating with the bed plate to form an anvil and adapted to vary the distance between the top of said anvil and the bottom of the hammer, one end of the axle being adapted to rest on said anvil, means mounted on one of the columns for centering the axle and guiding it to a vertical position, and a gauge also carried by one of the columns for indicating the extent to which an axle has been upset.

2. The upsetting machine defined in claim 1 wherein the valve includes a circular disc reciprocable about its axis in a valve chest and having a valve stem secured thereon, a crank mounted on the valve stem and a connection from the crank to a moving part of the hammer mechanism for reciprocating the valve so as to operate the hammer automatically when fluid pressure is admitted to the valve.

3. In a pneumatic hammer mechanism of the character described a pneumatic cylinder with top and bottom heads, a piston and rod extending through the bottom head, a hammer head on the piston rod, a valve chest with passageways leading to the cylinder above and below the piston, a circular valve in the valve chest and operable by a shaft secured thereto to reciprocate the piston my admitting pneumatic fluid alternately above and below the piston, a short operating crank secured to said shaft, a relatively long lever pivoted at one end to a stationary pivot and having its other end attached by a link to the hammer head, a link secured to the lever intermediate its ends and a lost motion connection between the other end of said link and said operating crank, so that movement of the hammer head serves to operate the valve and a relatively long stroke of the piston is permitted while the valve movement is relatively small and of such a character as to impart a full force downward stroke to the piston with proper cushioning effect, and with rapid but controlled upward movement of the piston.

4. In a pneumatic hammer axle upsetting mechanism a cylinder with top and bottom cylinder heads, a piston having a piston rod projecting thru the bottom cylinder head, a hammer head carried by the piston, means forming an axle receiving pit, bed plate in the pit, an axle end receiving anvil on the bed plate supporting posts secured to the corners of the bed plate and extending upwardly above the pit and connected to the bottom cylinder head to support the cylinder mechanism, straps secured to the posts and side walls of the pit, a bridge spacing member secured to the posts for supporting the same and having a center space for passing the hammer head and a gauge member movable vertically on the post to set it for axle length and secured on a vertical pivot to permit its being swung into the line of the hammer head to gauge the height of the axle during an upsetting operation.

5. In a pneumatic hammer axle upsetting mechanism a cylinder with top and bottom cylinder heads, a piston having a piston rod projecting thru the bottom cylinder head, a hammer head carried by the piston, means forming an axle receiving pit, bed plate in the pit, an axle end receiving anvil on the bed plate supporting posts secured to the corners of the bed plate and extending upwardly above the pit and connected to the bottom cylinder head to support the cylinder mechanism, straps secured to the posts and side walls of the pit, a bridge spacing member secured to the posts for supporting the same and having a center space and top and bottom guides for the axle to guide it during an upsetting operation for automatically centering and vertically aligning the axis of the axle.

6. In a pneumatic hammer axle upsetting mechanism a cylinder with top and bottom cylinder heads, a piston having a piston rod projecting thru the bottom cylinder head, a hammer head carried by the piston, means forming an axle receiving pit, bed plate in the pit, an axle end receiving anvil on the bed plate supporting posts secured to the corners of the bed plate and extending upwardly above the pit and connected to the bottom cylinder head to support the cylinder mechanism, straps secured to the posts and side walls of the pit, a bridge spacing member secured to the posts for supporting the same and having a center space, a top guide slightly below the bridge spacing member and secured across the posts for centering the top of the axle, and a two part bottom guide pivoted to the posts for centering the bottom of the axle and vertically aligning axis thereof.

7. In a pneumatic hammer axle upsetting mechanism a cylinder with top and bottom cylinder heads, a piston having a piston rod projecting thru the bottom cylinder head, a hammer head carried by the piston, means forming an axle receiving pit, bed plate in the pit, an axle end receiving anvil on the bed plate supporting posts secured to the corners of the bed plate and extending upwardly above the pit and connected to the bottom cylinder head to support the cylinder

mechanism, straps secured to the posts and side walls of the pit, a bridge spacing member secured to the posts for supporting the same and having a center space and a guide mechanism comprising a vertical member pivoted to the posts, a lower guide pivoted to the vertical member and projecting into the axle way between the posts, a guide at the top of the vertical member and resilient means tending to revolve the vertical member about its pivot to extend one of the guides while withdrawing the other guide from between the posts.

8. In a pneumatic hammer axle upsetting mechanism a cylinder with top and bottom cylinder heads, a piston having a piston rod projecting thru the bottom cylinder head, a hammer head carried by the piston, means forming an axle receiving pit, bed plate in the pit, an axle end receiving anvil on the bed plate supporting posts secured to the corners of the bed plate and extending upwardly above the pit and connected to the bottom cylinder head to support the cylinder mechanism, straps secured to the posts and side walls of the pit, a bridge spacing member secured to the posts for supporting the same and having a center space and a guide mechanism comprising a vertical member pivoted to the posts, a lower guide pivoted to the vertical member and projecting into the axle way between the posts, a guide at the top of the vertical member and resilient means tending to revolve the vertical member about its pivot to extend one of the guides while withdrawing the other guide from between the posts, and means for setting the upper guide with respect to the vertical member.

9. In a pneumatic hammer axle upsetting mechanism a cylinder with top and bottom cylinder heads, a piston having a piston rod projecting thru the bottom cylinder head, a hammer head carried by the piston, means forming an axle receiving pit, bed plate in the pit, an axle end receiving anvil on the bed plate supporting posts secured to the corners of the bed plate and extending upwardly above the pit and connected to the bottom cylinder head to support the cylinder mechanism, straps secured to the posts and side walls of the pit, a bridge spacing member secured to the posts for supporting the same and having a center space for passing the hammer head and a gauge member movable vertically on the post to set it for axle length and secured on a vertical pivot to permit its being swung into the line of the hammer head to gauge the height of the axle during an upsetting operation, a top guide slightly below the bridge spacing member and secured across the posts for centering the top of the axle, and a bottom guide mechanism comprising a vertical member pivoted to the posts, a lower guide pivoted to the bottom of the vertical member and supported to extend horizontally between the posts, an upper guide secured to move with the top of the vertical member, means for spacing the upper guide with respect to the vertical member, and a spring mechanism tending to withdraw the lower guide from between the posts while projecting the upper guide farther between the posts, the guides being so arranged and the upper guide spacing means so regulated that when the axle rests on the anvil in engagement with all three guides it will be centered and its axle aligned vertically.

In witness whereof, I hereunto subscribe my name this third day of April, 1926.

WILLIAM BAIRD.