

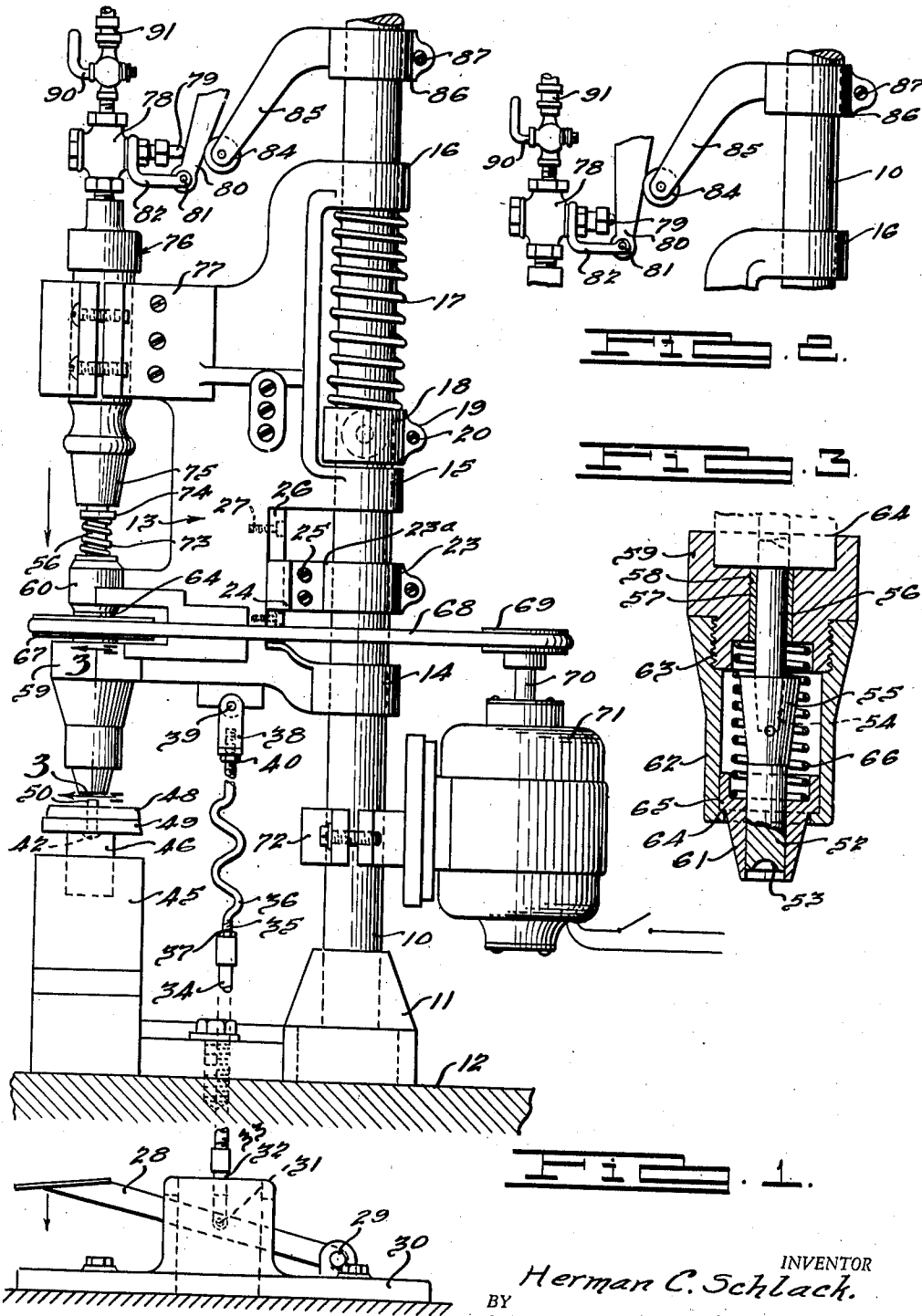
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RIVETING DEVICE

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RIVETING DEVICE

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The invention relates generally to rivet setting devices and it has special relation to mechanism which includes an air hammer for applying hammer blows to the end of the rivet.

More particularly, the invention is applicable to riveting mechanism wherein hammer blows are imparted successively to the end of a rivet by means of a heading tool which at the same time is rotated. Thus, the end of the tool successively hammers the end of the rivet while at the same time the tool rotates so as to effect a spinning action during formation of the rivet head. While mechanism of this general character is not new, desirable improvements have been made in accordance with the objects of the invention thereof set forth as follows.

One object of the invention is to provide a riveting mechanism such as mentioned which can be manufactured more economically and assembled and disassembled easily and which can be adjusted positively and readily in order to adapt the mechanism for a wide range of operating conditions, and in which the driving motor is adjustably mounted to accommodate such adjustment.

Another object of the invention is to provide a riveting mechanism such as generally designated which includes a guide between its supporting column and a head movable thereon so constructed and arranged as to enable wear thereof to be quickly and conveniently taken up.

Another object of the invention is to provide an improved riveting mechanism such as mentioned wherein improved means are provided for gradually and progressively opening and closing a control valve for the hammer as the mechanism is lowered and raised during its operation.

Another object of the invention is to provide improved means for clamping the parts to be riveted during the riveting operation and to effect this result automatically as the hammer heading tool moves into operative position.

Other objects of the invention will become apparent from the following specification, from the drawing relating thereto, and from the claims hereinafter set forth.

For a better understanding of the invention reference may be had to the drawing, wherein:

Figure 1 is an elevational view showing a riveting mechanism constructed according to one form of the invention;

Fig. 2 is a detail view of the valve operating arrangement, showing the valve in an open position; and

Fig. 3 is a cross-sectional view on a larger scale, taken substantially along the line 3—3 of Figure 1.

Referring to Figure 1, the machine illustrated includes a vertical column 10 which is suitably anchored in a support 11 disposed on a floor or

other foundation 12. A frame member 13 is vertically slidable on the column 10 by means of arms 14, 15, and 16, which have aligned apertures receiving the column. Between the arms 15 and 16, a coil spring 17 is disposed on the column and this spring, at its upper end, abuts the arm 16, while the lower end of the spring rests on a collar 18 anchored on the column. This collar is split at one point and has ears, such as indicated at 19, which may be drawn circumferentially toward each other by a screw 20, so as to clamp the collar on the column while still permitting its vertical adjustment whenever desired. The spring urges the arm 16 upwardly and is of sufficient strength, normally, to more than counterbalance the frame member 13 and the parts carried thereby.

Between the arms 14 and 15, a second collar 23 is adjustably mounted on the column and this collar has a forward extension 23a to which a bracket 24 is removably secured by means of screws 25. The extreme lefthand end of the extension 23a and the lefthand end of the bracket 24 are laterally spaced from one another and slidably but closely embrace the key or gib 26 fixed to the frame member in parallel relation to the column 10, so that turning of the frame member about the column is prevented while still permitting vertical movement of the frame member. The key or gib 26 is formed separately from the frame and is removably secured thereto by screws 27 so that in event of wear between these parts the key or rib may be replaced, or the bracket 24 may be removed and sufficient metal removed from that face thereof contacting the extension 23a to take up such wear.

For moving the frame member 13 downwardly against the action of the spring 17, a foot treadle 28 is provided, which is pivotally connected as indicated at 29 to a floor plate 30. The treadle intermediate its ends is pivotally connected as indicated at 31 to a fork 32 and the latter has a stud portion at its upper end which is threaded into the lower end of a union 33 until the union is tight against the fork at the base of the stud. In turn, the union is threaded onto the lower end of a tube 34. At its upper end the tube 34 is threaded into a similar union which in turn has the lower threaded end 35 of a connecting rod element 36 threaded therein and, for positively holding the parts connected, a lock nut 37 is provided on the threaded end of the element. It may be mentioned that the unions have a smaller diameter internal thread for receiving the end of rod 36 and the threaded stud on fork 32 and the tube is of such internal diameter as to allow extension of the rod and stud therein. The rod 36 is preferably longitudinally resilient and while it may take any suitable form to attain this characteristic, in the particular form shown

by way of illustration it is laterally bent into sinuous form to provide resiliency in an axial direction, and at its upper end it is threaded into a coupling member 38, in turn pivotally connected, as indicated at 39, to the frame member 13. A lock nut 40 on the upper end of the rod 36 holds the threaded parts tightly in position. It will be apparent now that when the treadle is depressed, the frame member may be moved downwardly against the action of the spring 17 and that in holding the treadle down, resiliency is provided through the element 36.

For supporting a rivet to be set, a member 45 is provided which has an anvil 46 provided with a recess 42 for receiving the usual pre-formed head on one end of the rivet and it will be noted that the anvil face around the recess 42 is adapted to support parts 48 and 49 to be riveted. The rivet is shown as projecting above the part 48 as indicated at 50 and it is to be understood that this projecting end is to be upset and shaped to form a head.

For forming this head on the rivet, and as best shown by Figure 3, a heading tool 52 is provided which has a cavity 53 in its lower end face corresponding in shape to the desired head. This heading tool has a conical cavity 54 in its upper end which receives the tapered end 55 of a shaft member 56 so as to lock the parts for rotation through a taper lock. The shaft member 56 is journaled in a bearing 57 located in a vertically arranged opening 58 formed in an arm 59 on the frame member 13 and in a similar bearing in a second arm 60 shown by Figure 1.

Referring again to the heading tool 52, a clamping element or sleeve 61 is slidable relative to the tool and is adapted to apply clamping pressure to the parts 48 and 49 during the riveting operation. This clamping element is slidably mounted in a barrel 62 threaded onto the arm as indicated at 63 and for retaining the element in the barrel. Cooperating shoulders 64 and 65 are provided on the barrel and sleeve respectively. A spring 66 within the barrel normally urges the clamping element downwardly so as to apply the desired clamping pressure against the parts 48 and 49.

Between the arms 59 and 60, a pulley 67 is provided which has a hub portion 64 splined to the shaft 56 so that the latter may be moved upwardly and downwardly while being driven by the pulley. Rotation of the pulley is effected by means of a belt 68 trained about the pulley 67 and about a second pulley 69 on a shaft 70 of a motor 71. The motor is adjustably secured by a collar 72 to the column 10 so that it may be moved upwardly and downwardly to accommodate it to any adjustment of the frame on the column required by variations in the thickness of the work or for other reasons. By mounting the motor on the column in the manner shown, it enables it to be readily adjusted as described and relieves the frame of the weight thereof as would be the case if the motor was mounted on the frame and was movable therewith.

Above the second arm 60, the shaft 56 is provided with a coil spring 73 abutting at its lower end, the upper side of the arm 60 and at its upper end a collar 74 on the upper end of the shaft. At its upper end the shaft abuts the lower end of a hammer 75 forming part of an air hammer 76. The air hammer is adjustably held on an arm 77 forming a part of the frame member 13 so that the vertical position of the hammer may be adjusted.

For controlling operation of the air hammer, a valve 78 is carried by the latter and this valve in turn is opened and closed by a slidable pin 79. An arm 80, pivotally connected as indicated at 81 to a bracket 82 fixed on the valve casing, is employed to move the pin 79 inwardly so as to open the valve, and it is to be understood that a spring inside the valve returns the pin outwardly to close the valve. Movement of the arm 80 is effected by a roller 84 on the end of an arm 85 which has a split collar portion 86 adjustably secured on the column 10 by a clamping screw 87. The arm 80 is so positioned with respect to the valve that it provides an inclined cam surface and it follows that when the frame member 13 is moved downwardly, the valve pin 79 is moved inwardly to open the valve gradually and progressively and that when the frame member 13 is moved upwardly by the spring 17, a reverse action of the pin 79 occurs. It will be noted that the cam surface of the arm 80 is substantially straight and its pivot point 81 is so located that although the opening movement of the valve 78 is relatively rapid during initial downward movement of the frame on the column during a riveting operation, the opening of the valve is progressive and so gradual as to admit of close control of the hammer operation. Additionally the arms 80 and 85 are located substantially in a plane including the axes of both the column 10 and pin 79, so that no lateral bending force is applied to these arms in operating the valve, and they may, therefore, be made relatively light but rigid. A manually operated valve 90 may be provided in an air supply line 91 so as to control the supply of air and it will be understood that this will allow for variable control of the hammer through variable control of the air supply. Likewise, by adjustment of the arm 85 on the column 10 the amount the valve is opened upon downward movement of the treadle may be readily adjusted.

When the parts are adjusted as desired, movement of the treadle downwardly brings the frame member and air hammer thereon downwardly and at the same time the air control valve 78 progressively opens. Action of the hammer on the upper end 50 of the rivet upsets the metal to form the head and at the same time the tool 52, through its connection with the rotating shaft 56, is turned so as to spin the metal and facilitate shaping of the head. During this operation the clamping element 61 around the tool 52 clamps the parts 48 and 49 against the anvil 46 so as to hold them in position and clamped together. By having resiliency in the treadle rod 36 through its sinuous form, it is easier to hold the treadle down and there is less fatigue on the operator. In other words, the operator may hold the treadle in its depressed position without that hammering or forced vibration of the treadle which would otherwise occur if there were no resiliency in the connection. At the same time, the rod is sufficiently rigid as to insure proper holding engagement of the tool 52 against the upper end of the rivet in order to secure the desired hammering action.

Although only one form of the invention has been described and illustrated in detail, it will be apparent to those skilled in the art that various modifications may be made without departing from the scope of the appended claims.

What is claimed is:

1. A mechanism comprising a vertical column,

a frame member having three horizontally extending, vertically spaced arms having aligned apertures receiving the column so that the frame member may slide vertically on the latter, a coil spring encircling the column between the intermediate and one end arm and anchored to the column so as to urge the frame member along the column in one direction, means non-turnably mounted on the column between the intermediate and other end arm and slidably engaging the frame member to prevent turning of the latter about the column, an air hammer device movable vertically with the frame member, a rotary shaft rotatably mounted on the frame member and being vertically movable by the hammer, a motor vertically adjustable on the column, means operatively connecting the motor and shaft for rotating the latter while it is reciprocated, and means for moving the frame member in the other direction along the column.

2. A mechanism comprising a vertical column, a frame member having three horizontally extending, vertically spaced arms having aligned apertures receiving the column so that the frame member may slide vertically on the latter, a coil spring encircling the column between the intermediate and one end arm and anchored to the column so as to urge the frame member along the column in one direction, means non-turnably mounted on the column between the intermediate and other end arm and slidably engaging the frame member to prevent turning of the latter about the column, an air hammer device movable vertically with the frame member, a rotary shaft rotatably mounted on the frame member and being vertically movable by the hammer, a motor vertically adjustable on the column, means operatively connecting the motor and shaft for rotating the latter while it is reciprocated, a valve for controlling the air hammer, means on the column for actuating the valve and depending for operation on movement of the frame member and hammer vertically of the column, and means for moving the frame member in the other direction along the column.

3. In a riveting mechanism, in combination, a vertical column, a frame member movable vertically on the column, spring means for urging the frame member in one direction, foot operated means for moving said frame in the opposite direction, an air hammer movable with the frame member, a valve fixed with respect to said hammer and including an axially movable valve stem arranged with its axis substantially in a plane including the axis of said column, an oscillatable cam member pivotally mounted about a point fixed with respect to said valve and having one edge thereof bearing on said valve stem, and means including an arm fixed with respect to said column and arranged for engagement with said cam member during movement of said frame on said column for operating said valve during movement of said frame member on said column.

4. A mechanism comprising a vertical column, a frame member having three horizontally extending, vertically spaced arms having aligned apertures receiving the column so that the frame member may slide vertically on the latter, a coil spring encircling the column between the intermediate and one end arm and anchored to the column so as to urge the frame member along the column in one direction, means non-turnably mounted on the column between the intermediate

and other end arm and slidably engaging the frame member to prevent turning of the latter about the column, an air hammer device movable vertically with the frame member, a rotary shaft rotatably mounted on the frame member and being vertically movable by the hammer, a motor vertically adjustable on the column, means operatively connecting the motor and shaft for rotating the latter while it is reciprocated, and means for moving the frame member in the other direction along the column, said cam member and said arm being arranged substantially in said plane including the axes of said valve stem and said column.

5. In a riveting mechanism, in combination, a vertical column, a frame member movable vertically on the column, spring means for urging the frame member in one direction, foot-operated means for moving said frame in the opposite direction, an air hammer movable with the frame member, a valve fixed with respect to said hammer and including an axially movable valve stem arranged with its axis substantially in a plane including the axis of said column, an oscillatable cam member pivotally mounted about a point fixed with respect to said valve, said cam member having one edge thereof bearing on said valve stem and having an approximately straight opposite edge, and means including an arm fixed with respect to said column, a roller on said arm in engagement with said cam member during movement of said frame on said column for operating said valve during movement of said frame member on said column.

6. A mechanism comprising a vertical column, a frame member movable vertically on the column, spring means for urging the frame member in one direction, an air hammer movable with the frame member, a rotary shaft mounted on the frame member for vertical movement by the hammer, means for rotating the shaft as it is moved, a valve carried by the hammer for controlling its operation, cam means for opening the valve gradually and progressively as the frame member is moved in the other direction and for closing the valve progressively when the frame member is moved in said one direction by the spring means, said cam means comprising a cam lever mounted on said valve for pivotal movement in a plane substantially including the axis of said column, an arm rigidly secured to said column and lying substantially in said plane, and a roller carried by said arm in engagement with said cam lever, and means including a foot treadle for moving the frame member in said other direction.

7. In a riveting machine, in combination, a base, a vertically extending column rigidly fixed at its lower end to said base, an anvil secured to said base, a frame vertically slidably mounted on said column, spring means constantly urging said frame in one direction on said column, foot operated means for moving said frame on said column in opposition to said spring means, an air hammer carried by said frame, a heading tool carried by said frame in axial alignment with said air hammer, and means for maintaining said tool in alignment with said anvil radially of said column comprising a gib removably secured to said frame, an arm secured to said column and having an end slidably engaging one side of said gib, and a bracket fixed to said arm and slidably engaging the opposite side of said gib.

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