Dec. 10, 1929. E. W. LARSEN 1,739,152

HEAD FOR MOVABLE RIVETING MACHINES

Filed May 17, 1920 3 Sheets-Sheet 1

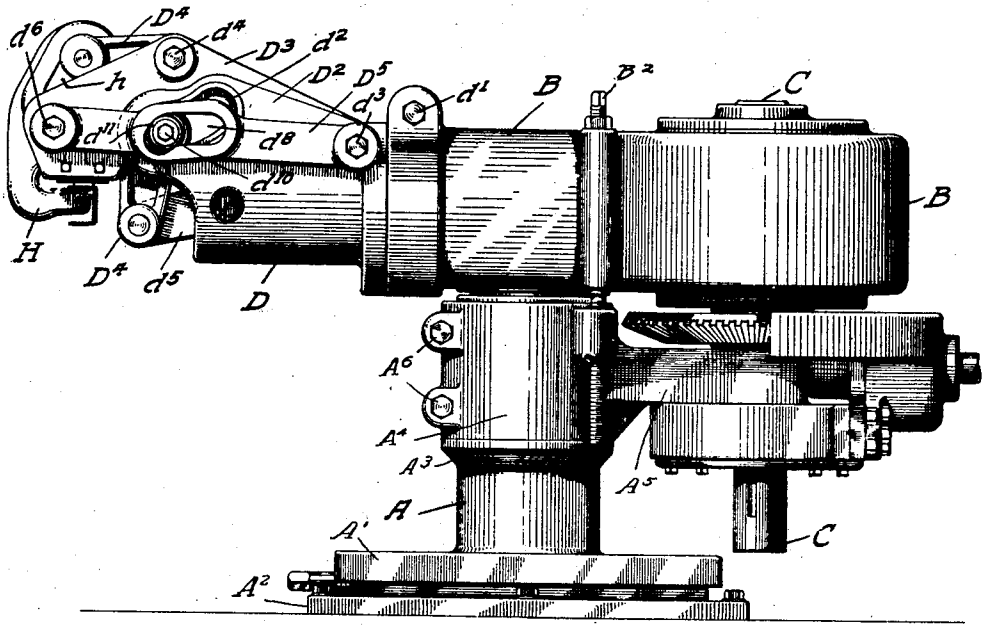


FIG. 1.

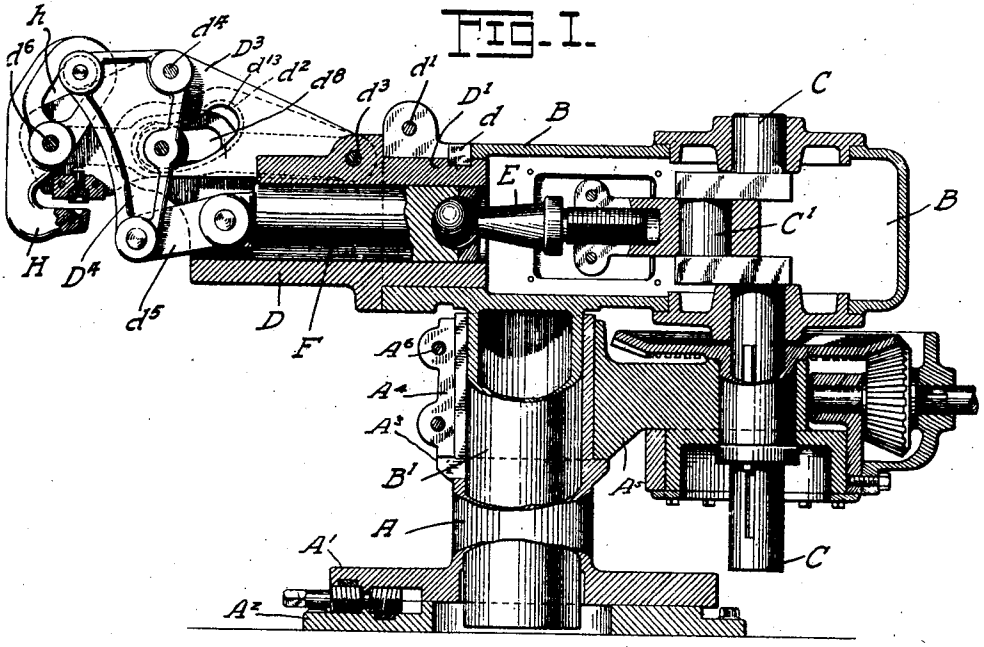


FIG. 2.

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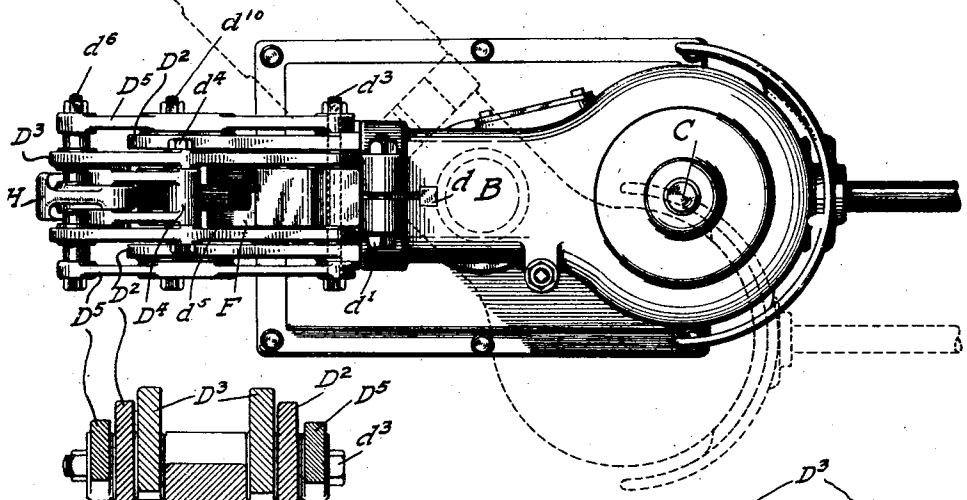
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HEAD FOR MOVABLE RIVETING MACHINES

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FIG. 3.



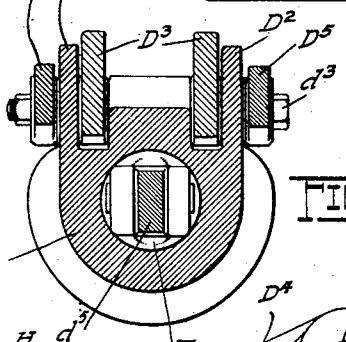


FIG. 5.

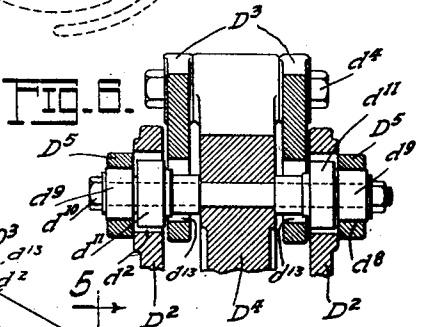


FIG. 6.

FIG. 4.

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HEAD FOR MOVABLE RIVETING MACHINES

Filed May 17, 1920 3 Sheets-Sheet 3

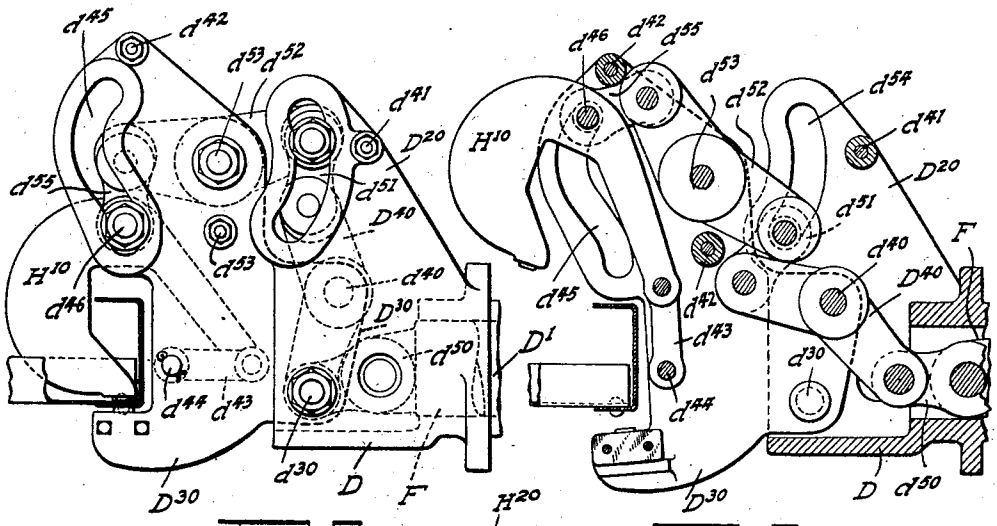


FIG. 7.

FIG. 8.

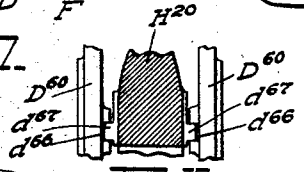


FIG. 10.

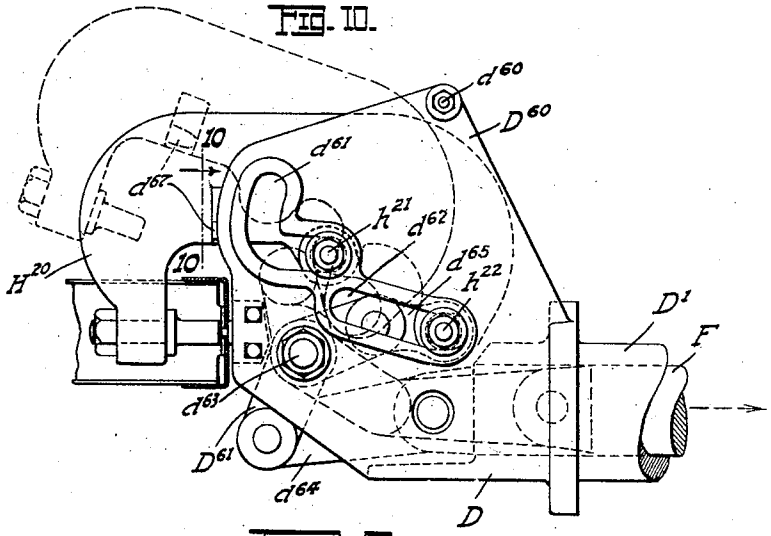


FIG. 9.

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UNITED STATES PATENT OFFICE

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HEAD FOR MOVABLE RIVETING MACHINES

Application filed May 17, 1920. Serial No. 381,893.

The invention relates to heads for movable riveting machines, and to the means for actuating the riveting dies when the head has been moved to position the dies operatively with relation to the work.

The movable riveting machine in its broader aspects is not of my invention, but is the invention of Thorvald Hansen and Reimar R. C. F. Kurtze, as disclosed in their application, Serial No. 507,737, filed Oct. 14, 1921, on which Patent No. 1,507,958, was granted September 9, 1924.

My invention relates particularly to the riveting head which is used in the riveting machine claimed in the said patent and embodies improvements whereby the said riveting machine may be better adapted to varying conditions encountered and be rendered more effective in the performance of its work, by reason of its larger range of action.

The riveting machine embodying my invention is designed for use as an element of the assemblage of machines disclosed in the application of R. Stanley Smith, Serial No. 212,934, filed January 21, 1918, and patented October 15, 1921, No. 1.397,020, such assemblage including machines which by their related, connected and successive operations, punch from metal plates and sheets the side and cross bar and other blanks used in constructing an automobile or other vehicle frame, shape such blanks according to the particular requirements appertaining to each, perform the necessary milling operations thereon, assemble the several constituent parts, and secure all of such parts in their respective positions, so that in a continuous operation of mechanical devices a completed automobile or other vehicle frame is automatically produced.

The present invention is designed particularly for riveting together the side bars and cross bars and other parts constituting the frame of an automobile or other vehicle. As is well known in the manufacture of such frames the connecting rivets are variously placed throughout the frame, and present more or less mechanical difficulties in effecting the riveting operation, which requires the employment of specially designed riveting devices which are constructed with capability for movement into places ordinarily and often difficult of access. The side bars of the automobile frame are formed as channeled bars drawn from sheet metal, as are also so formed the cross bars of the frame, and the rivets used to connect the frame elements may be inserted from either the inside or outside of the channel, some of such rivets projecting upwardly and some downwardly, while others project horizontally, as may be required in each particular case.

In passing the assembled frame elements along the line of riveting machines positioned at stations along the line of the assemblage, it is necessary that the riveting head and its operating parts have a movement into and out of the path of travel of the assembled frame elements, so that such frame elements may be properly positioned with respect to the riveting machine, and when so positioned, the head of the latter may be actuated so as to bring the riveting dies into correct position for upsetting or spreading the points of the rivets, to thus effectively unite the parts of the frame. The withdrawal of the riveting head and its dies from operative position with relation to the frame, permits the movement of the latter from station to station.

My present invention relates to a peculiarly novel construction and arrangement of the active members of the riveting head, whereby the latter may be properly positioned with relation to the work and when so positioned may be actuated at the proper time to perform the riveting operations.

The details entering into the construction of my invention will be later described in connection with the drawings forming a part of this specification, and the novel features thereof will be pointed out in the appended claims.

In the drawings hereto attached,

Figure 1 is a view in side elevation of an assembled riveting machine, in the construction of which my improvement is embodied.

Fig. 2 is a sectional view of the said riveting machine, showing details of arrangement and operation.

Fig. 3 is a plan view of the riveting ma-

chine shown in the views previously described, and showing in dotted lines the head as having been rotated for adjustment so as to stand at another angle.

Fig. 4 is an enlarged sectional view showing the dies of the riveting head as separated to permit the movement of the assembled frame elements into position for the riveting operation to be performed on a downwardly pointing rivet, and by dotted lines in riveting position.

Fig. 5 is a vertical section on the line 5—5, Fig. 4, looking in the direction of the arrow.

Fig. 6 is a vertical section on the line 6—6, Fig. 4, looking in the direction of the arrow.

Fig. 7 is a view in side elevation showing the relation of the members of the riveting head in spreading the end of an upwardly pointing rivet.

Fig. 8 is a view of the same elements, separated to permit the movement of the frame into riveting position.

Fig. 9 is a view in side elevation showing the elements of the riveting head in position for spreading the point of a horizontally extending rivet.

Fig. 10 is a sectional view on the line 10—10, Fig. 9, looking in the direction of the arrow, and showing the provisions for securing alignment of the riveting members at the time the riveting operation is performed.

Referring to Figs. 1, 2 and 3 of the drawing, the riveting machine in its entirety is shown. Inasmuch as such machine generically is not of my invention, detailed description thereof will be omitted from this specification, and reference may be had to application Serial No. 507,737, hereinbefore referred to. It may be stated, however, that the machine is supported upon a stand A, adjustable through its base A^1 upon the platform A^2, and comprises a housing B, from which depends a post B^1, which latter is both vertically and rotatively adjustable in the stand A. The stand A is slit along its upper side and is provided with a circumferential step A^3, upon which rests the encircling hub A^4 of a radially extending arm A^5, on which the shaft C and its driving gears are supported. The hub A^4 is slit vertically to correspond with the slit in the stand, and bolts A^6 are adapted to clamp the hub and the stand upon the post B^1, in any position of adjustment of the riveting head. Power is applied in any position of adjustment through the shaft C^2. The vertical adjustment of the riveting head is effected through the screw B^2. The housing supports a driven shaft C provided with a single crank C^1, which latter is employed to actuate the riveting dies. A general disclosure of the operation of these parts, as well as of the specific mechanism for driving the shaft C, is made in an application filed October 14, 1921, by B. T. Andren, Serial No. 507,785, on which Patent No. 1,491,182, was granted April 22, 1924, to which reference may be had, the parts therein indicated 15, representing the movable riveting machines embodying the present invention, the riveting machines being also indicated 25 in the patent to B. T. Andren, No. 1,408,156, granted February 28, 1922. It is not necessary for the purposes of the present invention to say more than that the rotation of the crank shaft C imparts the several movements to the members of the riveting head, with which the present application has to do.

The inner end of the housing B, that is that end of the machine which is nearest to the line of travel of the assembled automobile frame, is bored for the reception of a tubular head D, the shank D^1 of which enters the bore in the housing B and is secured therein by means of a locking pin d, by means of which registry of the parts is secured and movement of the tubular head D independently of the housing B, is prevented. The inner end of the housing B is split longitudinally at one side, and the engagement of the shank of the tubular head with the housing is further effected by means of a bolt d^1 which acts to clamp the split end of the housing upon the shank of the tubular head.

An adjustable pitman E connects the crank C^1 with slide F mounted in the tubular head, such connection between the pitman E and the slide F being effected by a ball and socket joint, as shown. The tubular head D is provided with two inwardly extending wings D^2, as indicated in Figs. 3 and 5. These wings are relatively stationary and are provided with cam slots d^2, for a purpose which will presently be described. A bolt d^3 which passes through the said wings at a point near the connection of the tubular head D with the housing, acts as a journal for two oscillating plates D^3 which intermediate their ends support a short shaft d^4 upon which is journalled the two armed floating lever D^4, the longer arm of which is connected by means of a link d^5 to the slide F, working in the bore of the tubular head. The said plates D^3 are separated sufficiently to receive the hub of the two armed lever D^4 between them, and at their other ends the pivotally mounted plates D^3 carry one member, as the anvil G, of the riveting dies.

Bars D^5 mounted also for vibratory movement on the bolt d^3 are arranged at the outer sides of the wings D^2 and are connected at their free ends by means of a bolt d^6, which passes through elongated openings d^7 in the free ends of the oscillating plates D^3, so that the said plates D^3 with the die member G have capacity for slight movement independent of that of the side bars D^5. The side bars D^5 have formed therein cam slots d^8 for the reception of antifriction rollers d^9 carried by a shaft or journal d^{10}, which passes through and is supported by the longer arm of the

two armed lever D^4. The said shaft or journal d^{10} is also provided with antifriction rollers d^{11}, which work in the cam slots d^2 formed in the fixed wings D^2 of the tubular head, previously referred to.

A retractive movement of the slide F will rock the two armed lever D^4 upon its journal, and the antifriction rollers d^{11} working in the cam slots d^2 in the fixed wings D^2, will serve to raise the plates D^3 and so give a slight movement of elevation to the die member G, carried at the free end of the said plates, and thus create a clearance space for the passage of the riveting machine into position with respect to the assembled frame elements. A reverse movement of the slide F will then lower the plates D^3 and the die into position to effect the riveting operation. Viewing Fig. 6, it will be observed that the slots d^{13} shown as formed in the plates D^3 have no function except to provide a clearance for the movement of the shaft or journal d^{10}, in the oscillation of the two armed lever D^4.

A riveting hammer H is journalled on the shaft d^6, carried at the free ends of the bars D^5. At its lower end this riveting hammer is provided with a complementary riveting die, and is slotted at its upper end as at h. The shorter arm of the two armed lever D^4 is shown as branched carrying an antifriction roller d^{12}, which works in the said slot h in the riveting hammer, so that as the two armed lever D^4 is oscillated by the movement of the slide F, the riveting hammer is actuated first to a retracted position to permit the movement of the riveting devices into operative relation to the assembled frame elements, and movement of the latter into position. The hammer is then rotated in a plane which intersects the longitudinal axis of the riveting head to riveting position, at which moment the riveting dies will be caused to approach each other by a parallel motion and complete the riveting operation by spreading the rivet then between the dies, so as to unite the parts.

Viewing Fig. 4, when the two-armed lever D^4 has made its throw to the dotted line position at the left to bring the riveting jaws into position for the performance of a riveting operation, the rollers d^{11}, operating in the ends of the curved cam slots d^2 formed in the fixed wings D^2, operate to depress the levers D^3 so as to advance the anvil G carried by the said levers D^3 into the dotted line position. In this movement the rollers d^9, operating at the outer ends of the curved slots d^8 formed in the side bars D^5, act to raise the said side bars, and the roller d^{12} on the short arm of lever D^4 having rotated the hammer H to the dotted line position and at this moment been brought into engagement with the upper end of the slot h of the hammer H, effects an upward thrust upon the latter, the slots d^7 in the free ends of the levers D^3 permitting such upward movement of the hammer. It follows, therefore, that at the instant of the riveting operation, the hammer H and the anvil G have their faces in parallelism, so that the compression exerted upon the rivet is directly in the axial line thereof.

The mechanism thus far described is designed to upset or spread a rivet passed through the upper flange of the side bar of an automobile frame, and connect the cross bar or gusset thereto. In performing this operation, the dies or members of the riveting head are separated as described to permit the automatic positioning of the riveting devices in operative relation to the assembled frame elements, and the hammer is then rotated into riveting position, followed by a movement of both dies toward each other to effect the riveting operation. Upon the completion of such riveting operation the dies are separated and the riveting head retracted as described, to permit the further automatic movement of the frame to another station in the assemblage of machines. It will be understood that the riveting dies and hammers will be properly formed so as to meet the requirements attendant upon the variously placed rivets, and although different forms of dies and anvils and actuating connections will be used, my invention is not departed from in so constructing the parts as to meet the exigencies existing in each particular case.

Figs. 7 and 8 show an arrangement adapted to spread a rivet passed through the lower flange of a side bar, to connect necessary frame elements thereto. In these views the tubular head D is provided with wings D^{20} as before. The oscillating plates D^{30} which carry one of the die members of the riveting head are pivoted by means of studs d^{30} to the wings D^{20}. The two armed lever D^{40} is journalled at d^{40} upon a short shaft mounted in the oscillating plates. A tie rod d^{41} unites the wings D^{20} and tie rods d^{42} unite the oscillating plates D^{30}. The riveting hammer H^{10} is pivoted to one end of a link d^{43} oscillating about a shaft d^{44}, set in the plates D^{30}. The said plates are provided with cam slots d^{45}, in which work antifriction rollers carried by the short shaft d^{46}, mounted in the riveting hammer. The two armed lever D^{40}, connected at one end to the slide F by the link d^{50}, oscillates upon the short shaft d^{40} carried by the plates D^{30}, and by means of a link d^{51} is connected at its other end with a two armed lever d^{52} mounted intermediate its ends upon a stud d^{53}, fixed in the oscillating plates D^{30}. The pivot connecting the link d^{51} with the first mentioned arm of the lever d^{52} is provided with an antifriction roller which is guided in a slot d^{54}, formed in the wings D^{20}. The other arm of the lever d^{52} is connected by means of a link d^{55} to the shaft d^{46}, upon

which the hammer H^{10} is mounted. From the construction described, it will be seen that a retractive movement of the slide F will separate the die members of the riveting head to permit the retraction of the head the assembled frame elements to pass into riveting position, and that a reverse movement of the slide will, through the connection described act to bring the riveting hammer into position and then to effectuate a movement of the riveting devices to spread the rivet and unite the parts of the frame, in the manner previously described.

In Fig. 9 I have shown my invention as embodied in a construction adapted to perform the riveting operation at those points where the rivets are extended horizontally in the frame. The tubular head D is provided with wings D^{60}, which are tied together at d^{60}. These wings are provided with a cam slot d^{61} and a guiding slot d^{62}. One of the riveting dies, the anvil, for example, is supported by the wings D^{60} with its face in a vertical plane. The hammer head H^{20} carrying the complemental riveting die, is provided with stub shafts h^{21} and h^{22} which carry antifriction rollers working in the slots d^{61} and d^{62}, respectively. The two armed lever D^{61} is pivoted at d^{63} upon a stud mounted in the said wings. The first arm of the said lever is connected by means of a link d^{64} to the slide F as before. The other arm of the said lever is connected by means of a link d^{65} to the stud h^{22} mounted in the hammer head H^{20}. The configuration of the slot d^{61} is such that during the upward travel of the antifriction roller of the shaft h^{21} therein, the hammer will be withdrawn to an elevated position to permit the assembled frame elements to be moved into riveting position. In such movement the slot d^{62} acts merely to guide the stub shaft h^{22}, on which the hammer will rotate as the shaft h^{21} passes into the cam portion of the slot. The retraction of the riveting head will likewise withdraw the anvil from the path of movement of the frame elements, thus permitting unobstructed passage of the latter into position for the performance for the riveting operation. Reverse movement of the slide F will act to bring the riveting hammer into proper position for the riveting operation, and further movement of the hammer will cause it to spread the rivet through the pressure applied during the final portion of such movement.

In order to insure that the hammer may travel in a parallel path at the moment the riveting operation is performed, I provide means for positively guiding the said hammer during the final portion of its movement. The opposed faces of the wings D^{60} are provided with a channel d^{66}, for the reception of registering projections d^{67} formed upon the sides of the riveting hammer. The operation of this feature will be clear from an inspection of Figs. 9 and 10 of the drawings. It will be understood that each of the several forms of riveting heads shown will be provided with similar means.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States, is:

1. In a riveting press, a stand, a head supported thereon and provided with cams, cooperating pivoted riveting jaws supported on the head, and a slide movable in the head for actuating the riveting jaws through the said cams.

2. In a riveting press, a stand, a head supported thereon and provided with wings and cams, pivoted riveting jaws supported on the head, a pivoted lever between the wings, and a slide movable in the head and connected to the said lever for actuating the riveting jaws through the said cams.

3. In a riveting press, a riveting head provided with a fixed cam, a riveting jaw in the form of an anvil pivotally supported upon the head, a riveting jaw in the form of a hammer also pivotally supported upon the said head, and means actuated by the fixed cam to move the said jaws to perform a riveting operation.

4. In a riveting press, a riveting head provided with a fixed cam, a riveting jaw in the form of an anvil pivotally supported upon the head, a riveting jaw in the form of a hammer also pivotally supported on the said head, a slide, and means operated thereby for actuating the riveting jaws through the said cam to perform a riveting operation.

5. In a riveting machine, a riveting head, and pivoted levers mounted thereon carrying riveting dies, in combination with a cam fixed upon the head, a cam upon one of the levers, a shaft carrying rollers engaging the said cams, and means for actuating the shaft to cause the riveting dies to perform a riveting operation.

6. In a riveting press, a riveting head, a cam fixed thereon, a lever carrying a riveting die pivoted upon the riveting head and provided with a cam, means engaging the fixed cam and movable thereby to move the lever through its cam to cause the die to perform a riveting operation.

7. In a riveting press, a riveting head, a riveting die, a fixed cam and a movable cam, and means operated by the fixed cam to move the movable cam to cause the die to perform a riveting operation.

8. In a riveting press, a movable riveting head, a riveting die, a fixed cam and a movable cam, and means operated by the fixed cam to move the movable cam to cause the die to perform a riveting operation.

9. In a riveting press, a riveting head, a riveting jaw in the form of an anvil pivotally supported upon the head, a riveting jaw in the form of a hammer also pivotally supported

upon the said head, the pivots of said jaws being located at different distances from the operating faces of the jaws, and means to move the said jaws to perform a riveting operation.

10. In a riveting press, a riveting head provided with a fixed cam, a riveting jaw in the form of an anvil supported upon the head, a riveting jaw in the form of a hammer pivotally supported upon the said head, and means actuated by the fixed cam to move the pivoted jaw to perform a riveting operation.

11. In a riveting press, a riveting head provided with a fixed cam, a riveting jaw in the form of an anvil supported upon the head, a riveting jaw in the form of a hammer pivotally supported on the said head, a slide, and means operated thereby for actuating the pivoted jaw through the said cam to perform a riveting operation.

12. In a riveting press, a riveting head provided with a fixed cam, a riveting jaw in the form of an anvil supported upon the head, a riveting jaw in the form of a hammer pivotally supported upon the head, a slide, and means moved thereby over the fixed cam for actuating the pivoted jaw to perform a riveting operation.

13. In a riveting press, a first pivoted lever carrying a riveting jaw, a second pivoted lever carrying a riveting jaw, a vibrator lever mounted upon the first pivoted lever and actuating the second pivoted lever, cam devices intermediate the vibrator lever and the pivoted levers for actuating the pivoted levers, and means for actuating the vibrator lever to effect a riveting operation.

14. In a riveting press, a riveting head comprising movable jaws pivoted at different distances from their faces carrying co-operating riveting dies, a single, floating vibrator lever, and connections therefrom to actuate the said jaws to effect a riveting operation.

15. In a riveting press, a riveting head comprising movable jaws pivoted at different distances from their faces carrying co-operating riveting dies, a single, floating vibrator lever pivoted upon one of the jaws, and connections for operating the other jaw therefrom.

16. A riveting head having jaws carrying cooperating riveting dies, a pivotal mounting for each of the jaws, the pivots being relatively arranged to permit rotational movement of both jaws about a common pivot and rotational movement of one jaw about another pivot, a single actuating member engaging both jaws for producing said relative jaw movements and effective during rivet upsetting action of the dies to produce substantially rectilinear movement of one jaw.

17. A riveting head including a pair of pivotally mounted jaws, means mounting one of said jaws for rotational movement into and out of riveting position through a wide swing on a short radius, means cooperating with said means for mounting said jaw for movement through a short swing on a long radius during riveting operation, which latter movement is substantially rectilinear, and a single actuator for effecting said movements in succession.

18. A riveting head including an upper and a lower jaw, cooperating riveting dies mounted on said jaws, means mounting said lower jaw for swinging movement through an arc downwardly and upwardly into a position at one side and above the horizontal plane of said upper jaw, additional means mounting said lower jaw for a short substantially rectilinear movement toward and away from said upper jaw during the riveting operation, means mounting said upper jaw for movement toward and away from said lower jaw, said several means producing a short movement of said jaws away from each other to release the riveted article and a wide swing of said lower jaw into position as stated permitting ready manipulation of work under said upper jaw, and a single actuator for operating said jaws.

In testmony whereof, I have signed my name at Milwaukee, this 30th day of April, 1920.

EINER W. LARSEN.

CERTIFICATE OF CORRECTION.

Patent No. 1,739,152. Granted December 10, 1929, to

EINER W. LARSEN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, line 5, after the word "head" insert the word "and"; same page, line 68, for the word "will" read "may"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of February, A. D. 1930.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)