

Dec. 11, 1945.

L. M. PATERSON

2,390,615

RIVET SETTING MACHINE

Filed June 7, 1940

5 Sheets-Sheet 1

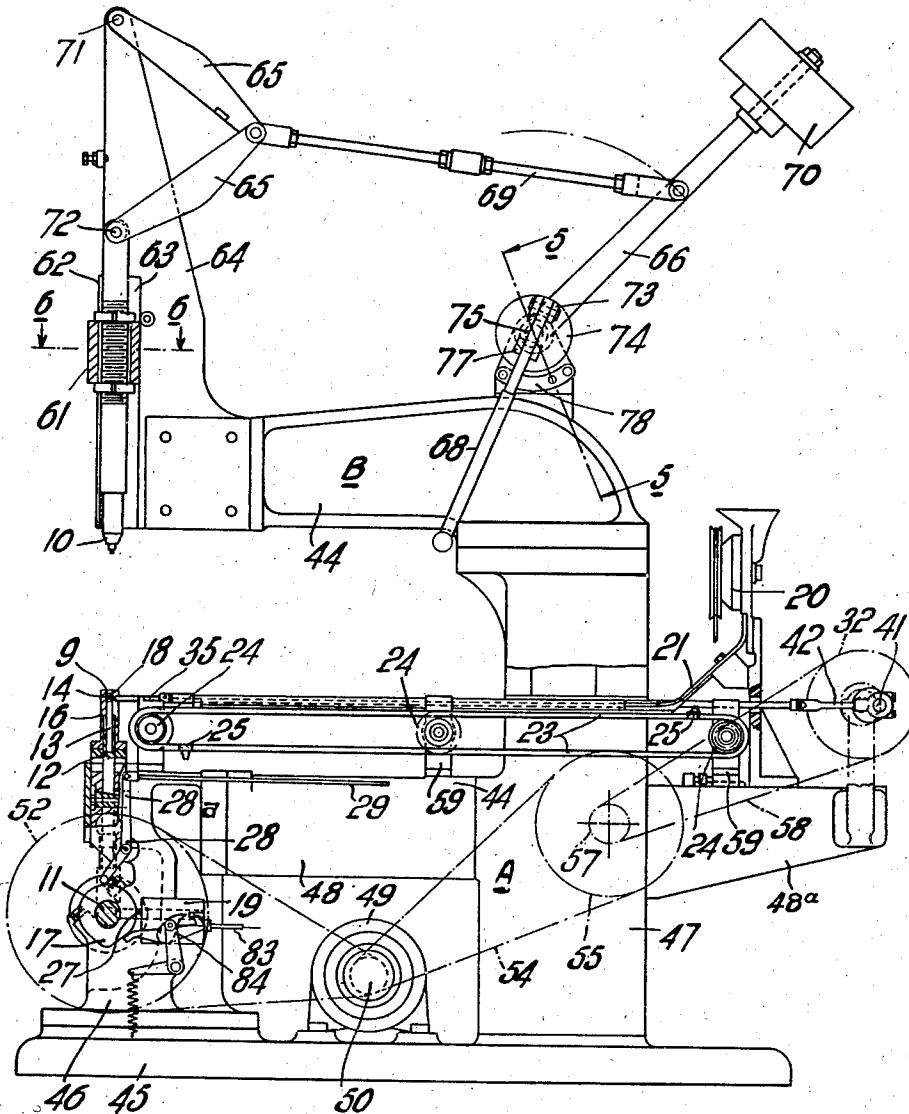


FIG. 1.

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5 Sheets-Sheet 2

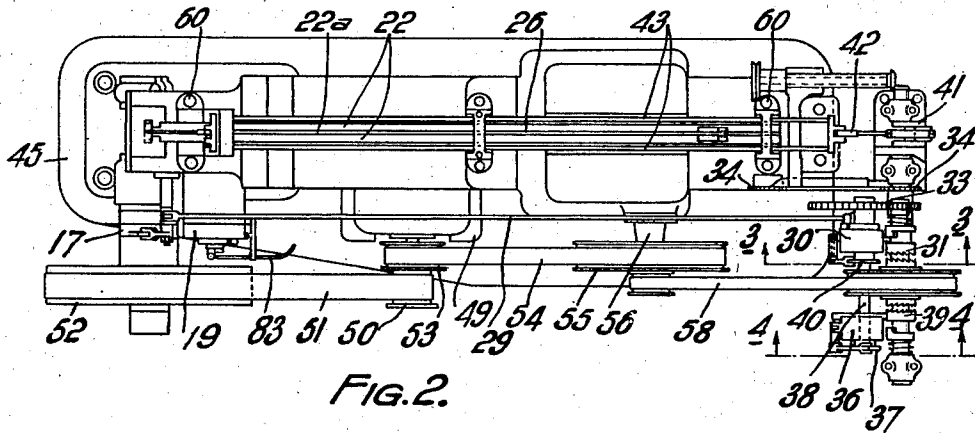


FIG. 2.

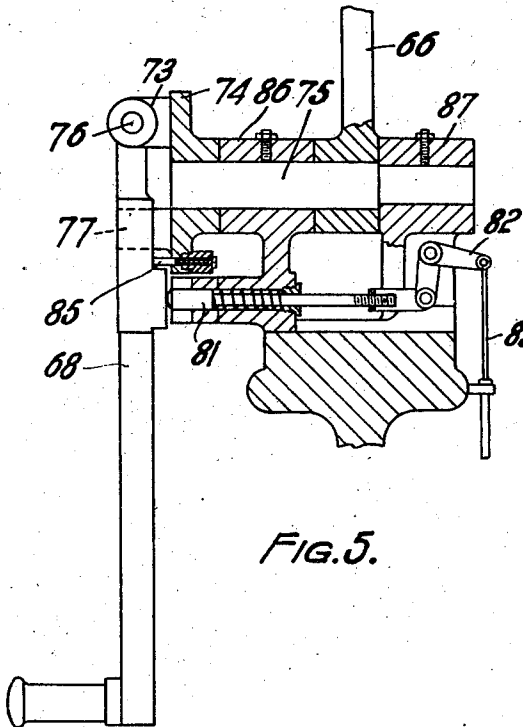


FIG. 5.

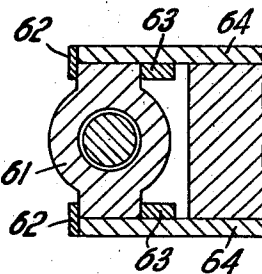


FIG. 6.

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5 Sheets-Sheet 3

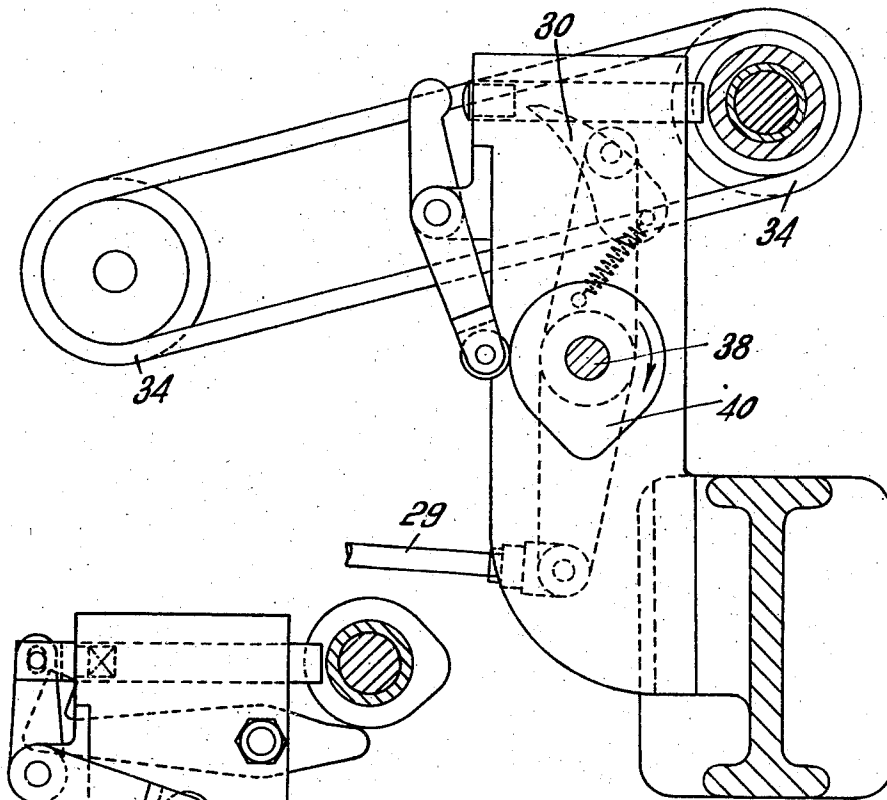


FIG. 3.

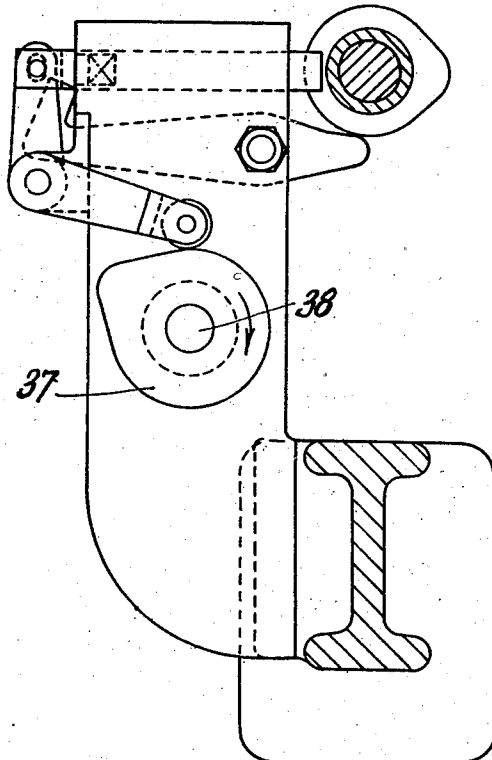


FIG. 4.

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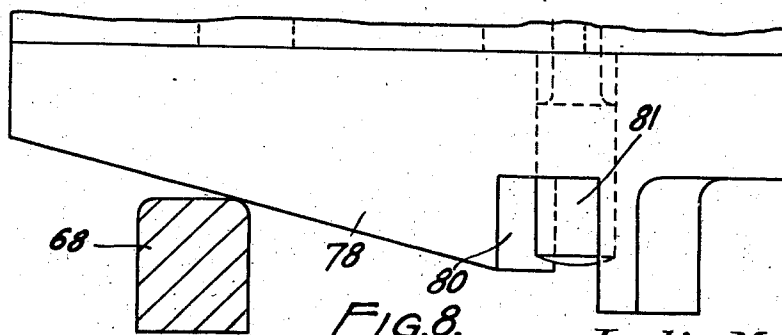
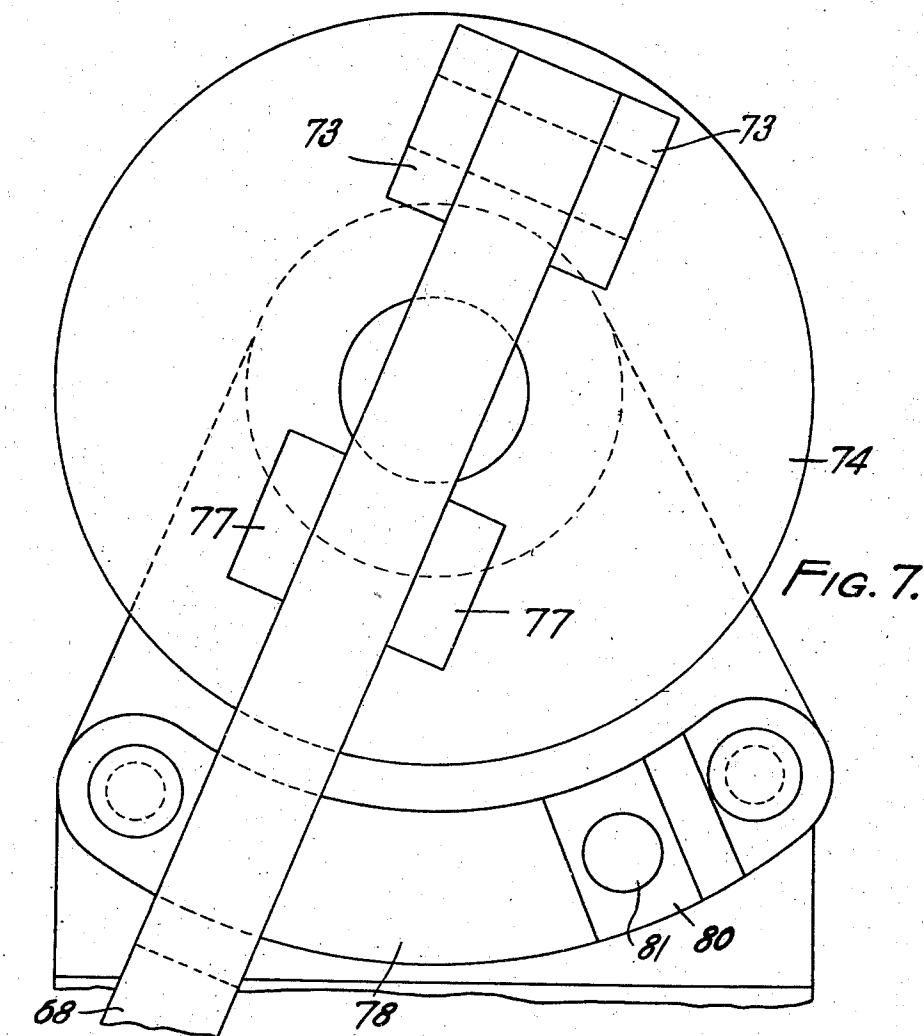
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5 Sheets-Sheet 5

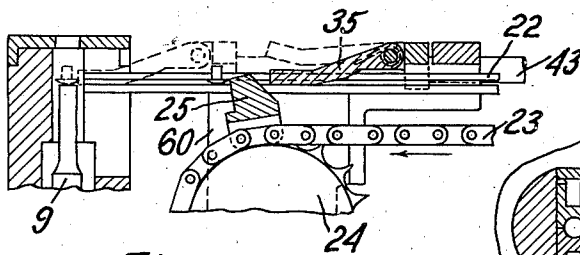


FIG. 9.

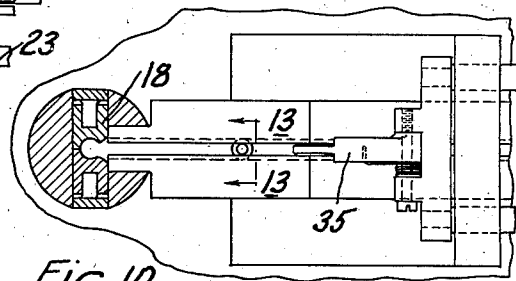


FIG. 10.

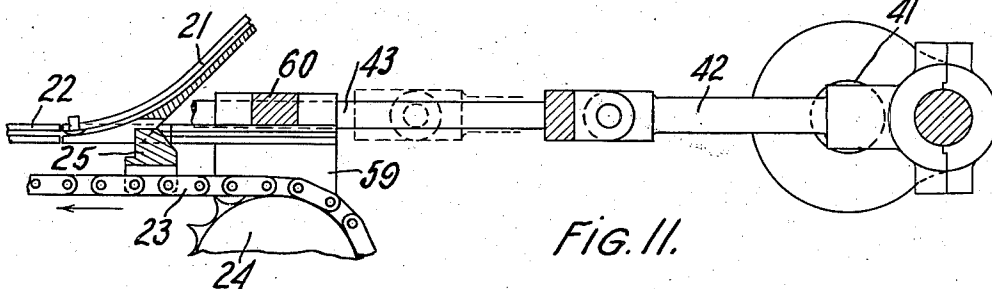


FIG. 11.

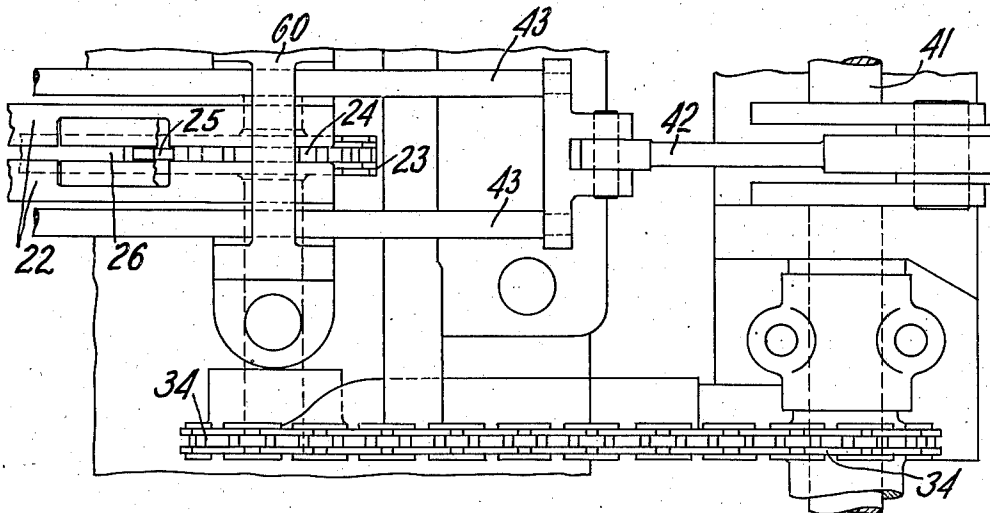


FIG. 12.

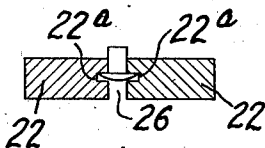


FIG. 13.

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UNITED STATES PATENT OFFICE

2,390,615

RIVET SETTING MACHINE

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Application June 7, 1940, Serial No. 339,390
In Great Britain June 7, 1939

5 Claims. (Cl. 78—48)

This invention relates to rivet setting machines and has for its object to provide improvements in the automatic rivet feeding mechanism and general arrangement of such machines which render the machines especially suitable for the flush riveting of aeroplane wings and like components.

According to one feature of the invention the rivet driving head is arranged below the anvil of the machine, the rivets being fed along a substantially horizontal, inclined or vertical track and presented with their shanks upward to the rivet setting station. This will ordinarily entail that the rivet driving head is carried by the base, and the anvil by the head, of the machine.

One embodiment of the invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which

Figure 1 is a part sectional side elevation of a flush rivet setting machine according to the invention especially suited for the flush riveting of aeroplane wings and like components,

Figure 2 is a plan view of the base of the machine, the machine head and the hopper mechanism having been removed for the sake of clear illustration,

Figures 3 and 4 are fragmentary elevations on the lines 3—3 and 4—4 respectively of Figure 2 but drawn on a larger scale to show details of the driving mechanism,

Figure 5 is a section on the line 5—5 of Figure 1 to show the mechanism by which the anvil of the machine is lifted and the main driving head clutch of the machine is put into and out of operation,

Figure 6 is a sectional plan on the line 6—6 of Figure 1 to show the slide in which the anvil is carried.

Figures 7 and 8 are detail elevational and plan views respectively on a larger scale of parts of the mechanism shown in Figure 5.

Figure 9 is a detail vertical sectional view showing the mechanism for feeding the rivet to the driver.

Figure 10 is a fragmentary view partly in top plan and partly broken away and in section of the parts shown in Figure 9.

Figure 11 is a fragmentary view partly in section showing the spring tongue actuating mechanism.

Figure 12 is a fragmentary top plan view of the mechanism shown in Figure 11 and to a larger scale than Figure 2.

Figure 13 is a detail cross sectional view of the rivet channel strips.

According to the embodiment of the invention illustrated in the drawings the rivet driving head 9 and anvil 10 of the machine, and the principle of riveting are as described in the specification of British Letters Patent No. 487,152 except that the parts are inverted as specified above, the rivet driving head having a crankshaft 11 driving a slide 12 which carries the plunger 13 which in turn pushes the rivet at 14 through the work and sets it on the anvil 10, at the same time flattening the originally slightly domed rivet head so that it lies flush with the surface of the plates being riveted. The rivet driving head 9 also carries a pressure pad 16 operated by two cams as before, the pressure pad having bolted to it the two-part pocket at 18 which holds the rivet prior to riveting. The clutch mechanism 19 by which the plunger 13 is driven may be as described in the specification of British Letters Patent No. 399,942 and finally the hopper mechanism 20 may be as described in the specifications of British Letters Patents Nos. 294,754 and 348,224.

In order to deliver the rivets from the hopper 20 to the two-part pocket 18 by which they are held prior to riveting, the downwardly inclined rivet track 21 from the hopper is connected to two parallel steel or like strips 22 disposed horizontally and having on their adjacent sides grooves 22a which form a channel 26 of sufficient width to take the head of a rivet. The spacing of the strips is such that the rivet shank can pass between them so that when a rivet is fed into the horizontal channel it lies with its head in the channel and its shank standing up vertically between the strips. Any suitable means (not shown) may be provided for insuring the passage of only one rivet at a time into the track 26 in position to be fed. The rivet is carried along the horizontal channel or track 26 in its inverted position by means of an endless chain or the like 23 carried on chain wheels 24 so that its upper run is disposed immediately below the track, the chain being provided with two fixed projections 25 which stand outwardly from the chain and pass along the space or channel 26 between the strips 22 when the chain is moved.

This chain feed mechanism is driven in the following manner. When the rivet driving head clutch 19 is tripped the crankshaft 11 rotates carrying with it a cam 17 which is employed positively to return the clutch bolt 27. This mechanism is mounted below the driving head 9 of

the machine, as shown in Figure 1. During the rotation this cam 17 also operates the lower end of a bell-crank lever 28. the upper end 28a of which is connected by a rod 29 running horizontally across the base A of the machine to a tripping mechanism 30 for the chain feed clutch 31. Upon engagement of this clutch a pulley 32 rotates a reduction gear 33 and chain sprockets 34 (Figures 2 and 3) which in turn drive one of the chain sprockets 24 of the aforesaid chain feed mechanism. The two fixed projections 25 of the chain feed mechanism are located at equidistant points of the chain 23 and the latter is so arranged that in a rivet feeding movement of the chain a rivet is pushed to a point immediately in front of a spring-loaded tongue 35 (Figures 9 and 10) preparatory to the rivet being forced into the two-part pocket 18 which is carried in front of the tongue, as shown in Figures 1 and 10. As soon as one of the projections 25 has passed the tongue 35 a further clutch tripping mechanism 36 is operated by means of a cam 37, fixed to a shaft 38 rotated by the aforesaid reduction gear 33, to engage what may be termed a rivet positioning clutch 39 (since it causes the actuation of mechanism to force the rivet into the two-part pocket) and disengage the chain feed clutch 31. This result is secured in that a second cam 40 on the shaft 38 positively pushes home the clutch bolt of the chain feed clutch tripping mechanism 30 to disengage the chain feed operating clutch 31 from the driving pulley 32 and the rivet positioning clutch 39 which has been engaged by the cam 37 is then driven by the pulley to rotate a crankshaft 41 which through a connecting rod 42 and push rods 43 moves the spring-loaded tongue 35 towards the rivet bearing head 9 and pushes the rivet positively into the two-part pocket 18 by which it is held until the rivet driving head clutch 19 is engaged to perform a rivet setting operation.

The end of the spring loaded tongue 35 normally lies between the two horizontal strips 22 (Figures 9, 10 and 13), but when a rivet is being carried along the horizontal track, by means of one of the projections 25, the rivet slightly lifts the tongue against the action of its spring and passes beneath it. (See Figure 9.) After the rivet and the projection have passed, the tongue 35 drops back into the space between the horizontal strips, as shown in full lines in Figure 9. When the projection 25 reaches the limit of its horizontal travel, the chain feed clutch 31 is tripped and the chain 23 stops.

The machine frame comprises a part 44 of substantially C shape the upper part of the C constituting the head B of the machine and carrying the anvil 10 while the lower part of the C is formed by a portion of the base A. The latter consists of a base plate 45, a short standard 46 upon which the rivet driving head mechanism 9 is erected, a second standard 47 supporting the head B and a horizontal member 48 extending between the two standards and forming the lower part of the C shaped part 44. The base plate 45 supports a motor 49 between the standards 46 and 47, this motor providing the motive power for performing the operations already described. Thus the motor shaft is provided with a pulley 50 from which the crankshaft 11 of the rivet driving head mechanism 9 is driven through a belt 51 and pulley 52. Also carried on the motor shaft is a pulley 53 which through a belt 54 drives a pulley 55 mounted on a shaft 56 outstanding from the standard 47. A smaller pulley

57 is also carried on the shaft 56 and drives through a belt 58 the pulley 32 already referred to. The latter and the clutch mechanisms and crankshaft 41 which it drives are mounted, together with the hopper mechanism 20, upon a rearward horizontal extension 48a of the standard 47, as will be evident from an examination of Figure 1. It will also be clear that the chain wheels 24 of the chain drive 23 are carried by supports 59 erected upon the horizontal members 48 and 48a of the machine frame. The horizontal strips 22, forming the track or channel 26 along which the rivets are fed, are attached to the supports 59 by plates 60 as shown in Figures 2 and 12.

The anvil 10 is fixed in axially adjusted position in a slide 61 which is slidable in guides 62 and 63 carried by a member 64 upstanding from the head B of the machine. The anvil 10 is adjustably carried by the slide 61 by being threaded therethrough and is fixed in adjusted position by nuts threaded thereon above and below the slide 61. Thus the anvil 10 can be raised into the position shown in Figure 1 to increase the gap of the C to enable an aircraft wing, for example, carrying stiffeners to support the skin plates and carried on a travelling carriage with the stiffeners projecting from the upper surface of the wing, to pass into the gap. This raising of the anvil 10 is performed by means of toggles 65 linked to a counter-weighted lever 66 movable about a pivot formed by a shaft 75 by means of a hand lever 68. The link is indicated at 69 and the counter-weight of the lever 66 at 70; it will be seen that the upper member of the toggle 65 is pivoted to the member 64 at 71 and the lower member to the upper end of the slide 61 at 72. In addition to raising the anvil 10 movement of the hand lever 68 also operates the main clutch mechanism 19 on the rivet driving head 9 to start the cycle of operations, the arrangement being such that the clutch cannot be tripped until the hand lever 68 has been operated to lower the anvil 10 into its rivet setting position. This result is secured in the embodiment illustrated in the following manner. The hand lever 68 is hinged between two lugs 73 on a disc 74 fast on the shaft 75 which rotates in bearings 86 and 87 and forms the pivot of the aforesaid counter-weighted lever 66 which is also fixed to the shaft. The hand lever 68 can swing at right angles to the disc on its hinge pin 76 and also between two projections 77 aligned with the lugs 73 to relieve the twisting moment on the latter when the hand lever is operated. In partially rotating the hand lever to lower the anvil 10 it climbs up a cam surface 78 formed on a member which supports the disc 74 and constitutes a part of the machine head B. The end of the cam surface 78 forms one side of a slot 80 (Figures 7 and 8). When the lever 68 reaches the end of the cam surface 78 which constitutes a stop preventing actuation of the lever 68 to start the actuation of the main clutch mechanism, it has moved the anvil 10 to its lowered position and the lever can only then be pushed inwardly into the slot 80 towards the disc 74. It will be appreciated that when the hand lever is in the slot it is impossible for it to move to the left to raise the anvil. When the lever is pushed towards the bottom of the slot it engages a spring loaded spindle 81 which it moves against the spring pressure to operate a bell crank lever 82. Rotation of the latter pulls a flexible cable or other connection 83 (Figures 1, 2 and 5) to operate the normal bolt tripping device 84 on the rivet driv-

ing head clutch mechanism 19. A second spring loaded plunger 85 may be provided to hold the hand lever away from the bottom of the slot until the lever 68 is pressed inwardly to overcome the spring pressure of this second plunger. By this means the rivet driving head clutch mechanism is not set into operation before desired.

What I claim and desire to secure by Letters Patent is:

1. In a rivet setting machine, rivet setting mechanism including an anvil and a rivet driving head beneath said anvil, a rivet track leading toward said setting mechanism and having means for supporting rivets therein with their shanks upwardly presented, an endless feeding member located beneath said track and having a rivet engaging member positioned while in one stretch of its path to project into said track, and means for driving said feeding member in a direction to cause said engaging member to move a rivet in said track toward said setting mechanism.

2. A rivet setting machine comprising a substantially C shaped frame, opposed supports carried by the free ends of said frame, rivet driving means carried by one of said supports, an anvil carried by the other of said supports in opposed relation to said rivet driving means, one of said supports being movable toward and from the other support between an operative position for riveting and an inoperative retracted position facilitating the introduction and removal of work, toggle arms, one of which is connected to said movable support and the other of which is connected to said frame and being in made position when said movable support is in operative position and broken when said movable support is in retracted position, means for making and breaking said toggle, means for actuating said rivet driving means, and interlocking connections between said toggle making and breaking means and said actuating means preventing operation of said actuating means except when said toggle is made.

3. A rivet setting machine comprising a substantially C shaped frame, opposed supports carried by the free ends of said frame, rivet driving means carried by one of said supports, an anvil carried by the other of said supports in opposed relation to said rivet driving means, one of said supports being movable toward and from the other

support between an operative position for riveting and an inoperative retracted position facilitating the introduction and removal of work, means including a lever fulcrumed on a pair of angularly related axes movable about one of said axes to move said movable support, means including a normally open clutch for actuating said rivet driving means, and means for closing said clutch positioned to be actuated by swinging of said lever about the other of said axes but only when said lever is in the angular position about said one axis when said movable support is in operative position.

4. In a rivet setting machine, rivet setting mechanism, means for supporting a rivet in operative relation to said mechanism, a rivet track leading toward said supporting means, a spring held element normally projecting into said track in the path of motion of rivets in said track, means effective to feed rivets one by one along said path past said element which yields to permit passage of such rivets in between said element and supporting means, and means for moving said element toward and from said supporting means to move a rivet located between said element and supporting means into said supporting means in operative relation to said setting mechanism.

5. A rivet setting machine comprising a substantially C-shaped frame, opposed supports carried by the free ends of said frame, rivet driving means carried by one of said supports, an anvil carried by the other of said supports in opposed relation to said rivet driving means, one of said supports being movable toward and from the other support between an operative position for riveting and an inoperative retracted position facilitating the introduction and removal of work, means including a lever movable about its fulcrum for moving said movable support, means for actuating said rivet driving means, said lever being mounted for movement other than about its fulcrum after it is in position to hold said movable support in operative position, and means associated with said rivet driving actuating means and said lever and operable by said lever to effect operation of said rivet driving actuating means when the second mentioned movement of said lever is initiated.

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