June 29, 1943. W. C. DENT 2,323,016

MACHINE FOR SETTING OR DRIVING RIVETS AND THE LIKE

Filed July 25, 1941 3 Sheets-Sheet 1

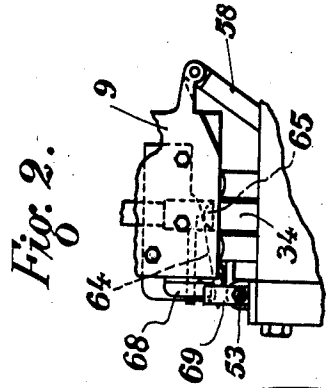


Fig. 2.

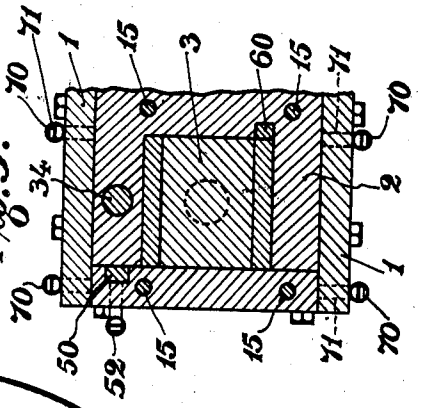


Fig. 3.

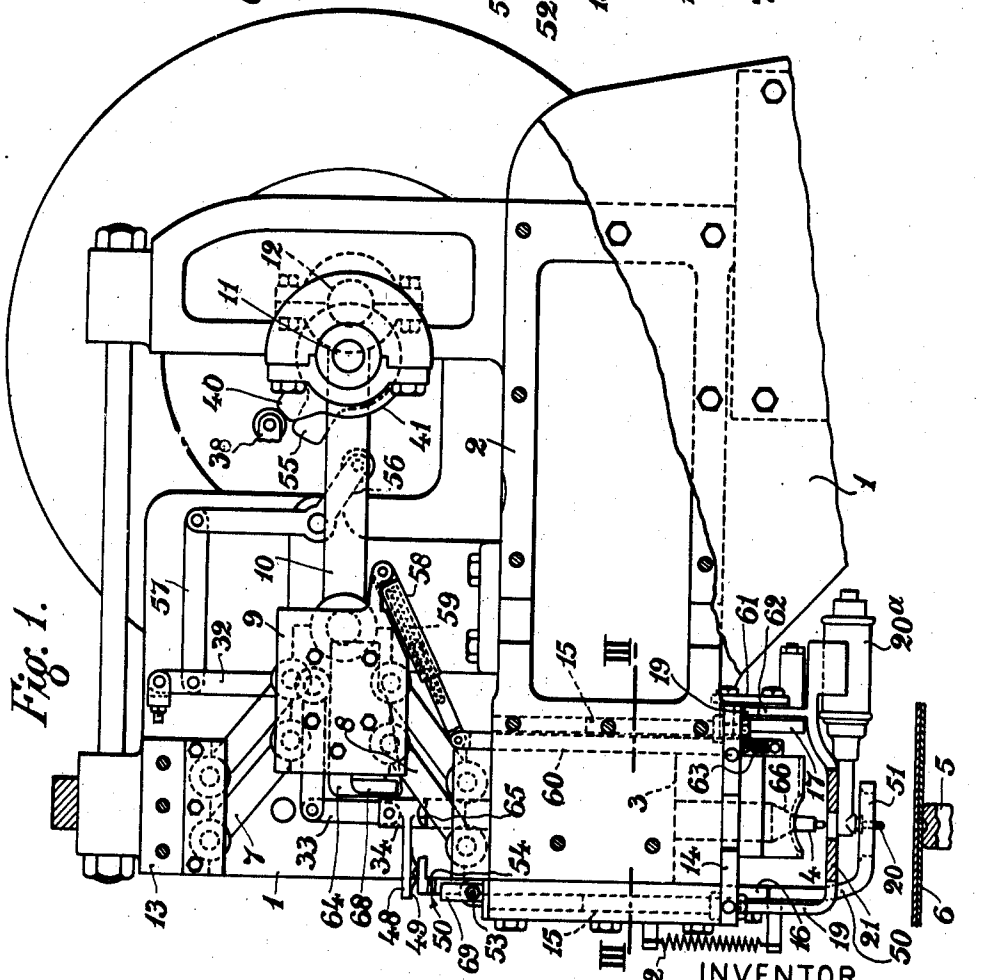


Fig. 1.

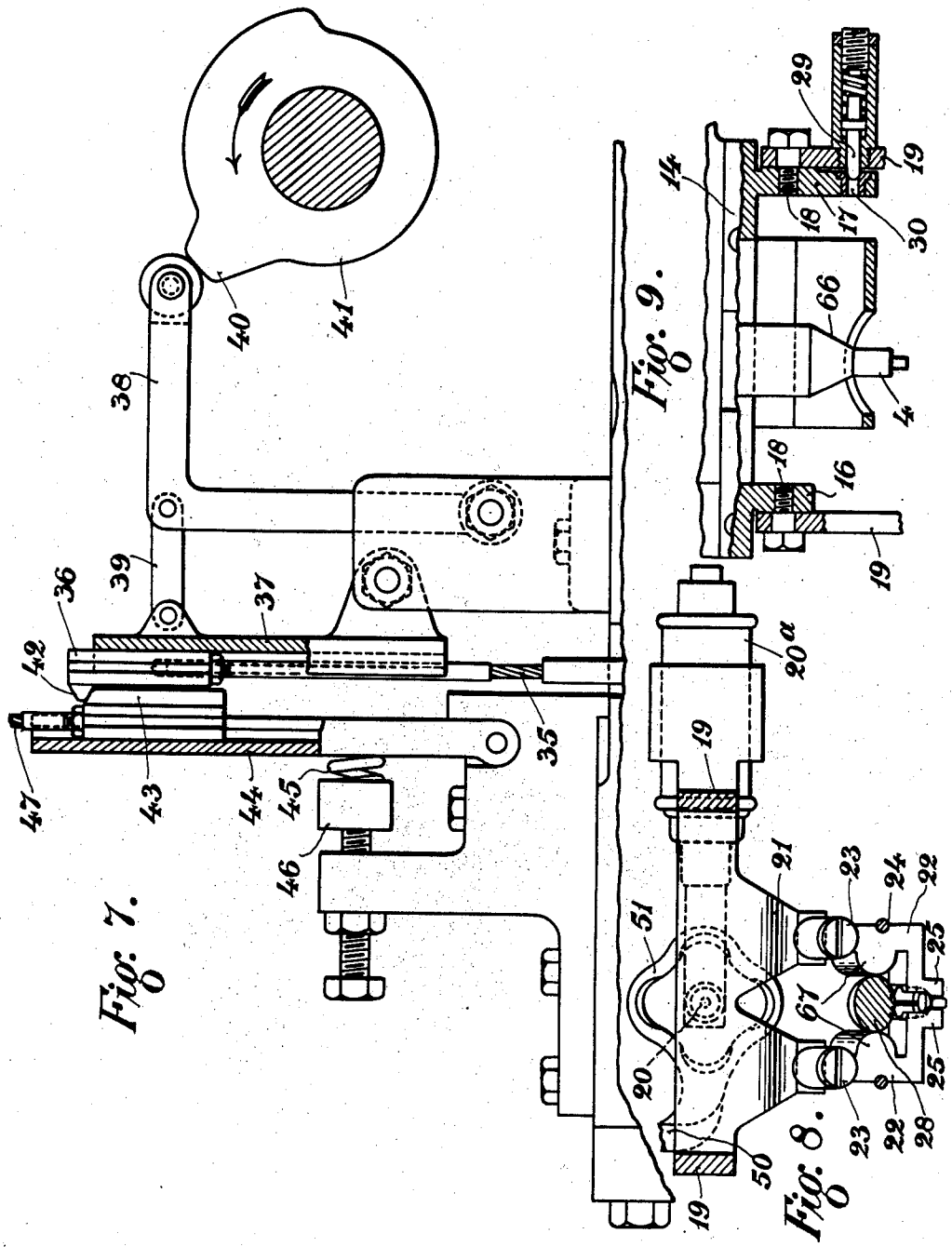
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MACHINE FOR SETTING OR DRIVING RIVETS AND THE LIKE

Filed July 25, 1941 3 Sheets-Sheet 2



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MACHINE FOR SETTING OR DRIVING RIVETS AND THE LIKE

Filed July 25, 1941 3 Sheets-Sheet 3

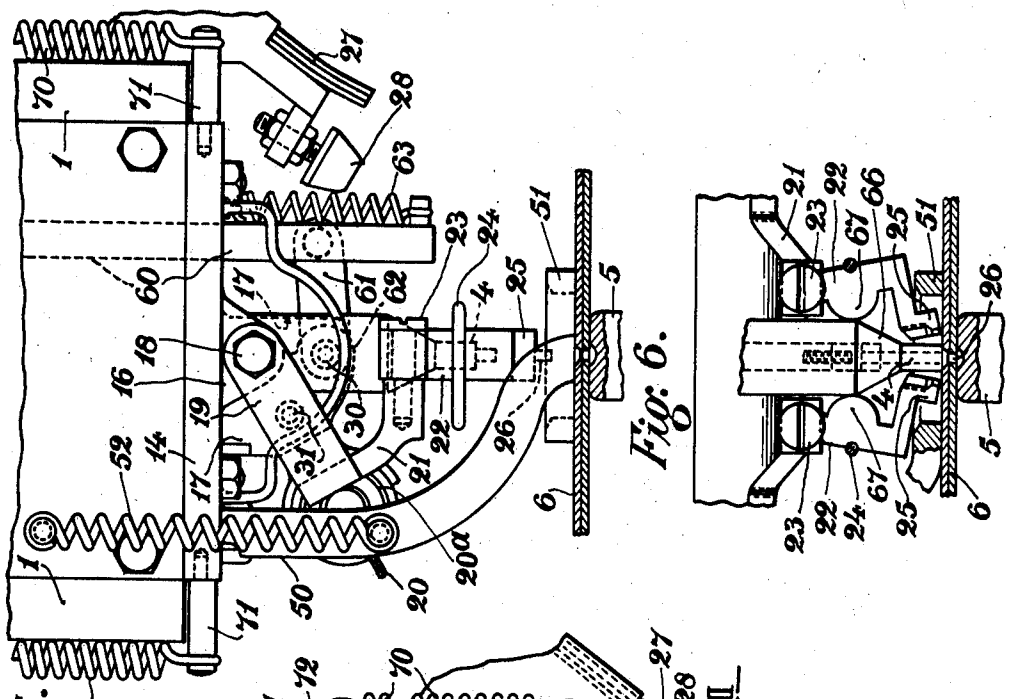


Fig. 5.

Fig. 6.

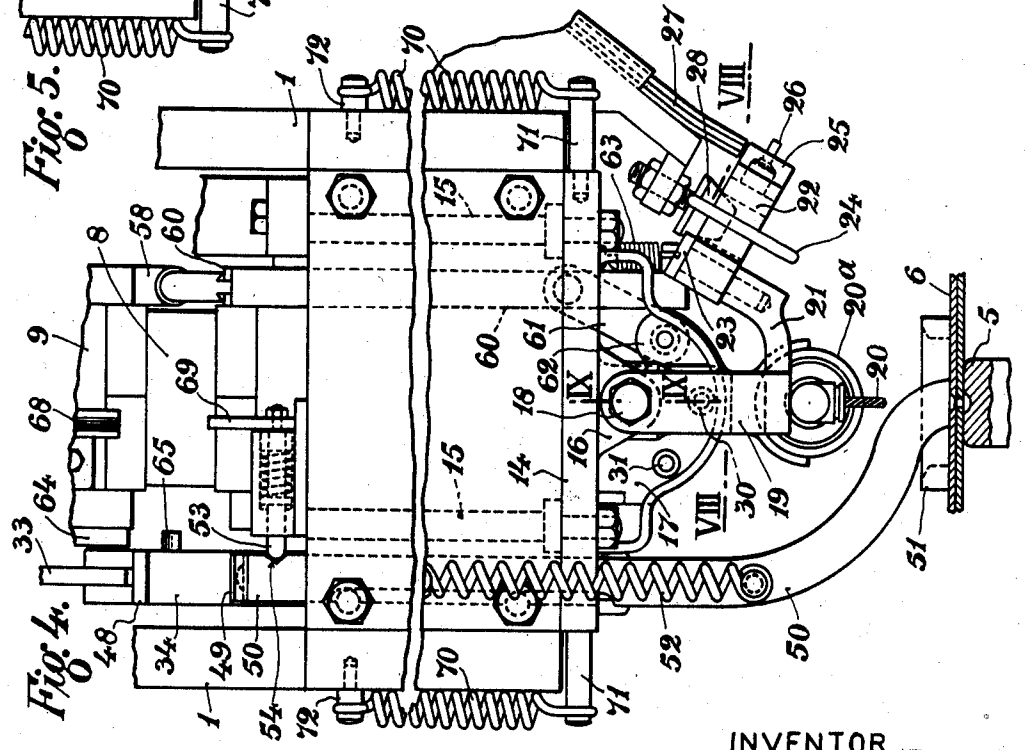


Fig. 4.

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UNITED STATES PATENT OFFICE

2,323,016

MACHINE FOR SETTING OR DRIVING RIVETS AND THE LIKE

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Application July 25, 1941, Serial No. 404,015
In Great Britain July 26, 1940

6 Claims. (Cl. 78—48)

This invention relates to machines for setting or driving rivets and the like, being of the kind in which the said rivets or the like are fed in succession to a pocket or holding device for operation upon by a setting or driving tool.

The object of the present invention is to provide a riveting or like machine, designed for use particularly with very short rivets or the like, wherein provision is made for the visible location of the work in relation to the rivets, so as to ensure said rivets properly entering the holes provided for their reception in the work components to be joined.

According to the invention, in a riveting or like machine, of the kind referred to, the work is visibly located by means of a locating pin or projection (which may be rotatable) visibly situated above the work and not forming part of the rivet or like setting or driving tool. The locating pin or projection is adapted to be visibly lowered into the holes in the work and then raised and moved out of the way while the seting tool descends.

Also according to the invention, a riveting or like machine, of the kind referred to, comprises a vertically-movable slide or member having pivoted to it an angularly-movable member carrying a locating projection and a rivet or like receiving pocket either of which is adapted to be brought into operative position in relation to the work. The locating projection is adapted first to be brought into position and lowered to locate the work and then, after said projection has been raised, the angularly-movable member is adapted to be turned to bring the pocket into operative position for the setting or driving of the rivet or the like.

The angularly-movable member may be automatically operated from one position to another by the machine, and may be held in the set position by a retaining or indexing device. The slide may be operated by a suitable part of the machine at the required times to lower the locating projection and the pocket to the work. It may, for example, be initially lowered to take the locating projection into the holes of the work by means of a pedal that controls the clutch of the machine. It may then be raised by a cam and subsequently lowered to take the pocket to the work by a cam on the ram-operating mechanism, being again raised, after setting of the rivet, by a spring or other means.

As the locating projection is lowered, a clamp device is also lowered to clamp the work components, and it may be held in clamping position by a suitable retaining device.

Figure 1 of the accompanying drawings is a vertical sectional elevation of a riveting machine in accordance with the present invention, the ram and tool being shown raised.

Figure 2 is a fragmentary elevation showing the cams of the toggle block in operation when the ram is lowered.

Figure 3 is a horizontal section on line III—III, Figure 1.

Figure 4 is a front elevation, on a larger scale, showing the angularly-movable member carrying the locating pin and pocket, when in a position with the locating pin operative over the work.

Figure 5 is a similar view when the said angularly-movable member has been swung over to bring the pocket into operative position.

Figure 6 is a sectional view showing the pocket opened after the setting tool has descended.

Figure 7 is a side elevation of the pedal-operated mechanism for lowering the locating pin, and of the cam that controls said mechanism.

Figure 8 is a section on line VIII—VIII, Figure 4, showing the pocket in plan.

Figure 9 is a vertical section on line IX—IX, Figure 4, showing the spring plunger device for indexing the swinging frame member carrying the locating pin and pocket.

Referring to the said drawings, the riveting machine therein shown comprises a head frame having two spaced side plates or cheeks 1 between which a giude block 2 is fixed. A vertically slidable ram 3 is guided within the forward end of the block 2 and carries the setting tool 4 which cooperates with a stationary anvil 5 situated below the head and upon which the work 6 is placed. The ram 3 may conveniently be operated by toggle mechanism comprising upper and lower pairs of links 7, 8, pivoted to a central member 9 coupled by a connecting-rod 10 to a crank 11 on the main shaft 12 of the machine, the upper links 7 being pivotally anchored to a top block 13 fixed between the head side plates 1 and the lower links being pivoted to the ram 3.

Below the guide block 2 is a vertically-movable slide consisting of a plate 14 carrying vertical guide pins 15 slidable in guide holes in said block 2. Upon the underside of this slide 14 are two diametrically-opposite depending lugs or brackets 16, 17, between which is pivoted, at 18, 18, a frame 19 of inverted U-shape carrying a locating pin 20. This pin may simply be a plain shank, but, as shown, it may take the form of a drill operated by pneumatic or other means,

the drill casing 20a from which it is driven being attached to the underside of the pivoted frame 19. This drill may be used for locating the work as well as for clearing out and aligning the holes in the two work components to ensure that the rivet can subsequently be properly fitted into the holes. The pivoted frame 19 is provided at one side with a lateral arm or bracket 21 which, when the frame 19 is vertical (Figure 4) extends upwardly and obliquely, and to which is attached a rivet-receiving pocket device consisting of a pair of levers 22 pivoted at 23 to the arm or bracket 21 and tending to be closed together by a spring 24, the levers carrying at their outer ends inwardly-projecting short arms or jaws 25 recessed at their ends to receive the head of a rivet 26 between them. When the pivoted frame 19 is vertical and the slide 14 is raised (Figure 4), the pocket is lifted to a position in which the jaws 25 are adjacent the end of a chute 27 (Figure 4) descending from a rivet hopper, so that the pocket can receive a rivet from the chute, the jaws being slightly opened by the levers 22 engaging a fixed cone 28; and in this position the locating pin 20 is above the work and anvil. By turning the pivoted frame 19 angularly, the pocket device 22, 25, can be swung into a depending vertical position over the holes in the work, as in Figure 5, the locating pin 20 then being raised angularly into an inoperative position. The pivoted frame 19 is adapted to be retained in one or other of the two positions, with either the locating pin or the pocket in an operative position, by a suitable holding or indexing device, such as a spring plunger 29 (Figure 9) on the frame 19 engaging one or other of two spaced holes or recesses 30, 31, in the bracket or lug 17 on the slide.

The slide is adapted to be lowered initially, to take the locating pin to the work, by the operation of a pedal which also controls the clutch of the machine. This pedal is connected through a yielding coupling device to a bellcrank lever 32 (Figure 1) mounted on one side of the frame and having a horizontal arm connected, by a vertical link 33, to a vertical rod 34 extending upwardly from the pocket and locating-pin slide 14, so that the operation of the pedal depresses said slide, the work being located, during this operation, so that the pin 20 enters the holes in the work components. The pedal mechanism and yielding coupling device may be as described in my application Serial No. 404,016, the pedal being connected by a cable 35 to a vertically-moving slide 36 (Figure 7) mounted in a guide in a lever 37 normally held rigidly in a vertical position by a bell-crank 38 connected by a link 39 to lever 37 and supported against the nose 40 of a cam 41 which, when the clutch is engaged, is operated to cause the said vertical lever 37 to be released or collapsed. The pedal-operated slide 36 carries a V-shaped nose-piece 42 which engages over the curved upper end of another slide 43 mounted in guides in the rear face of an upstanding lever 44 supported against a spring 45 bearing upon an abutment 46, the spring being sufficiently strong to ensure the second slide 43 being drawn downwards by the first slide 36 for normal lowering of the locating-pin but yielding, to allow the one slide to move over the other, in the event of the locating pin failing to enter the holes of the work due to faulty location. The slide 43 on the spring-supported lever 44 is connected by a cable 47 passing across the machine to the bell-crank lever 32 that operates the pocket and locating-pin slide 14.

The means whereby the pedal throws in the clutch of the machine may also be as described in my application Serial No. 404,016 or it may comprise any other suitable mechanism.

During the initial descent of the main slide and locating pin, a clamping device is lowered to hold the work components together during subsequent riveting. For this purpose, the rod 34 on the main slide 14 has a horizontal arm 48 bearing, through the medium of a spring 49, upon the upper end of a vertical slide 50 the lower end of which terminates in a horizontal clamping ring or frame 51 lying over the work. As the bell-crank lever 32 and rod 33 are operated to lower the main slide 14, the arm 48 presses the clamping ring on to the work with a yielding pressure and against the action of a spring 52 tending to raise the clamping ring. When thus lowered, the clamp slide 50 is held in this position by a spring plunger or catch device 53 (Figure 4) engaging a recess 54 in the slide.

When the machine is in operation, the pedal control is thrown out of operation by the collapsing of the lever 37 carrying the pedal-operated slide 36, as above described, the locating pin 20 having entered the holes in the work. The clutch is then engaged and the machine started and a cam 55 (Figure 1) then comes into operation to raise the main slide 14 and to withdraw the said pin. This cam 55, which is on the main shaft 12, acts on the arm 56 of a bell-crank lever that is connected by a link 57 to the vertical arm of the main bell-crank lever 32 which operates the main slide. The arm 56 is in the path of the cam 55 owing to the forward movement of lever 32 and thus the slide 14 is caused to be raised, although the clamp 51 remains pressed upon the work by reason of the catch device 53. As the main slide is thus raised the frame 19 is arranged to be swung over to cause the pocket jaws 25 to come into a vertical position in alignment with the located holes in the work. For this purpose the member 9 of the toggle mechanism (Figure 1) has one end of a telescopic link 58 connected to it, the link containing a compression spring 59 and its other end being pivoted to the upper end of a vertical slide 60 the lower end of which projects below the slide plate 14, being connected by a link 61 to a tail-piece or arm 62 on the frame 19. As the ram 3 is descending while the slide 14 is rising the toggle member 9 moves downwards in an oblique direction and through the telescopic spring link 58 causes the slide 60 to move downwards and, by means of the lower link 61, causes the frame 19 to be swung over from the position in Figure 4 to the position in Figure 5, bringing the pocket over the work, the frame being held in this position by the plunger 29 engaging the indexing hole 31. A spring 63 tends to raise the slide 60.

As the ram continues to descend the spring 59 in link 58 is further compressed and the pocket is lowered on to the work to take the rivet into the holes. For this purpose the toggle member 9 carries a cam 64 which, as said member moves obliquely downwards, engages a projection 65 on the rod 34 (Figures 1 and 2) and thereby lowers the slide 14 and the pocket thereon, causing the rivet to enter the holes in the work. As the tool 4 approaches the bottom of its stroke, a conical enlargement 66 on the tool shank (Figure 6) engages cam projections 67 on the pocket

levers 22 and thereby separates the pocket jaws to release the rivet, as described in my application Serial No. 404,016. The tool then effects the setting of the rivet and at about the same time another cam 68 on the toggle member 9 engages an arm 69 on the catch plunger 53 (see Figures 1, 2 and 4) so as to withdraw the latter from the notch 54 in the clamp slide 50 which is thus free to be raised by its spring 52.

As the ram rises after the setting of the rivet, the slide 14 is raised by means of springs 70 connected between pins 71 in the sides of the slide and pins 72 on the side plates 1 of the machine. As it rises and the telescopic link 58 extends the spring 63 lifts the slide 60 and the link 61 throws over the frame 19 to the position shown in Figure 4, with the locating pin 20 in position for the next operation.

Briefly, the sequence of operations is as follows: the locating pin 20 being in operative position (Figure 4), the main slide 14 is lowered by the pedal to locate the work. The cam 55 comes into operation to raise the slide 14 and pin 20, and the link 58 and slide 60 act on the pivoted pocket and locating-pin frame 19 to swing it over and bring the pocket into position (Figure 5). The slide 14 is then lowered by the cam 64 on the toggle mechanism to insert the rivet into the work, and the setting tool 4 descends on to the rivet to set the same. The slide is next raised by its springs 70 as the ram ascends and the spring 63 acting on slide 60 and link 61 causes the pivoted frame to be again swung over to lift the pocket into a position adjacent the chute 27 (Figure 4) and to bring the locating pin 20 in an operative position for the next locating operation.

The clamp 51 is lifted by its spring 52 as the ram rises.

I claim:

1. A machine for setting rivets and the like comprising a setting tool, an anvil upon which the work is placed, a vertically movable slide, a displaceable member mounted on said slide, a locating projection and a rivet or like receiving pocket mounted on said member, means for operating said member to bring either the locating projection or the pocket into operative position over the anvil and work, a clutch for starting the machine, a pedal controlling the clutch to start the machine but being inoperative upon the clutch during its initial movement, a sliding member connected to the pedal and having an inclined nose part, a lever upon which the sliding member is mounted, a second sliding member engaged by the inclined nose part of the first sliding member, a cam normally supporting the lever until the clutch is engaged and the machine is started but moving into an inoperative position after engagement of the clutch to render the pedal inoperative upon the second sliding member, a lever connected to the second sliding member and operative upon the vertically-movable slide whereby the initial operation of the pedal causes the slide to descend, before the clutch is engaged, for lowering the locating projection, when in operative position, into holes in the work, means operated by the machine for raising the locating projection from the work, means operated by the machine for operating the displaceable member to bring the pocket into operative position, mechanical means for lowering the pocket to the work, means for lowering the setting tool on to the work, means for raising the pocket, and means for again operating the displaceable member to bring the locating projection into operative position.

2. A machine for setting rivets and the like comprising a setting tool, an anvil on which the work is placed, a vertically-movable slide, a pivoted member mounted on said slide, a locating projection and a rivet or like receiving pocket on said pivoted member, means for operating the pivoted member to bring either the locating projection or the pocket in operative position over the anvil and work, a clutch for starting the machine, a pedal operative on the clutch only during its final movement for starting the machine, a sliding member connected to the pedal and having an inclined surface, a lever upon which the sliding member is mounted, a second sliding member engaged by the inclined surface of the first sliding member, a cam normally supporting the said lever until the clutch is engaged and the machine is started but then moving into an inoperative position to render the pedal inoperative upon the second sliding member, a spring-supported lever carrying the second slide said lever yielding if the resistance to the pedal exceeds a predetermined value, a lever connected to the second sliding member and operative upon the vertically-movable slide for lowering the locating projection, when in operative position, into holes in the work, and means for raising the locating projection from the work.

3. A machine for setting rivets and the like comprising a main shaft, a setting tool driven from the main shaft, an anvil upon which the work is placed, a vertically-movable slide, a pivoted member on the slide, a locating projection and a rivet or like pocket on the pivoted member, means for operating the pivoted member to bring either the locating projection or the pocket into an operative vertical position over the anvil and work, a clutch for starting the machine, a pedal operative on the clutch only during its final movement for starting the machine, means operated by the initial movement of the pedal for lowering the slide when the locating projection is in operative position to take said projection into holes in the work, means for rendering the pedal inoperative on the slide when the clutch is engaged, a cam on the main shaft of the machine acting on the slide to raise the locating projection from the work, mechanical means for automatically bringing the pocket into operative position when the slide is raised, means for lowering the slide and pocket, means for raising the slide and pocket after setting of the rivet, and automatic means for finally bringing the locating projection into operative position.

4. A machine for setting rivets and the like comprising a main shaft, a ram, means for operating the ram, a setting tool carried by the ram, an anvil upon which the work is placed, a vertically-movable slide, a pivoted member on the slide, a locating projection and a rivet or like receiving pocket on the pivoted member, means for operating said pivoted member to bring either the locating projection or the pocket into an operative vertical position, a clutch, a pedal operative upon the clutch only during its final movement for starting the machine, means operated by the pedal only during its initial movement for lowering the slide when the locating projection is in operative position to take said projection into holes in the work, means whereby the pedal is rendered inoperative upon the slide when the machine has been started, a cam on the main shaft of the machine acting on the slide to raise

the locating projection from the work, means for bringing the pocket into operative position, a cam on the ram-operating mechanism for lowering the slide and pocket, and means for raising the pocket after setting of the rivet.

5. A machine for setting rivets and the like comprising a setting tool, an anvil on which the work is placed, a vertically-movable slide, a pivoted member mounted on said slide, a locating projection and a rivet or like receiving pocket on said pivoted member, means for operating said pivoted member to bring either the locating projetcion or the pocket into operative vertical position over the anvil and work, means controlled by the operator for lowering the slide when the locating projection is in operative position to take said projection into holes in the work, a work clamping device, means operated by the lowering of the slide for depressing said clamping device upon the work, catch means for retaining said clamping device in its depressed position, means for raising the slide, means for bringing the pocket into operative position, means for lowering the slide to take the pocket to the work, means for operating the setting tool to set the rivet or the like, means for releasing the catch means holding the clamping device when the rivet is set, and spring means for raising the clamping device.

6. A power-driven machine for driving or setting rivets and the like comprising a vertically-reciprocating setting or driving tool, an anvil upon which the work is placed, a vertically-movable slide, an angularly-movable member pivoted to said slide, a locating projection on said angularly-movable member, a rivet or like receiving pocket also on said angularly-movable member either the locating projection or the pocket being adapted to take a position over the anvil and work, a clutch for starting the machine, a pedal controlling the clutch, means whereby the initial movement of the pedal lowers the slide when the locating projection is over the anvil and before the clutch is engaged in order to take said projection into pre-formed holes in the work, means whereby further operation of the pedal engages the clutch and starts the machine, means operated by the machine whereby the pedal is then rendered inoperative upon the slide, means whereby the machine then causes the slide to rise, means operated by the machine to cause the angularly-movable member to be swung over when the slide rises in order to bring the pocket into operative position, means for mechanically lowering the slide to cause the pocket to take a rivet into the work, means for causing the descent of the setting tool, means for again raising the slide, and means for turning the angularly-movable member to bring the locating projection into operative position.

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