April 26, 1932. A. R. HAVENER 1,855,235

RIVET SETTING MACHINE

Filed March 20, 1931 5 Sheets-Sheet 1

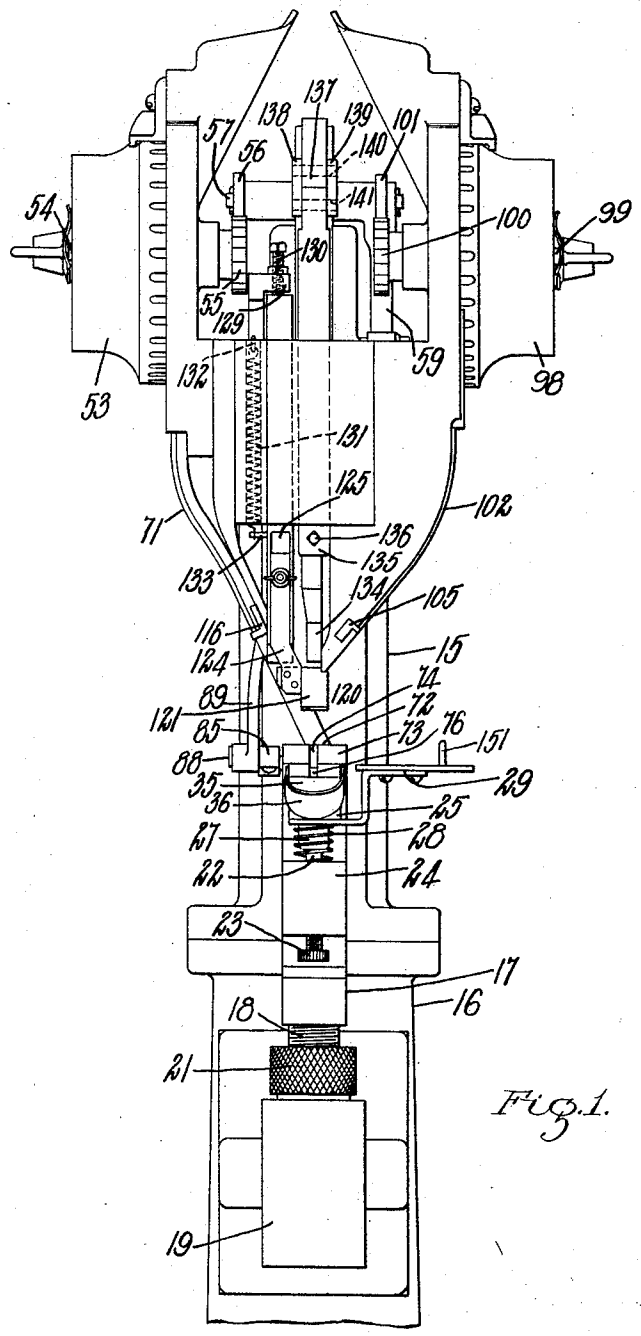


Fig. 1.

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RIVET SETTING MACHINE

Filed March 20, 1931 5 Sheets-Sheet 2

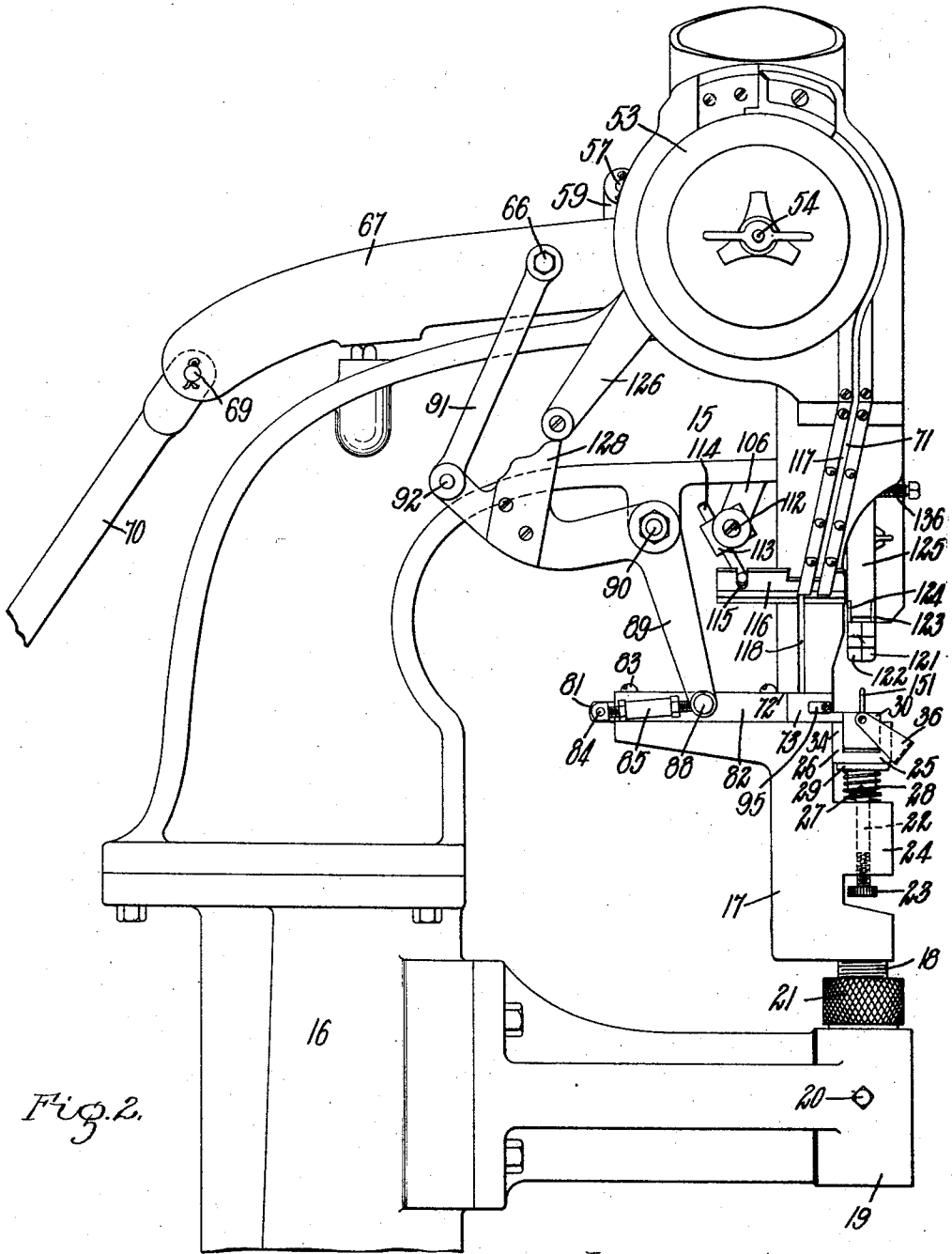


Fig. 2.

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RIVET SETTING MACHINE

Filed March 20, 1931 5 Sheets-Sheet 3

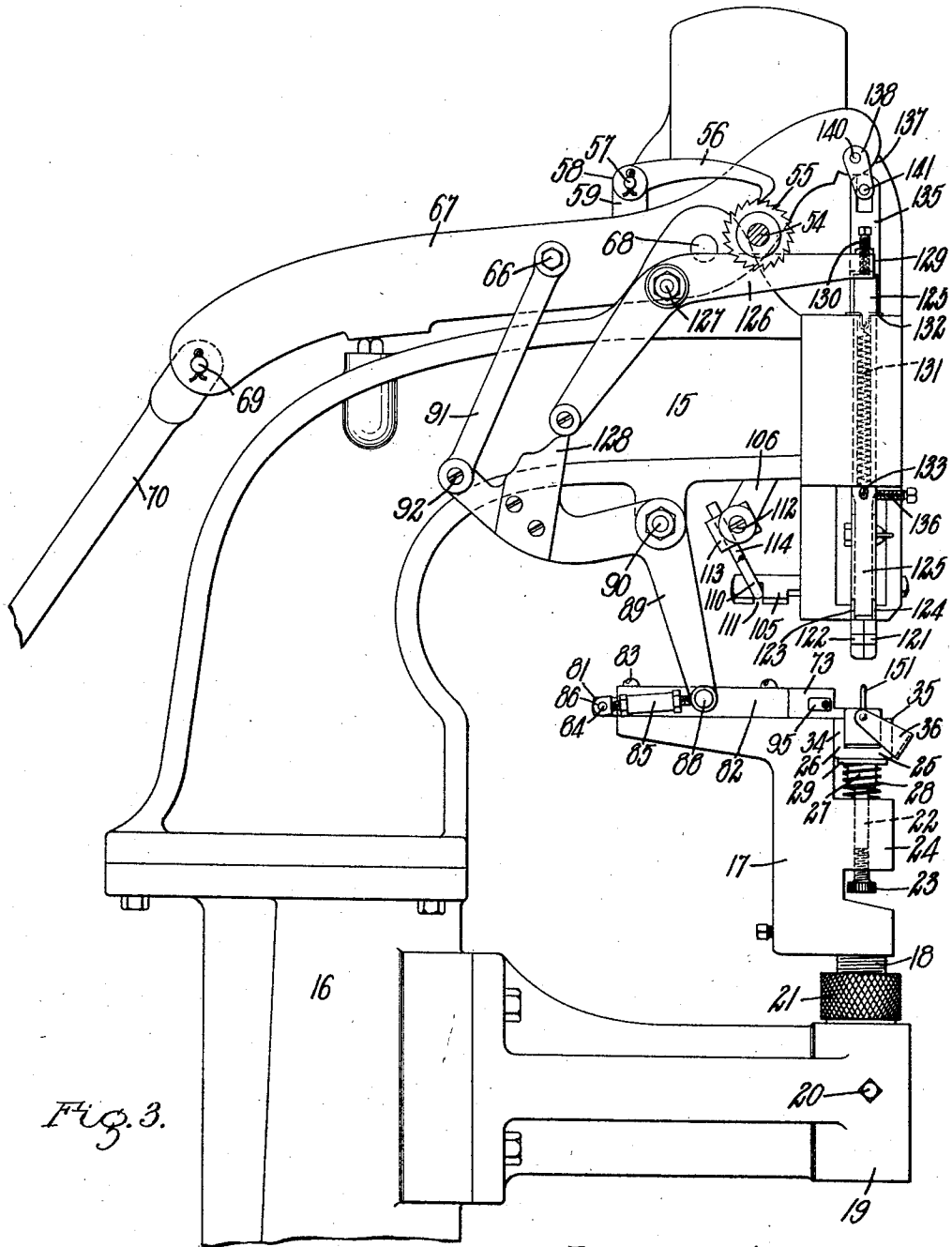


Fig. 3.

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RIVET SETTING MACHINE

Filed March 20, 1931 5 Sheets-Sheet 4

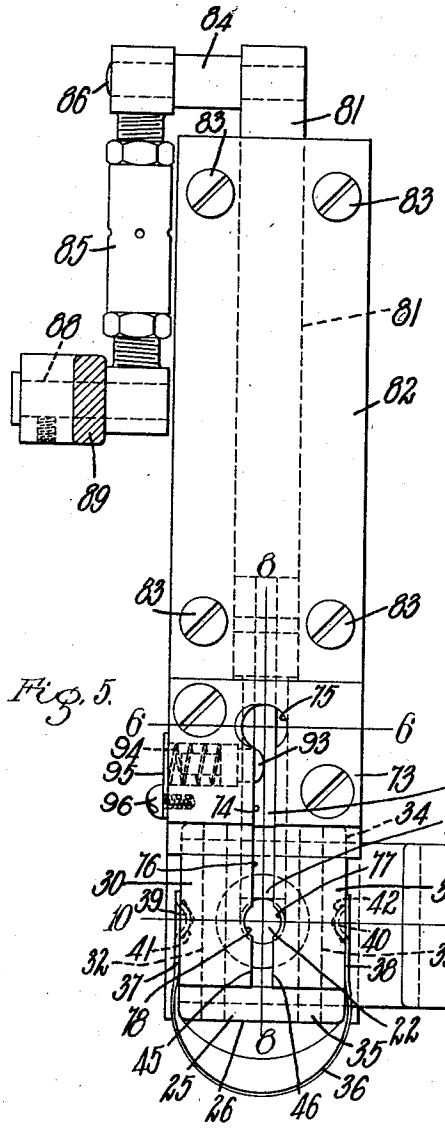


Fig. 5.

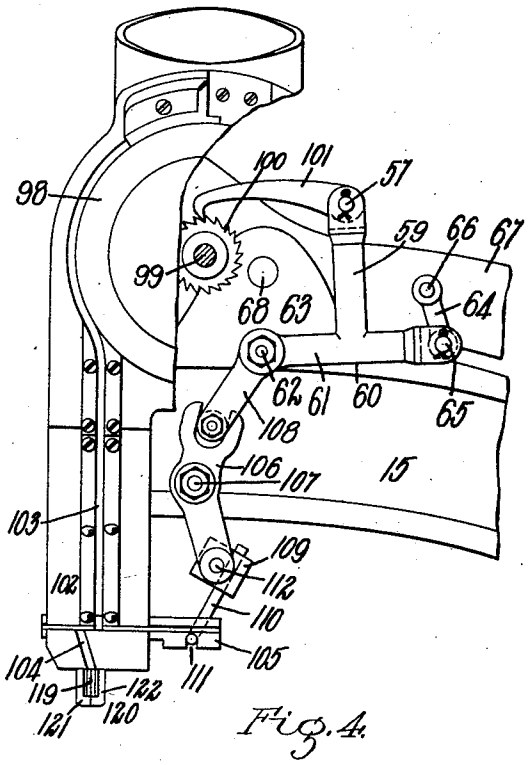


Fig. 4.

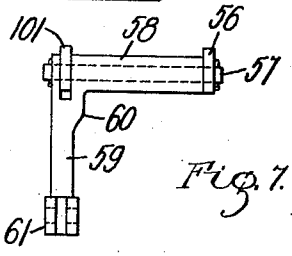


Fig. 7.

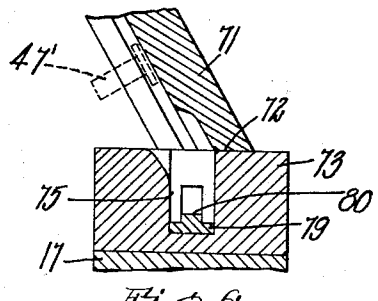


Fig. 6.

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RIVET SETTING MACHINE

Filed March 20, 1931 5 Sheets-Sheet 5

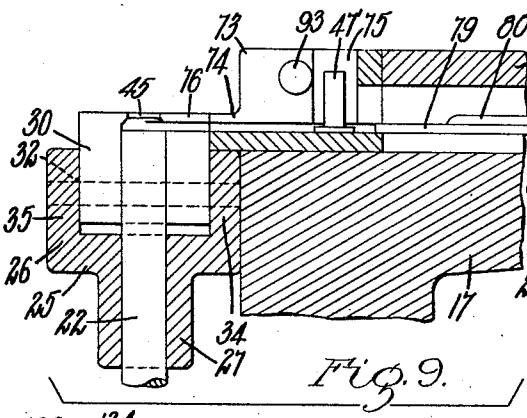


Fig. 9.

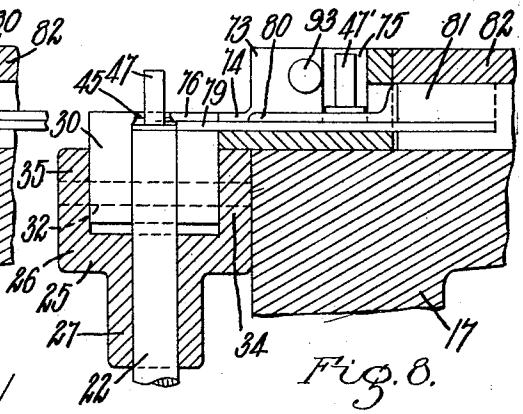
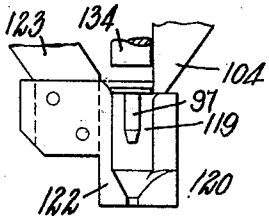


Fig. 8.



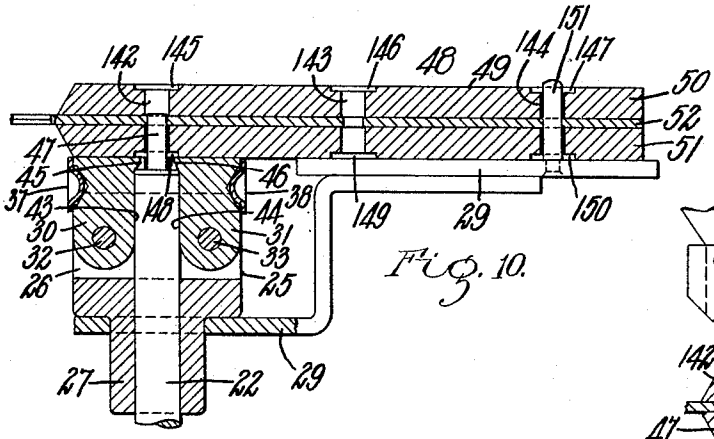


Fig. 10.

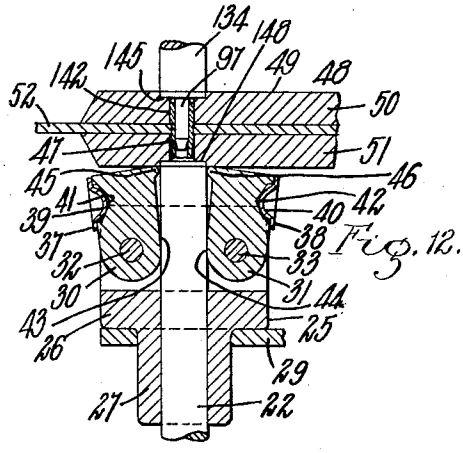


Fig. 12.

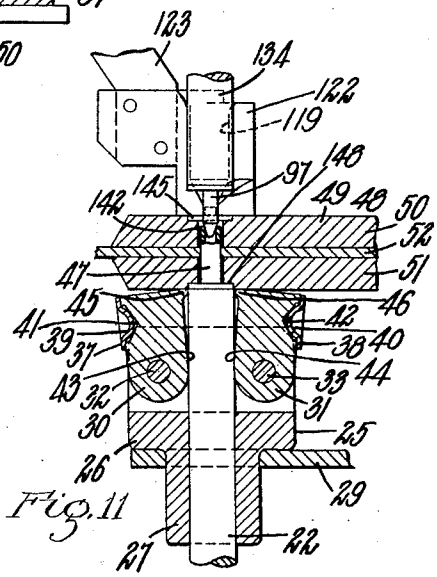


Fig. 11

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Patented Apr. 26, 1932 1,855,235

UNITED STATES PATENT OFFICE

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RIVET SETTING MACHINE

Application filed March 20, 1931. Serial No. 524,109.

This invention relates to a riveting machine.

The object of the invention is to fasten together a knife blade and its handle by means of a plurality of rivets extending through the knife handle and through the blade, the blade extending between two pieces of material, preferably wood, throughout the length of the handle, the rivets being inserted in the handle and through the blade in pairs, one rivet of each pair being a tubular rivet and the shank of the other rivet of each pair projecting into the shank of the tubular rivet, the diameter of the shank of the rivet which is inserted in the tubular rivet being slightly greater than the diameter of the bore of the tubular rivet, so that when the rivets are inserted in a handle and driven into each other as set forth, the shank of the tubular rivet will be expanded and firmly fasten the knife blade and the parts of the handle thereof together, and at the same time the rivets will be firmly fastened in the handle and knife blade due to the fact that the shank of the tubular rivet has been expanded within the pieces of material forming the handle.

The invention consists in a rivet setting machine embodying therein the different combinations of elements set forth in the different claims.

Referring to the drawings:—

Fig. 1 is a front elevation of a machine embodying my invention.

Fig. 2 is a left hand side elevation of the same.

Fig. 3 is a left hand side elevation similar to Fig. 2 with the exception that the hopper and raceway for feeding the tubular rivets is removed.

Fig. 4 is a side elevation broken away and partly shown in section of the upper portion of the machine, illustrating the hopper for feeding the solid shank rivets and mechanism for rotating the hopper shaft and for feeding rivets one at a time from the lower end of the upper portion of the raceway to the upper end of the lower portion of the raceway.

Fig. 5 is a detail plan view of the mechanism for holding a tubular rivet on the upper end of an anvil, and of mechanism for feeding tubular rivets one at a time from the lower end of a raceway on to the top of the anvil.

Fig. 6 is a sectional elevation taken on line 6—6, Fig. 5, illustrating the means for feeding the tubular rivets.

Fig. 7 is a detail rear elevation of the pawl lever by means of which a pair of pawls are actuated to rotate the shafts of two rivet hoppers.

Fig. 8 is a sectional elevation taken on the line 8—8, Fig. 5, illustrating the mechanism for feeding a tubular rivet from the bottom of its raceway on to the top of the anvil, the feed finger and its slide being shown in a forward position as it appears when just having fed a tubular rivet on to the top of the anvil.

Fig. 9 is a sectional elevation similar to Fig. 8, but with the feed finger and its slide retracted and another tubular rivet positioned to be engaged by the feed finger and fed forward on to the top of the anvil.

Fig. 10 is a sectional elevation taken on the line 10—10, Fig. 5, illustrating a knife blade and handle positioned to be fastened together by a pair of rivets, the rivet holder and carrier and the rivet driver being shown in elevated position.

Fig. 11 is a sectional elevation similar to Fig. 10, but with the rivet holder and carrier and the rivet driver in lowered position.

Fig. 12 is a sectional elevation similar to Fig. 11, but showing the driver in its lowermost position with the solid shank rivet driven into the tubular rivet, thus fastening the blade of the knife between the two parts of the handle.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, 15 is the frame of the machine supported upon a column 16. 17 is an auxiliary frame with a screw-threaded shank 18 projecting downwardly into a bracket 19 and fastened against rotation in said bracket by a set screw 20. A nut 21 has screw-threaded engagement with the screw-threaded

shank 18 and rests upon the bracket 19, whereby the auxiliary frame 17 and the parts thereon may be adjusted. The bracket 19 is fastened to the column 16.

An anvil 22 shown as cylindrical is mounted in a vertical position on the auxiliary frame 17 and is supported therein by a screw 23 having screw-threaded engagement with the lower end of an ear 24 on said auxiliary frame. A jaw carrier frame 25 is slidably mounted on the anvil 22 and consists of a U-shaped portion 26 which has a cylindrical shank 27 extending downwardly therefrom. The jaw-carrier frame 25 is supported upon a spring 28 which encircles the shank 27, its lower end bearing against the ear 24 and its upper end bearing against a portion of a work-support 29 which is rigidly fastened to the jaw-carrier frame 25.

A pair of jaws 30 and 31 are pivotally mounted upon pins 32 and 33, which pins are fastened to the opposite sides 34 and 35 of the jaw-carrier frame 25. The jaws 30 and 31 are normally positioned as illustrated in Fig. 10 and are held in this position by a U-shaped spring 36, the arms 37 and 38 of which are provided respectively with lugs 39 and 40 which project into corresponding recesses 41 and 42 in the jaws 30 and 31. The spring 36 thus holds the inner faces 43 and 44 of the jaws 30 and 31 against opposite sides of the anvil 22. The upper end of the anvil 22 is flat and when in their normal positions, the upper ends of the jaws 30 and 31 are level and flush with the top of the work-support 29. The jaws 30 and 31 are provided at the upper ends thereof and on their inner faces with teeth 45 and 46 which project inwardly toward each other over the top of the anvil 22 when in their normal position, as illustrated in Fig. 10, and thus position a tubular rivet 47 upon the upper end of the anvil 22.

A knife 48 which consists of a handle 49 in two parts 50 and 51 has a blade 52 positioned between the two parts 50 and 51 of the handle and is shown in Fig. 10 positioned in readiness to have the three pieces of material 50, 51 and 52 fastened together by rivets.

Prior to placing the handle 49 of the knife in the position illustrated in Fig. 10, the tubular rivet 47 is fed on to the top of the anvil 22 and between the teeth 45 and 46 of the jaws 30 and 31 as follows:—Tubular rivets en masse are contained within a hopper 53 which is fastened to a shaft 54 to which an intermittent rotation is provided by a ratchet 55 fast to the shaft 54 and rotated by a pawl 56 pivoted to a pin 57 which projects through a hub 58 on the upper end of an arm 59 on a pawl lever 60. The pawl lever 60 is T-shaped, and embodies therein a bell-crank lever 61 which is pivoted on a stud 62 fast to an ear 63 on the frame 15. A rocking motion is imparted to the bell-crank lever 61 by a link 64, the lower end of which is pivoted at 65 to the bell-crank lever and the upper end of which is pivoted to a stud 66 fast to a main rocker arm 67. The main rocker arm 67 is pivoted at 68 to the ear 63 of the frame 15 and extends rearwardly therefrom to receive a pin 69 to which is attached a link 70 which may be connected by suitable connections to a foot treadle, or if desired, to power driven mechanism. The tubular rivets are fed in a well-known manner from the hopper 53 down a raceway 71 which terminates at its lower end at 72 immediately above a block 73 which is fastened to the top of the auxiliary frame 17, and constitutes a stop to limit the upward movement of the jaw-carrier frame 25.

A horizontal guideway 74 is provided in the block 73, the entrance to the said guideway being arcuate in form as at 75, said guideway being in alignment with the space 76 between the adjacent teeth 45 and 46 of the jaws 30 and 31, this space being provided immediately above the anvil 22 with arcuate portions 77 and 78. A feed finger 79 is slidably mounted in the guideway 74 and has a plate 80 fast thereto, the rear end of the feed finger 79 being fastened to a slide 81 slidably mounted on the top of the auxiliary frame 17 and held thereon by a cap 82 which is fastened to the auxiliary frame 17 by screws 83. A reciprocatory motion is imparted to the slide 81 and to the feed finger 79 and plate 80 by a stud 84 fast to the rear end of the slide 81 and connected by a link 85, the rear end of which is pivoted at 86 upon the stud 84 and the front end of which is pivoted to another stud 88 fast to the lower end of a bell-crank lever 89 pivoted at 90 to the frame 15, a rocking motion being imparted to the bell-crank lever 89 by a link 91 which is pivotally connected at its lower end at 92 to the bell-crank lever 89 and at its upper end to the stud 66 on the lever 67. When a rocking motion is imparted to the bell-crank lever 89 by the link 91 and main lever 67, a reciprocatory motion will be imparted to the slide 81 through the link 85 and studs 88 and 84 and thus a reciprocatory motion will be imparted to the feed finger 79 and the plate 80 fast thereto.

When the tubular rivet 47′ arrives at the lower end of its raceway 71 it will drop on to the plate 80 on the feed finger 79, which at that time is in its forward position as illustrated in Fig. 8. At this time the rivet 47′ will be prevented from tipping over by a spring-actuated detent 93 mounted to slide laterally of the guideway 74 in the block 73 and being held inwardly as illustrated in Fig. 5 by a spiral spring 94, one end of which bears against the detent 93 and the other against a plate 95 fast by a screw 96 to the block 73.

The rivets 97, which are preferably solid shank rivets, are contained en masse in a hop-

per 98 which is rotated by means of a shaft 99 rotated by a ratchet 100 and pawl 101, the pawl 101 being pivotally mounted on the pin 57 mounted on the pawl lever 60. The rivets slide down a raceway 102 which consists of an upper portion 103 and a lower portion 104. The rivets 97 are fed from the lower end of the portion 103 of the raceway 102 to the upper end of the portion 104 of said raceway by a slide 105 which has a reciprocatory motion imparted thereto by a lever 106 pivoted at 107 to the frame 15, a rocking motion being imparted thereto by an arm 108 on the pawl lever 60. A block 109 is mounted upon the lower end of the lever 106 and has a pin 110 fast thereto and engaging a slot 111 in the slide 105. The block 109 is frictionally mounted on the lever 106 by a screw pin 112. The screw pin 112 also has another block 113 frictionally mounted thereon which has a pin 114 fast thereto and projecting at its lower end into a slot 115 in a slide 116. The slide 116 is thus reciprocated and feeds tubular rivets from the lower end of the upper portion 117 of the raceway 71 to the lower portion 118 of said raceway. The blocks 109 and 113 are frictionally mounted on the screw pin 112, so that in case either of the slides 105 or 116 become jammed, these blocks will rock on the pin 112, thus preventing breakage of any part of the machine.

The rivets 97 are thus fed one by one down the lower portion 104 of the raceway 102 and drop into the upper end of a chamber 119 of a rivet holder and carrier 120, said rivet holder and carrier comprising two plates 121 and 122 which are fastened to the lower ends of flat springs 123 and 124. The flat springs 123 and 124 in turn are fastened at their upper ends to a slide 125 slidably mounted in the frame 15. The slide 125 is moved downwardly and positively by a lever 126 pivoted at 127 to the frame 15 and having a rocking motion imparted thereto by a cam plate 128 fast to the lever 89. The lever 126 has an ear 129 extending laterally from the front end thereof and projecting above the slide 125 and the said ear has a screw 130 projecting therethrough and adapted to engage the upper end of the slide 125. Thus the slide 125 is moved downwardly positively and is moved upwardly by means of a spring 131, the upper end of which is fastened to the frame 15 by a U-shaped wire 132, the lower end of said spring being fastened to a pin 133 fast to the slide 125. Thus it will be seen that the slide 125 and the carrier plates 121 and 122 are moved positively downward and yieldingly upward.

The rivets 97 are driven out of the carrier and holder 120 and into the tubular rivets 47 by a driver 134 which is fastened to the lower end of a driver slide 135 by a screw 136. The driver slide 135 has a reciprocatory motion imparted thereto by the main lever 67 which has a rounded forward end 137 which bears against the upper end of the slide 135, the lever 67 and the slide 135 being connected together by a pair of links 138 and 139 which are pivotally connected to the lever 67 and the slide 135 respectively by pins 140 and 141.

Referring to Fig. 10, it will be seen that the two portions 50 and 51 of the knife handle 49 and the blade 52 are provided with holes 142, 143 and 144, these holes in the portions 50 and 51 of the handle being counterbored at 145, 146, 147, 148, 149 and 150. The counterbored portions 145, 146 and 147 in the part 50 of the knife handle receive the heads of the rivets 97, while the counterbored portions 148, 149 and 150 receive the heads of the tubular rivets 47.

In positioning the knife upon the work support ready to have the parts 50, 51 and 52 fastened together by rivets, the part 51 of the knife handle is first placed with the rivet 47 projecting into the hole 142 and with a positioning pin which projects upwardly from the work support 29 projecting into the hole 144. The knife blade 52 is then positioned upon the upper end of the rivet 47 and upon the positioning pin 151, and finally, the portion 50 of the knife handle is placed upon the positioning pin 151 and with the upper end of the rivet 47 projecting slightly into the hole 142 in the portion 50. Thus the knife is positioned to have the rivets driven into it and into each other by the tubular rivet 47 on the upper end of the anvil 22 which at that time is gripped between the jaws 30 and 31, and furthermore, it is positioned by the pin 151 on the work support 29.

The general operation of the mechanism hereinbefore specifically and to some extent in general described is as follows:—The knife handle and blade are positioned upon the work-support and upon the tubular rivet 47 as hereinbefore described and as illustrated in Fig. 10. The tubular rivet 47 is positioned as aforesaid on the upper end of the anvil 22 and is held in position thereon by the spring-pressed jaws 30 and 31 and their inwardly projecting teeth 45 and 46. The tubular rivet 47 has been positioned on the upper end of the anvil 22 by the feed finger 79 and another tubular rivet 47′ has at that time been fed downwardly on the lower end portion 118 of the raceway 71 and rests upon the plate 80 on the feed finger 79. As the tubular rivet 47′, Fig. 8, arrives at this position it is kept from tipping over by the spring detent 93. The tubular rivet 47 is now in the position illustrated in Fig. 10 and it will be noted that the upper end of the anvil is below the upper faces of the jaws 30 and 31, upon which upper faces at that time the lower portion 51 of the handle rests.

In the manner hereinbefore described, a rivet 97 is fed down the raceway portion 104, so that it will drop into the chamber 119 with its head resting on the upper edges of the rivet carrier and holder plates 121 and 122. The carrier and holder 120 and the driver 134 are now in the relative positions illustrated in Fig. 10. The driver and the holder now descend until the lower ends of the holder plates 121 and 122 contact with the upper surface of the part 50 of the knife handle. Further, at the same time the driver 134 moves the rivet 99 downwardly between the plates 121 and 122, said plates springing apart laterally, due to their being mounted on springs 123 and 124, and the rivet 97 is pushed downwardly relatively to the rivet holder 120 until it assumes the position illustrated in Fig. 11. It will be noted that the shank of the rivet 97 is tapered, so that it will enter the bore of the tubular rivet 47.

During this downward motion, when the plates 121 and 122 of the holder 120 contact with the upper surface of the part 50 of the knife handle, they will push the knife handle and blade downwardly, due to the fact that the work-support 29 and jaw-carrier 25 are supported by the spring 28, and as the jaws 30 and 31 descend in this manner, they will be forced apart to the relative positions illustrated in Fig. 11, and at the same time the tubular rivet will be driven upwardly into the hole 142 until the head is driven into the counterbore portion 148 of the hole 142 as illustrated in Fig. 11, and at this time the bevelled end of the shank of the rivet 97 is just entering the bore of the tubular rivet 47 as illustrated in Fig. 11. Upon further downward movement of the rivet driver 134 and its slide 135, the rivet 97 will be driven out of the holder 120 and into the shank of the tubular rivet 47 as illustrated in Fig. 12, the shank of the rivet 97 being solid, will cause the shank of the tubular rivet to be expanded as illustrated in Fig. 12, and will force it tightly into the parts 50 and 51 of the knife handle and will lock it positively in the knife blade 52 as shown in Fig. 12.

The driver 134 and rivet holder and carrier 120 will now move upwardly until they assume the relative positions illustrated in Fig. 10. Meantime the feed finger 79 and the plate 80 thereon have been moved backwardly by the slide 81, link 85 and lever 89 to the position illustrated in Fig. 9, whereupon the tubular rivet 47′ is dropped from the position illustrated in Fig. 8 to the position illustrated in Fig. 9 with its head in alignment with the guideway 74 and with the feed finger 79, so that when the feed finger again moves forward, the tubular rivet will be fed by it along the guideway 74 on to the top of the anvil 22 and between the spring-pressed jaws 30 and 31, and especially between the teeth 45 and 46 upon the upper ends of said jaws, where it will be positioned and held on the upper end of the anvil ready to receive a rivet 97.

When the rivet 97 has been driven into the tubular rivet as hereinbefore described, and the driver 134 and rivet carrier and holder 120 move upwardly to the position illustrated in Fig. 10, then the jaw-carrier 25 will move upwardly carrying with it the work-support 29 and the jaws 30 and 31 will move into the positions illustrated in Fig. 10 ready for a tubular rivet 47′ to be fed on to the top of the anvil and between the jaws 30 and 31 as hereinbefore described.

When the first rivet 97 has been driven into the tubular rivet 47 as illustrated in Fig. 10, the operator removes the knife handle from the positioning pin 151 and places the hole 144 in the knife handle parts 50 and 51 and in the blade 52 upon the new tubular rivet 47′ as soon as it has been fed to the position illustrated in Figs. 8 and 10, then the driving of the tubular rivet up into the handle and the driving of the solid shank rivet into the tubular rivet is repeated as hereinbefore described. Upon the parts again assuming the positions illustrated in Fig. 8, the operator places the knife handle in position with the tubular rivet 47 projecting into the hole 143 and the riveting operation is then repeated.

It will be particularly noted that the tubular rivet 47 is forced into the knife handle until the head of the rivet enters the counterbored portion 148 in the portion 51 of the handle before the rivet 97 is driven into the shank of the tubular rivet, otherwise the shank of the tubular rivet would be expanded before it was entirely entered into the knife handle and the knife blade and could not be driven into its full depth in the knife handle and blade, and this is a very important feature in the operation of the machine of this invention.

In the series of operations hereinbefore described, of driving the rivets into the holes 142, 143 and 144, when the first rivet 47 has been set in the knife handle and the tubular rivet 47′ is fed forward for another setting operation, it will strike the rear edge of the knife handle, and the knife handle being pivoted on the pin 151 will swing on that pin. When the rivets are set in the holes 144 and 143, the operator holds the knife by its tip and allows it to swing when the rear edge of the knife handle is struck by the tubular rivet which is being fed forward.

I claim:

1. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable longitudinally of said anvil, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other and adapted to position a rivet on the

upper end of said anvil, and a work-support fast to said jaw-carrier frame.

2. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other about horizontal axes and adapted to position a rivet on the upper end of said anvil, the upper ends of said jaws being normally positioned in a plane above the upper end of said anvil, and a work-support fast to said jaw-carrier frame, a work-contacting surface of which is approximately flush with said upper ends.

3. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other and adapted to position a rivet on the upper end of said anvil, a guideway extending transversely of said anvil in alignment with the upper end thereof, a raceway adapted to feed a rivet to said guideway, a spring-actuated detent normally projecting into said guideway adjacent the entrance thereof and adapted to maintain a rivet at the entrance of said guideway in a vertical position, and a reciprocatory feed finger adapted to engage a rivet adjacent the lower end of said raceway and feed it along said guideway on to the top of said anvil and between said jaws.

4. A rivet setting machine for fastening together pieces of material by inserting the solid shank of one rivet in a tubular rivet having, in combination, an anvil means for positioning a tubular rivet on the upper end of said anvil with its shank projecting into said pieces of material, and means to insert the solid shank of another rivet in said tubular rivet.

5. A rivet setting machine for fastening together pieces of material by inserting the solid shank of one rivet in a tubular rivet having, in combination, an anvil, means for positioning a tubular rivet on the upper end of said anvil, means for feeding said tubular rivet to said positioning means, and means to insert the solid shank of another rivet in said tubular rivet.

6. A rivet setting machine for fastening together pieces of material by inserting the solid shank of one rivet in a tubular rivet having, in combination, an anvil, means for positioning a tubular rivet on the upper end of said anvil, means for feeding said tubular rivet to said positioning means, means to feed another rivet with a solid shank into alignment with said tubular rivet, and means to insert the solid shank thereof in said tubular rivet.

7. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable longitudinally of said anvil, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other and adapted to position a tubular rivet on the upper end of said anvil, and means to insert the shank of another rivet in said tubular rivet.

8. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other and adapted to position a tubular rivet on the upper end of said anvil, and means to insert the shank of another rivet in said tubular rivet.

9. A rivet setting machine having, in combination, an anvil, a spring supported jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other and adapted to position a tubular rivet on the upper end of said anvil, and means to insert the shank of another rivet in said tubular rivet.

10. A rivet setting machine having, in combination, an anvil, a spring supported jaw-carrier frame slidable on said anvil longitudinally thereof, a stop to limit the upward movement of said jaw-carrier frame, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other and adapted to position a tubular rivet on the upper end of said anvil, and means to insert the shank of another rivet in said tubular rivet.

11. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws pivotally mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other and adapted to position a tubular rivet on the upper end of said anvil, and means to insert the shank of another rivet in said tubular rivet.

12. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws pivotally mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other and adapted to position a tubular rivet on the upper end of said anvil, a spring adapted to move said jaws toward each other and thereby position a tubular rivet on the upper end of said anvil, and

means to insert the shank of another rivet in said tubular rivet.

13. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on oppoiste sides of said anvil, movable toward and away from each other about horizontal axes and adapted to position a tubular rivet on the upper end of said anvil, and means to insert the shank of another rivet in said tubular rivet.

14. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other about horizontal axes and adapted to position a tubular rivet on the upper end of said anvil, the upper ends of said jaws being normally positioned in a plane above the upper end of said anvil, and means to insert the shank of another rivet in said tubular rivet.

15. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable longitudinally of said anvil, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other and adapted to position a tubular rivet on the upper end of said anvil, a work-support fast to said jaw-carrier frame, and means to insert the shank of another rivet in said tubular rivet.

16. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other about horizontal axes and adapted to position a tubular rivet on the upper end of said anvil, the upper ends of said jaws being normally positioned in a plane above the upper end of said anvil, a work-support fast to said jaw-carrier frame, a work-contacting surface of which is approximately flush with said upper ends, and means to insert the shank of another rivet in said tubular rivet.

17. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other and adapted to position a tubular rivet on the upper end of said anvil, means to feed a rivet on to the top of said anvil and between said jaws, and means to insert the shank of another rivet in said tubular rivet.

18. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other and adapted to position a tubular rivet on the upper end of said anvil, a guideway extending transversely of said anvil in alignment with the upper end thereof, a raceway adapted to feed a rivet to said guideway, a reciprocatory feed finger adapted to engage a rivet adjacent the lower end of said raceway and feed it along said guideway on to the top of said anvil and between said jaws, and means to insert the shank of another rivet in said tubular rivet.

19. A rivet setting machine having, in combination, an anvil, a jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other and adapted to position a tubular rivet on the upper end of said anvil, a guideway extending transversely of said anvil in alignment with the upper end thereof, a raceway adapted to feed a rivet to said guideway, a spring-actuated detent normally projecting into said guideway adjacent the entrance thereof and adapted to maintain a rivet at the entrance of said guideway in a vertical position, a reciprocatory feed finger adapted to engage a rivet adjacent the lower end of said raceway and feed it along said guideway on to the top of said anvil and between said jaws, and means to insert the shank of another rivet in said tubular rivet.

20. A rivet setting machine for fastening together pieces of material by inserting the shank of one rivet in a tubular rivet having, in combination, an anvil, means for positioning, a tubular rivet on the upper end of said anvil with its shank adapted to project into holes provided in said pieces of material, and means to force the shank of another rivet into said tubular rivet, the diameter of said shank being greater than the diameter of the bore of said tubular rivet, whereby the shank of said tubular rivet may be expanded within said pieces of material.

21. A rivet setting machine for fastening together pieces of material by inserting the shank of one rivet in a tubular rivet having, in combination, an anvil, means for positioning a tubular rivet on the upper end of said anvil with its shank adapted to project into holes provided in said pieces of material, a rivet holder and carrier, and a rivet driver in alignment with said anvil, mechanism to move said carrier downwardly into contact with said material, and mechanism to move said driver downwardly into contact with a rivet positioned in said carrier, whereby said rivet may be driven into said tubular rivet and the shank of said tubular rivet expanded within said pieces of material.

22. A rivet setting machine for fastening

together pieces of material by inserting the shank of one rivet in a tubular rivet having, in combination, an anvil, means for positioning a tubular rivet on the upper end of said anvil with its shank adapted to project into holes provided in said pieces of material, a rivet holder and carrier, and a rivet driver in alignment with said anvil, said rivet holder and carrier embodying a slide, and a pair of oppositely disposed fingers on said slide movable relatively to each other and provided with a chamber therebetween adapted to receive a rivet, mechanism to move said carrier downwardly into contact with said material, and mechanism to move said driver downwardly into contact with a rivet positioned in said carrier, whereby said rivet may be driven into said tubular rivet and the shank of said tubular rivet expanded within said pieces of material.

23. A rivet setting machine for fastening together pieces of material by inserting the shank of one rivet in a tubular rivet having, in combination, an anvil, means for positioning a tubular rivet on the upper end of said anvil with its shank adapted to project into holes provided in said pieces of material, a rivet holder and carrier, and a rivet driver in alignment with said anvil, said rivet holder and carrier embodying a slide and a pair of oppositely disposed fingers on said slide movable relatively to each other and provided with a chamber therebetween means to feed a rivet into said chamber, mechanism to move said carrier downwardly into contact with said material, and mechanism to move said driver downwardly into contact with a rivet positioned in said carrier, whereby said rivet may be driven into said tubular rivet and the shank of said tubular rivet expanded within said pieces of material.

24. A rivet setting machine for fastening together pieces of material by inserting the shank of one rivet in a tubular rivet having, in combination, an anvil, a jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other about horizontal axes and adapted to position a rivet on the upper end of said anvil with its shank adapted to project into holes in said pieces of material, the upper ends of said jaws being normally positioned in a plane above the upper end of said anvil, a rivet holder and carrier, and a rivet driver in alignment with said anvil, mechanism to move said carrier downwardly into contact with said material, and mechanism to move said driver downwardly into contact with a rivet positioned in said carrier, whereby said tubular rivet may be removed from between said positioning jaws and inserted to a greater depth in said pieces of material and said rivet driven out of its carrier and holder and into said tubular rivet and the shank of said tubular rivet expanded within said pieces of material.

25. A rivet setting machine having, in combination, an anvil, means to position and hold a rivet on the upper end of said anvil with its shank projecting upwardly, whereby a plurality of pieces of material with holes therein, said holes being in alignment with each other, may be placed upon said rivet and positioned thereby relatively to said anvil and to each other, and a pin spaced apart from said anvil and adapted to be inserted in other holes extending through said pieces of material in alignment with each other, whereby said pieces of material may be positioned relatively to said anvil and to each other.

26. A rivet setting machine having, in combination, an anvil, a spring-supported jaw-carrier frame slidable on said anvil longitudinally thereof, a pair of oppositely disposed jaws pivotally mounted on said jaw-carrier frame on opposite sides of said anvil, movable toward and away from each other about horizontal axes, a spring adapted to move said jaws toward each other and thereby position a tubular rivet on the upper end of said anvil, the upper ends of said jaws being normally positioned in a plane above the upper end of said anvil, a work-support fast to said jaw-carrier frame, the work-contacting surface of which is approximately flush with said upper ends, a guideway extending transversely of said anvil in alignment with the upper end thereof, a raceway adapted to feed a tubular rivet to said guideway, a spring-actuated detent normally projecting into said guideway adjacent the entrance thereof and adapted to maintain said tubular rivet at the entrance of said guideway in a vertical position, and a reciprocatory feed finger adapted to engage said tubular rivet adjacent the lower end of said raceway and feed it along said guideway on to the top of said anvil and between said jaws with its shank adapted to project into holes in pieces of material positioned thereon, a rivet holder and carrier, and a rivet driver in alignment with said anvil, mechanism to move said carrier downwardly into contact with said material, and mechanism to move said driver downwardly into contact with a rivet positioned in said carrier, whereby said tubular rivet may be removed from between said positioning jaws and inserted to a greater depth in said pieces of material and said rivet driven out of its carrier and holder and into said tubular rivet and the shank of the tubular rivet expanded within said pieces of material.

27. A rivet setting machine having, in combination, means to force a tubular rivet into pieces of material, and means to subsequently engage the head of a second rivet and force the shank thereof into the shank of said tubu-

lar rivet, whereby said pieces of material may be fastened together.

28. A rivet setting machine having, in combination, means to force a tubular rivet into pieces of material, and means to subsequently engage the head of a second rivet and force the shank thereof into the shank of said tubular rivet, the diameter of the shank of said second rivet being greater than the diameter of the bore of said tubular rivet, whereby the shank of said tubular rivet may be expanded and said pieces of material fastened together.

29. A rivet setting machine for fastening together pieces of material by a pair of rivets having, in combination, an anvil, a tubular rivet positioned thereon, means to force said tubular rivet into said pieces of material, and means to subsequently engage the head of a second rivet and force the shank thereof into the shank of said tubular rivet, whereby said pieces of material may be fastened together.

30. A rivet setting machine for fastening together pieces of material by a pair of rivets having, in combination, an anvil, a tubular rivet positioned thereon, means to force said tubular rivet into said pieces of material, and means to subsequently engage the head of a second rivet and force the shank thereof into the shank of said tubular rivet, the diameter of the shank of said second rivet being greater than the diameter of the bore of said tubular rivet, whereby the shank of said tubular rivet is expanded in said pieces of material and said pieces of material are fastened together by said rivets.

In testimony whereof I have hereunto set my hand.

ARTHUR R. HAVENER.