

Nov. 1, 1932.

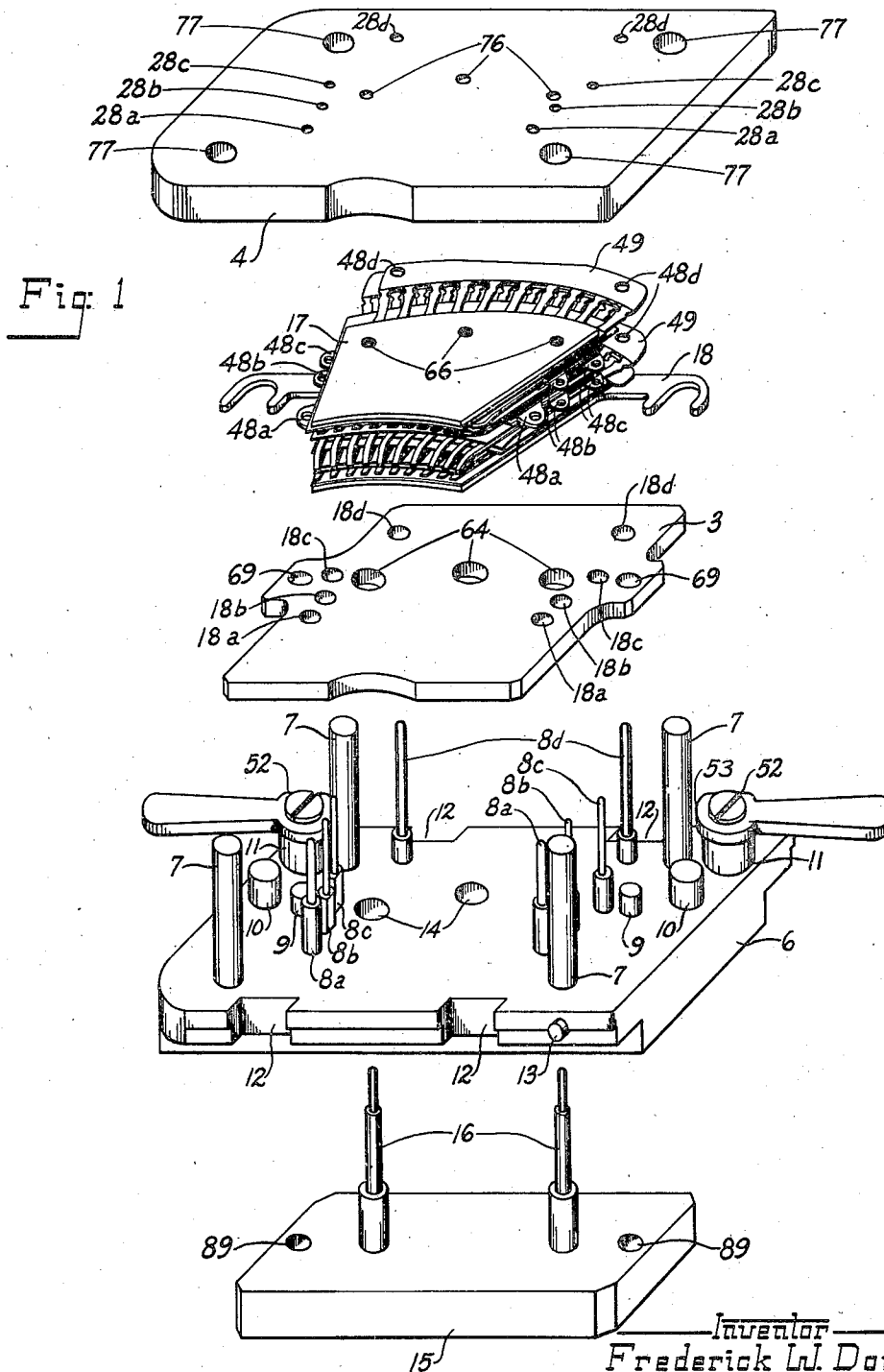
F. W. DOYLE

1,885,690

ASSEMBLING MACHINE AND JIG

Filed June 27, 1928

3 Sheets-Sheet 1



Inventor
Frederick W. Doyle

R. G. Richardson Atty.

Nov. 1, 1932.

F. W. DOYLE

1,885,690

ASSEMBLING MACHINE AND JIG

Filed June 27, 1928

3 Sheets-Sheet 2

Fig. 3

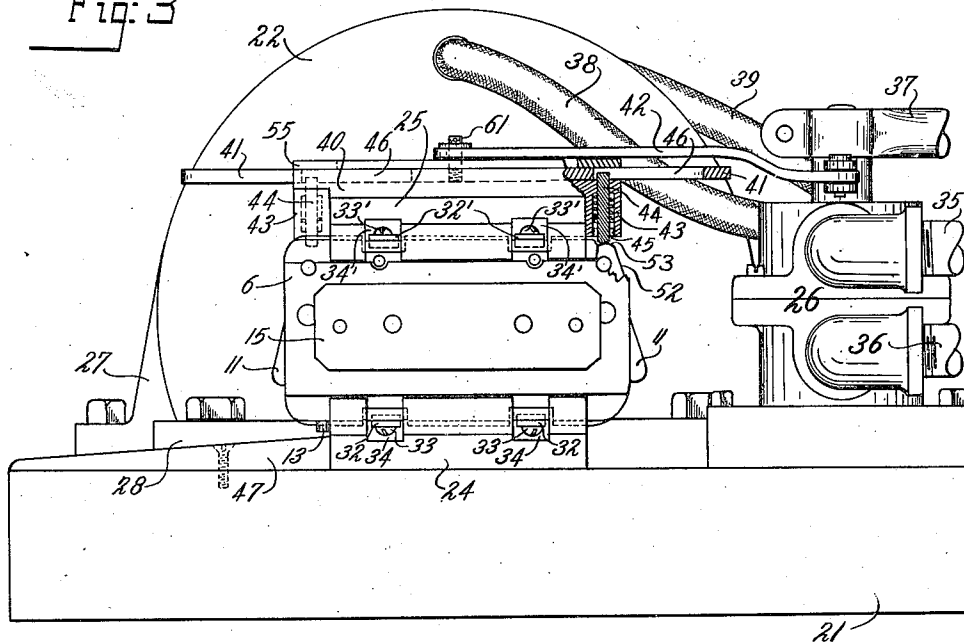
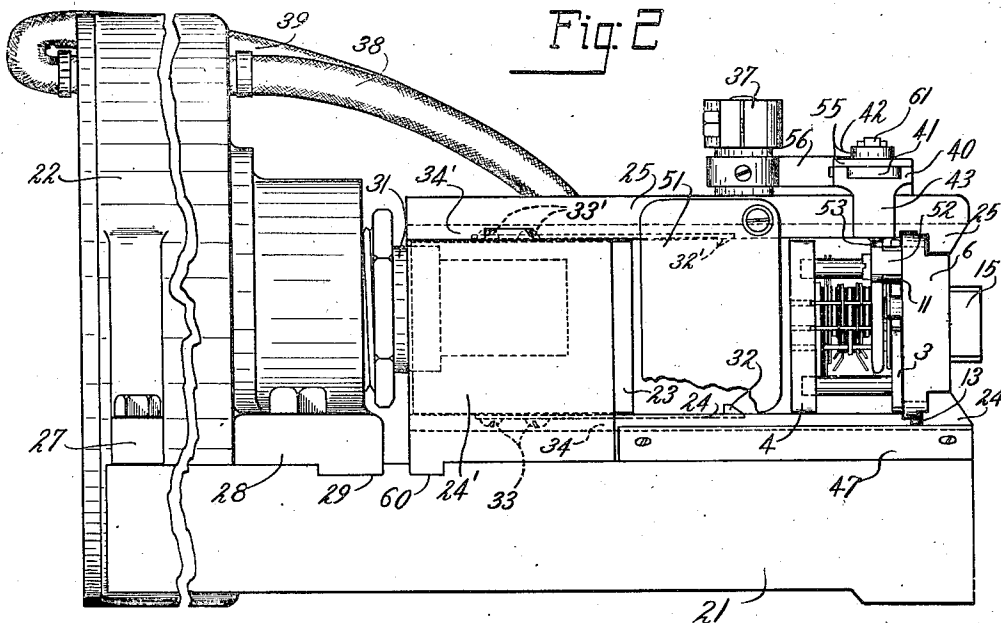


Fig. 2



Inventor
Frederick W. Doyle

R. B. Richardson Att'y.

Nov. 1, 1932.

F. W. DOYLE

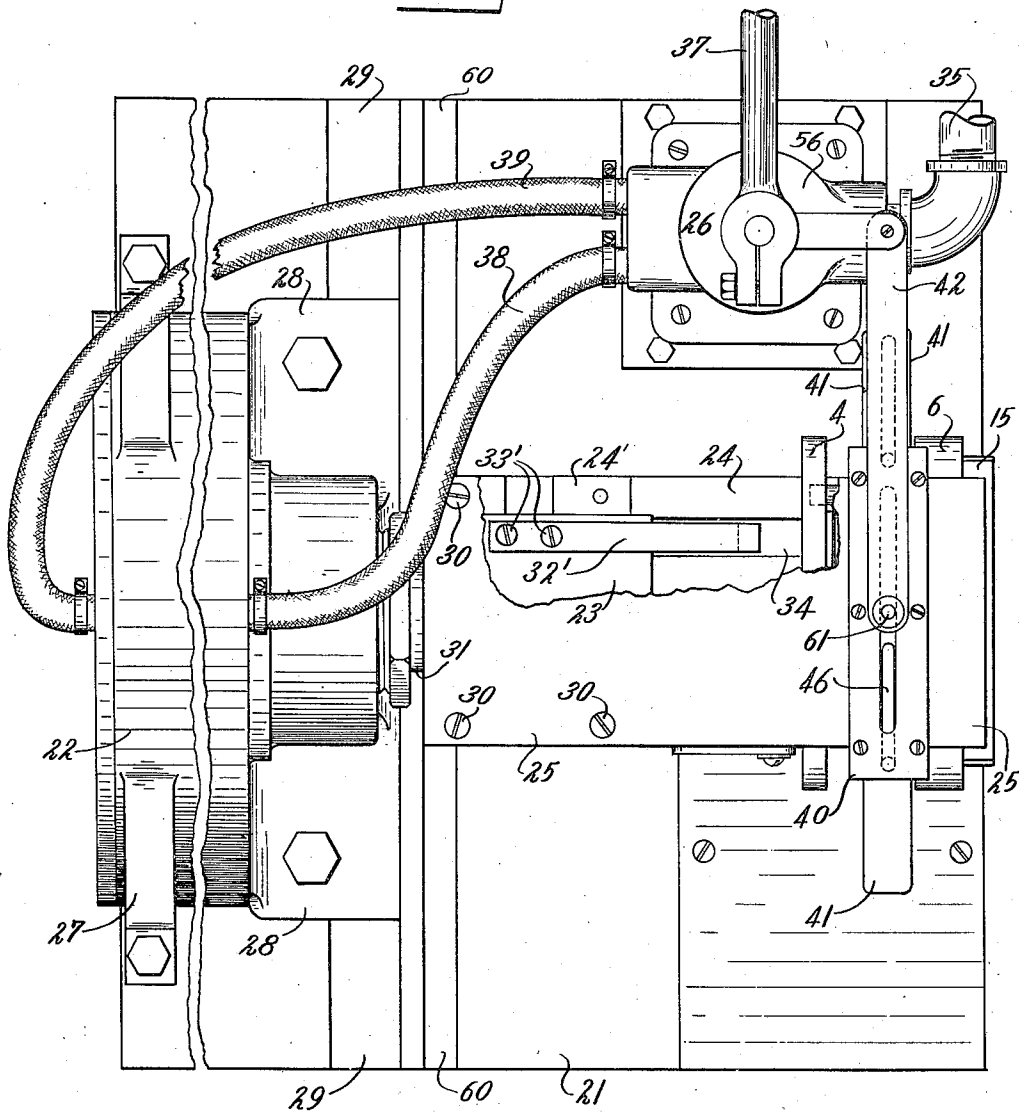
1,885,690

ASSEMBLING MACHINE AND JIG

Filed June 27, 1928

3 Sheets-Sheet 3

Fig. 4



Inventor
Frederick W. Doyle

R. B. Richardson Atty.

UNITED STATES PATENT OFFICE

FREDERICK W. DOYLE, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ASSOCIATED ELECTRIC LABORATORIES, INC., OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE

ASSEMBLING MACHINE AND JIG

Application filed June 27, 1928. Serial No. 288,601.

This invention pertains to assembling machines and jigs in general, but more particularly to machines and jigs for use in assembling articles comprising a relatively large number of separate parts held together by clamping members.

The object of this invention is the production of means by which such articles may be assembled in such a manner that greater uniformity of results are obtained with a less expenditure of manual labor and with greater rapidity than is obtainable with present machines and methods.

Machines of this kind find particular utility in the manufacture of bank contact assemblies for automatic switches such as are used, for example, in automatic telephone systems. The invention has therefore been illustrated in the accompanying drawings in the form of a machine and jig for assembling bank contact assemblies for switches known in the telephone art as plunger type line switches. The invention, however, lends itself to many modifications without departing from the scope thereof, and many other uses will suggest themselves to those skilled in the art. For example, a machine and jig of this kind with certain modifications may be used in the assembling of contact springs on relays.

The construction of the machine and jig is illustrated in the accompanying drawings comprising Figs. 1 to 4. Fig. 1 is an exploded view of the jig and its associated parts in their respective relative positions. A plunger type line switch bank assembly is also shown. Fig. 2 is a side view of the pneumatic compressor with the jig in position just before the compression operation. Fig. 3 is a front view of the compressor with the jig in position, with certain hidden parts shown in section for better illustration. Fig. 4 is a plan view of the compressor with the jig in position.

The jig shown in Fig. 1 comprises an assembling base, an insulator liner, a stripping plate, and a compressing plate. The assembling base consists of a base plate 6 into which the compressing plate liner pins 7, the bank assembly locating pins 8a, 8b, 8c, and 8d, the stripping plate positioning pins 9, the bottom

bracket locking pins 10, and the locking cams 11 are mounted. Four notches 12 are cut in the base plate 6, the purpose of which will be described later. The underside of the base plate is suitably shaped to fit in between the jaws of the compressor, as is shown in Fig. 2. A stop pin 13 is also provided to properly position the jig in the compressor. In the base plate 6 three screw holes 14 are provided (one being hidden). These holes are large enough to pass the heads of the screws that are used to clamp the bank assembly together.

The insulator liner consists of a bottom plate 15 into which two insulator locating pins 16 are mounted. These pins are located so they will pass through the two outer holes 14 in the assembling base. Holes 89 are provided into which extensions of the positioning pins 9, extending through the bottom of the base plate 6, fit to properly position the insulator liner when a jig is assembled. It may be explained that the pins 9 pass clear through the plate 6 and project out on the under side about the same amount as they do on the upper side, and it is these extensions on the under side of the plate 6 that fit into holes 89.

The stripping plate 3 is a single flat plate having the holes 18a, 18b, 18c, 18d, 69, and 64. The holes 18a, 18b, 18c, 18d, and 69 are of the proper size and location so that the stripping plate may be placed on the assembling base over the locating pins 8a, 8b, 8c, 8d, and positioning pins 9, respectively. Holes 64 line up with and are of the same size as holes 14 in the base plate 6.

The compressing plate 4 is a single plate having holes 77, 28a, 28b, 28c, 28d, and 76. The size and location of the holes 77 is such that the compressing plate may be placed down over the liner pins 7, the fit of the pins in these holes being an easy sliding one. The holes 28a, 28b, 28c, 28d are provided to pass the locating pins 8a, 8b, 8c, and 8d, respectively. The two outside holes 76 not only pass the ends of pins 16 but all three holes 76 are large enough to receive the ends of the screws which are used to clamp the bank assembly together as will be described more in detail later.

The bank assembly for which the locating pin arrangement of the jig is particularly adapted comprises a bottom bracket 18, a top bracket 17, four rows of multiple contacts, four rows of individual contacts (when completed), a plunger guide, and suitable insulators and spacers. The whole assembly is secured by three screws passing through the bottom bracket 18 through the assembly and threading into the three holes 66 in the top bracket 17. The particular construction of the bank assembly itself forms no part of this invention, so no further description or drawing of it is thought necessary.

The pneumatic compressor, shown in Figs. 2, 3, and 4, comprises essentially a base 21, a double ended cylinder 22 in which a piston moves either forward or backward depending on which end compressed air is conducted into, a plunger 23 controlled by the piston, a lower jaw 24 and an upper jaw 25 adapted to receive the jig, and a two-way valve 26 for directing compressed air in either end of the cylinder 22.

The cylinder 22 rests in a recess in the base 21, and is secured thereto by means of bolts passing through the lugs 27 and 28 of the cylinder and into the base 21. The base has a groove 29 into which a projection on the lower side of the lugs 28 fits to give added strength.

The bottom jaw 24 is suitably secured to the base 21 directly in front of the cylinder. A projection on the lower side of the jaw fits into the groove 60 in the base 21 and adds to the strength of the union of the two. At the end nearest the cylinder, the jaw 24 has two side walls 24' of about the same thickness as the jaw itself. These walls project upward to form a three-sided enclosure. On the top of these two walls, the upper jaw 25 is fastened by means of four screws 30, thereby forming an inclosure in which the square faced plunger 23 slides, the plunger 23 being suitably fastened to the end of the piston rod 31. The working ends of the two jaws are suitably shaped to accommodate the jig of Fig. 1 in the position shown in Fig. 2.

On the under side of the plunger 23 two spring hook members 32 are fastened by means of screws 33. Two grooves 34 are provided in the lower jaw which extend the full length of the jaw to accommodate the spring-hooks 32. Similar spring-hook members 32' are fastened by means of screws 33' to the upper side of the plunger 23. Two grooves 34' are also provided in the upper jaw to accommodate the spring-hooks 32'.

A guard plate 51 is rotatably mounted on the side of the upper jaw 25 in such a position that after the jig is placed in position between the two jaws, the operator cannot place his hand in the space between the plunger and the compressing plate 4 without deliberately rotating the plate 51 out of position. This

safe-guards the operator against having his hand crushed between the plunger 23 and the compressing plate 4.

A beveled plate 47 is fastened to the base 21 by two screws. This plate butts against the side of the lower jaw and forms an inclined surface which facilitates the sliding of the jig into position between the jaws.

The two-way valve 26, which may be of any suitable type, is bolted to the base 21. Hose connections 38 and 39 are provided from the valve to the two ends of the cylinder 22. The two pipe fittings 35 and 36 are intake and exhaust pipe, respectively. In the drawings, the valve is shown in its neutral position. Turning the control lever 37 clockwise through a small angle causes air to be conducted into the rear end of the cylinder through the hose connection 39; turning it counter-clockwise through a small angle causes air to be conducted into the front end of the cylinder through the hose connection 38.

A valve locking mechanism is provided, by which the control lever is prevented from being turned in a counter-clockwise direction past its neutral position when so doing would cause damage to a bank assembly. This mechanism comprises a U-shaped member 40 which fits over the end of the upper jaw 25, and which has a groove along the top in which the sliding member 41 slides. The sliding member 41 is connected to, and is controlled by, the valve lever 37 by means of the connecting link 42, which is pivoted to the extension arm 56 fastened to the valve stem. A slotted member 55 fits over the top of the U-shaped member 40 to hold the sliding member 41 in the groove. The slot in the top plate 55 is of sufficient dimensions to allow the free play of the pin 61 connecting the connecting link 42 with the sliding member 41.

In each of the side arms 43 of the U-shaped member 40 a locking pin 44 is positioned in a recess provided for the purpose. Each pin has a small flange which under the tension of a small spring normally bears against the upper side of the stop screw 45 threaded into the bottom of the recess. The stop screw has a hole in the center through which the lower end of the pin 44 passes. In their normal position, the upper ends of the pins are flush with the bottom of the groove in the U-shaped member 40, in which case the sliding member 41 may slide over these pins unrestrained.

When the pins 44 are forced upward (by the insertion of the jig between the jaws, as will be described later), the upper end of each pin projects up into a slot 46, one such slot being provided in each end of the sliding member 41. When the pins 44 are in this position the valve lever 37 may be turned in a clockwise direction until the pin 44 strikes the right hand end wall (looking at Fig. 3)

of the slot 46, but it cannot be turned in a counter-clockwise direction past its neutral position by reason of the pins 44 striking against the left hand end wall of the slot 46.

The procedure in assembling a bank contact assembly with the aid of the jig and compressor is as follows:

The assembling base is placed over the insulator liner, the lower projection of the pins 9 fitting into the holes 89, and the locating pins 16 projecting through the two outer screw holes 14. The stripping plate 3 is then placed on the assembling base, the pins 9 fitting into holes 69, and the locating pins 8a, 8b, 8c, 8d, and 16 passing through the holes 18a, 18b, 18c, 18d, and 64. The jig is now ready to receive the various parts constituting the bank assembly. The bottom bracket 18, is first placed on top of the stripping plate, the two supporting forks of the bracket hooking around the locking pins 10. This bracket is then clamped into position against the locking pins 10 by rotating the two locking cams downward (to the position shown in Figs. 2 and 3), these cams being slightly eccentric for this purpose.

The various insulators, bank contact strips, separators, etc., are next placed on top of the bottom bracket over the proper locating pins and in their proper order. The perforated projections, such as projections 48b, and 48c, on each end of the multiplied contact strips, which later on will serve as terminals to which connections are made, now function as the means for properly locating these strips in the assembly. The strips having the projections 48b and those having the projections 48c are located by the pins 8b and 8c, respectively. The plunger guide has a perforated projection 48a at each end and is located by the pins 8a. The contact strips (which become rows of individual contacts when the waste material 49 is broken off after the bank is completely assembled) are located by means of the pins 8d passing into the holes 48d. The position of the insulators and separators is determined by the pins 16, these pins passing through the screw holes in these parts. The top bracket 17 is the last piece of the assembly and its position is also determined by the pins 16, the ends of which pass through the two outer threaded screw holes 66. The middle section of the pins 16, however, is considerably larger than the hole 66, being the size of the screw holes in the insulators, and separators, so the bracket 17 will rest on the shoulder between, the end and middle sections.

The compressing plate 4 is now placed on top of the assembly over the liner pins 7, and the whole jig is then slid in between the two jaws 24 and 25 in the position shown in Figs. 2, 3, and 4. Its proper lateral position is determined by the stop pin 13, the jig being

slid in from the left, looking at Fig. 3, until the pin 13 strikes the side of the jaw 24.

When the jig is slid into position between the jaws as described, the pins 44 of the valve locking mechanism, ride up on top of the raised portion 53 of the locking cams 11. The top end of the pins are then pushed up into the slots 46 in the position shown in Fig. 3.

The jig is now in position ready for the compression operation. The valve lever 37 is now turned in a clockwise direction. This causes air to be conducted into the rear end of the cylinder 22 which forces the plunger 23 against the compressing plate 4, sliding the compressing plate 4 further over the pins 7 and pressing the bank assembly together. By this operation the insulator liner is forced part way out by reason of the bracket 17 bearing against the shoulder between the end and middle sections of the pins 16. Furthermore, when the plunger 23 moves forward, the spring hooks 32 which are fastened to the under side of the plunger 23 and the spring hooks 32' which are fastened to the upper side of the plunger, are also forced past the compressing plate 4 and past the stripping plate 3, coming to rest behind the latter in the recesses 12 in the base 6 of the assembling base.

The operator now pulls the insulator liner out the rest of the way and inserts a screw into each of the three holes 14, pushing them through the compressed bank assembly, and then tightens them with a screw driver into the threaded holes 66 in the top bracket 17.

The operator now unlocks the bank assembly from the jig by rotating the two locking cams 11 to a horizontal position, the position indicated in Fig. 1. Sections 52 of the clamping cams 11 are flattened. These sections come up on top and permit the pins 44 to recede to their normal position when the cams 11 are rotated to a horizontal position which is the unlocked position.

It is now possible for the valve lever 37 to be rotated counter-clockwise past its neutral position to cause air to be conducted into the front end of the cylinder 22. When this is done, the plunger 23 is forced back to its initial position. The spring-hooks 32 and 32' which were hooked behind the stripping plate 3, pull the stripping plate 3, the bank assembly, and the compressing plate 4 free from the assembling base, after which the completed bank assembly and the jig parts may be removed from the compressor.

Considering the results which are accomplished when the plunger 23 is forced back to its initial position, the detrimental results which would occur if it were possible to cause this operation before the bank assembly were unlocked from the assembling base and such were done, are apparent; but such detrimental results are prevented by making it

impossible to cause the plunger 23 to be forced to its normal position until the bank assembly has been unlocked from the assembling base.

In the description of the operation of the jig and compressor, the use of only one jig was considered. In actual practice, however, it is much more economical and a greater speed in the operation is obtainable when eight or ten of these jigs are provided for each compressor and when six or more persons are employed to progressively assemble the bank parts. In such case, the first assembler continually receives empty jigs from the operator of the machine, places the first several parts of the bank assembly on each jig as he receives it, and then passes it on to the next person in line, who places the next several parts on the jig, and passes it on to the next in line. The operator of the compressor continually receives the jigs from the last assembler in line with the completed assemblies thereon, and as he receives one, he places the compressing plate on top and then inserts the jig into the compressor and performs the compressing operation. By employing the proper number of assemblers, the assemblers and also the compressor operator can be kept busy continually, thereby obtaining more speed than has heretofore been obtainable.

What is claimed is:

1. In combination, a jig for positioning parts of an assembly, and a two-way compressor, said compressor comprising means to compress the assembly when operated in one direction and means to remove the assembly from the jig when operated in the other direction.

2. In combination, a jig comprising a base plate and a stripping plate adapted to rest on said base plate upon which a plurality of parts may be assembled, a two-way compressor having a supporting frame in which said jig may be positioned, a plunger for the compressor adapted to compress said parts when the jig is in the supporting frame when the plunger is operated in one direction, and spring members attached to said plunger adapted to engage said stripping plate when the plunger is operated in said one direction and strip the assembly and said stripping plate from the base plate when the plunger is operated in the other direction.

3. In combination, a jig upon which a plurality of parts may be assembled, means for locking the first part on the jig, a two-way compressor adapted for compressing the parts when operated in a forward direction, and for removing the assembly from the jig when operated in a backward direction, and means controlled by the locking means for preventing the premature operation of the compressor in a backward direction.

4. In combination, a jig upon which a plurality of parts may be assembled, means for

locking the first part on the jig, a two-way compressor adapted for compressing the parts when operated in a forward direction, and for removing the assembly from the jig when operated in a backward direction, and means controlled by the locking means for preventing the operation of the compressor in a backward direction until the first part of the assembly is unlocked from the jig.

5. In combination, a jig upon which a plurality of parts may be assembled, a cam for locking one of the parts in position on the jig, a two-way compressor adapted to receive the jig and compress the parts when operated in a forward direction, and for removing the assembly from the jig when operated in a backward direction, a two-way valve for controlling the operation of the compressor, a sliding member operatively attached to the valve, and a pin adapted to be forced into a slot in the sliding member by the cam when the jig is placed in the compressor, the slot being of such dimensions that the valve may be operated in one direction irrespective of the position of the pin, while its operation in the other direction is prevented when the pin is in the slot by reason of the pins bearing against one end wall of the slot and preventing the movement of the sliding member, said cam having a flat portion to allow the pin to recede from the slot in the sliding member when the cam is rotated to its unlocked position, so that thereafter the valve may be operated in either direction.

6. An assembling jig, comprising a base plate having locating pins, a stripping plate which fits down over the locating pins on the base plate, and upon which a plurality of parts may be assembled over the locating pins, and a compressing plate for compressing the parts, said stripping plate and said base plate being provided with holes through which screws may be inserted to clamp the assembly together while compressed.

7. An assembling jig comprising a base plate having locating pins, a stripping plate which fits down over the locating pins on the base plate, and upon which a plurality of parts may be assembled over the locating pins, a compressing plate for compressing the parts, said stripping plate and said base plate being provided with holes through which screws may be inserted to clamp the assembly together while compressed, and a pair of cams rotatably mounted on the base plate to lock one part of the assembly in position.

8. In combination, a jig for positioning the parts of an assembly, a two-way compressor having jaws for supporting said jig, means effective when said compressor is operated in one direction for compressing the parts of the assembly while permanent retaining means are being applied, and means

including a stripping plate on said jig for removing the assembly from the jig when the compressor is operated in the other direction.

9. In combination, a plate upon which a plurality of parts may be assembled, a movable plunger adapted to compress said parts when operated in a forward direction, and spring members adapted to engage the assembly during the compression to remove it from the plate when the plunger is returned to normal.

10. In combination, a base plate upon which the article to be compressed is positioned, a plunger adapted to compress said article against said base plate on its forward stroke, and means for automatically removing said article from said plate when said plunger returns to normal.

11. In combination, an assembling jig, a two-way compressor having jaws for supporting said jig, a two-way valve for controlling the forward and backward movements of said compressor, and means controlled by said jig when positioned between said jaws for preventing the premature operation of said valve in a direction to cause the backward movement of said compressor.

12. In combination, a plate upon which a plurality of parts may be assembled, a two-way compressor adapted to compress the parts when operated in one direction and to remove the assembly from the plate when operated in the other direction, means for retaining said parts on said plate while they are being compressed, and means for preventing the operation of said compressor in said other direction until said retaining means have been rendered ineffective.

13. In combination, a plate upon which a plurality of parts may be assembled, means for temporarily locking said parts in position on said plate, a two-way valve, means responsive to the operation of said valve in one direction for compressing said parts and responsive to the operation of said valve in the other direction for removing the assembly from the plate, and means for preventing the operation of said valve in said other direction until said parts have been unlocked from said plate.

14. In combination, a base plate upon which a plurality of parts may be assembled, means for compressing said parts, there being a plurality of holes in said base plate, and a positioning device having locating pins which extend through said holes and are utilized to position said parts on said base plate, said device being removable to allow permanent retaining means to be applied to the assembly through said holes while said parts are under compression.

15. An assembling jig comprising a base plate upon which a plurality of parts may be assembled, means for compressing said

parts, a plurality of locating pins on said base plate for positioning some of said parts, there being a plurality of holes in said base plate, and a positioning device having locating pins which extend through said holes for positioning other of said parts, said device being removable to allow retaining screws to be applied to the assembly through said holes while the parts are under compression.

16. In combination, a jig comprising a base plate upon which the parts of an assembly may be positioned, a compressor in which said jig may be positioned, means for operating said compressor after said jig is inserted to compress the parts assembled thereon and to hold them while permanent retaining means are being applied, and means for automatically removing the completed assembly from its base plate when the compressor returns to normal.

17. In combination, a jig, a removable member having locating pins secured thereto over which a plurality of parts may be assembled, a compressor in which said jig may be positioned, means for operating said compressor to compress said parts, and means in said compressor for holding said jig with the parts under compression while said member is removed and permanent retaining means substituted for the locating pins.

18. In combination, an assembly fixture having a base plate on which a plurality of parts may be assembled, there being a plurality of holes in said plate, means for compressing said parts, and a positioning device having locating pins which extend through said holes and are utilized to properly position said parts on said plate, the base plate and the positioning device being so related to the compressor that the said device is displaceable to withdraw said pins to allow permanent retaining means to be substituted for said pins while the parts are under compression.

In witness whereof, I hereunto subscribe my name this 22d day of June, A. D. 1928.
FREDERICK W. DOYLE.