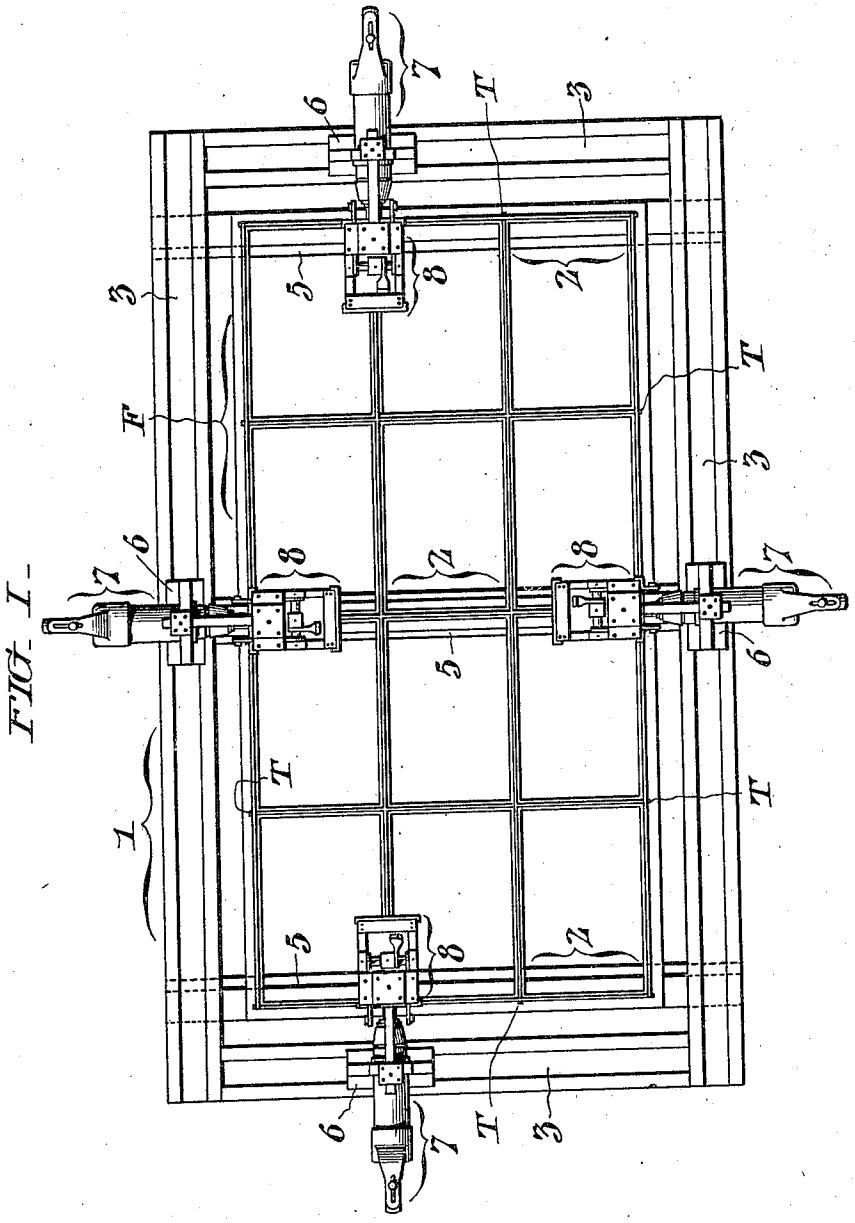
Oct. 9, 1923. 1,469,864

J. H. WAY

RIVETING APPARATUS

Filed Feb. 17, 1921 4 Sheets-Sheet 1

FIG. 1.



WITNESSES:

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Oct. 9, 1923. 1,469,864

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RIVETING APPARATUS

Filed Feb. 17, 1921 4 Sheets-Sheet 2

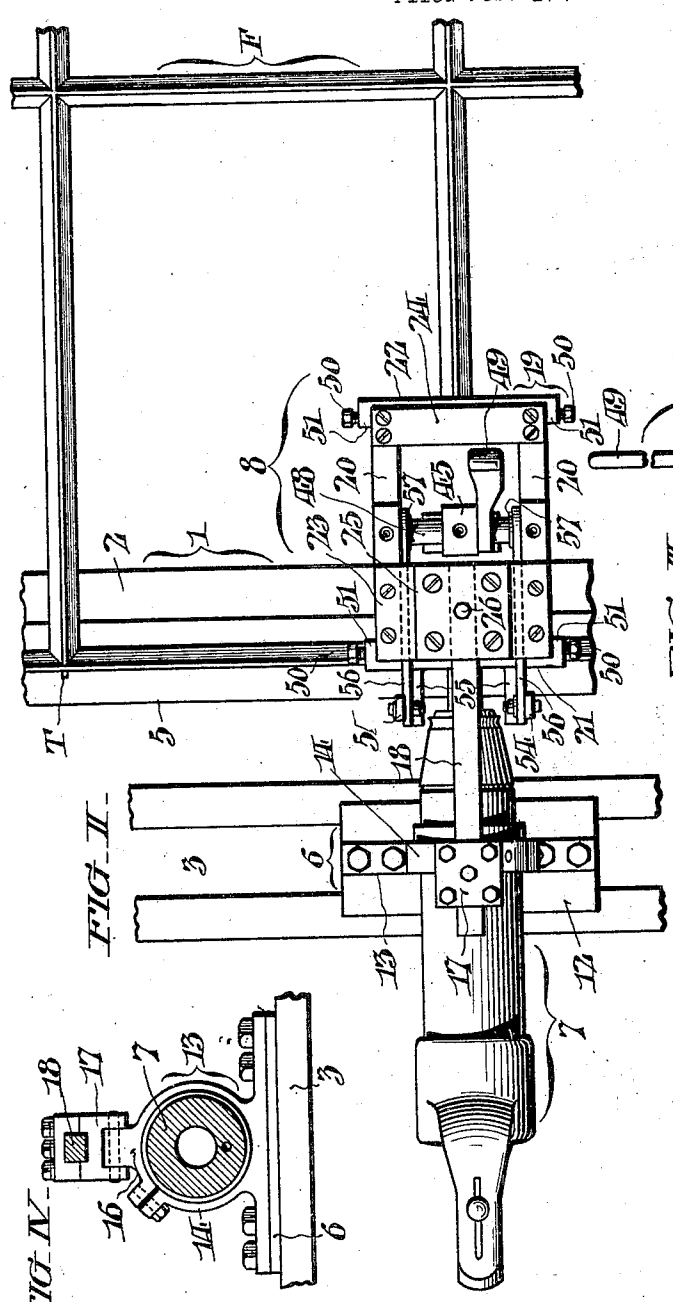


FIG. II.

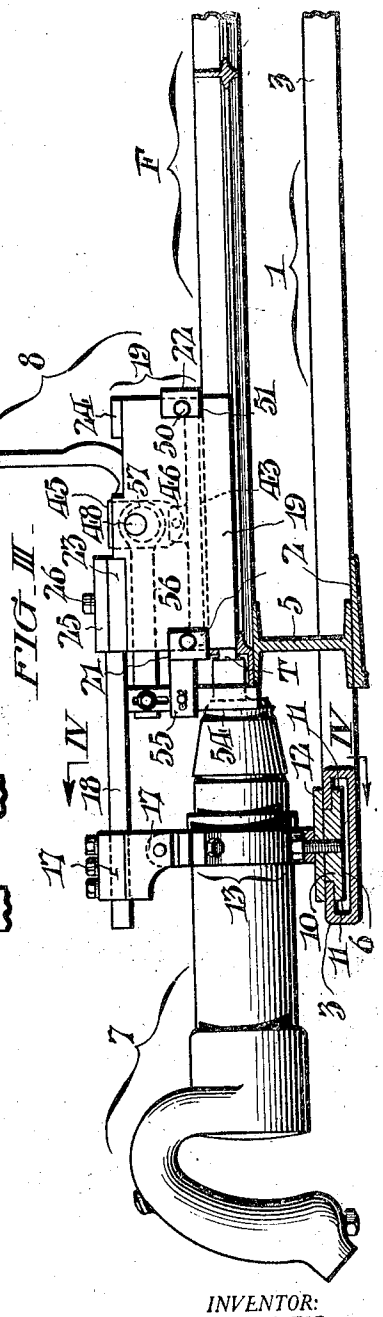


FIG. III.

FIG. IV.

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1,469,864

Oct. 9, 1923.

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RIVETING APPARATUS

Filed Feb. 17, 1921

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FIG. V.

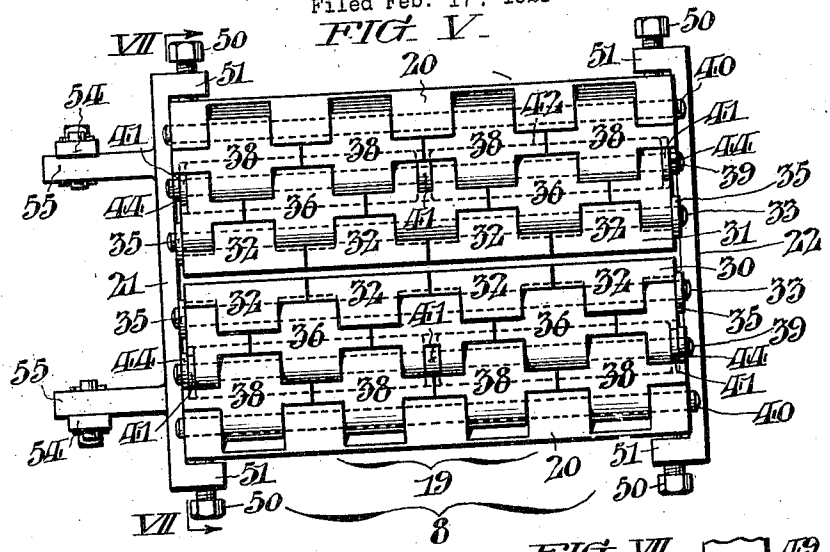


FIG. VI.

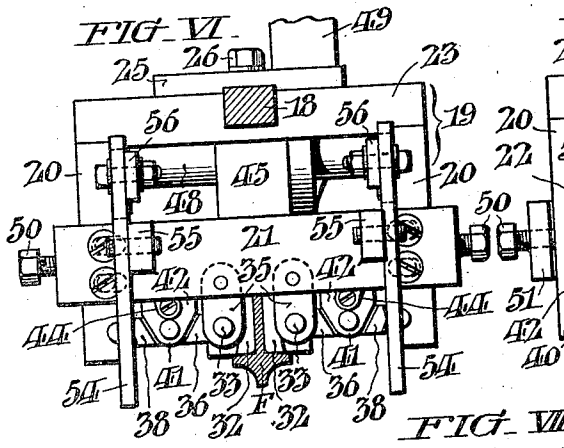


FIG. VII.

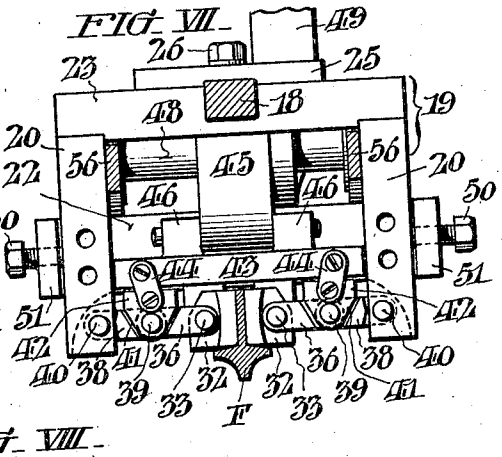


FIG. VIII.

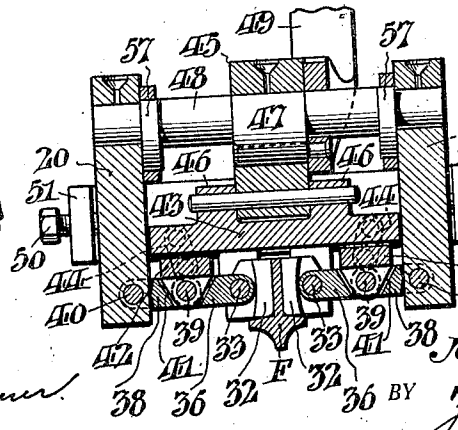


FIG. IX.

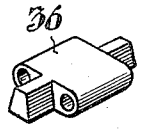
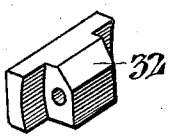


FIG. X.



WITNESSES:

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RIVETING APPARATUS

Filed Feb. 17, 1921 4 Sheets-Sheet 4

FIG. XI.

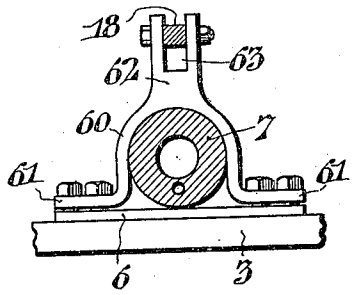


FIG. XII.

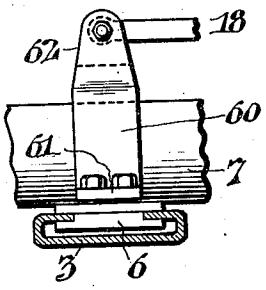


FIG. XIII.

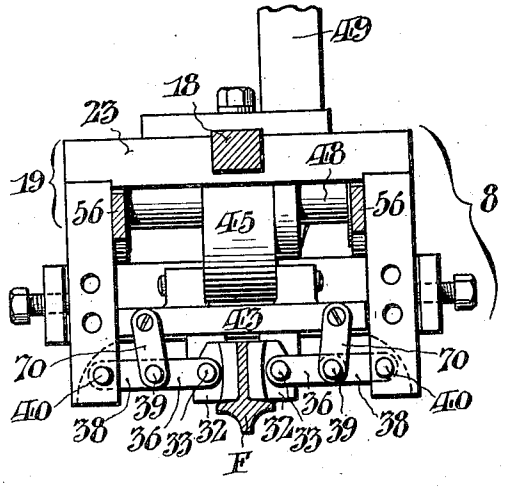
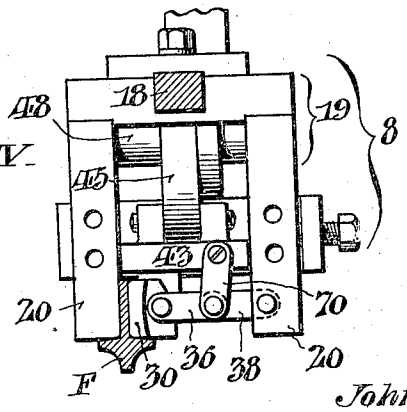


FIG. XIV.



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Patented Oct. 9, 1923. 1,469,864

UNITED STATES PATENT OFFICE.

JOHN HOWARD WAY, OF PHILADELPHIA, PENNSYLVANIA.

RIVETING APPARATUS.

Application filed February 17, 1921. Serial No. 445,647.

To all whom it may concern:

Be it known that I, JOHN HOWARD WAY, a citizen of the United States, residing in Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Riveting Apparatus, whereof the following is a specification, reference being had to the accompanying drawings.

The invention relates generally to riveting apparatus and more especially to riveting apparatus useful in connection with the assembly of metallic window sash frames.

Window sashes such as are used in modern fire-proof building structures are almost universally constructed of standard metallic shapes. These shapes are cut to the proper lengths, and those which are to become muntins and mullions, incidentally formed with tongues adapted to be inserted through appropriate apertures in those which ultimately constitute the perimetrical or side rails of the window sash, and the protruding ends of the tongues subsequently headed over or upset in effecting permanent assembly of the structure. Heretofore upsetting has been accomplished either manually by use of an ordinary hand riveting hammer, or by fusing the protruding end of the tongue of the muntin or mullion to obtain an analogous result. These methods have been found more or less objectionable, the first on account of the high cost of labor involved, and the second on account of unreliability of the joint formed due to burning of the metal.

The object of my invention is to overcome these difficulties and to effect the permanent assemblage of structural steel window sash frames with expediency and at a cost which is not prohibitive. This I accomplish by aid of an apparatus which comprises one or more pneumatic riveting tools wherewith are associated individual clamping devices by which the members of the window sash may be firmly engaged locally at the regions where the riveting is to be performed. Means are also provided for appropriately supporting the sashes, and provision made whereby the pneumatic riveting tools may be shifted from one position to another with respect to the sash so that the several muntins and mullions may be successfully headed over or upset as above noted.

The advantages of my invention will become readily apparent from the detailed description which follows:

Fig. I is a plan view, more or less diagrammatically represented, of a window sash frame riveting apparatus conveniently embodying my invention.

Fig. II is a detail plan, on a large scale, showing one of the pneumatic riveting hammers and a portion of the window sash in position for the upsetting of one of the muntins or mullions of said sash.

Fig. III is a side elevation of the showing in Fig. II.

Fig. IV is a detail cross section, the plane of which is indicated by the arrows IV—IV in Fig. III.

Fig. V is an inverted plan view of the clamping device which is associated with each of the pneumatic riveting tools.

Fig. VI is an end view of the clamping device as viewed from the left of Figs. II, III and V, the rod, by which the same is attached to the pneumatic tool, being shown in cross section.

Fig. VII is a cross section through the clamping device along the plane of the arrows VII—VII in Fig. V.

Fig. VIII is a central cross section through the clamping device.

Figs. IX and X are detail perspective views of certain of the elements forming part of the toggle mechanism by which clamping is directly effected.

Fig. XI is a detail cross section corresponding to Fig. IV showing a modified means by which the pneumatic riveting tool is secured to its supporting slide carriage.

Fig. XII is a fragmentary side view of the structure shown in Fig. XI.

Fig. XIII is a cross section corresponding to Fig. VII showing a modified form of clamping device; and

Fig. XIV is a similar view showing still another modification of the clamping device.

Referring first to the complete organization as set forth in Fig. I, it will be observed to include a table, comprehensively indicated at 1, for supporting the work to be riveted, in this case shown as a metallic sash frame "F." This table 1 is built up preferably of structural steel forms, and comprises a series of transverse standards 2, 2, which are united by a guideway structure comprising sections 3, 3, extending lat-

erally about the table. Surmounted upon the standards 2, 2, are beams 5, 5, adapted to support the window sash frame "F" at the proper level as will be better understood from further description. Shiftable in the guideways 3, 3, are slide carriages 6 upon which are mounted pneumatic riveting tools 7 having associated with them, clamping devices comprehensively indicated at 8. By this construction, the tools 7, together with their associated clamping devices 8, may be shifted into alignment or registry with the muntins and mullions, along the respective sides of the window sash frame which is supported upon the table. Standard metallic sashes of the type herein chosen for illustrative purposes, have their muntins and mullions provided, at the ends, with short tongues "T" which project through suitable openings in the side rails, in order that they may be headed over or upset in effecting permanent assemblage of the window sash structure.

Referring now more especially to the enlarged detail showings of Figs. II to VIII inclusive, it will be seen that the guideways 3 have a channeled cross section and that the lower slide carriage members 10 are formed with extensions 11 which cooperate with removable top plates 12 in holding the carriages to the guideways. Bolted to each slide carriage is a bracket 13 formed with an integral split ring 14 by which pneumatic riveting tool 7 is secured to its carriage. At its top, the ring 14 has an upstanding lug 16 to which is pivoted a hinge fitting 17 appropriately machined to receive an extension bar 18 to the outer extremity of which is adjustably secured, in axial alignment with the tool, and forward of its front end, a clamping device 8 such as previously referred to. The hinge connections thus formed between the clamping devices 8 and the pneumatic riveting tool mountings allow said clamping devices to be lifted and swung so that the window sash "F" may be readily placed upon the supporting table 1 initially, and also to permit subsequent shifting of the tools to various positions along the guideways in effecting the riveting of the several muntins and mullions of the window sash.

Each clamping device comprises a rectangular housing 19 consisting of side members 20, 20 which are joined at their ends by cross bars 21 and 22. The side members 20 of the housing are further united at their tops by bridging plates 23 and 24, (Figs. II and III) of which the former is comparatively wide and cooperates with a superimposed cap piece 25 in slidably engaging the outer end of the extension bar 18. The clamping device is secured in adjusted positions upon the extension bar 18 by means of a set screw 26, which extends through the cap piece 25.

Clamping of the muntins or mullions of the window sash is effected by toggle mechanism which includes opposed pinch elements respectively designated, comprehensively, by the numerals 30, 31. In order to allow for slight variations in the thickness of the webs of the muntins or mullions of the window sash, the pinch elements are preferably made composite, each accordingly comprising a series of aligned link sections 32 which are united by common pivot rods 33, 33. Said pivot rods are suspended at their opposite ends from the cross bars 21 and 22 of the housing 19, by means of the connecting links 35, 35. The pinch elements 30, 31 are respectively coordinated with groups of toggle links by which their movement is effected. Each of said toggle groups consists of a row of aligned links 36, 36 which are connected at one of their ends to the sections 32 of the pinch elements by the pivot rod 33, and at their opposite ends, to fellow links 38, 38 likewise aligned respectively in a row, and united by means of a pivot rod 39. The opposite ends of the links 38 are in turn pivotally connected to the side members 20, 20 of the casing 19 by a rod 40. As best shown in Figs. V, IX and X, the several links of the toggle mechanism are so shaped as to be intermeshing with each other and with the sections 32 of the pinch elements, and it will be observed that the side walls 20, 20, of the housing are appropriately notched in carrying out the scheme of intermeshing so that by this construction, ample stability is afforded the various pivot rods by which the links of the toggle mechanism are connected.

The intermediate pivot rods 39, 39 of the two toggle groups are carried or supported in depending ears 41, 41 of the coextensive sustaining bars 42, 42 which are suspended, at their ends, from a pressure plate 43 by connecting links 44, 44, said pressure plate thus becoming a common means by which the toggle groups may be simultaneously operated. Said pressure plate is guided for vertical movement within the confines of the housing 19, and actuated through the instrumentality of a master link 45, which, at its lower end, is pivotally connected to lugs 46 of the pressure plate, and at its upper end engages an eccentric 47 forming an integral part of a shaft 48 extending transversely of the housing 19 and journalled in the side members 20, 20 of the same. A handle 49 is provided as a means for manually turning the shaft to effect, through the eccentric 47 and the various interposed instrumentalities above described, the actuation of the toggle mechanism in relatively shifting the pinch members 30, 31 to clamp or release the muntins or mullions of the window sash structure.

When adjustment of the spacing of the

pinch elements in the clamped position should become necessary on account of wear or for any other reason, this may be had through the instrumentality of set screws 50, 50 let into laterally projecting lugs 51, 51 at the ends of the cross bars 21 and 22 of the housing 19. Said set screws engage the side members 20, 20 of the housing, and by varying the distancing of the latter, it will be noted that the entire toggle system will be effected. In actual practice, the extent of such an adjustment need not be more than a few hundredths of an inch.

In order that the perimetrical or side rails of the window sash may be rigidly held in proper relative position with respect to the muntins or mullions being riveted, I have provided each of the clamping devices with auxiliary clamping means consisting of one or more grip fingers 54 which are pivoted to integral lugs 55 of the cross bar 21 of housing 19. The upper ends of the grip fingers 54 are adjustably pivoted to the rods 56 of eccentrics 57 which, together with the eccentric 47 previously referred to, form integral parts of the shaft 48. By this construction, it will be seen that both the main and the auxiliary clamping means may be simultaneously actuated by movement of the handle 49. As shown in Fig. III, the side rail of the sash frame is clamped between the forward ends of the housing side members 20 and the lower ends of the grip fingers 54.

Referring now to the modifications of Figs. XI and XII, the bracket by which the pneumatic riveting tool 7 is secured to its slide carriage 6 takes a somewhat different form than in the first described instance. In this case, this bracket assumes the shape of a yoke 60 which straddles the barrel of the tool, sufficient leeway being allowed beneath the laterally turned feet 61, 61 of the bracket, so that the tool may be rigidly clamped in position. This form of bracket differs also from the preceding, in that its upstanding lug 62 is bifurcated as at 63 to receive the end of the extension bar 18 by which the clamping device 7 is attached to the tool.

In Fig. XIII, I have shown a modified form of clamping device which is identical with the form first described, except that in this instance, the intermediate or common pivot rods 39 of the toggle link groups are directly suspended from the pressure plate 43, by means of links 70 without the interposition of sustaining bars, such as are shown at 42 in Fig. VII. In all other respects, the construction and operation of the form shown in Fig. XIII is the same as already understood.

Referring, lastly, to Fig. XIV, I have shown a clamping device in which but one group or set of toggle links is employed. Here the pinch element 30 cooperates directly with one of the side members 20 of the housing frame 19, actuation of the toggle mechanism being effected in a manner similar to that explained in connection with the first described embodiment.

While I have shown and described my invention as particularly applicable to assembling of window sash structures, I do not wish to be necessarily restricted to such adaptation alone, since it may obviously be employed in other arts with advantages similar to these herein pointed out.

Having thus described my invention, I claim:

1. An apparatus of the character described including in combination, a table; a pneumatic riveting tool; and an associated clamping device, said device being hinged to the pneumatic tool so as to be capable of being swung clear of the work as the latter is placed upon, or removed from the table.

2. An apparatus of the character described including in combination, a table; a guideway forming part of said table; a slide carriage mounted in said guideway; and a pneumatic tool and associated clamping device mounted on the carriage so as to be capable of simultaneous movement with respect to the work supported by said table.

3. An apparatus of the character described including in combination, a table adapted to support a structural metallic window sash frame, whose muntins and mullions are formed at opposite ends with tongues which project through apertures in the perimetrical or side rails of the frame; guideways extending laterally about the table; a slide carriage mounted in each of said guideways; and a pneumatic riveting tool secured upon each carriage so as to be capable of being shifted into position in alignment with the several muntins or mullions for the purpose of upsetting the aforesaid tongues in effecting permanent assembly of the frame.

4. An apparatus of the character described including in combination, a table adapted to support a structural metallic window sash frame; guideways extending laterally about the sides of the table; a slide carriage mounted in each of said guideways; a pneumatic riveting tool secured upon each carriage so as to be capable of being shifted successfully into alignment with the muntins or mullions which are to be riveted to the side rails of the window sash frame; and a clamping device associated with each of the tools, said clamping devices being hinged to the tools so as to be capable of being swung clear of the window sash frame while said tools are shifted from one position to another.

5. An apparatus of the character described including in combination, a pneumatic riveting tool; and an associated clamping device adapted to rigidly hold the work to be riv-

eted, said clamping device being hinged to the tool so as to facilitate its application to the work.

6. An apparatus of the character described including in combination, a pneumatic riveting tool; and an associated clamping device attached to said tool for firmly holding both a side rail and a cross rail of a metallic window frame structure, which are to be permanently riveted together.

7. An apparatus of the character described including in combination, a pneumatic riveting tool; an associated clamping device for rigidly holding the work to be riveted, said clamping device being disposed in axial alignment with the tool forward of the front end of the latter; and a bar extending from the tool for the adjustable attachment of the clamping device.

8. An apparatus of the character described including in combination, a riveting tool; and an associated clamping device for rigidly holding the work to be riveted, said device comprising, opposed pinch elements; coordinated toggle mechanism for relatively shifting said pinch elements; and an eccentric for actuating the toggle mechanism.

9. An apparatus of the character described including in combination, a riveting tool; and an associated clamping device for rigidly holding the work to be riveted, said device comprising, opposed pinch elements; a group of intermeshing toggle links associated with each of the pinch elements; and common means for simultaneously actuating the toggle link groups.

10. An apparatus of the character described including in combination, a riveting tool; and an associated clamping device, said device comprising, opposed pinch elements; coordinated toggle mechanism for relatively shifting the pinch elements; said toggle mechanism consisting of intermeshing links; and means for actuating said toggle mechanism.

11. An apparatus of the character described including in combination, a riveting tool; and an associated clamping device for rigidly holding the work to be riveted; said clamping device comprising, opposed pinch elements each composed of a number of aligned link segments; coordinated groups of toggle links for relatively shifting said pinch elements, the toggle links of each group intermeshing with each other, and with the constituent segments of the pinch elements; fulcrum rods serviceable as common connectors for the ends of adjacent rows of intermeshing toggle links; and means for simultaneously actuating the aforesaid toggle groups.

12. An apparatus of the character described including in combination, a riveting tool; and an associated clamping device for rigidly holding the work to be riveted; said clamping device comprising, opposed pinch elements; coordinated toggle links for relatively shifting the pinch elements; a pressure plate; connecting links by which the intermediate pivots of the toggle links are attached to said pressure plate; and means for moving the pressure plate to actuate the toggles.

13. An apparatus of the character described including in combination, a riveting tool; and an associated clamping device for rigidly holding the work to be riveted; said clamping device comprising, opposed pinch elements; a series of toggle links for relatively shifting said pinch elements; a bar co-extensive with the series of toggle links and carrying a rod which forms the common pivot of said toggle links; a pressure plate; connecting links whereby said bar is suspended from the pressure plate; and means for moving the pressure plate to actuate the toggle links.

14. An apparatus of the character described including in combination, a riveting tool; and an associated clamping device for rigidly holding the work to be riveted, said device comprising, opposed pinch elements; toggle mechanism for relatively shifting said pinch elements; means for actuating the toggle mechanism; and means for adjusting the toggle mechanism to vary the spacing of the pinch elements in the closed or clamping position.

15. An apparatus of the character described including in combination, a riveting tool; and an associated clamping device for rigidly holding the work to be riveted, said clamping device comprising, a housing; opposed pinch elements; toggle links interposed between the pinch elements and the respective opposite side members of the housing; means for actuating the toggles to shift the pinch elements; and means for relatively adjusting the side members of the housing to vary the spacing of the pinch elements in closed or clamping position.

16. An apparatus of the character described including in combination, a riveting tool; and an associated clamping device for rigidly holding the work to be riveted, said clamping device comprising, a housing having side members and uniting cross bars; opposed pinch elements; toggle links interposed between the pinch elements and the respective side members of the housing frame; means for actuating the toggle links to shift the pinch elements; and set screws carried by the aforesaid cross bars for engaging the side members of the housing in adjusting the same to vary the spacing of the pinch elements in closed or clamping position.

17. An apparatus of the character described including in combination, a riveting

tool; and an associated clamping device, said clamping device comprising, a main clamping means, and an auxiliary clamping means operative at right angles to said main clamping means; and instrumentalities for simultaneously actuating said main and auxiliary clamping means.

18. An apparatus of the character described including a riveting tool; and an associated clamping device, said device comprising, a main clamping means in the form of opposed pinch elements, toggle mechanism for relatively shifting said pinch elements, and an eccentric for actuating said toggles; together with an auxiliary clamping means adapted to be operative at right angles to the main clamping means, comprising pivoted grip fingers; eccentrics for actuating said fingers; in combination with a common shaft upon which the eccentrics, both for the main clamping means and the auxiliary clamping means, are mounted so that said means may be simultaneously operated.

In testimony whereof, I have hereunto signed my name at Philadelphia, Pennsylvania, this 15th day of February 1921.

JOHN HOWARD WAY.

Witnesses:

JAMES H. BELL,

E. L. FULLERTON.