July 15, 1958 F. E. MUNSCHAUER 2,843,204

STRAIGHT SIDE PUNCH PRESS

Filed Feb. 27, 1953 2 Sheets-Sheet 1

FIG. 1.

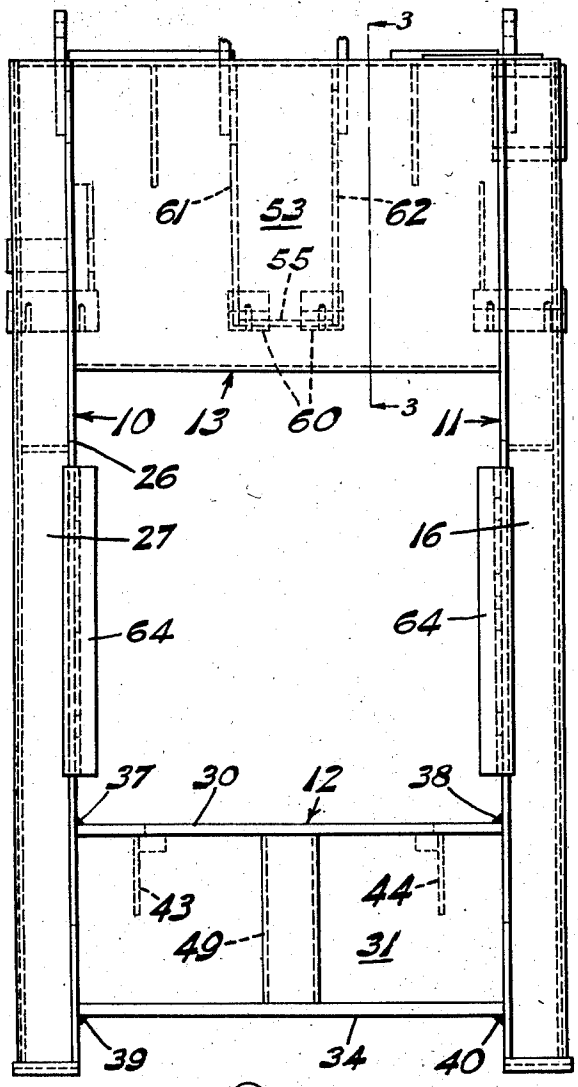


FIG. 2.

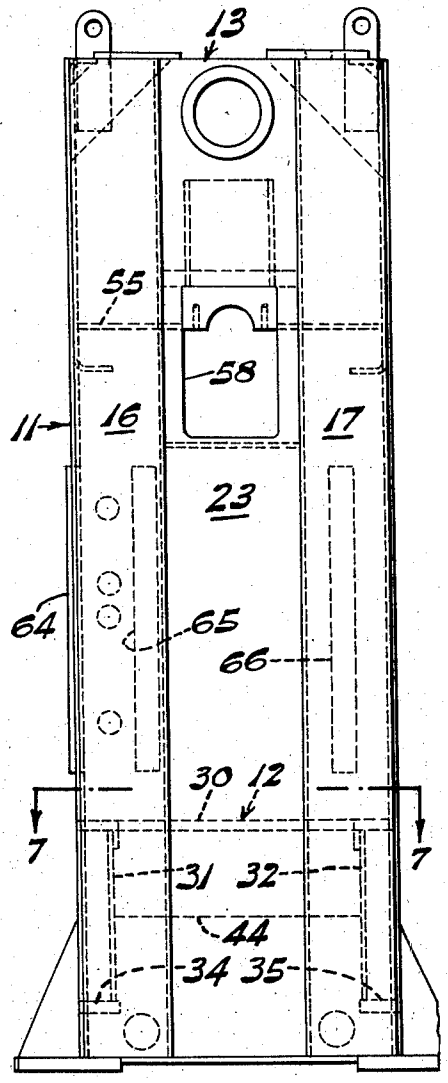


FIG. 3.

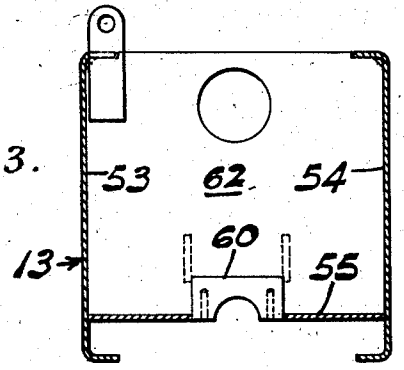
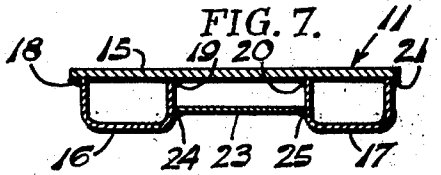


FIG. 7.



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FIG. 4.

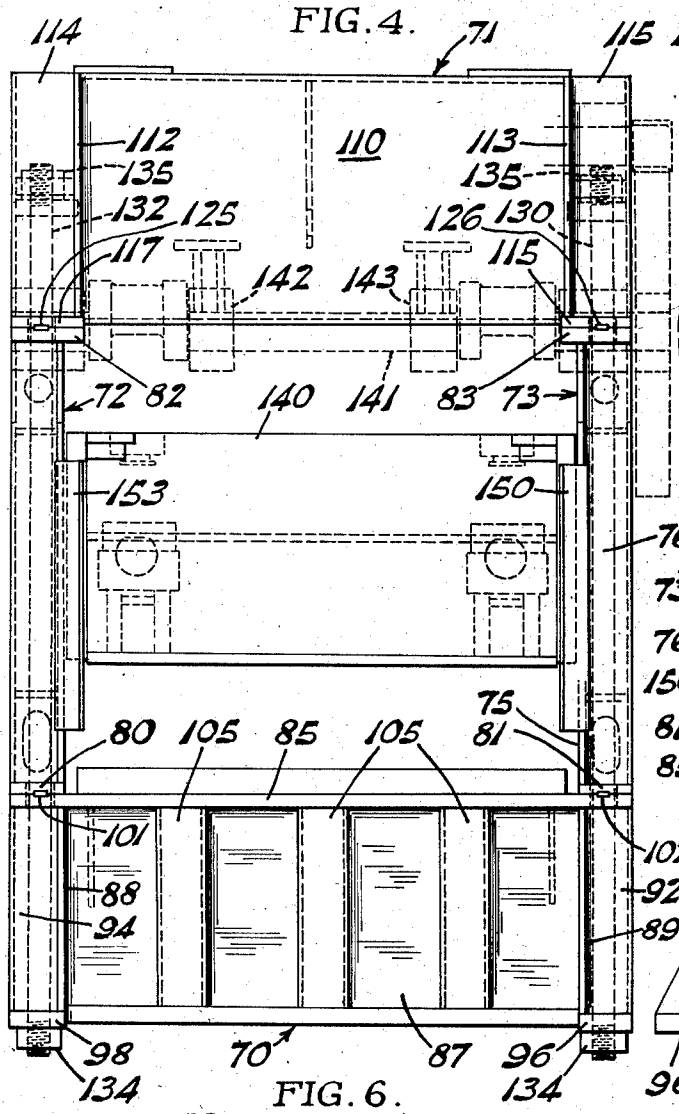


FIG. 5.

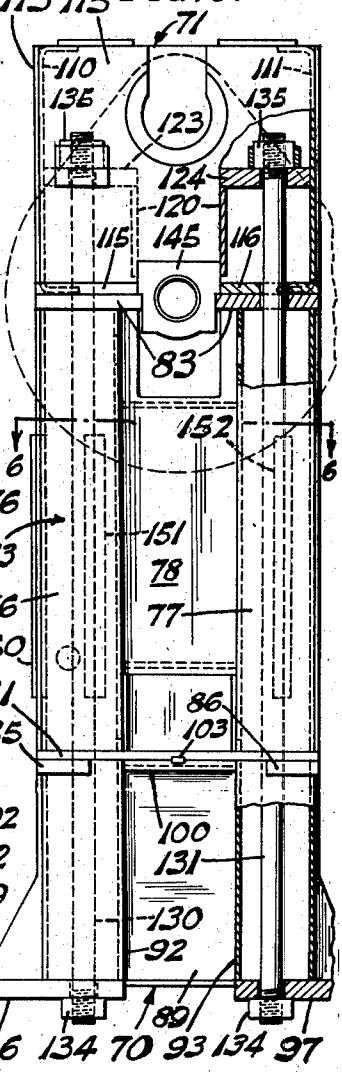
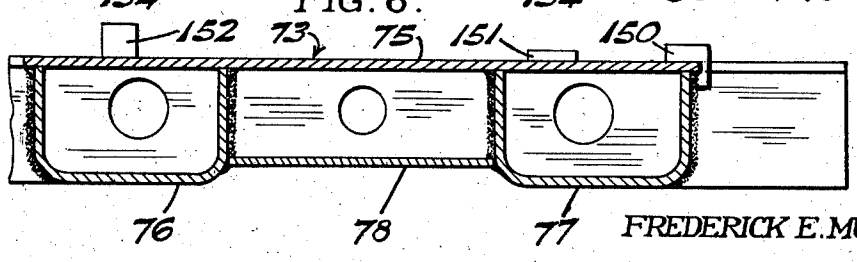


FIG. 6.



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United States Patent Office 2,843,204 Patented July 15, 1958

2,843,204

STRAIGHT SIDE PUNCH PRESS

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Application February 27, 1953, Serial No. 339,417

3 Claims. (Cl. 164—86)

This invention relates to punch presses and particularly to that class of punch presses known generally in the art as straight side presses.

In straight side punch presses a pair of vertical side columns support the crown or superstructure of the press above the bed or base structure of the press. The crown of the press supports the power drive and transmission means for a vertically reciprocable slide or ram, the latter having vertical sliding bearing between the side columns of the press whereby it moves downwardly and upwardly toward and away from the bed or die receiving surface of the punch press. The present invention contemplates a novel frame structure for straight side presses and particularly a novel side column construction, whereby the frame generally and the side columns in particular are far more rigid and structurally efficient than straight side press frame and side column constructions of the prior art.

Heretofore the principal structural component of each side column of a straight side press has been a plate or wall member extending in a plane generally fore and aft of the press proper. This general structural arrangement was more or less universal in the construction of punch press side columns of cast iron or cast steel and the same general structural arrangement has carried on into the design and manufacture of punch presses wherein the side frame members or columns are fabricated from steel plates. Thus the art has followed a common trend in more or less duplicating the cast metal side frames of the prior art in the general evolution from cast metal to welded plate construction which has been in progress for the past decade or more.

The result of this trend or tendency has been a failure to take full advantage of the new design possibilities which are afforded and made possible at least in part by the newer construction methods and a failure to adapt the side frames themselves to meet present problems. I have found that a new and highly advantageous side column construction can be achieved by departing materially from the forms and constructional conventions evolved during many years of cast metal press frame construction.

The punch press side frames of the present invention are of novel design and arrangement and are constructed so as to take full and unusual advantage of the possibilities of welded plate construction. Design inhibitions previously regarded as unavoidable, due to various limitations of the metal founding art, do not impose arbitrary restrictions on the design of the press frames of the present invention. The distribution and proportioning of the elements of construction as well as the method of fabricating and assembling the several components and elements are novel and unusual, both in conception and in the economy and structural efficiency of the practical embodiment of the inventive concept.

Various other objects and advantages will disclose themselves to those skilled in the art to which the present invention pertains from a study of the following specification and the accompanying drawings. While several complete and specific embodiments of the principles of the present invention are set forth in the drawings and specification, it is to be understood that such embodiments are by way of example only and that the principles of the present invention are not limited to the forms thus shown or otherwise excepting as defined in the appended claims.

In the drawings:

Fig. 1 is a general front elevational view of one form of punch press frame constructed according to the present invention, only the rigid framing and structural portion of the press being illustrated in this embodiment in the interests of clearness;

Fig. 2 is a side elevational view of the form of the present invention shown in Fig. 1;

Fig. 3 is a detailed cross-sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a view similar to Fig. 1 but showing another form of the punch press framework of the present invention and illustrating generally the punch press slide and certain other portions of the operating mechanism;

Fig. 5 is a side elevational view of the embodiment illustrated in Fig. 4 with a portion thereof broken away for added illustration;

Fig. 6 is a cross-sectional view on the line 6—6 of Fig. 5; and

Fig. 7 is a detailed cross-sectional view on the line 7—7 of Fig. 2.

Throughout the several figures of the drawings like characters of reference denote like parts and, referring particularly to Fig. 1, the numerals **10** and **11** designate respectively the left and right hand side frame or column members of the straight side punch press frame there shown. The bed member of the press which in this embodiment extends between the side frame or column members is designated generally by the numeral **12** and the crown portion of the press frame, which in this embodiment likewise extends between the side columns, is designated generally by the numeral **13**.

In the form of the present invention illustrated in Figs. 1, 2, 3 and 7, the side columns **10** and **11** extend generally the full height of the punch press from the floor to the top. The general transverse cross sectional arrangement of the components which make up the right-hand side column **11** is shown in detail in the cross section, Fig. 7, and as there shown the right-hand side column comprises an inner plate member **15** which extends the full depth of the side column from front to rear.

A pair of upright front and rear channel members **16** and **17**, respectively, are disposed against the outer face of plate member **15** with the outer edge portions of the flanges of the channel members in abutment with the plate member. The plate member **15** and the channels **16** and **17** are welded into an integral whole along these lines of abutment as indicated at **18**, **19**, **20** and **21** in Fig. 7. A central outer plate member **23** is disposed in this space between the channel members **16** and **17** and is welded thereto at its edges as indicated at **24** and **25**. The left-hand side column **10** is of course constructed in a similar manner, its main inner plate member being designated **26** in Fig. 1 and its front channel member **27**.

The foregoing general method of fabricating the side columns of a punch press of the straight side type provides a structure which receives and absorbs the complex stresses which must be borne and absorbed by punch press side columns in a highly efficient and unusually satisfactory manner. Further, this side column construction is one which is relatively simple and straightforward to fabricate, both from the standpoint of producing the individual components and from the standpoint of weld-

ing those components into an integral and unitary side column.

In the form of the present invention shown in Figs. 1 and 2 the bed **12** or die receiving and supporting surface of the press comprises a horizontal upper plate member **30** and suitable underlying bracing and supporting elements which may vary widely in form and arrangement. A pair of vertically disposed front and rear plate members **31** and **32**, respectively, extend downwardly from plate member **30** and are supported at their lower edges by horizontal front and rear lower rail members **34** and **35**, respectively.

These several components which make up the bed **12** of the press are securely welded along their meeting edges and are also welded to the inner main plate members **26** and **15** of the side columns **10** and **11** as indicated at **37**, **38**, **39** and **40** in Fig. 1. In the form of bed structure illustrated in Figs. 1 and 2 the bed is further reinforced by vertical fore and aft bracing plates **43** and **44** which immediately underlie the top plate **30** of bed **12** and extend from front plate member **31** to rear plate member **32**. Plates **43** and **44** are likewise welded at their edges to the other portions of the bed with which they abut.

Vertical front and rear channel members **49** are welded against the outer sides of the front and rear plate members **31** and **32** and further reinforce and support the bed structure. The channel members **49** are arranged with their web portions generally in the plane of the front and rear portions of the side columns **10** and **11** and with the outer edges of their flange portions abutting against the exterior surfaces of the front and rear vertical plate members **31** and **32** to which elements the channel members **49** are welded.

The crown portion of the punch press frame which connects the upper ends of the side columns **10** and **11** and which is designated generally **13** in Figs. 1 and 2 is shown in cross sectional detail in Fig. 3 and comprises front and rear vertical plate portions **53** and **54** which are inwardly flanged at their upper and lower edges. The crown **13** further comprises bottom plate members **55** which extend from front to rear between the plate members **53** and **54** at the center portion thereof.

The punch press for which the frame illustrated in Figs. 1, 2, 3 and 7 is designed is of the double crank type having two crank throws laterally spaced with two separate connections downwardly to the slide of the press. Crankshafts of straight side presses of this type are conventionally provided with a center bearing structure and two end bearings, usually of the split type although not necessarily.

In the present instance the two end bearings for the crankshaft, that is the stationary upper portions of such bearings, are secured in appropriate openings formed in the inner and outer wall portions of the side columns **10** and **11**, as, for instance, in openings **58** formed in the main plate member **15** and the outer plate member **23** of the right-hand column **11**. As shown in Fig. 2, openings **58** are of sufficient extent to permit ready assembly of the usual bearing caps when the crankshaft is in assembled position.

The crankshaft center bearing structure, that is, the upper stationary portion of the center bearing structure, is designated **60** and is secured to the lower portions of a pair of fore and aft supporting plates **61** and **62** which are welded to the front and rear plate members **53** and **54** of the crown and the lower plate member **55**.

Suitable slide bearings are provided for guiding the vertical reciprocation of the slide which carries the upper or movable part of the die set. In Fig. 2 these slide bearings are designated **64**, **65** and **66**.

Reference will be had now to the modification illustrated in Figs. 4, 5 and 6. In this form of the invention the side column members are basically the same as the side columns in the previously described modification as to transverse cross section and as to the manner in which the several principal components are fabricated and assembled to form the side column. However, in the present modification the base and the crown of the press each extends substantially the full width of the press from side to side and the side column members extend vertically between the bed and the crown, having their bottom ends supported upon the bed and their upper ends extending to a point directly beneath and in abutment with the crown for supporting the latter.

In Fig. 4 the press crankshaft and its driving gear and the slide of the press are indicated in position to more fully disclose a complete punch press, although those components are entirely conventional and form no part of the present invention.

In Fig. 4 the bed of the press is designated generally by the numeral **70**, the crown by the numeral **71**, and the left and right hand side columns by the numerals **72** and **73**, respectively. The right-hand side column **73** is shown in horizontal transverse cross section in Fig. 6 and comprises a relatively heavy inner plate member **75**, front and rear channel members **76** and **77**, and an outer central plate **78**. The manner in which these components are fabricated and welded to each other to form a vertically extending side column is the same as that described in connection with Fig. 7 of the previous embodiment and thus need not be repeated in detail here.

In the present form of the invention the side columns **72** and **73** have at their lower ends horizontal plate members **80** and **81**, respectively, which extend forwardly and rearwardly, generally coextensively with the main body portions of the column member. Similarly, the upper ends of the side columns **72** and **73** are provided with plate members **82** and **83**, respectively. The bed of the press of Figs. 4, 5 and 6 includes upper, front and rear laterally extending rail members **85** and **86**, underlying vertical front and rear plate members, the front plate member being designated **87** in Fig. 4, and vertical end plate members **88** and **89**.

The end plate members **88** and **89** have welded to their outer faces front and rear vertical channels which comprise downward vertical extensions of the channel members which are included in the side column construction. The front vertical channel member of the right-hand portion of the bed structure is designated **92** in Fig. 5 and the rear channel member is designated **93**. In Fig. 4 the front channel member of the left-hand column member is designated **94**.

Relatively heavy horizontal bottom plate members are welded to the lower ends of each of the outer side channel members of the bed of the press, the bottom plate of channel member **92** being designated **96**, the bottom plate of channel member **93** being designated **97**, and the bottom plate of channel **94** being designated **98**. The left rear channel member and its bottom plate member do not appear in either Fig. 4 or Fig. 5. An intermediate upper horizontal plate member **100** extends between the channel members **92** and **93** of the bed structure as shown in Fig. 5 and a similar horizontal plate member is provided at the left-hand side of the bed **70** between the front channel member **94** and the rear channel member thereof.

For accurately locating the side columns with respect to the bed of the press fore and aft keys **101** and **102** and laterally extending keys **103** interfit with the lower ends of the side column structures and the adjacent abutting upper surfaces of the bed structure.

In the form of bed illustrated in Fig. 4 the front and rear vertical plate elements are further reinforced by vertically extending channel members as indicated in connection with plate **87** at **105** in Fig. 4.

The crown **71** of the press of Figs. 4 and 5 includes front and rear vertical wall members **110** and **111**, respectively, and end wall plate members **112** and **113**. Channel members **114** and **115** whose width is substantially equal to the full depth of the crown from front to

back are disposed against the end plate members **112** and **113** to form substantially a double wall end structure at each end of crown **71**. The lower end of the crown structure is provided at each corner with a horizontal supporting plate portion for seating against the corresponding horizontal plate portions at the upper ends of the respective side columns. The lower end plate portions appearing in Figs. 4 and 5 are designated **115**, **116**, and **117**.

Referring to Fig. 5, a pair of vertical plate members **120** extend laterally between the web portion of channel **115** and plate member **113** to provide, in effect, approximate upward extensions of the side channels **76** and **77** of the side column **73**. Similar plate members are provided in association with the channel member **114** and plate member **112** at the left-hand side of the crown **71**. Rigid horizontal abutment plate members **123** and **124** surmount these approximate channel extensions as shown in Fig. 5 at the right-hand side of the press and similar horizontal abutment plate members are provided in conjunction with the left-hand channel member **114** and plate member **112** of the crown **71** of the punch press now being described.

The meeting surfaces of the crown **71** and the upper ends of the side columns **72** and **73** are provided at opposite sides with keys **125** and **126** which extend generally in a direction from front to back of the press and accurately locate the crown **71** with respect to the side columns **72** and **73**.

The entire framing assembly of the punch press of Figs. 4, 5 and 6, comprising the bed **70**, the crown **71**, and the side frame members **72** and **73**, is held in rigid assembly by means of vertical tie rods which extend through the bottom support plate members at the lower extremity of the bed of the press and upwardly through the abutment plate members which are designated **123** and **124** at the right-hand side of the press and are integrally associated with the crown **71**.

The front and rear tie rods at the right-hand side of the press are designated **130** and **131**, respectively, and the front tie rod at the left-hand side of the press is designated **132** in Fig. 4. The several tie rods are provided at their lower ends with nuts **134** and at their upper ends with nuts **135** by means of which nuts the bed, the side columns and the crown may be compressed through the medium of the tie rods to establish a rigid unitary assembly and one wherein the vertical tensile forces, which arise during and from the actual punching operation and which tend to move the bed and the crown of the press vertically apart from each other, are borne directly by the four tie rods which retain the press frame components in assembled relation.

In Fig. 4 the vertically reciprocating slide for the press is designated **140** and the double throw crankshaft is designated **141**. In the present instance the latter has two center bearings **142** and **143** which may be of the split type, the upper half being integrally included in the crown assembly. As shown in detail in Fig. 5 the crankshaft end bearings, one of which is designated **145** in Fig. 5, may comprise solid circular bearings held between the upper ends of the side frames **72** and **73** and the lower portion of the crown **71**, those elements being suitably apertured to receive and locate the end bearings of the crankshaft. The connections between crankshaft **141** and the slide **140** are entirely conventional and are not illustrated in the drawings.

As in the previous embodiment, the inner wall members of the side columns are provided with suitable slide guide bearings. The bearings of inner wall **75** of column **73** are designated **150**, **151** and **152** and the front slide bearing of side column **72** is designated **153** in Fig. 4.

What is claimed is:

1. In a punch press of the straight type, a pair of laterally spaced generally vertical side column members at opposite sides thereof, each of said column members including an inner wall extending generally from the front to the rear of said punch press, a die receiving bed rigidly connected at its opposite sides with the lower portions of said side columns, a crown spaced above said die receiving bed and extending between said side column members at their upper portions with the ends of said crown fixed against said inner walls, each of said column members having a pair of vertical channel members disposed adjacent to the front and rear vertical edges of the inner wall member thereof with the outer edges of the flanges of each channel member in abutment with and welded to the exterior surface of said inner wall, and a vertically extending plate element extending between the facing flanges of each of said pair of channel members and welded thereto along the vertical edges of said plate element, each plate element being disposed outwardly of and parallel to its associated inner wall member, said inner walls being substantially thicker than the walls of said channel members and said plate elements.

2. In a punch press of the straight side type, a pair of laterally spaced generally vertical side column members extending substantially the height of said press at opposite sides thereof, each of said column members including an inner wall extending generally from the front to the rear of said punch press, a die receiving bed between said side column members at their lower portions and fixed against said inner walls, a crown between said side column members at their upper portions and likewise fixed against said inner walls, each of said column members having a pair of vertical channel members disposed adjacent to the front and rear vertical edges of the inner wall member thereof with the outer edges of the flanges of each channel member in abutment with and welded to the exterior surface of said inner wall, said pair of channel members being spaced from each other from front to rear of said press, and a vertically extending plate element extending between the facing flanges of each of said pair of channel members and welded thereto along the vertical edges of said plate element, each plate element being disposed outwardly of and parallel to its associated inner wall member, said inner walls being substantially thicker than the walls of said channel members and said plate elements.

3. In a punch press of the straight side type, a pair of laterally spaced generally vertical side column members extending substantially the height of said press at opposite sides thereof, each of said column members including an inner wall extending generally from the front to the rear of said punch press, a die receiving bed between said side column members at their lower portions and fixed against said inner walls, a crown between said side column members at their upper portions and likewise fixed against said inner walls, each of said column members having a pair of vertical channel members disposed adjacent to the front and rear vertical edges of the inner wall member thereof with the outer edges of the flanges of each channel member in abutment with and welded to the interior surface of said inner wall, said pair of channel members being spaced from each other from front to rear of said press, said inner walls being substantially thicker than the walls of said channel members.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,843,204 July 15, 1958

Frederick E. Munschauer

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 60, for "interior" read -- exterior --.

Signed and sealed this 16th day of September 1958.

(SEAL)
Attest:
KARL E. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents