Jan. 22, 1946. F. ADAM 2,393,276

DOORS, ESPECIALLY FOR CELLS, GRATINGS, AND THE LIKE

Filed June 3, 1944 2 Sheets-Sheet 1

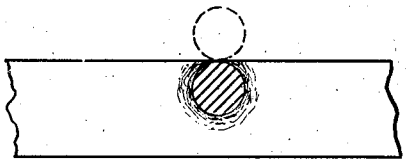


Fig.4.

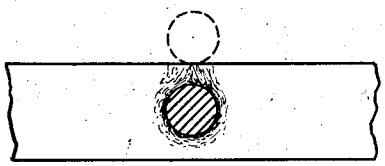


Fig.5.

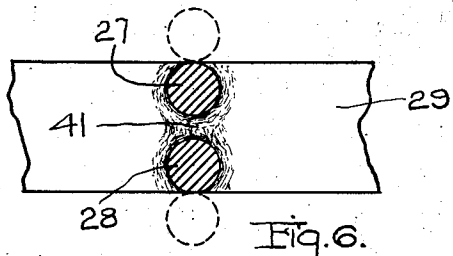


Fig.6.

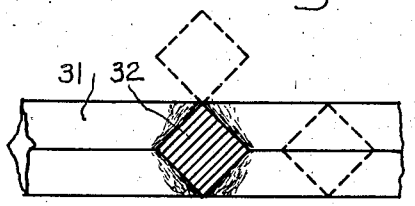


Fig.7.

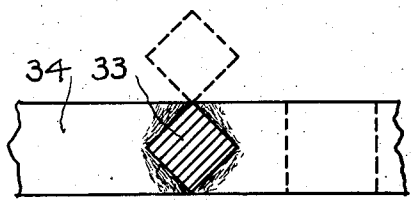


Fig.8.

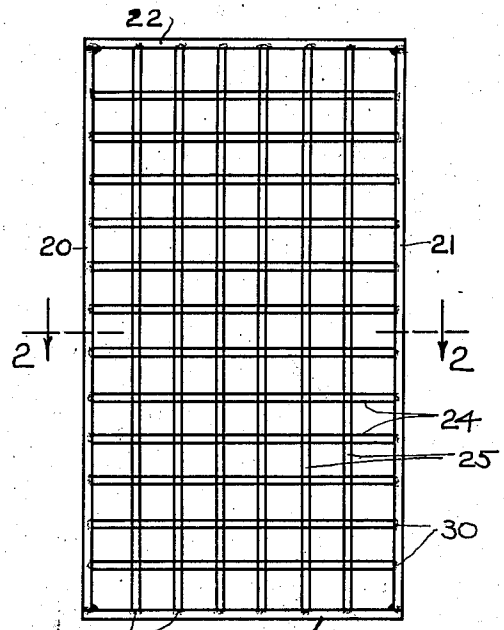


Fig.1.

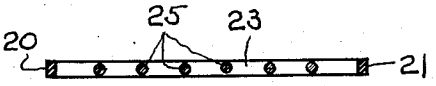


Fig.2.

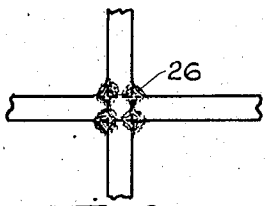


Fig.3.

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Jan. 22, 1946. F. ADAM 2,393,276

DOORS, ESPECIALLY FOR CELLS, GRATINGS, AND THE LIKE

Filed June 3, 1944 2 Sheets-Sheet 2

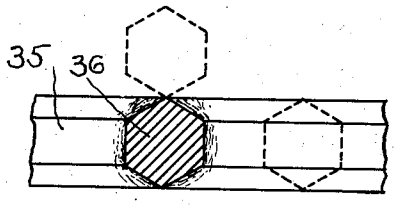


Fig. 9.

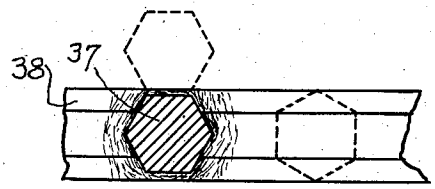


Fig. 10.

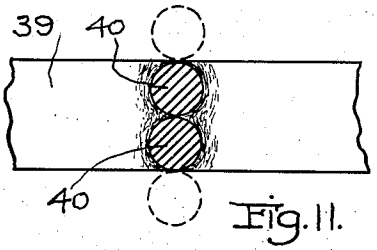


Fig. 11.

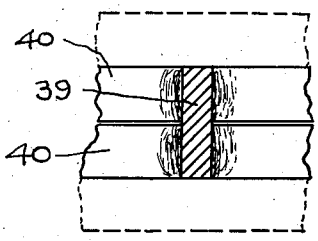


Fig. 12.

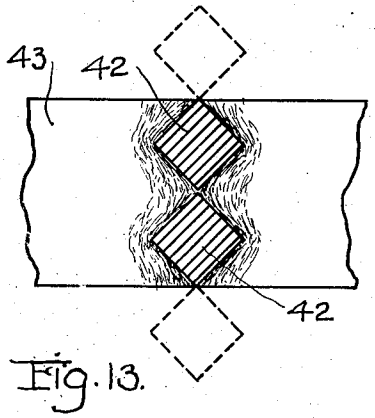


Fig. 13.

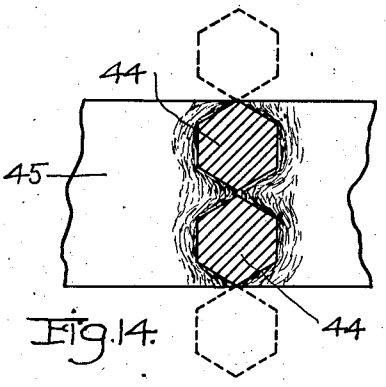


Fig. 14.

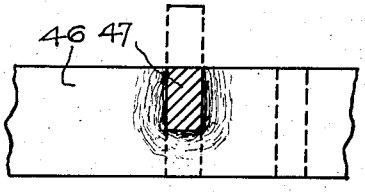


Fig. 15.

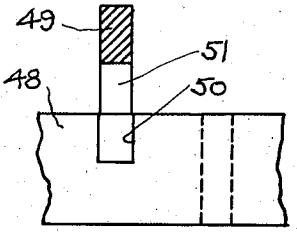


Fig. 16.

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UNITED STATES PATENT OFFICE

2,393,276

DOOR, ESPECIALLY FOR CELLS, GRATINGS, AND THE LIKE

Folger Adam, Joliet, Ill.

Application June 3, 1944, Serial No. 538,639½

4 Claims. (Cl. 189—82)

This invention relates to improvements in doors for jail cells, especially of that type in which the body portion of the door comprises a grating or the like; and the invention also relates to improvements in grating panels such as are used in constructing the wall portions of the cells, and for other purposes.

Heretofore it has been the general practice to construct these doors and panels from sets of cross-wise extending or intersecting bars, generally lying at right angles to each other; one set of bars (generally the horizontal bars) being flat, and the other set of said bars being round; and with this type of construction it has also been the custom to provide the flat bars with centrally placed holes through which the round bars are extended during the assembling of the two sets of bars together. Such grating of intersecting flat and round bars has then been surrounded or enclosed within a rectangular frame, generally of flat plates or bars, the ends of the grating bars being received within sockets or recesses formed in the inner faces of such frame bars. Frequently the intersecting round and flat bars have been secured together at their points of intersection by welding operations performed at the points of intersection after assembly of the sets of flat and round bars, and by use of welding rod in the well understood manner or practice.

The foregoing scheme presents a number of objections both in the completed product itself, as well as in the process whereby it is carried forward; and the cost of manufacture is high due to the need of forming the holes in the flat bars for reception of the round bars therein, as well as the cost of the separate welding operations at many points. Furthermore, the strength of such a grating is somewhat uncertain as these numerous and separate welding operations may not be of uniform characteristics.

It is the main object of my present invention to provide a door and grating panel for such installations as jails and the like in particular, which panel is composed of intersecting sets of bars and rods, generally at right angles to each other; said bars generally being flat and the rods being either round, or square, or hexagonal or of other suitable cross-sections as selected; and the rods being bodily intersected into or embedded in the bars by or during a welding operation wherein some of the metal of the location of intersection is slightly displaced around the intersection and comprises a portion of the welded intersection, to thereby greatly reinforce and strengthen the grating at each point of intersection between the bars and rods; and furthermore, this grating is so formed that the intersecting of the several bars and rods is accomplished without the need of providing any pre-formed holes in the bars for reception of the rods, said rods being forced into the bodies of the bars during and as a portion of the welding operation itself. During this welding operation the forcing of the rods laterally against and into the bodies of the bars serves to displace a portion of the metal of the bars immediately around the points of intersection so as to strengthen and reinforce the grating at each such location.

Sometimes I provide by this means a grating wherein the rods are centralized with respect to the bars; sometimes I provide arrangements wherein the rods are set closer to one edge of the bars than to the other edge thereof; sometimes I provide arrangements in which there is a single set of rods intersecting a single set of bars; sometimes I provide two or more sets of rods intersecting a single set of bars, as for example, an arrangement wherein there is a set of rods adjacent to each of the bar edges. Sometimes, also, I provide arrangements wherein the "bars" comprise also rods, the grating comprising two intersecting sets of rods of selected cross-section. For example, both sets of intersecting rods may be of hexagonal section, or both may be of square section, or both may be of round section; or again, one set of these bars may be of one cross-section, for example, round, and the other of another cross-section, for example, hexagonal; or again, the bars of the two sets may be brought together in selected manners. For example, in the case of angular cross-section bars, such as square or hexagonal, said bars may be brought together with their edges in contact in both sets, or with the edges of one set in contact with the flat faces of the other set; or in other manners.

It is to be noted that by use of my improved grating construction in combination with the encircling or enclosing framework into which the ends of the several bars and/or rods are entered, I provide a very strong and rigid door or panel for the cell structure, and one in which the thickness of the grating portion is not greater than the thickness of the bars or rods from which it is composed. Every intersection between the bars and/or rods is integrally formed by reason of the electric welding of the parts together during the process of forming the grating.

In connection with the foregoing, it is a further feature of my present invention that the welding of the intersections between the bars

and/or rods is performed electrically. For this purpose I set said bars and rods together in crossing fashion, with the two sets of elements in contact with each other at the points of intersection; and then I apply electric current through said intersecting contacts and with the pressure between the contacting elements under control, so that said current flows through points of high resistance and with generation of high heats at the points of contact; and with accompanying rise of temperature to the welding point; and during the further operation of the procedure I press these intersecting elements together while hot and soft, thereby forcing the bars down bodily into the co-operating elements until complete intersection is secured between the two sets of elements; whereupon the application of current may be completely discontinued, and pressure discontinued, leaving the interembedded and intersecting elements to cool.

In the drawings:

Figure 1 shows a face view or elevation of a typical cell door embodying the features of my present invention, and having a grating composed of intersecting sets of bars and rods, with an enclosing rectangular frame formed of bars with their ends welded together;

Figure 2 shows a cross-section on the line 2—2 of Figure 1, looking in the direction of the arrows;

Figure 3 shows on enlarged scale a typical intersection between a bar and a round rod of the grating shown in Figures 1 and 2;

Figure 4 shows how a round bar or rod may be brought into engagement with the edge of a flat bar, and then weldingly embedded into the body of said bar by use of electric current and pressure according to the method or process which comprises a portion of the present invention, the rod being embedded only sufficiently to bring the circular surface of the rod flush with the edge of the bar;

Figure 5 shows a view similar to that of Figure 4, but with the rod embedded to the central portion of the bar by further application of current and pressure;

Figure 6 shows a view similar to those of Figures 4 and 5, but wherein there are two rods embedded into the two edges of the bar;

Figure 7 shows how a pair of intersecting square rods may be brought and embedded together edge to edge;

Figure 8 shows a view similar to that of Figure 7, but with the rods brought together with an edge of one against the flat face of the other;

Figures 9 and 10 show views similar to those of Figures 7 and 8, but using hexagonal rods;

Figure 11 shows how two round rods may be brought against and embedded into the edge portions of a bar to bring them completely into the confines of the bar by my process or method;

Figure 12 shows a view at right angles to that of Figure 11;

Figure 13 shows a view similar to that of Figure 11, but making use of a square rod in connection with a flat bar at each edge of said bar;

Figure 14 shows a view similar to that of Figure 13 but making use of a hexagonal rod in connection with a flat bar at each edge of said bar;

Figure 15 shows a scheme in which two sets of intersecting flat bars may be integrated and pressure welded together into a grating comprising flat bars of substantially equal widths and completely integrated and pressure welded together; and

Figure 16 shows a grating scheme in which two sets of flat bars previously notched are brought together with their notches in registry after which said bars are integrated by pressure welding operation.

Referring first to Figures 1 and 2, I have therein shown a typical cell door embodying the features of the present invention. In this case the door comprises a rectangular frame, including the vertical end members or posts **20** and **21**, and the top and bottom horizontal sills **22** and **23**. This frame may be formed from members of suitable section, said members in the construction shown comprising flat bars, but as far as the present invention is concerned any suitable sections might be employed. Usually the door frame bars are welded together, as shown at the corners, suitable kerfs being provided if desired, according to well understood practice.

The body of this door comprises a grating including the horizontal members **24** and the crosswise or intersecting members **25**. The principal features of the present invention concerns themselves with the construction and manner of producing this grating. Heretofore it has been a very common practice to form the horizontal bars **24** from flat plates or bars, and these have generally been provided with vertical through holes to receive the vertical bars or rods **25**, same being extended vertically through the entire height of the door panel. In such case, also it has been common practice to separately weld these vertical rods to the horizontal bars at the intersecting points, thus requiring numerous individual welding operations after assembly of the grating. This has been expensive, has been a relatively slow procudure; and sometimes such individual welds have been imperfectly made.

According to the principal feature of the present invention I electrically weld the horizontal and vertical members of the grating together at their points of intersection, by what I may call a pressure welding operation. In performing this pressure welding operation the two sets of members or elements (vertical and horizontal) are set together, edge to edge, in proper spacing and in proper intersecting relationship, one pole of a welding current circuit being connected or established to each such set of members. Then these two sets of members are moved towards each other to bring the members of one set into contact with the members of the other set at the points of intersection, and with a relatively light pressure, so that high resistance points of contact are established at all points of intersection. High and fusing or softening temperatures are soon generated at these points of intersection, whereupon further pressure is applied between the two sets of members, forcing them together bodily at the intersecting points, and bringing the medial planes of the two intersecting sets of members closer together so that actual bodily merging of the sets is caused at the points of intersection. During this portion of the procedure the current may be reduced or completely discontinued, sufficient heat having been generated to enable the completion of the welding operation.

In those cases in which one set of the members comprises flat bars as in Figures 4, 5 and 6, the other set comprising round or other sectional bars or rods being pressed against the relatively narrow edges of the flat bars, a relatively small area of contact is established, requiring a relatively small current delivery and requiring the fusing of a relatively small body of metal in order to enable

the penetration of the round or other section rods into the body of the flat bars. During the operation of forcing the rods bodily into the edge portions of the bars there is a displacement of metal of the two elements so that a reinforcement of the welded or integrated junction is provided, as shown in Figures 2 and 3, wherein there is evident an enlargement or fillet such as **26** around the junction. This enlarged portion comprises metal moved bodily from the point of junction, and the volume of such metal is of course substantially equal to the volume of metal contained within the portion of one element which is enclosed by the projection of the perimeter of the other intersecting element.

Generally the foregoing procedure will be continued until the one set of members or elements has been completely embedded into the other set so that a substantially flush surface is established over both sets. Further penetration might be secured by carrying the operation to a further extent; but it will be noted that full strength in the junction is attained when complete intersection is secured between the members of both sets, and that further movement of the one set across the width of the other set results in no substantial gain in strength, but nevertheless requires considerable additional time and current consumption.

It is thus evident that when forming the grating of the cell door or element according to the principles of my present invention I secure full integration between the two sets of elements and complete joining together of said two sets of elements, while at the same time retaining the members of one set adjacent to the edges of the members of the other set, instead of passing the members of the one set centrally through the members of the other set, as in past practice wherein the bars have been provided with central holes for accommodation of the rods passing through them. Furthermore, when forming the grating according to the present invention the entire operation is performed at one time, including the intersecting of the members of the two sets, the securing of said members together, and the welding of the members of the two sets together into an integral structure. Furthermore, all this is performed without the need of any drilling operations, and therefore with a great saving of time and expense in that connection.

Sometimes I provide two sets of rods in connection with a single set of the flat bars, as shown in Figure 6, wherein the two rods **27** and **28** are shown intersected with the opposite edge portions of the common flat bar **29**. Such result is secured by forcing the two sets of rods simultaneously against the opposite edges of the bars, so that integration takes place between the two sets of rods and the opposite bar edges. This will produce a doubly strong and reinforced grating, without the need of forming any holes in the flat bars, and with the use of bars of standard or previously used width; thus securing the benefits of the double rod construction, without having to use bars of any greater width than have heretofore been customarily used. Furthermore, it is noted that when using the previous method of passing the rods through holes formed in the flat bars, said holes cannot be formed too close to the bar edges, without sacrifice of strength; so that when forming the grating according to the previous practice it has been necessary to set the rods inwardly from the bar edges, thereby requiring additional width in the bars, and additional weight and cost of construction.

Generally the end portions of the horizontal and vertical intersecting elements are received within sockets or recesses such as shown at **30** in Figure 1. Such sockets may be formed by providing through holes in the frame elements, and afterwards closing the outer portions of these holes by welding rod or in other suitable manner.

In Figures 7 and 8 I have shown grating elements in the form of two sets of intersecting square rods which are integrated together by the pressure welding according to my present disclosure. In Figure 7 these two rod elements **31** and **32** are brought together edge to edge and pressure integrated or welded; whereas in Figure 8 the rod **33** is brought edge against the flat surface of the rod **34**, and then the two rod elements are pressure integrated or welded.

In Figures 9 and 10 I have shown gratings similar to those of Figures 7 and 8, but using hexagonal rods. In Figure 9 the two hexagonal rods **35** and **36** are brought together and integrated or welded edge to edge; whereas in Figure 10 the two rods **37** and **38** are brought together with the edge of the rod **38** against a flat surface of the rod **37**. In all the schemes of Figures 7, 8, 9 and 10 it is noted that the completed grating will comprise two sets of rods or selected cross-sections, generally of the same size, but necessarily so, completely integrated together by pressure welding, so that the faces of the grating comprise planes in contact with opposite portions of both these sets of rods.

In Figures 11 and 12 I have shown the grating as comprising the flat, relatively narrow or thin bars, **39**, together with the round rods **40**, integrated into both edges of such bars, as shown by the dotted circles and lines in said figures. This general type of construction has already been referred to in connection with Figure 6; but I wish to emphasize the fact that when using this double rod scheme, said rods may be so proportioned with respect to the width of the bars that there is left a substantial space such as shown at **41** in Figure 6, between the two sets of rods; or so that said sets of rods will come substantially together, as shown in Figures 11 and 12.

In Figure 13 the grating comprises the square rods **42** integrated into the edges of the flat bar **43**, being set edge of rod against edge of bar and then integrated into the body of the bar by the pressure welding operation; and in Figure 14 the grating comprises the hexagonal rods **44** integrated into the edges of the flat bar **45**, being set edge of rod against edge of bar and then integrated into the body of the bar by the pressure welding operation. In the cases of both Figures 13 and 14 the sizes of the rods are such, with respect to the bars, that when complete integration has been effected the rods come substantially together as well shown.

In Figure 15 I have shown a grating comprising the two sets of flat bars **46** and **47** of unequal widths, and brought together edge to edge, and then integrated together by the pressure welding operation, into the dotted line position of Figure 15. In this case there is substantially complete intersection between the two sets of elements, and when the operation has been completed the edges of these two sets of elements lie substantially in common planes at the two faces of the grating.

In Figure 16 I have shown a grating comprising the two sets of flat bars **48** and **49**, each pro-

vided with notches such as 50 and 51, respectively, so that these bars may be initially interlocked or internotched and registered; and then the sets of bars so set together may be pressure welded and integrated together. By providing the notches 50 and 51 initially, or prior to the pressure welding operation, the time and current consumption needed to secure completion of the pressure welding and integrating operation may be materially reduced, with corresponding reduction of cost for these portions of the operation. It is also to be noted that with this scheme the amount of metal to be displaced during the pressure welding operation may be reduced as much as desired (up to the full amount otherwise displaced during the operation), so that the size of the fillet which will be formed during the pressure welding operation may be controlled. Generally when using this initial notching scheme of Figure 16, it will be desirable to so proportion the notches that complete intersection of the bars is not secured prior to the pressure welding operation, so that some movement of the bars together will take place during the pressure welding operation, to thereby ensure more perfect welding action, and the production of slight fillets at least. For example, in case such notched bars are used to produce a grating in which the two sets of bars are eventually to come together with their edges in a common plane, the notch sizes should be such that when internotched prior to pressure welding the edges of one set of bars would project slightly beyond the edges of the other set of bars; and then during the pressure welding operation the two sets of bars would be forced slightly together and brought into final relative position desired.

I claim:

1. In a cell door or the like, for a jail structure, a grating composed of two sets of parallel elements, one set of elements comprising flat bars with their narrow edges lying in grating enclosing planes, and the other set of elements comprising two sets of rods lying substantially at right angles to the bars aforesaid, one set of said rods being integrated into the edge portions of the bars adjacent to each of the grating enclosing planes and lying completely inside of the enclosing plane at that side of the grating, a rod of one set being located opposite to a companion rod of the other set, and said rods having their proximate portions substantially in contact with each other, the sum of the dimensions of said rods measured through said contacting portions being substantially as great as the depth of the bars at the points of integration of the rods with said bars, all said rods being integrated into the edge portions of the bars by a pressure welding operation wherein said rods are displaced into the edge body portions of the bars, and completely without preformation of holes in the bars, substantially as described.

2. A structure as defined in claim 1 wherein the rods of said other set are round rods, substantially as described.

3. A structure as defined in claim 1 wherein the rods of said other set are square rods, substantially as described.

4. A structure as defined in claim 1 wherein the rods of said other set are hexagonal rods, substantially as described.

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