

[54] **BALCONY RAILING ASSEMBLIES OF
EXTRUDED METAL**

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[52] **U.S. Cl.**..... **256/65; 256/22**

[51] **Int. Cl.**..... **E04h 17/14**

[58] **Field of Search** 256/65, 59, 21, 22, 66-70,
256/24

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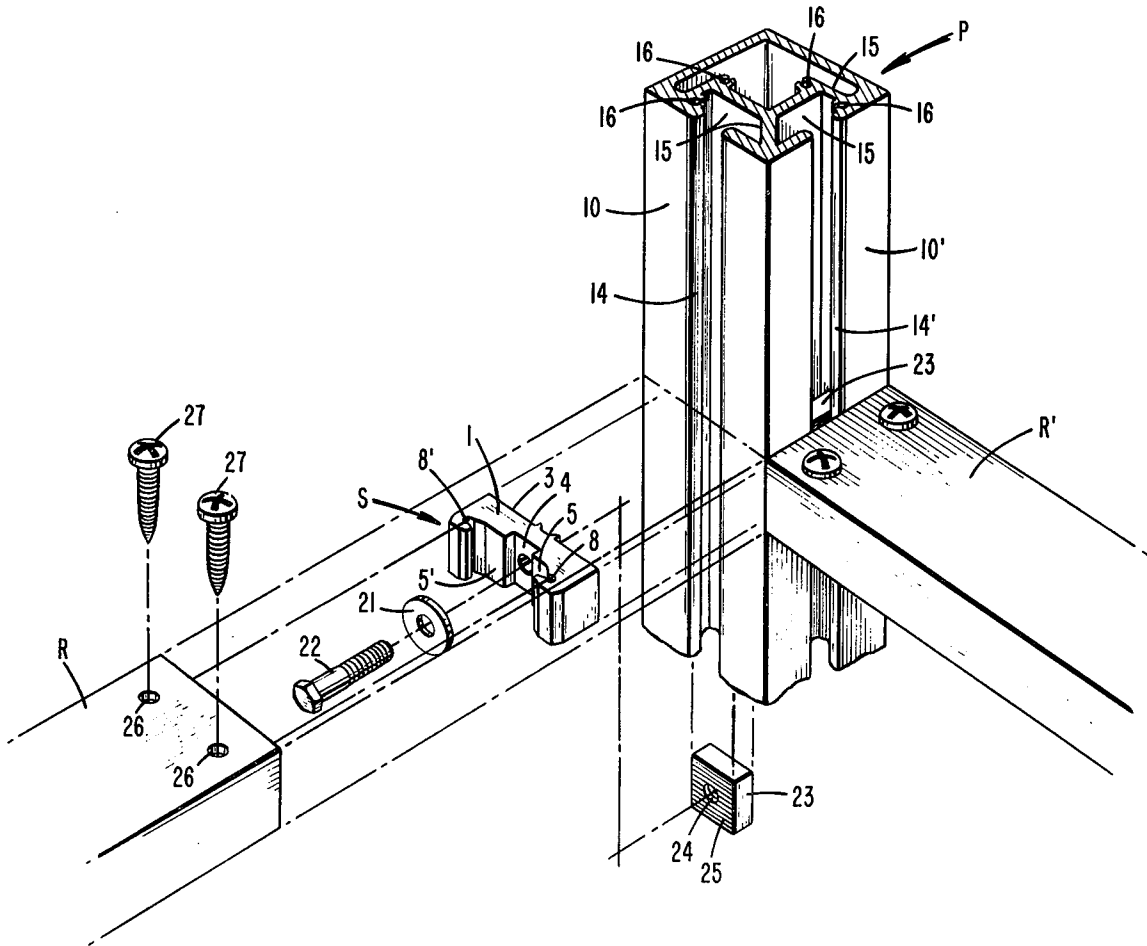
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Attorney, Agent, or Firm—Samuel Lebowitz

[57] **ABSTRACT**

A metallic railing assembly, comprised of vertical posts, horizontal rails and pickets of extruded aluminum or alloys thereof, which are interconnected by means of bolts and screw fasteners without welding procedures. Splines of special and simple construction, which are severed from a length of extruded alloy, are affixed to the posts to provide a secure support for the ends of the rails to transmit the horizontal loadings to the anchored vertical posts, without loosening any of the component parts.

15 Claims, 16 Drawing Figures



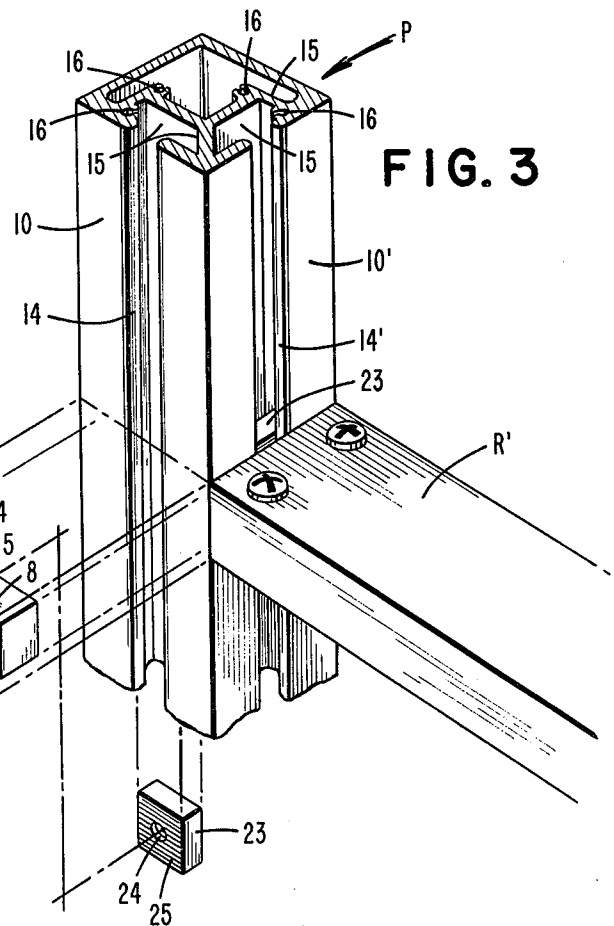
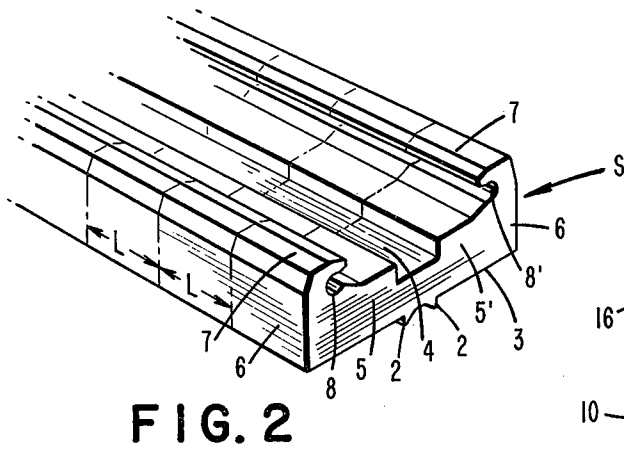
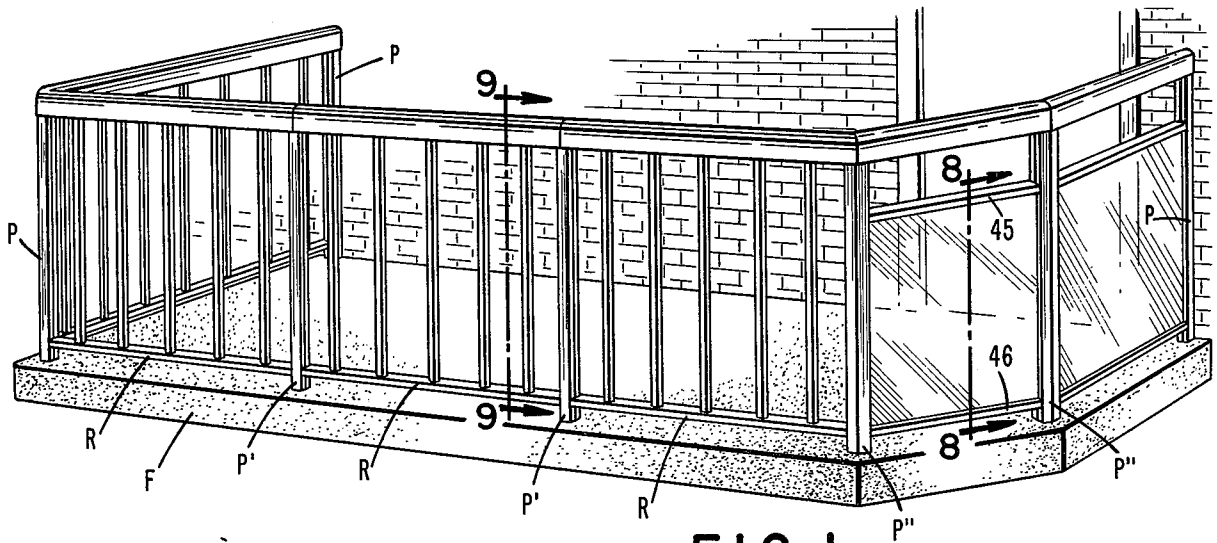


FIG. 4

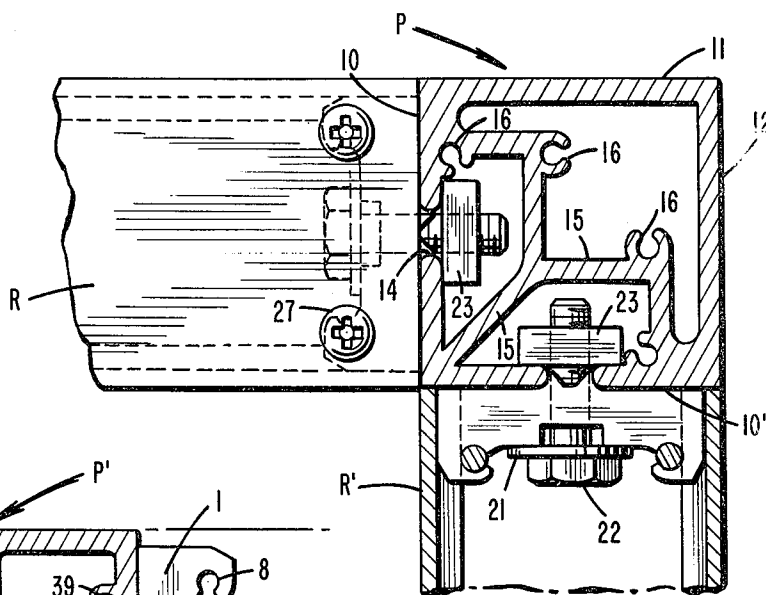


FIG. 5

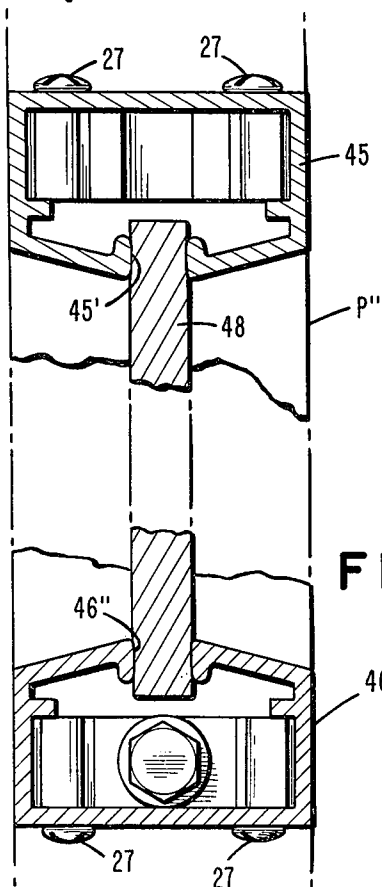
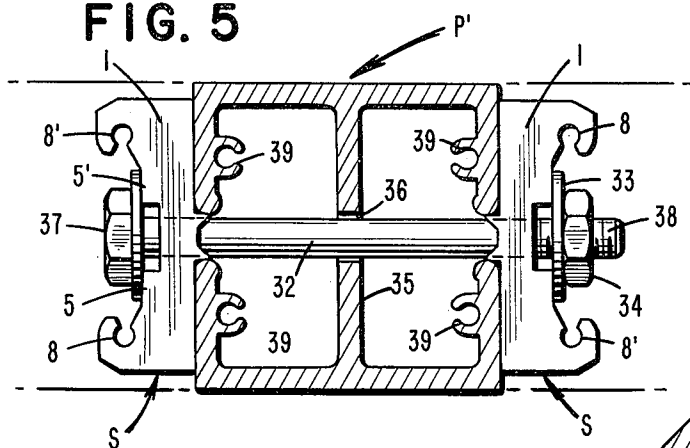


FIG. 8

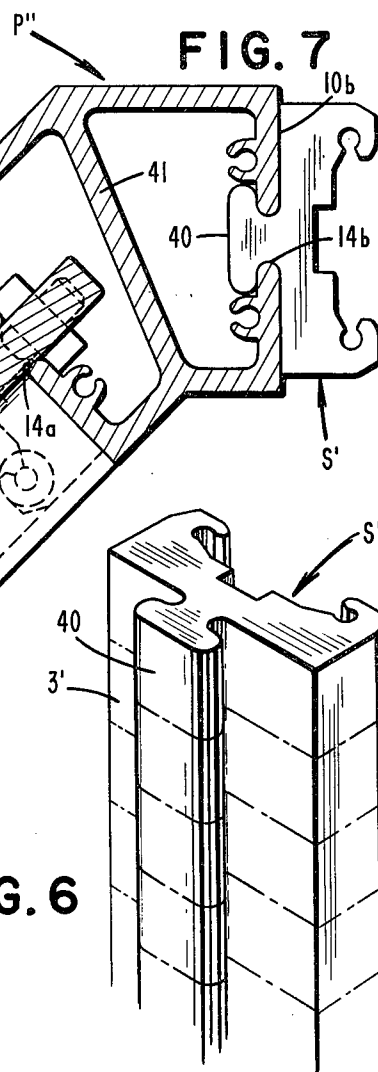


FIG. 6

FIG. 9

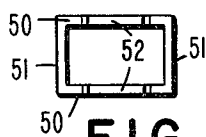
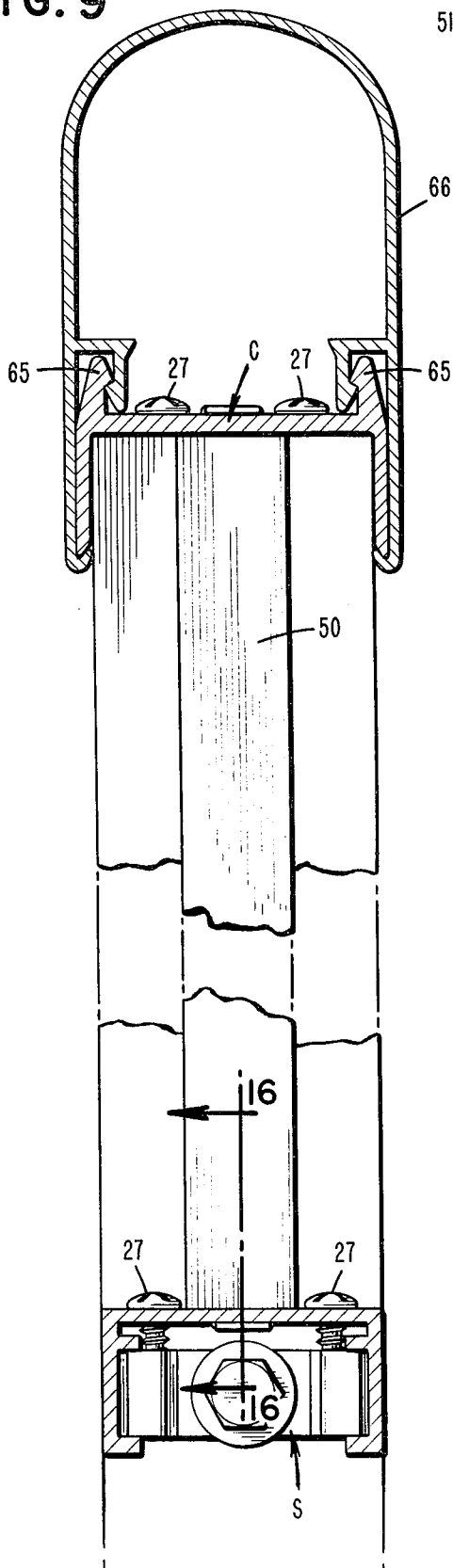


FIG. 10

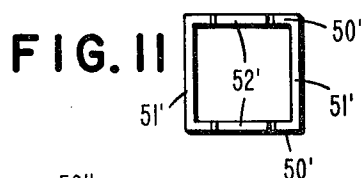


FIG. 11

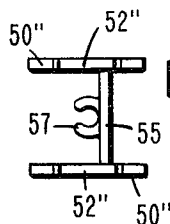


FIG. 12

FIG. 13

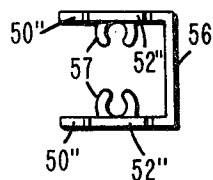


FIG. 14

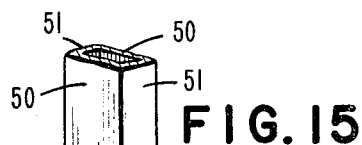
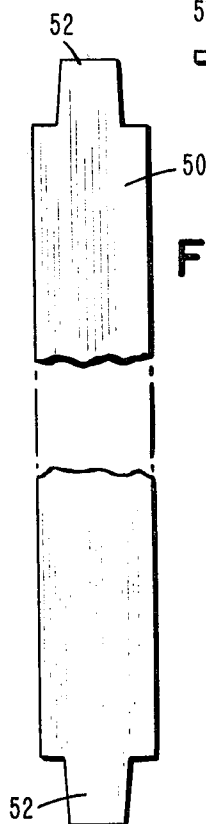


FIG. 15

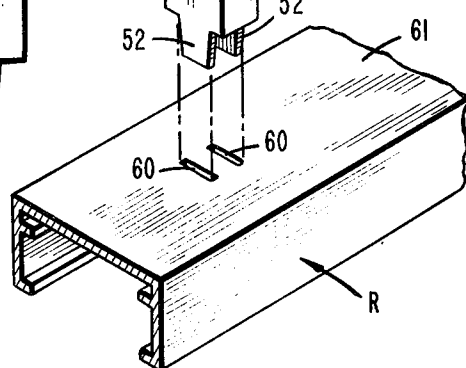
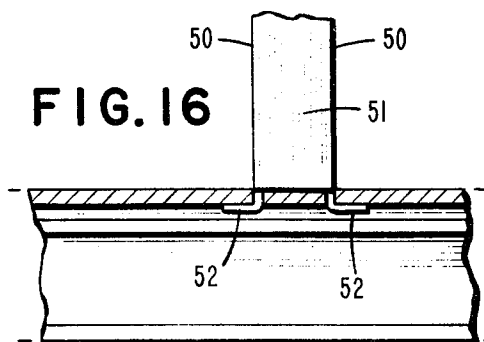


FIG. 16



BALCONY RAILING ASSEMBLIES OF EXTRUDED METAL

This invention relates to aluminum railing systems and more particularly to railings formed of extruded aluminum components which may be combined in unique architectural designs to create distinctive and structurally sound arrangements.

It is the object of the present invention to provide aluminum railing systems composed of extruded aluminum sections which are rugged and economical in design, and which may be assembled with minimal labor costs to produce structural units of maximum safety.

It is another object of the invention to provide especially strong mechanical connections between vertical posts of a rail assembly and the rails extending therebetween which are easily adapted to the use of either picket elements or panels of solid or reticulated sheet material. The resulting assemblies, in addition to presenting pleasing architectural effects, are characterized by a high factor of safety, which is a very important consideration in view of the wide use of such railings on balconies in modern high-rise building constructions.

It is another object of the invention to provide spline connections between vertical posts and horizontal rails by providing a strong tamper-proof connection for transferring horizontal loads to high strength vertical posts, without need for any welding procedures at these joints. The joints between the posts and the picket rails are maintained in tight connection without loosening therebetween in the course of time.

It is also the object of the invention to provide tight connections between picket rails and the pickets integrated therewith by simple metal bending operations, without welding or soldering.

Other objects and purposes will appear from the detailed description of the invention following hereinafter, taken in conjunction with the accompanying drawings, wherein

FIG. 1 is a perspective view of a railing system for building balconies, patios, porches or other enclosures, showing vertical pickets at one part thereof and panels of sheet material at other parts thereof;

FIG. 2 is a perspective view of the continuous length of extruded aluminum wherefrom is cut the spline segments for mounting on vertical posts;

FIG. 3 is a perspective view of a corner post of square cross-section showing one end of a horizontal rail affixed thereto in a manner indicated by the phantom view of the components adapted to be affixed to the adjacent face of the corner post, for supporting the end of another rail;

FIG. 4 is a horizontal sectional view, with certain parts in elevation, of the completed connections of the horizontal rails to the corner post shown in FIG. 3;

FIG. 5 is a horizontal sectional view of an intermediate post, with the spline segments connected to the opposite faces thereof, for supporting the horizontal rail sections adapted to extend from the opposite faces of the post;

FIG. 6 is a perspective view of a second embodiment of a continuous aluminum extrusion wherefrom is cut spline segments for mounting on the vertical posts;

FIG. 7 is a horizontal sectional view, with certain parts in elevation, of a vertical post which supports spline segments of the type illustrated in FIG. 6, at the right portion, and a spline as shown in the preceding

figures, in dotted lines, in the left portion, for supporting panels extending in obtuse directions;

FIG. 8 is a vertical sectional view along line 8—8 of FIG. 1, illustrating the mounting of a panel between the intermediate and bottom rails of the railing section in the right portion of FIG. 1;

FIG. 9 is a vertical sectional view of a picket rail assembly along line 9—9 of FIG. 1;

FIGS. 10 to 13 are sectional views of different extruded metal pickets of rectangular outline, each comprising two parallel sides displaced from each other;

FIG. 14 is a side elevation of the picket shown in FIG. 9, illustrating the ends thereof;

FIG. 15 is a perspective view of the mode of interconnecting vertical pickets of the type shown in FIG. 10, with a picket rail as shown at the bottom of FIG. 9; and

FIG. 16 is a vertical sectional view along line 16—16 of FIG. 9.

In the drawings is shown a metallic railing system for enclosing balconies, porches, patios and the like, the components of which are formed of metallic extrusions of aluminum or other ductile metals. The fabricated extruded aluminum sections, especially the supporting posts and rails, are assembled quickly with bolt and screw fasteners, with the elimination of welding procedures and the consequent labor costs. The fasteners which are employed in the railing system in accordance with the invention are fabricated of aluminum or stainless steel to eliminate any corrosive effects resulting from outdoor exposure.

The alloys which are employed are generally designated in the industry as 6063 T5, 6005 T5, or 6061 T6, and these may be fabricated for both anodized and painted finishes. The castings employed in the system are fabricated of alloy 214 or 356.

As shown in FIG. 1, the railing system in accordance with the invention lends itself for construction on a balcony floor F of concrete, which is prepared for mounting the railing system in accordance with the invention by providing cupped openings at predetermined points of the floor, of a depth of approximately 4 inches, and 3 inches in diameter, for receiving a hardenable cement or other mixtures to securely fix the several vertical supporting posts within the floor at displaced points along the latter.

As shown in the drawing, the railing comprises a corner post P at one end of the floor for mounting vertically displaced horizontal picket rails R which extend in directions perpendicular to each other, and intermediate posts P' for supporting horizontal picket rails in opposite directions along the length of the balcony. The particular contour of the balcony floor accommodates a pair of intermediate posts P'' which support intermediate and bottom rails which extend at obtuse angles of 135° in order to complete the enclosure of the railing system. The end posts p adjacent to the building are set within the floor and are affixed to the building wall in a manner well known in the art and are fitted with spline connections to support the rail terminals in the same manner as the latter are supported in the balance of the balcony system.

The rugged and strong connection between the end posts, corner posts and intermediate posts, and the horizontal picket rails which extend therebetween, is attained by the provision of special spline segments of extruded aluminum which are produced in continuous lengths and sheared into segments of predetermined

depth for secure mounting against one or more faces of the vertical posts, whereupon they serve as supports for the ends of the picket rails. Thus, in FIG. 2 is shown the extruded aluminum splines S which may be cut from a length of extruded aluminum alloy of 20 feet, into individual lengths L, for mounting on one or more faces of the extruded aluminum posts, which are suitably reinforced by internal webs, and which are formed with longitudinal slots for permitting the mounting of the splines at desired points along the length thereof. In addition, both the splines and posts are extruded with integral open cylindrical channels of curved cross-section, which serve as arcuate openings for receiving self-tapping screws for affixing the additional components of the assembly cooperating therewith.

As shown in FIG. 2, the lengths L may be five-eighths inch, and are adapted to be cut and set into the position shown in FIG. 3 by seating the face 3 thereof against the face 10 of the post P containing the slot 14 extending longitudinally thereof along its medial axis. The cross-section of the post P is preferably square, 2 inches on each side, with the slots on the faces 10 and 10' being approximately five-sixteenths inch in width. The face 3 is provided with ribs 2 at the central portion thereof in order to guide the seating of the spline S within the longitudinal slots extending along the central axes of the faces 10 and 10'.

Each spline is formed with a channel 4 on the face thereof opposite the seating face 3, and enlargements 5 extending from each side thereof project outwardly from the center of the spline to the flanges 6 wherefrom the overhangs 7 are contoured to form curved channels 8,8'. These channels are in the form of open cylindrical passages of metal of approximately 300°. An open sector of about 60°, permits easy extrusion while leaving about 300° as a screw boss for engagement with the threaded bits of the screw fasteners. Thus, there is present sufficient metal to form a biting engagement with fastening screws 27, which extend through punched openings 26 in the horizontal rail R, to affix the latter to the supporting face 1 of the spline after it is rigidly fastened to the supporting post.

The splines S may be fastened to the posts in different ways.

The preferred mode of attachment of the splines is shown in FIGS. 3 and 4. In this embodiment the spline element is bored mid-way of its length in the channeled groove 4 to permit a bolt 22 to be extended therethrough with the interposition of a washer 21 spanning the shoulders 5,5' of the spline. The spline is seated at the mid-portion of the face 10 of the corner post P by means of the ribs 2 which engage the edges of the longitudinal slot 14 at the center of the post 10. A nut 23 of stainless steel, having a threaded central opening 24, is disposed in the interior of the post behind the longitudinal slot 14 for receiving the threaded end of the bolt 22, and the surface 25 adjacent the slot is roughened by serrations, knurling and the like, so that the relative turning of the bolt within the nut effects a secure connection between the spline member and the post, leaving the main portion of the spline with its top surface 1 in position to support the end of the rail R thereon. The rail R, which is also formed of extruded aluminum, may have the openings 26 bored therein at the factory, for these, of necessity, must be in alignment with cylindrical passages or screw bosses 8,8' in the spline, to interconnect the rail with the post.

As stated above, the extruded aluminum post P may be 2 inches square in cross-section, with the spline surface 1 being slightly shorter in order to enable the picket rail to be supported by the spline with the outer surface of the rail disposed in a common plane with the adjacent face of the post.

As shown in FIGS. 3 and 4, a second picket rail R' may be affixed to the face 10' of the corner post, provided with a longitudinal slot 14' by a second bolt 22 with the washer 21 on the outer side of the spline, and the threaded nut 23 on the interior of the post for interconnecting the other rail section R' in the direction perpendicular to the first, with the outer faces of the rails coincident with the smooth faces 11 and 12 of the corner post P.

The extrusion of the corner post P is designed to provide open cylindrical channels 16 at different parts thereof in order to accommodate screw fasteners for top clips and top rails for the post. These serve the additional function of reinforcing the core of the post in conjunction with the reinforcing webs 15 which extend therethrough between the different faces of the post.

In the case of the intermediate posts P', individual bolt fasteners for affixing the individual splines S to the opposite faces of the posts may be employed in the same manner illustrated in FIG. 4 for the individual mounting of the splines on the faces 10 and 10' extending perpendicularly to each other. On the other hand, a single bolt may be employed to connect the splines to the opposite faces of the post P' as shown in FIG. 5. The medial reinforcing web 35 of the post P' is drilled at 36 to accommodate a long bolt 32 having a head 37 at one end and threads 38 at the opposite end, so that the bolt can be passed through one of the splines and reinforcing web 35 through the opposite wall of the post and the spline device at the opposite end, whereat it is engaged by the fastening nut 34 with the washer 33 adjacent it. Thus, a single bolt and nut serves to interconnect the post with two splines for supporting the picket rails extending from the opposite faces of the post, which are fastened thereto by self-tapping screws engaging openings 8 and 8', similar to those shown in FIG. 2.

The intermediate post P' is similarly extruded with open cylindrical channels 39 for receiving therein self-tapping screws which serve to affix additional components such as webs, ornamental caps, and the like, to the fence post.

FIG. 7 illustrates a different style of post for supporting rails extending at angles other than 90° or 180° to each other, and this angularity can be varied in dependence upon the directions sought to be attained for the mountings of the rails. The reinforcing web 41 may be in a straight plane extending from the inner and outer corners of the post, or this reinforcing web may assume different contours as the same in directed and/or branched towards the slotted faces of the post, in which case the web would assume the form of a Y-section or T-section. These internal webs reinforce the load-bearing properties of the posts, but these are beyond the purview of the instant invention.

The faces 10a and 10b of the extruded posts P'', to which the splines are designed to be connected, are slotted longitudinally, as described above. In the case of face 10a, spline S, in dotted lines, is shown connected thereto by a bolt and nut assembly, as described above, and as shown in detail in FIG. 4. The same type

of spline may be affixed to the other face 10b. On the other hand, a different type of spline S' may be affixed to the post and FIG. 7 illustrates this mounting at face 10b of the latter. These mountings may be used interchangeably, and FIG. 8 illustrates a spline S affixed to the lower end of the post P'' and spline S' to the upper portion of the post.

FIG. 6 illustrates the extruded length from which the spline segments S' are severed. While the main portions of the body of the splines S' are contoured similarly to those shown in FIGS. 2 to 5, with the main surface 3' adapted to abut the vertical surface of the post, a bulbous projection 40 extends from the center of the vertical surface 3' which is adapted to be slid along the slot 14 of the supporting post and to be affixed along said slot by a frictional fit as the narrowed section of the protuberance engages the opposite edges of the longitudinal slot 14b. Such splines may be used for mounting the picket rails at multiple levels, or may be used in conjunction with splines which are fixed by bolts as shown in FIGS. 3 to 5, and at the bottom of FIG. 8. The latter illustrates an advantageous arrangement for the mounting of sheet panels between upper and lower rails 45 and 46, the latter of which is supported by splines which are fastened by bolts, as shown in FIG. 4, while the rail 45 is affixed to splines S' of the character shown in FIG. 6 and at the right of FIG. 7. The panels 48 rest within the slots 45' and 46' of rails 45 and 46, respectively, disposed between sloping surfaces of said rails remote from the opposite planar faces which receive the fastening screws 27. These panels may extend within the longitudinal slots of any of the posts described above to reinforce the connections between the components.

The railing system in accordance with the invention lends itself ideally to the use of pickets of extruded aluminum which may be interconnected with upper and lower rails to attain a tight interengagement therewith comparable to welded structures. Such pickets may assume different contours of closed perimetric section of either rectangular or square cross-section as shown in FIGS. 10 and 11, respectively, or they may be of open section as shown in FIGS. 12 and 13, so long as they present two parallel sides displaced from each other with some connection therebetween at an outer edge or at an intermediate web therebetween, as shown in FIGS. 12 and 13. In FIGS. 10, 14 and 15, the parallel sides 50, which are spaced from each other about three-fourths inch by the end walls 51, terminate in trapezoidally-shaped tongues 52. The sides of the latter have a slight symmetrical inclination from about 0.400 inch at the juncture line of the tongue and picket base of 1 inch, and 0.350 inch at the free end of the tongue.

Similar tongue extensions 52' may be provided on the 1 inch square pickets defined by rectangularly extending walls 50' and 51', as shown in FIG. 11.

The tongues 52'' in FIGS. 12 and 13, project from the parallel side walls 50'', which are integrated by transverse walls 55 and 56, at intermediate points and ends of the side walls 52'', respectively. The picket extrusions shown in FIGS. 12 and 13 may include reinforcement channels of open cylindrical formation of the nature described above.

The picket rails, with the integrated pickets therebetween, are designed to be mounted on the splines affixed to the posts in the manner described above. The secure connection between the vertical pickets and the

horizontal rails are effected by inserting the above-mentioned trapezoidally-shaped tongues on the pickets into parallel slots 60 in the rail surface 61, which slots are displaced correspondingly, and which are designed to receive the tongues with a close fit especially at the ultimate junction point between the bases of the trapezoidal tongues and the picket sides. Preferably, the bases of the tongues are slightly longer than the slots to attain a swaged connection between the parts in consequence of the bending of the tongues. The wedge fit between these tongues and the slot is so tight that when the tongues are bent transversely on the inner face of the rails, as shown in FIG. 16, the fit therebetween is equivalent to a swaged engagement between the parts, which clamps the end of the vertical picket to the horizontal rail. The shouldered ends of the parallel sides of the picket adjacent to the base of the trapezoidal tongues serve to hide the slots 60 and the joint between the parts, which complement the engagement therebetween. Also, the picket railing may be channeled, as shown in FIG. 15, so that the swaged engagement between the pickets and rail is clear and above the space for seating the spline into which is threaded the fastening screws 27 (FIG. 9).

As shown in FIG. 9, a clip C, of limited length, such as 4'', or a continuous length of an extrusion of similar section, is adapted to be affixed to the top of the posts P' as well as the others by means of Phillips head self-tapping screws 27 engaging the open cylindrical channels 16 in the interior of the vertical posts. These clips are provided with camming flanges 65 onto which is snapped lengths of top rails of any desired sectional outlines.

We claim:

1. A metallic railing assembly comprising
 - a. a vertical post of extruded metal having a longitudinal vertical slot extending along the central portion of at least one face thereof,
 - b. a horizontal rail having one end thereof connected to said post at said face,
 - c. a discrete segment severed from a continuous extrusion having a pair of continuous screw bosses projecting symmetrically with respect to the longitudinal axis of the extrusion from one face thereof, for interconnecting said post and rail,
 - d. said screw bosses adapted to receive self-engaging screw fasteners adapted to extend through openings in said end of said rail which is in overlying engagement with the upper severance plane of said segment, and
 - e. means for securing said segment at a predetermined level of said vertical post to adjust the plane of attachment of said horizontal rail to said post.

2. A device as set forth in claim 1, including means on said continuous extrusion on the face thereof opposite said screw bosses for cooperation with the longitudinal slot in said vertical post.

3. A device as set forth in claim 1, wherein said last-mentioned securing means comprises a bolt fastening assembly extending through an opening in said segment at said longitudinal axis for clamping said segment to said post at the opposite face of said segment.

4. A device as set forth in claim 2, wherein said last-mentioned means comprises continuous ribs projecting slightly from the opposite face of said segment, said ribs fitting along the opposite edges of said longitudinal ver-

tical slot for facilitating the alignment of said segment at said slot.

5. A device as set forth in claim 3, wherein said bolt fastening means comprises a headed bolt having the head thereof disposed between said screw bosses, and a cooperating nut for engagement with the free end of said bolt.

6. A device as set forth in claim 3, wherein said bolt fastening assembly comprises a headed bolt having the head thereof disposed between said screw bosses, and a cooperating nut positioned in the interior of said post adjacent to the slot therein.

7. A device as set forth in claim 5, wherein said cooperating nut is provided with a roughened surface adjacent to said slot, to enhance the gripping effect thereof with the inner surfaces of said post which borders said slot.

8. A device as set forth in claim 6, including a continuous groove of predetermined width in said first-mentioned face of said continuous extrusion at the longitudinal axis thereof, for accommodating the head of said headed bolt and restraining it against rotation.

9. A device as set forth in claim 2, wherein said last-mentioned means comprises a projection of bulbous cross-section on the face thereof opposite said screw-bosses, with an intermediate narrowed neck therebetween for movement along said vertical slot.

10. A device as set forth in claim 3, wherein said last-mentioned means comprises a projection of bulbous cross-section diverging from the narrowed central portion of the segment which is adapted to be embraced by the wall of the post adjacent to said vertical slot, with the inner faces of the bulbous portions in contact with the rear face of said last-mentioned wall.

11. A metallic railing assembly comprising

- a. a vertical post of extruded metal having a longitudinal vertical slot extending along the central portions of the opposite faces thereof,
- b. horizontal rails having their adjacent ends connected to said post at said faces for extension in opposite directions,
- c. discrete segments severed from a continuous extrusion having a pair of continuous screw bosses projecting symmetrically with respect to the longitudinal axis of the extrusion from one face thereof, for interconnecting said post and rails, with the opposite face of each of said segments in contact with said opposite faces of said vertical post, said screw bosses adapted to receive self-engaging screw fasteners adapted to extend through openings in said adjacent ends of said rails which are in overlying engagement with the upper severance planes of said segments, and

e. a bolt fastener for rigidly connecting said segments to said vertical post at the opposite faces thereof, comprising a headed bolt extending from the outer face of one segment through an opening in the midportion of the latter and through said longitudinal slots in the opposite faces of said vertical post, and a nut for engagement with the free end of said bolt extending through an opening in the midportion of the second segment beyond said slots, and positioned exteriorly of said post.

12. An assembly as set forth in claim 11, wherein said vertical post includes an internal longitudinal reinforcing web in a plane parallel to said opposed faces, said web provided with an opening for permitting the passage of said headed bolt extending between the opposite faces of said post.

13. A metallic railing assembly composed of a plurality of laterally displaced vertical posts with vertically spaced horizontal rails extending between said posts as set forth in claim 1 for mounting a plurality of vertical metallic pickets therebetween,

- a. said last-mentioned pickets being of rectangular contour, each comprising two parallel sides disposed in displaced parallel planes, extending in parallel relation between said vertically spaced horizontal rails at longitudinally displaced points therealong,
 - b. each of said picket rails having a pair of vertically aligned longitudinal slots at said points displaced correspondingly to the displacement of the parallel sides of each picket,
 - c. each of said pickets having said sides extending transversely in parallel planes relative to the length of the rails and terminating in centrally disposed trapezoidally-shaped tongues with slightly sloping edges, and bases which are smaller than said transverse parallel sides of said pickets, and
 - d. said tongues projecting into said slots and bent into planes parallel to said picket rails and in juxtaposition to the internal picket rail surfaces containing said slots, with the bases of said tongues wedged into said slots, and with the edges of said transverse parallel sides adjacent to the external surfaces of said picket rails in tight engagement with the latter.
14. An assembly as set forth in claim 13, wherein said metallic pickets are of a closed perimetric contour in cross-section.
15. An assembly as set forth in claim 13, wherein said bases of said tongues are slightly longer than said slots to attain a swaged connection between the pickets and rails in consequence of the bending of said tongues at said bases.

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