July 10, 1928. 1,676,317

G. L. BENNETT

METALLIC STAIRWAY

Filed Feb. 1, 1926

Fig. 1.

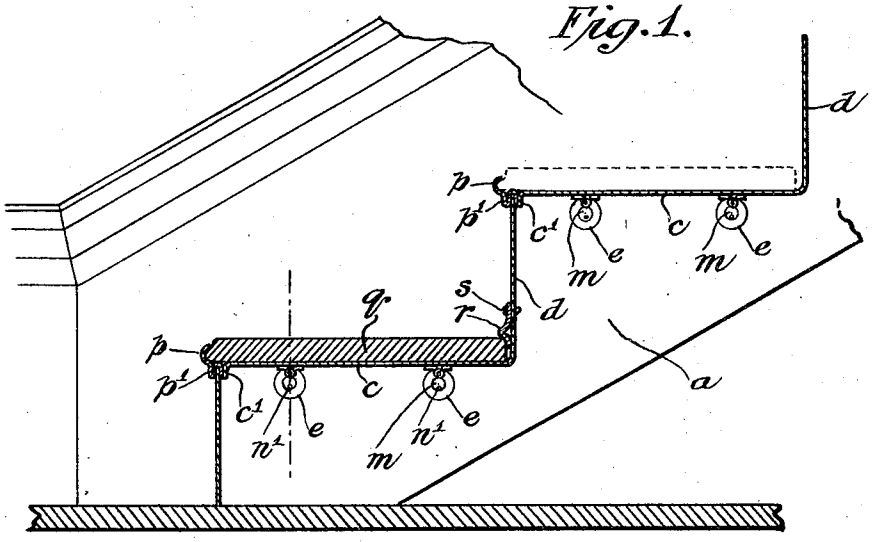
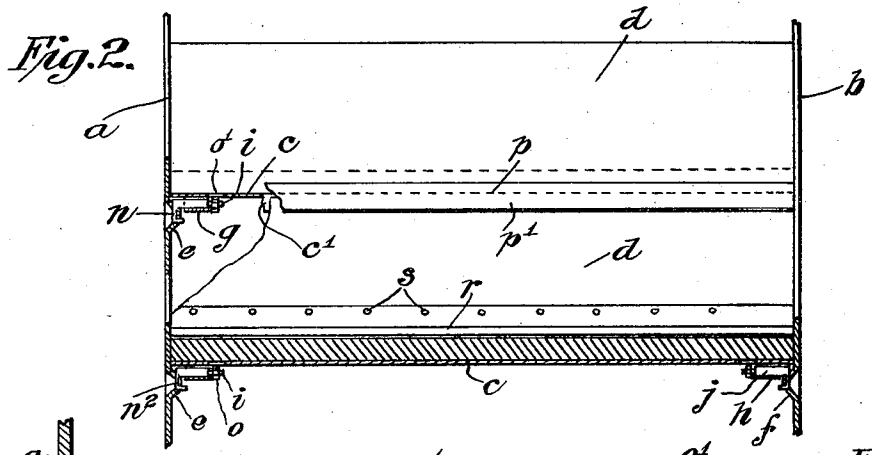


Fig. 2.



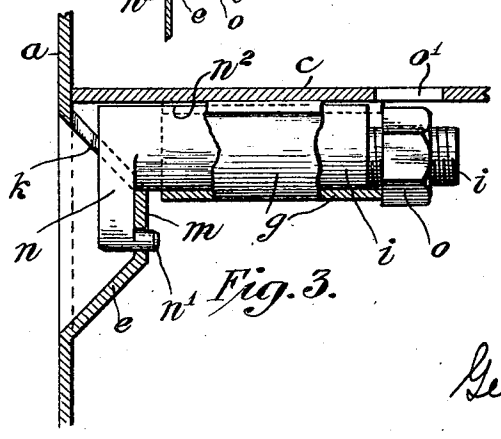
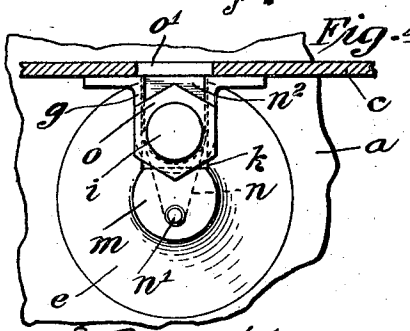


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

GEORGE L. BENNETT, OF CLEVELAND, OHIO.

METALLIC STAIRWAY.

Application filed February 1, 1926. Serial No. 85,105.

My invention relates to metallic stairways, and more particularly to a stairway construction of which the major portion thereof is formed of sheet metal.

In addition to a desirable fireproof property of a stairway embodying my invention, the structure of said stairway is such as to permit the utilization therein of standardized parts, the dimensions of which parts will be so closely uniform in every respect as to permit a rapid and accurate assembly of the stairway structure without the necessity for any modification of these parts in order to ensure the accurate fitting of one with relation to another. Hence the parts entering into the stairway may be conveniently shipped and delivered at a building under construction, in convenient knockdown form with the assurance that a stairway or stairways may be erected without requiring machine work in the alteration of parts, or nicety in the selection and fitting of parts. Skilled labor is not required in the erection of stairways embodying my invention, and the weight of the various parts entering into a stairway, is sufficiently light to make the convenient handling of these parts possible, thus effecting a material saving in the cost of installation, as well as in the cost of production of the parts entering into the stairway.

A stairway embodying my invention includes therein a sequence of metallic step units each comprising in a unitary structure a tread section and a riser section, the tread section of one step having formed therein a channel adapted to receive the riser of the unit below. Each tread unit is supported from the stringers in a manner to hold each unit in relation to said stringers and the tread section of one unit in its position with relation to the riser of the adjacent unit.

Each tread section is provided with a nosing adapted to retain a non-slip composition tread or other wear surface for the tread, the riser of this unit being provided with a detachable cove for engaging the wear surface adjacent the riser and at the same time avoiding the presence of a sharp angle in which unsanitary matter will accumulate.

The various step units are so secured to the stringers as to be supported therefrom without resting upon stepped cutouts in the stringers, thus permitting these stringers to serve as mop boards at the sides of these units, while at the same time permitting the stringers to be drawn tightly against the side edges of the several step units. The manner of securing the step units to the stringers is such as to permit their rapid and accurate assembly in the stairway structure while ensuring the transmission of all loads upon the treads to the stringers and avoiding any material loosening or racking of the stairway structure from long continued use, while permitting the parts to be readily tightened in the event that any such looseness should develop.

The invention consists primarily in a metallic stairway embodying therein metallic stringers, a sequence of step units, each unit being of sheet metal so formed as to include a tread section and a riser section integral therewith, each tread section having a downwardly presented channel adapted to span the edge of the riser section of an adjoining unit, means adapted to receive a bolt, carried by and located inwardly of said stringers and upon the lower face of the tread section of each unit respectively, and bolts engaging said means respectively, whereby said step units are supported from said stringers, and said stringers and said units may be drawn tightly together; and in such other novel features of construction and combination of parts as are hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings,

Fig. 1 is a vertical section through a portion of a stairway embodying my invention;

Fig. 2 is a front view thereof with portions of one of the risers broken away;

Fig. 3 is a detail enlarged view showing the construction by which the step units are connected with the stringers; and

Fig. 4 is an end view of the construction shown in Fig. 3.

Like letters refer to like parts throughout the several views.

In the embodiment of the invention shown in the drawings, the two stringers are indicated at *a* and *b*, these stringers being right and left, but otherwise one a counterpart of the other. The manner of mounting these stringers in relation to a building structure is immaterial to the invention. Each of these stringers is made of heavy sheet metal stock, the outer face of each being substantially flat so that it may be snugly fitted to the wall of the building. The

upper and lower edges thereof, when in position, are parallel with each other, these stringers being provided with no stepped portions upon the upper face thereof to receive the treads and risers.

Supported from, and between, these stringers, is a plurality of step units so constructed as to co-operate with each other and with the stringers in rigidly securing them in relation to said stringers and to each other.

Each of these step units is a replica of every other, and a detailed description of but one of them is therefore necessary.

Each of the step units is composed of sheet metal stock formed or bent at a 90° angle to afford a tread section *c*, and a riser section *d*, these parts being integrally formed in order to simplify and cheapen the production of the unit. The width of the unit may be varied according to the width of the stairway, and the depth of the tread section, and the height of the riser section, may also be varied according to the requirements of the stairway construction. The width of each step unit is such as to bring the ends thereof, when assembling the stairway into a close sliding fit with the stringers *a* and *b*, the vertical stresses upon each unit being transmitted to these stringers through co-operating means formed upon or carried by the stringers, and formed upon or carried by the under face of the tread section of each unit, these members being adapted respectively to receive a bolt, which in addition to receiving and transmitting such stresses to the stringers, are also utilized to draw the stringers tightly against the ends of the tread and riser sections of each step unit. Rigidity is imparted to each step unit by the riser section of that unit, and of the step unit below, and by a channel member co-operating with the riser section of said step unit below.

In the form of the invention shown, the co-operating members carried by the stringers and the tread section of each unit, comprise a socket formed up from the material of each stringer and presented inwardly thereof with relation to the stairway structure, and a stirrup secured to the under face of the tread section of each unit in a position to bring a bolt seated therein in a position where it will engage the socket upon the stringer with which the bolt co-operates, said bolt being so formed as to support the tread section of the step unit.

In the drawings the sockets upon the stringers, ordinarily two of such, rectilinearly arranged being formed upon each stringer in relation to each step unit, are indicated at *e* as to the stringer *a* and *f* as to the stringer *b*. The stirrups adjacent the sockets *e* are indicated at *g* and those adjacent the sockets *f* at *h*. The bolt passing through the stirrups *g* and engaging the sockets *e* are indicated at *i* and those passing through the stirrups *h* and engaging the sockets *f* are indicated at *j*. The stirrups *g*—*h* are secured to the under side of the tread section *c* of each unit in any desired manner, preferably by spot, or other, welding methods which will make these stirrups practically an integral part of the step unit.

Each socket *e* and *f* opens upwardly thereof as at *k* and is provided with an opening below the top thereof so as to form a barrier or abutment *m* which by engagement with a specially formed head *n* upon each bolt *i* or *j* will resist any lifting stresses upon the step unit, and support the tread section of the step unit with which said bolts co-operate.

Each of said bolts, in lieu of the ordinary head, has a hooked end *n'* adapted to enter the opening *m* of its co-operating socket *e* or *f*, and a shouldered rest n^2 adapted to bear against and support the tread section *c*. The screw-threaded end of the bolt has mounted thereon a nut *o* adapted to bear against an end of the stirrup for the purpose of taking up any looseness between an end of the step unit and the adjacent stringer, and locking the step unit with relation to the stringer.

Each tread section *c*, to permit ready access to the nut *o* upon the screw-threaded end of each bolt has an opening *o'* formed therethrough adjacent the point of attachment of the stirrup *g* or *h* thereto, thus permitting the tightening of the parts entering into the stairway structure, from the steps themselves.

Each tread section *c* is provided with a nosing *p* adapted to receive and retain a wear tread *q* upon said tread section, this wear tread preferably being of anti-friction or non-slip material. Adjacent said nosing, the metal is so formed as to present a downwardly opening channel *p'* extending for the full width of the tread section and so located as to receive the top edge of the riser of the step unit below. This channel *p'* will compensate for any slight variance in the height of the risers of different step units and will stiffen said riser, and the tread carrying it, thus adding to the rigidity of the entire structure. Preferably the nosing piece and the channel are formed from a separate strip of sheet metal and secured in any desired manner, as by spot, or other, welding methods, to a downturned flange *c'* upon the tread section of the unit carrying the nosing. By so constructing the nosing and the tread section, the production of the step unit is simplified from the manufacturing standpoint, and, yet the nosing and channel, to all intents and purposes, forms an integral part of the step unit.

To permit the convenient mounting and

replacement of the wear tread q with relation to the tread section c, I provide each riser with a removable metal cove piece r which in addition to holding the wear tread in relation to the nosing p will also serve to produce a curved cove at the junction of this wear plate q with the riser section d. The said cove piece extends for the entire width of the step unit and may be made of spring metal having a normal tendency to thrust the wear tread q toward the nosing p. It is removably secured to the riser d in any desired manner, as by a plurality of screws s.

A stairway constructed as above described possesses a degree of rigidity permitting the use of fairly light sheet metal throughout, the construction and arrangement of the stringers of the various step units being such as to withstand all of the stresses of use to which the stairway is subjected, notwithstanding the light weight of the structure, while at the same time not being subject to likelihood of fracture in the event of a sudden sharp impact of any object therewith.

In the erection of a stairway structure embodying the invention, it may be necessary to provide a flat riser plate t co-operating with the channel p' of the lowermost step unit, which riser plate t may be secured in relation to the lower landing of the stairway in any desired manner. The finish of the upper landing for the stairway at the edge thereof adjacent the riser d of the uppermost step unit will be such as to protect the upper edge of said riser section.

While if desired the stairway may be assembled in the shop and shipped to the site of its installation, it will ordinarily be found more convenient to ship the stringers, the various step units and the bolts in their unassembled relation so that they may be assembled by the workmen on the job. In so assembling a stairway embodying the invention, the stringers a and b are first set in the desired relation, with the sockets e and f presented toward each other. The bolts n are then fitted in the stirrups adjacent the opposite ends of the various step units, the bearing portion n^2 of these bolts preventing rotative movement thereof in relation to the stirrup g or h. When the bolts are so positioned, the lowermost step unit is merely dropped in the proper position between the stringers, the hooked ends n' of said bolts i or j passing through the open top k of the socket e or f with which the bolt is to co-operate until the hook n' is permitted to enter the opening forming the abutment m. The nut o is then tightened, drawing said hooked end n' below the abutment m and at the same time drawing the stringers a and b into a tight engaging relation with the tread and riser sections c and d of the step unit. This procedure is repeated with the succeeding steps upwardly, the downwardly presented channel p' upon the tread section of each step unit being passed over the top of the riser section d of the unit below.

It is preferable not to draw the bolts too tightly until all of the step units have been mounted with relation to and between the stringers, the openings o' being provided to permit the insertion of a spanner wrench for the final tightening of the various nuts. The light metal stock of the stringers will permit them to be flexed sufficiently to draw them tight against the ends of the step units as described, it being possible, however, to make these step units of sufficient uniformity as to width to reduce the amount of clearance between the ends of each step unit and the adjacent risers, to require a movement of the stringers so small as not to be appreciable. In fact the clearance allowed between the risers and each step unit is merely sufficient to permit the units to be readily placed in position. The wear treads q after the stairway structure has been properly tightened throughout, are positioned upon the tread sections d of the several step units by means of the spring coves r, thus avoiding the labor incidental to the screwing of such treads in position with relation to the tread base or section c.

In assembling the stairway structure, the flat riser plate t secured to the lower landing, is placed in position as the lowermost step unit is mounted between the stringers, and the upper landing for the stairway may be finished off in any desired manner above the riser section d of the uppermost step unit.

The various sockets e and f are drawn up from the sheet metal of the stringers a and b, the metal stock being pierced to form the open top k and the abutment m in said sockets. In this manner the outer face of each stringer a and b is free from all projections of any kind and may thus be brought flush against the wall of a building.

The manner of mounting the step units also permits the stringers to serve as mop boards, giving a finish at the sides of the steps, the depth of the stringers being capable of variation not only for the purpose of securing the desired strength thereof for resisting vertical stresses, but the desired finish at the sides of the stairway. It will be noted that these stringers are not stepped to receive the various step units, and will thus have uniform strength throughout every portion of the length thereof.

The flange afforded the riser d of each unit and by the channel p' of the tread section of each unit, imparts sufficient strength to each tread section to resist any load to which these sections may be subjected. The arrangement of the co-operating means,

the sockets *e* or *f*, the stirrups *g* and *h*, and the bolts *i* and *j* at points adjacent the forward and the rear edges of each tread section will afford an effective distribution of the weight of a load upon any tread section and avoid any likelihood of the tilting of the step unit. Hence the step units will remain true since the methods of manufacture permit accuracy in the positioning of these co-operating members with relation to each other and to the stringers.

The abutment *m* engaged by the hooked end *n'* upon the head *n* of the bolt, will prevent any lifting action of any step unit, the interlocking of the bolt with its retaining socket forming means upon the stringer serving to firmly position each unit with relation to the stringers and to the adjoining units.

The abutment *m* engaging the under face of the head of the bolt will transmit the stresses from all loads upon the tread to the stringers.

All parts of the stairway structure excepting the bolts *i* and *j* may be made of sheet metal which may be readily and accurately fabricated and so formed as to impart to the stairway the desired rigidity and strength while limiting the weight of the materials entering thereinto. The sheet metal, even though light stock be used, may by the construction described be effectively used in stairway structures and will be found to possess many advantages as compared with cast metal stairways.

The use of the spring coves *r* not only facilitates the mounting of wear treads *q* with relation to the step units but also facilitates the removal of said treads in the event of wear and the necessity for replacement. The springiness or flexibility of the cove piece will serve to hold the wear tread *q* firmly against the nosing *p* at all times, it being noted that the construction of this cove piece is such that a tongue engages the rear edge of the tread *q* presented towards the riser *d* and that the curved portion thereof, forming the cove, holds said tread *q* against the tread section *c*.

It is not my intention to limit the invention to the precise construction and arrangement of parts shown in the drawings, it being apparent that such may be varied without departing from the spirit and scope of the invention.

Having described the invention, what I claim as new and desire to have protected by Letters Patent, is:—

1. A metallic stairway embodying therein metallic stringers, a sequence of step units, each unit being of sheet metal so formed as to include a tread section and a riser section integral therewith, each tread section having a downwardly presented channel adapted to span the edge of the riser section of an adjoining unit, means adapted to receive a bolt, carried by and located inwardly of said stringers and upon the lower face of the tread section of each unit respectively, and bolts engaging said means respectively, whereby said step units are supported from said stringers, and said stringers and said units may be drawn tightly together.

2. A metallic stairway embodying therein metal stringers, a sequence of step units, the material of said stringers being pierced to form an opening and an abutment below same, stirrups secured to the under side of each of said step units in a position to be adjacent the openings and abutments and said stringers respectively, bolts mounted in said stirrups respectively, each of said bolts having a hooked head and provided with means adapted to pass through an opening in said stringer and engage below the abutment adjacent said opening, each of said bolts engaging the section of the step unit with which said bolts are associated, and nuts carried by said bolts respectively engaging an end of a stirrup, whereby each step unit is supported from said stringers, and said stringers may be drawn tightly to said units.

3. In a metallic stairway as claimed in claim 1, sheet metal stringers of uniform depth throughout, having the outer surface thereof free from projections, whereby the stringers may be brought close to the wall of a building.

4. In a metallic stairway as claimed in claim 1, a nosing adjacent the channel of each step unit, a wear tread engageable with said nosing and engageable by the tread section, and means detachably connected with the riser section in engageable relation with said wear tread.

5. In a metallic stairway as claimed in claim 1, a nosing, and channel forming means integrally formed from a strip of sheet metal separate from the metal of the tread and riser, and permanently secured to the edge of the tread section of the unit, a wear tread engageable with said nosing and engageable by the tread section, and means detachably connected with the riser section in engageable relation with said wear tread.

6. In a metallic stairway as claimed in claim 1, means supporting the step units from the stringers and for drawing said stringers and said units tightly together, consisting of a plurality of rectilineally arranged socket forming means projecting inwardly of each of the stringers, the sockets of said means opening upwardly and having an abutment formed thereon below said opening, stirrups carried upon the under side of the tread section of each step unit, and bolts mounted in said stirrups respec-

tively, each having a head provided with means adapted to pass through the upwardly presented top opening of said sockets and engageable below said abutment, and also engageable with the tread section of the step unit with which it is associated, and nuts carried by said bolts respectively engaging an end of a stirrup.

7. In a metallic stairway as claimed in claim 1, socket forming means formed integrally with the material of the stringers by being drawn inwardly to form the socket with an upwardly presented opening, and pierced below this opening to form an abutment engageable by a portion of the head of a bolt.

8. In a metallic stairway as claimed in claim 1, a step unit having a tread section provided with an opening therethrough adjacent the bolt receiving means upon the lower face of the tread section of the unit, whereby a tool may be engaged with the nuts upon said bolts from above the tread section.

In witness whereof I have hereunto affixed my signature, this 23rd day of January, 1926.

GEORGE L. BENNETT.