Nov. 29, 1927. 1,650,956

R. E. OGDEN ET AL

BOLT ANCHOR

Filed April 14, 1922 2 Sheets-Sheet 1

Fig. 3

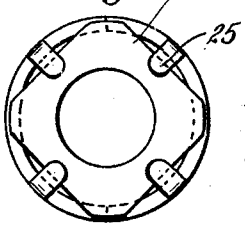


Fig. 1,

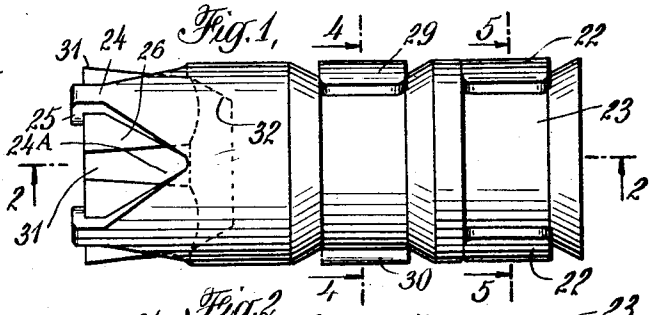


Fig. 4,

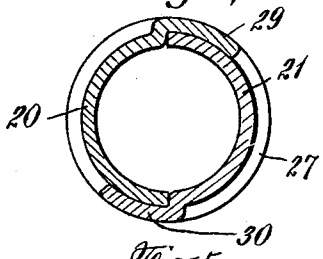


Fig. 2

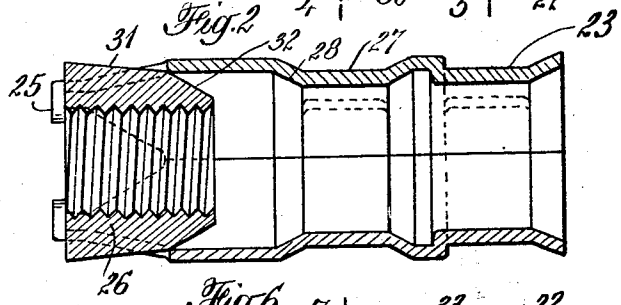


Fig. 5,

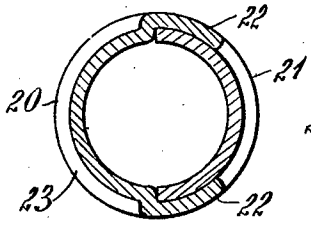


Fig. 6,

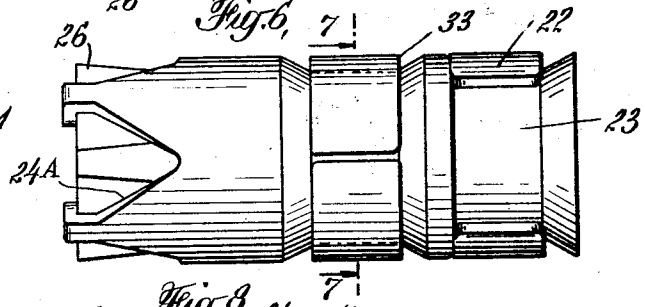


Fig. 7,

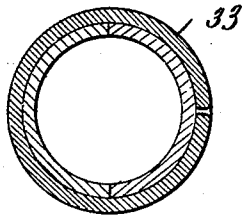
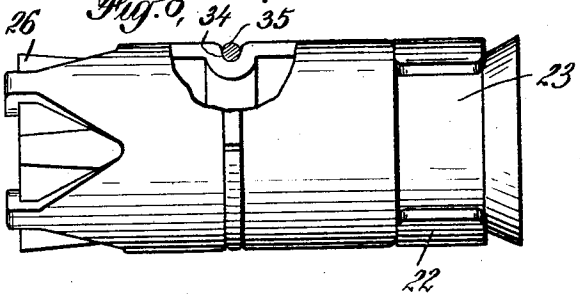


Fig. 8,



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BOLT ANCHOR

Filed April 14, 1922 2 Sheets-Sheet 2

Fig. 9.

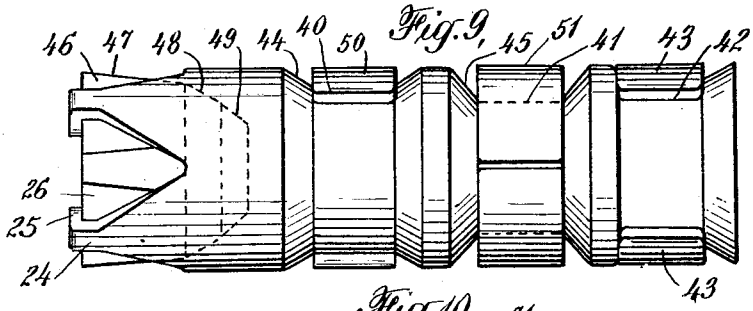


Fig. 10.

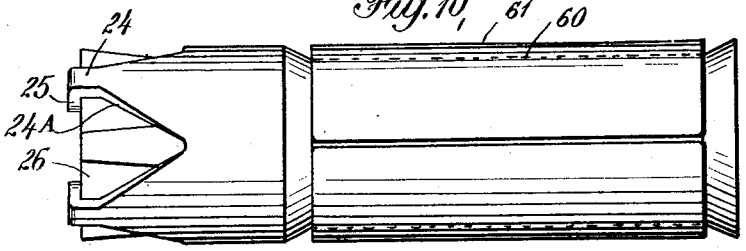


Fig. 11.

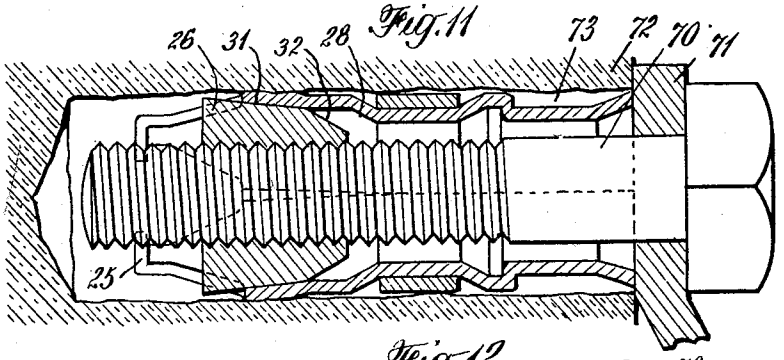
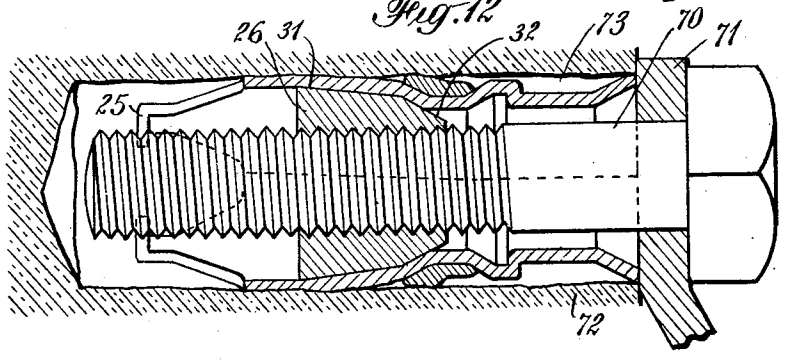


Fig. 12.



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Patented Nov. 29, 1927. 1,650,956

UNITED STATES PATENT OFFICE.

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BOLT ANCHOR.

Application filed April 14, 1922. Serial No. 552,814.

This invention relates to improvements in bolt anchors of the character employed for obtaining anchorage in walls of brick, stone and cementitious material not adapted to directly receive a threaded member.

One of the objects of the invention is to provide an expansion shield so constructed and arranged as to possess superior gripping qualities.

Another object of the invention is to provide a shield and an expanding member for the shield so relatively constructed and arranged as to obtain gripping actions at a plurality of different points or areas throughout the length of the shield.

Another object of the invention is to provide an expansion shield and an expanding member so relatively constructed and arranged that successive gripping actions may be obtained.

Another object of the invention is to provide an expansion shield having excess metal on its outer surface for effecting a secure gripping action when the shield is expanded.

Another object of the invention is to provide a sheet metal expansion shield having an excess of metal on its outer surface, this excess of metal being obtained without requiring the folding or bending of the metal of the shield.

Further objects of the invention will appear from the following specifications taken in connection with the drawings which illustrate the invention and in which

Figure 1 is an elevation of an expansion shield having an expanding element or nut therein, these parts being constructed in accordance with the invention.

Fig. 2 is a longitudinal sectional elevation taken substantially on line 2—2 of Fig. 1.

Fig. 3 is an end elevation of the inner end of the shield and expanding element shown in Fig. 1.

Fig. 4 is a transverse sectional elevation taken substantially on line 4—4 of Fig. 1.

Fig. 5 is a transverse sectional elevation taken substantially on line 5—5 of Fig. 1.

Fig. 6 is an elevation showing another form of the shield constructed in accordance with the invention.

Fig. 7 is a transverse sectional elevation taken on line 7—7 of Fig. 6.

Fig. 8 is an elevational view partly broken away showing another form of the invention.

Fig. 9 is an elevational view illustrating still another form of the invention.

Fig. 10 is an elevation of another form of shield constructed in accordance with the invention.

Fig. 11 is a longitudinal sectional elevation of a bolt anchor including the shield and expanding elements shown in Fig. 1, the anchor being shown expanded in an opening or bore in a wall or other structure, and

Fig. 12 is a sectional elevation similar to Fig. 11 but showing the parts still further expanded.

The invention may be briefly described as comprising an expansion shield formed preferably from a plurality of sheet metal stampings. The shield has formed adjacent its inner end a plurality of V-shaped notches, with fingers formed between them which are bent over at their extremities thereby forming retaining means for the expanding element or nut. The shield has formed therein an internal inwardly extending annular shoulder and on the outer surface of the shield there is provided an excess of metal adjacent the portion of the shield having the internal shoulder. In certain forms of the invention a plurality of these shoulders of different angularity is provided. The expanding element in the embodiments of the invention shown consists of a nut having a substantially square end and having its outer surfaces comprising a plurality of co-axial conical surfaces of different angularity. One of these surfaces is adapted to effect an initial expansion of the shield as the nut travels lengthwise of the shield and other conical surfaces are adapted to successively engage the internal shoulders which serve the double function of forming stops for the nut and of effecting in conjunction with

the conical surfaces further expansion of the shield. As this further expansion takes place the excess metal on the outer surface of the shield is forced into engagement with the wall of the bore in which the shield is positioned. Further details of the invention will be hereinafter described.

The expansion shield shown in Figs. 1 to 5, inclusive, comprises a shell divided longitudinally throughout its length and comprising in the form of the invention illustrated a pair of sections 20 and 21. These sections are preferably formed of sheet metal stampings and as shown in Fig. 5 one of the sections 20 has formed thereon a pair of lugs or tabs 22 adapted to overlap the other section and to seat in an annular depression 23 formed therein. These tabs bond the sections together and it should be understood that any other form of bonding means may be used if desired.

The shield has formed therein adjacent its inner end a plurality of inwardly extending V-shaped notches 24A, these notches forming tapered fingers 24. The ends of the fingers 24 as shown at 25 are bent inwardly toward the axis of the shield and form retaining means for the expanding element or nut 26 when this member is positioned within the shield.

The expansion shield has formed therein in addition to the depression 23 an annular depression 27, this latter depression being disposed intermediate the ends of the shield and forming an inclined internal shoulder 28.

In order to provide an excess of metal to facilitate the gripping action when the shield is expanded, we have illustrated in Figs. 1 and 4 a pair of tabs 29 and 30, the tab 29 being formed on the section 20 and the tab 30 being formed on the section 21. The tab 29 overlaps the section 21 and the tab 30 overlaps the section 20, but it should be noted that the tabs 29 and 30 do not perform any bonding function, this function being performed by the tabs 22 above described.

The expanding element or nut 26, as shown in Fig. 3, is substantially square at one end and has its outer surface formed into a plurality of conical surfaces 31 and 32. These conical surfaces are co-axial and from the showing in Fig. 2 it will be noted that the surface 32 is formed on a steeper incline than the surface 31. Although two conical surfaces have been shown in Fig. 2 and a single internal shoulder 28 has been illustrated, it will be understood that any desired number of these surfaces and shoulders may be used, and in another form of the invention hereinafter described a construction is shown in which three conical surfaces on the nut and two internal shoulders in the shield are employed.

The operation or manner of use of the construction shown in Figs. 1 to 5 will be outlined after the other modifications or forms of the invention have been described.

The construction shown in Figs. 6 and 7 is similar to that shown in Figs. 1 to 5 and differs therefrom only in the fact that instead of the overlapping tabs 29 and 30 the excess metal is provided by an annular split band or ring 33.

In Fig. 8 another form of the invention is illustrated and in this form an annular groove 34 is formed in the shield and a split ring 35 is seated in the groove and provides the excess metal upon the expansion of the portion of the shield upon which the ring is positioned.

In Fig. 9 another form of the invention is shown and in this form the expansion shield has formed therein annular depressions 40, 41 and 42. Tabs 43 similar to the tabs 22 shown in Fig. 5 bond the sections together.

The depressions 40 and 41 form internal shoulders at 44 and 45 of different angularity. The outer surface of the expanding element or nut 46 in this instance comprises a plurality of conical surfaces 47, 48 and 49, these surfaces being co-axial and inclined at different angles with reference to the axis of the nut. The angle of inclination of the surfaces 48 and 49 will be so worked out as to effectively co-act with the internal shoulders at 44 and 45 in expanding the shield.

The excess of metal in the depression 40 is formed by tabs 50 similar to the tabs 29 and 30 shown in Fig. 4, and the excess of metal in the depression 41 is formed by an annular split ring or band 51 of sufficient thickness to bring the outside dimension thereof within the cylindrical surface which forms the outer peripheral surface of the shield. It should be noted in this connection that in each embodiment the different parts of the shield and the outer surfaces of the members forming the excess metal are all disposed substantially within one cylindrical surface.

In Fig. 10 still another form of the invention is shown and in this form the shield has an elongated depression 60 in which is positioned an elongated split sleeve or ring 61. The sleeve 61 performs both the bonding function and the function of providing excess metal on the outer surface of the shield.

Referring particularly to Figs. 11 and 12, the operation or method of using the device will be described.

The shield nut and bolt are assembled and are then inserted in the opening in which the threaded element is to be secured. In Fig. 11 the bolt 70 is illustrated as securing an object 71 to a wall or structure 72 in which is formed an opening 73. As the bolt 70 is turned, with the parts positioned as shown, the nut 26 will travel lengthwise on

the bolt within the shield and its outer surface 31 will at first engage and expand the portion of the shield adjacent the inner end. If the shield and wall opening are so proportioned that such an initial expansion as that shown in Fig. 11 is sufficient to retain the shield within the opening, the nut may be advanced no further than the position shown in said figure. It has been found, however, that the nut in this type of shield does not come to a fixed position but can usually be drawn further into the shield by the rotation of the bolt. The shoulder 28, however, will provide a stop in case the nut has traveled outward to the limit of its expansion. If, however, the limit of expansion has not then been reached, a further rotation of the bolt will cause the conical surface 32 to co-act with the internal shoulder 28 and effect a further expansion of the parts as shown in Fig. 12. This further expansion will force the excess metal formed by the tabs 29 and 30 or by the split ring 33 or other parts illustrated in the drawings into gripping contact with the inner wall of the opening. This, as will readily be seen, forms a very rigid and firm anchorage.

In case the form of anchor shown in Fig. 9 is used, a third stage of expansion may be obtained by the co-action of the conical surface 49 of the inclined shoulder at 45.

From the foregoing specification it will be evident that a simple, practical and effective bolt anchor construction has been developed and that the parts constructed as shown in the various embodiments of the invention will effectively perform the functions for which they were designed, namely, to obtain a firm and secure anchorage.

Although certain specific embodiments of the invention have been particularly shown and described, it will be understood that the invention is capable of further modification and that further changes in the construction and in the arrangement of the various co-operating parts may be made without departing from the spirit or scope of the invention as expressed in the following claims.

What we claim is:

1. An expansion shield comprising a plurality of expansible elements having walls of uniform thickness, and an expanding member, said expansible elements and expanding member being so relatively constructed and arranged that the expanding member will expand the expansible elements in a plurality of successive stages.

2. An expansion shield comprising a plurality of expansible elements having walls of uniform thickness, and an expanding member, said expansible elements and expanding member having surfaces adapted to co-act in such a manner that the expanding member will expand the expansible elements in a plurality of successive stages.

3. An expansion shield comprising a plurality of expansible portions having walls of uniform thickness, and an expanding member adapted to travel lengthwise in said shield and having a plurality of surfaces adapted to successively engage and expand different portions of said shield.

4. An expansion shield comprising a plurality of expansible portions having walls of uniform thickness, and an expanding member adapted to travel lengthwise in said shield and having a plurality of surfaces disposed angularly with respect to the normal surface of the shield adapted to successively engage and expand different portions of said shield.

5. An expansion shield comprising a plurality of expansible elements, and expanding member, said expansible elements and expanding member being so relatively constructed and arranged that the expanding member will expand the expansible elements in a plurality of successive stages, and means providing an excess of metal on the outer surface of said shield.

6. An expansion shield comprising a plurality of expansible elements, an expanding member, said expansible elements and expanding member being so relatively constructed and arranged that the expanding member will expand the expansible elements in a plurality of successive stages, and means intermediate the ends of the shield providing an excess of metal on the outer surface of said shield.

7. An expansion shield substantially cylindrical at its inner end comprising a plurality of expansible sections, means within said shield adapted to travel lengthwise thereof and expand said sections, an annular depression intermediate the ends of the shield, and common means disposed in said depression for initially securing said sections together and providing an excess of metal at the expansible portions of said sections.

8. An expansion shield comprising a plurality of expansible sections, single means within said shield adapted to travel lengthwise thereof and expand said sections and means encircling the shield for initially securing said sections together and providing an excess of metal at the expansible portions of said sections.

9. An expansion shield comprising a plurality of expansible sections having walls of uniform thickness, a nut within said shield adapted to travel lengthwise thereof and expand said sections, said nut and shield having a plurality of successively engageable portions whereby different portions of the shield will be expanded successively.

10. An expansion shield having a plurality of expansible portions, a nut within said shield adapted to travel lengthwise therein and expand said portions, said shield being indented forming an inclined shoulder in the shield engageable by the nut, and means on the outer surface of the shield in the indentation thereof forming an excess of metal thereon.

11. An expansion shield comprising a plurality of expansible sections, means for securing said sections together including means carried by each section and overlapping a portion of the other section providing an excess of metal on the outer surface of the shield.

12. An expansion shield comprising a plurality of expansible sections, means for securing said sections together including a tab carried by each section and overlapping a portion of the other section providing an excess of metal on the outer surface of the shield.

13. In combination, an expansion shield having a plurality of expansible sections of uniform thickness, a nut adapted to travel lengthwise in the shield and having a conical outer surface adapted to engage and expand one portion of the shield and having another conical outer surface adapted to engage and expand another portion of the shield.

14. In combination, an expansion shield having a plurality of expansible sections of uniform thickness, a nut adapted to travel lengthwise in the shield and having a conical outer surface adapted to engage and expand one portion of the shield and having another co-axial conical outer surface inclined at a different angle to its axis from the other conical surface and adapted to engage and expand another portion of the shield.

15. In combination, a sheet metal expansion shield having a plurality of expansible sections of uniform thickness, a nut adapted to travel lengthwise in the shield and having an inclined outer surface adapted to engage and expand one portion of the shield and having another inclined outer surface adapted to engage and expand another portion of the shield.

16. In combination, an expansion shield having a plurality of notches at its inner end and a nut having angular portions adapted to extend into said notches and having conical portions adapted to successively engage different portions of the shield.

17. An expansion shield comprising a pair of expansible sections, tabs on one member overlapping and engaging a depressed portion of the other member and an additional tab formed on each member overlapping and engaging a depressed portion in the other member for providing an excess of metal on the outer surface of the shield.

18. In combination, an expansion shield having inwardly turned end portions for retaining a nut within the shield and a nut within the shield having a plurality of inclined portions adapted to successively engage longitudinally spaced portions of the shield.

19. An expansion shield having longitudinally spaced annular depressions therein and expansible excess metal disposed in certain of said depressed portions intermediate the ends of the shield expansible into an anchorage engagement.

20. An expansion shield having longitudinally spaced annular depressions therein and an expansible annular band disposed in certain of said depressed portions intermediate the ends of the shield providing excess metal at the outer surface of the shield expansible into an anchorage engagement.

21. A sectional expansion shield having longitudinally spaced annular depressions therein and expansible excess metal disposed in certain of said depressed portions intermediate the ends of the shield, and means seated in other depressed portions for securing the sections of the shield together.

22. A sectional expansion shield having longitudinally spaced, annular depressions therein, means engaging and seated in a depression adjacent the outer end of the shield for securing the sections together and expansible means in a depression adjacent the central portion of the shield for providing an excess of metal expansible into an anchorage engagement.

23. A sectional expansion shield having longitudinally spaced, annular depressions therein, means including tabs carried by one section and engaging the other section and seated in a depression adjacent the outer end of the shield for securing the sections together and means in a depression adjacent the central portion of the shield for providing an excess of metal.

24. A sectional expansion shield having longitudinally spaced, annular depressions therein, means including tabs carried by one section and engaging the other section and seated in a depression adjacent the outer end of the shield for securing the sections together and means including tabs formed on each section engaging the other section in a depression adjacent the central portion of the shield for providing an excess of metal.

25. In combination, a sheet metal expansion shield having a plurality of inwardly extending internal shoulders and an expanding element having a plurality of surfaces adapted to successively co-act with said shoulders to expand the shield.

26. In combination, an expansion shield of substantially uniform thickness throughout its length and having a plurality of inwardly extending internal shoulders of different

angularity and an expanding element having a plurality of surfaces of different angularity, said angularly disposed surfaces of the expanding element being adapted to successively co-act with said shoulders to expand the shield.

27. An expansion shield comprising a plurality of sections, one of said sections having means for securing said section to the other section and the other section having means adapted to overlap the first section and provide excess metal on the outer surface of the shield.

28. In combination, an expansion shield having a plurality of inwardly extending internal shoulders, an expanding element having a plurality of surfaces adapted to successively co-act with said shoulders to expand the shield, and means carried by the shield and disposed adjacent said shoulders providing excess metal on the outer surface of the shield.

29. In combination, an expansion shield having a plurality of inwardly extending internal shoulders, an expanding element having a plurality of surfaces adapted to successively co-act with said shoulders to expand the shield and separate means overlying the outer surface of the shield and disposed adjacent said shoulders for providing excess metal.

30. In combination, an expansion shield comprising a tube of sheet metal with expansible parts thereof depressed to constrict the bore and with a separate metallic member overlying and substantially filling the depression to thicken the wall of the tube and expanding means within the shield engageable with the expansible parts thereof to expand the shield into permanent gripping engagement with the wall of an opening.

31. In combination, an expansion shield comprising a tube of sheet metal with expansible parts thereof depressed to constrict the bore and with a separate metallic member extending circumferentially of the tube and seated in and substantially filling the depression to thicken the wall of the tube and expanding means within the shield engageable with the expansible parts thereof to expand the shield into permanent gripping engagement with the wall of an opening.

32. In combination, an expansion shield comprising a tube of sheet metal with expansible parts thereof annularly depressed to constrict the bore and with a flat ring seated in and substantially filling the depression to thicken the wall of the tube and expanding means within the shield engageable with the expansible parts thereof to expand the shield into permanent gripping engagement with the wall of an opening.

33. An expansion shield comprising a plurality of expansible sheet metal elements, together forming a tube, with similar expansible parts of each element depressed to form an annular constriction in the bore of the tube and with a separate metallic member overlying and substantially filling the depression to thicken the wall of the tube.

34. An expansion shield comprising a plurality of expansible sheet metal elements, together forming a tube, with similar expansible parts of each element depressed to form an annular constriction in the bore of the tube and with a separate metallic member extending circumferentially of the tube and seated in the depression to thicken the wall of the tube.

35. An expansion shield comprising a plurality of expansible sheet metal elements, together forming a tube, with similar parts of each element depressed to form an annular constriction in the bore of the tube and with a flat ring seated in the depression to thicken the wall of the tube.

36. An expansion shield comprising a tube of sheet metal with longitudinally spaced annular depressions of unlike depths and with metallic members of different thicknesses seated in said depressions.

37. In combination, an expansion shield having a plurality of expansible sections provided with tapered fingers thereon, said shield having an inclined shoulder formed therein and a nut disposed within said shield and having flat portions engaged by said fingers and having tapered portions for expanding the shield sections, said nut having an inclined end surface adapted to engage the inclined shoulder within the shield whereby the movement of the nut in the shield is restricted.

38. An expansion shield formed of sheet metal having intermediate its ends a depressed portion constricting the bore of the shield and forming an internal beveled shoulder, a nut having a beveled end portion adapted to engage said internal shoulder and excess metal disposed in the depressed portion of the shield.

39. In combination, an expansion shield having a plurality of expansible sections of uniform thickness, a nut adapted to travel lengthwise in the shield and having a conical outer surface adapted to engage and expand one portion of the shield and having another conical outer surface adapted to engage and expand another portion of the shield, said shield having an inwardly extending shoulder disposed in the path of movement of one of the conical surfaces adapted to limit the movement of the nut in the shield.

40. An expansion shield having an expansible portion, a nut within said shield bearing upon the inner surface of the walls

of said expansible portion arranged to travel lengthwise therein to effect expansion, said walls being bent inwardly to form a shoulder within the shield in the path of travel of the nut, the end of said nut being beveled to provide a sliding engagement with said shoulder whereby the movement of the nut is retarded and further expansion is imparted to the shield.

In witness whereof, I have hereunto set my hand this 13th day of April, 1922.

RALPH EDWARD OGDEN.

In witness whereof, I have hereunto set my hand this 13th day of April, 1922.

CHARLES C. TOMKINSON.

In witness whereof, I have hereunto set my hand this 13th day of April, 1922.

ARTHUR R. VAN TASSELL.