Oct. 24, 1944. O. F. ARTHUR 2,361,164

FIELD MAT

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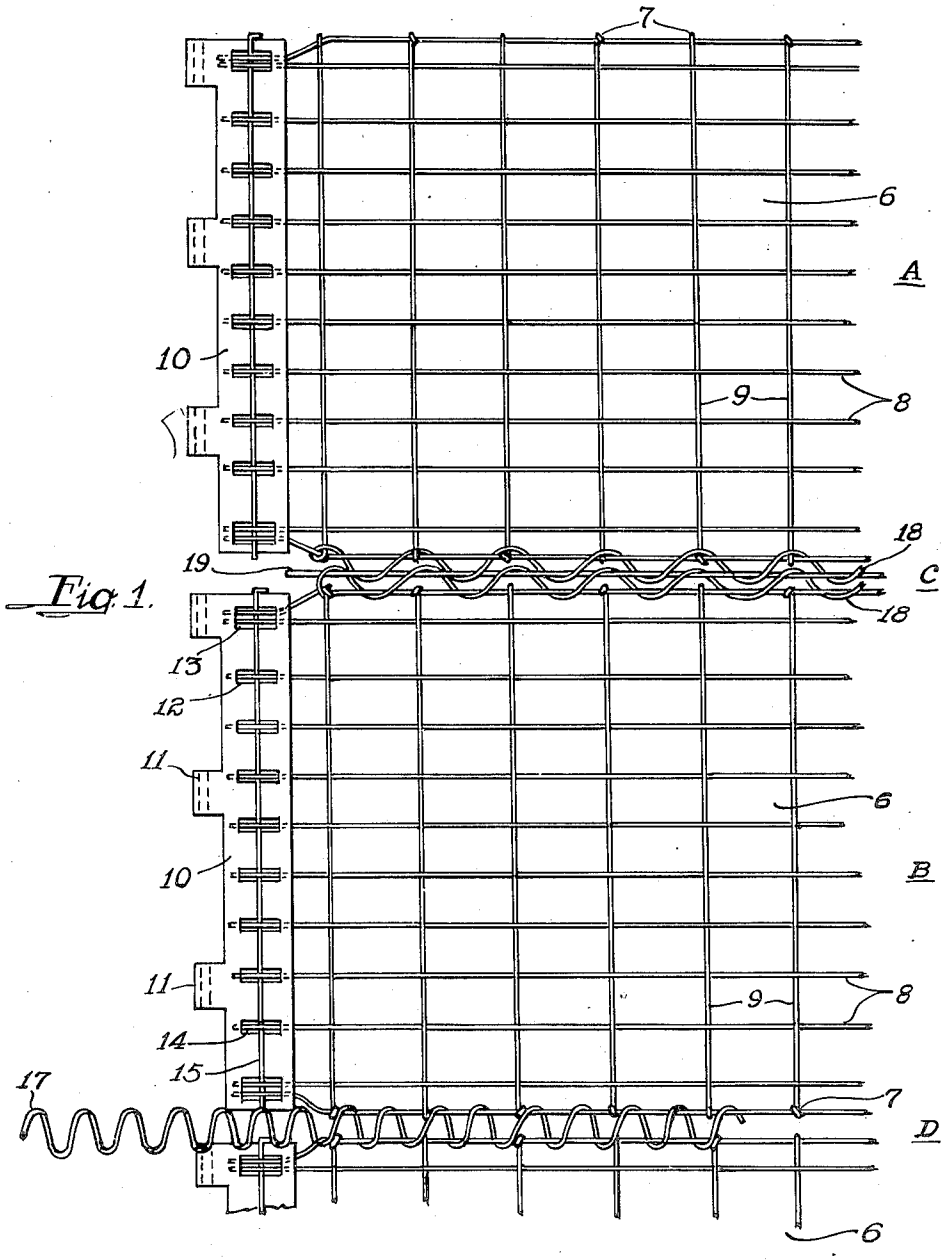



Fig. 1.

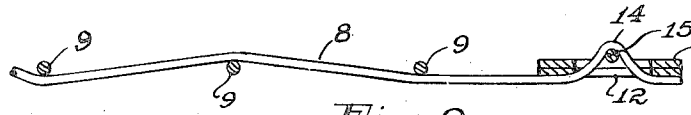



Fig. 2.

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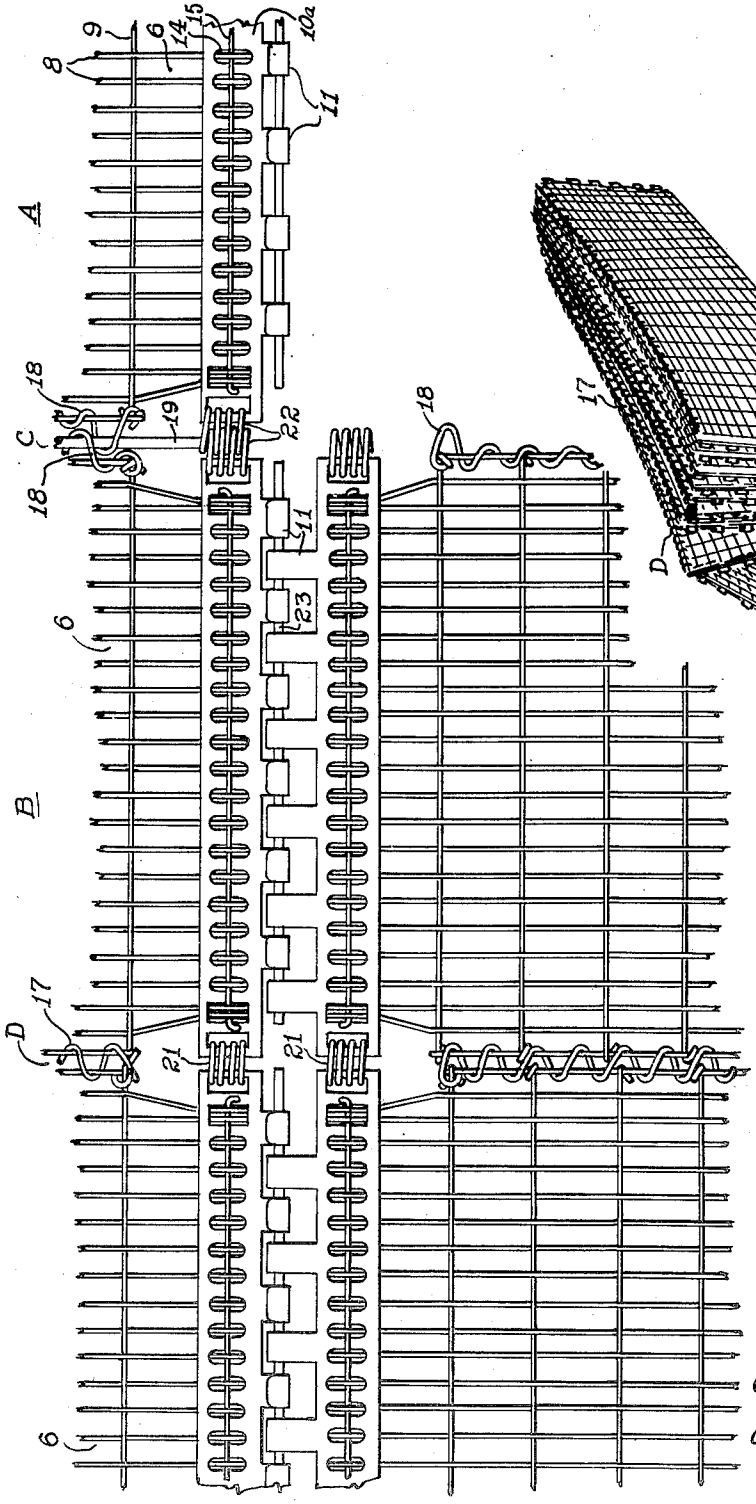



Fig. 4.




Fig. 3.

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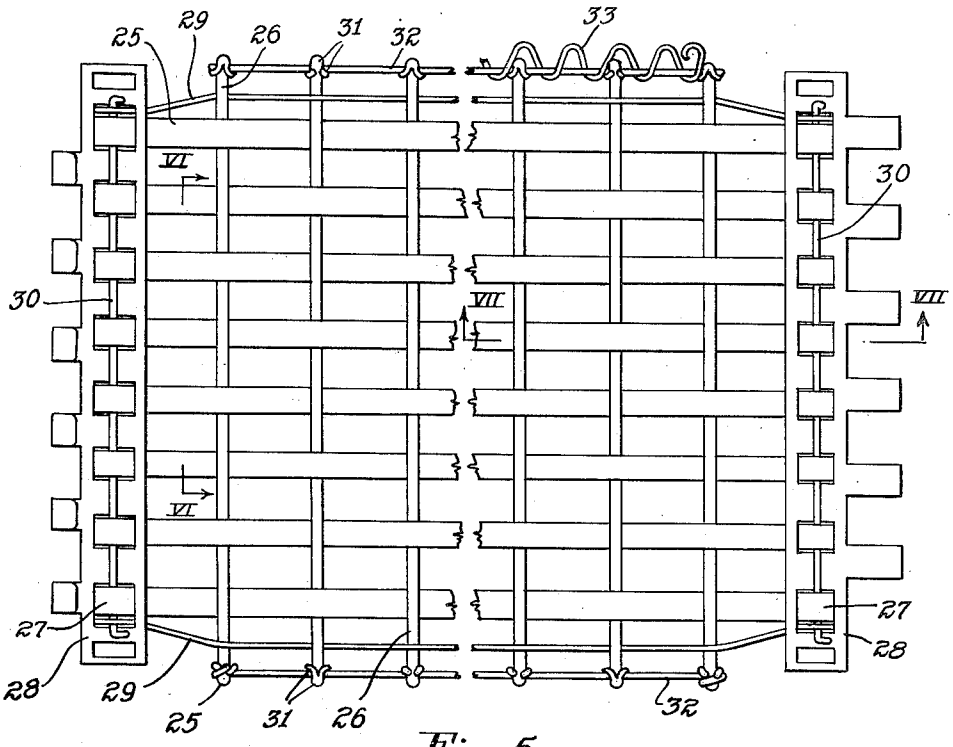



Fig. 5.

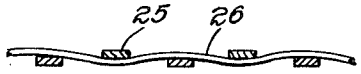



Fig. 6.

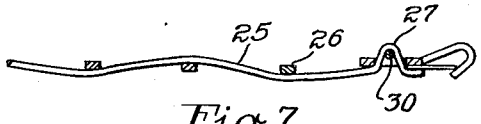



Fig. 7.

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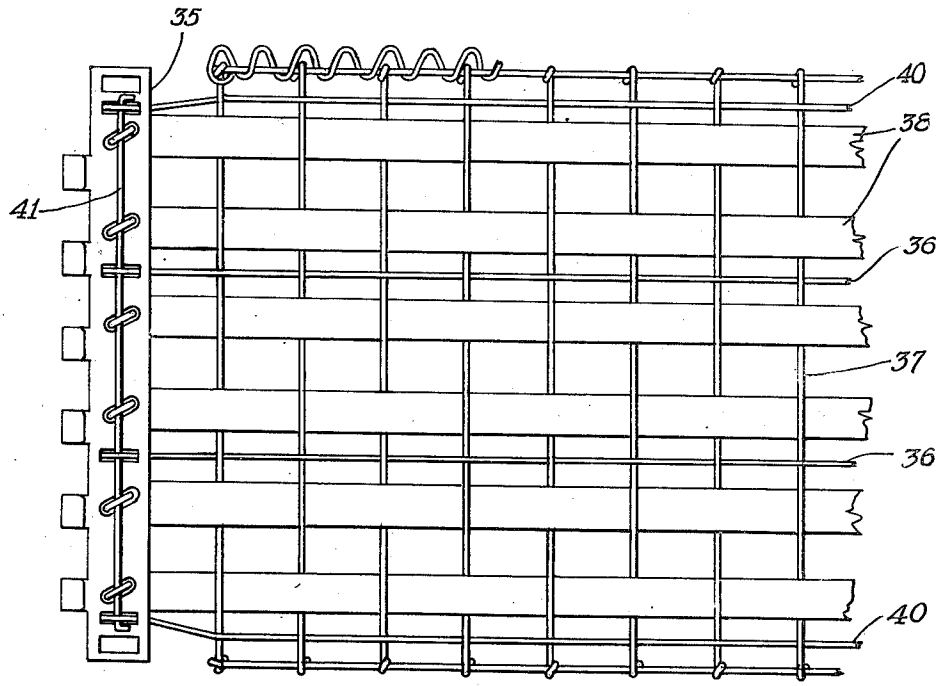



Fig. 8.

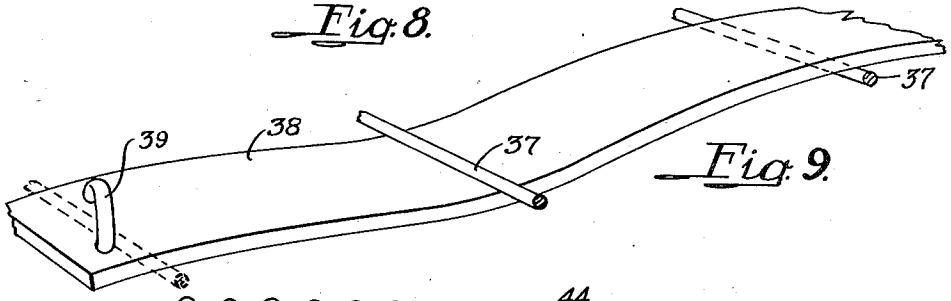



Fig. 9.

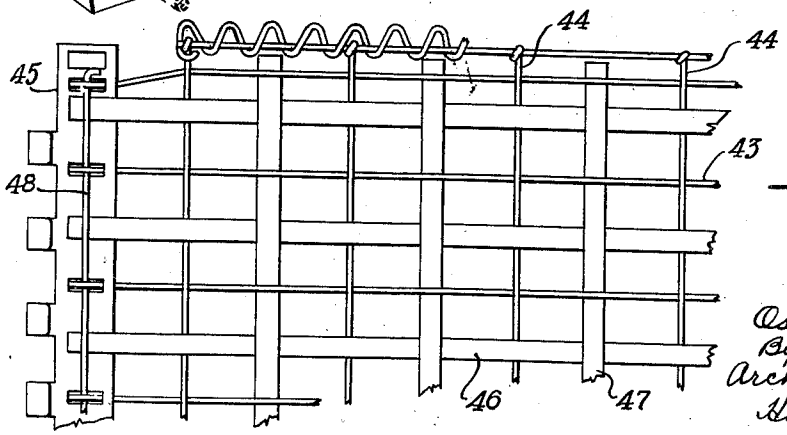



Fig. 10.

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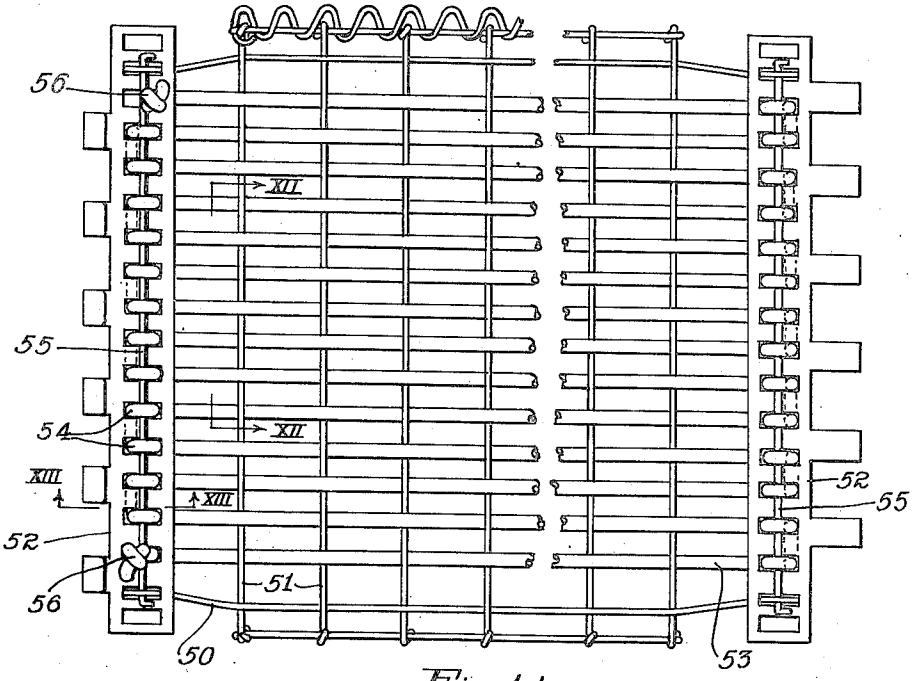



Fig. 11.

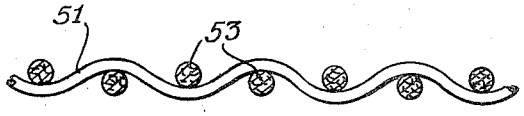



Fig. 12.

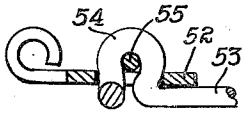



Fig. 13.

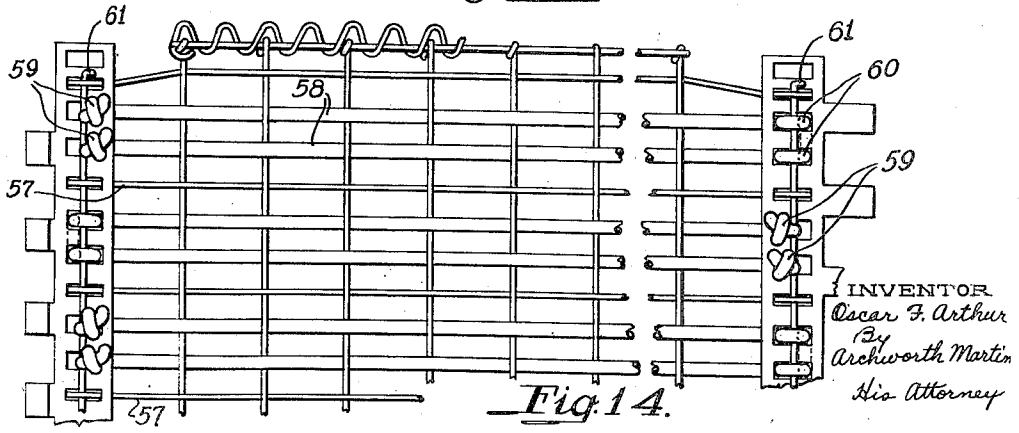



Fig. 14.

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Patented Oct. 24, 1944

2,361,164

# UNITED STATES PATENT OFFICE

2,361,164

## FIELD MAT

Oscar F. Arthur, Belle Vernon, Pa.

Application October 14, 1942, Serial No. 461,917

5 Claims. (Cl. 94—13)

My invention relates to mats, and more particularly to mats of wire mesh that are especially suited for use on soft, swampy or sandy ground, to thereby provide temporary landing fields for airplanes, truck tracks, beach aprons, hangar floors, bomb shelters, etc. This application is a continuation in part of my application Serial No. 437,989, filed April 7, 1942 (now Patent 2,315,180), and relates more particularly to the forms of hinge connections between the panels of the mats and between the mat sections, and to the panel structures.

One object of my invention is to provide a mat structure that can readily be folded to compact form, without bending or distortion of the mat elements entering into the structure of each panel.

Another object of my invention is to provide a mat of the character referred to which can quickly be laid in sections of a size suitable for convenient handling, and the sections then connected to form a unitary complete mat structure which has great strength, although made of mesh wires of standard gauges, and which is not subject to any substantial degree of billowing or bulging though made largely of flexible elements.

Still another object of my invention is to provide a mat panel having a skeleton-like framework of metal bars, wires and the like, which may be built at the factory, and between which additional strip-like mat elements can be assembled at the place of installation, to complete the panel.

In the accompanying drawings, Figure 1 is a plan view of a portion of my mat structure; Fig. 2 is a sectional view, on an enlarged scale, of a portion of the mat of Fig. 1; Fig. 3 is a perspective view, on a reduced scale, showing a group of mat panels in folded relation to one another; Fig. 4 is a plan view showing portions of two mat structures disposed in side-by-side relation and connected to one another; Fig. 5 is a fragmentary plan view of a panel formed mainly of flat metal strips; Figs. 6 and 7 are views taken on the lines VI—VI and VII—VII respectively, of Fig. 5; Fig. 8 is a plan view of a portion of another form of mat panel; Fig. 9 is a perspective view, on an enlarged scale, of one of the mat elements of Fig. 8; Fig. 10 is a plan view of a modification of the structure of Fig. 8; Fig. 11 shows a metal frame having rope or the like incorporated therein; Figs. 12 and 13 are enlarged views taken on the lines XII—XII and XIII—XIII respectively, of Fig. 11, and Fig. 14 shows a modification of the structure of Fig. 11.

In Figs. 1 to 4 of the drawings, a portion of a mat structure is shown as composed of panels that form sections A and B arranged in end-to-end relation and connected together as at C. As many of these sections will be employed as is desired. Each section is composed of a series of panels 6 which are connected together at D. The number of panels 6 in each section A and B will usually be such that their combined weight will not be too great for convenient handling, when a section is folded as in Fig. 3. When placed on a field, these sections will be joined as at C. Each section may conveniently be 12-feet wide and each panel about 14-inches long (in directions longitudinally of the mat). Where a mat structure of greater than 12-foot width is required, additional mat sections will be laid alongside other sections and connected thereto as in Fig. 4.

Each panel is formed of strand members 8 which may be of about 12 feet in length—when a 12-foot wide mat section is desired. The stay wires 9 are intermeshed or woven with the strands 8 by passing them over and under successive strand wires, the strands in turn passing over and under successive stay wires. The stay wires 9 may conveniently be about 14 inches long. The wires 8 and 9 may be 9-gauge wire, and are preferably of hard-drawn wire or of spring steel so that they will not easily become permanently bent in use or through handling, and the panels are further resistant to such deformation, because the strands can have slight sliding movement on the stays 9.

The extremities of the stays are snugly bent back around the marginal strands as at 7, connecting plates 10 being provided on both edges of each panel. While only one plate is here shown on each panel, it will be understood that at the other longitudinal edge of each group of strands 8 a similar plate 10 will be provided. These plates are here shown as formed of a single metal strip folded upon itself to form a loop at one edge, after which portions of the loop are cut away to form eyes or knuckles 11. The plates have slots 12 and 13 punched therein and the strand wires, near their ends, are pushed into the slots by suitable dies, a distance sufficient to form permanent bends 14 therein. Rods or heavy wires 15 are then inserted through these loops or bends, to anchor the strands 8 to the plate and thereby prevent the strands from being pulled or shifted out of place, in either longitudinal or transverse directions.

The panels of each mat section are hingedly

connected by a spiral or helical rod or wire 17 at each joint. This spiral wire is inserted by rotating it on its longitudinal axis with the bends or turns of the wire engaging the marginal strand wires of adjacent panels, as indicated in Fig. 1. This spiral connecting rod not only provides a hinge joint whereby the panels may conveniently be folded as in Fig. 3, but serves to stiffen or reinforce the transverse edges of the panels against deflection under weights imposed thereon. The plates 10 at the longitudinal edges of the panels also serve to stiffen the panels, without detracting from the flexibility at the joints. It should be noted that the longitudinal edge of the panel is actually the short edge of the panel. This word "longitudinal" is used because this edge extends longitudinally of the mat section.

The end-most panel of each section is provided with a spiral wire 18 that is threaded along the adjacent strandwire. When the spiral wires 18 of two panels are brought together as shown in Fig. 1, a retaining rod 19 can be inserted through the turns of both wires 18, to connect the two mat sections together.

The panels of each mat section may conveniently be arranged in groups at the factory, the panels in each group being connected by wires 17, to a suitable total length. The wires 18 may also be applied to the end-most panels of the section at the factory, and the sections then connected at the field simply by inserting the rods 19. There can be some hundreds or even a thousand feet preassembled at the factory, then folded as in Fig. 3 and shipped to the field, where they can be spread simply by pulling the end-most panels and succeeding panels from a truck.

In Fig. 4 I show a somewhat different arrangement of end-plates 10—*a*. In this arrangement the end-plates are provided with slots for the reception of spiral connecting wires 21 and 22. The wires 21 are brought into connected relation to the plates by a screwing action, as are the wires 17, to form hinged connecting joints. Each of the helical wires 22 is threaded simply into one plate 10—*a*. The coils 22 are then brought into inter-mesh or overlapping relation and the rod 19 that connects the wires 18 can be passed therethrough and thus employed also to connect the coils 22.

As shown in Fig. 4 a series of mat sections are connected in side-by-side relation to another series of mat sections, by a rod 23 that extends through the knuckles 11 of the respective mat sections.

Referring now to Figs. 5 to 7, I show a structure wherein the mesh elements consist mainly of transversely-extending metal ribbons 25 and longitudinally-extending metal ribbons 26 that are interwoven. The end portions of the ribbon 25 are deflected upwardly at 27 through the openings in the plates 28, and wires 29 are similarly bent upwardly for connection to the plates. Retaining rods 30 are inserted between the plates and these bends to retain the members in assembled relation. At their ends the narrow ribbons 26 are split to form prongs which are bent at 31 around end wires 32, these end wires serving as elements whereby panels can be connected together as by a spiral wire 33.

In Figs. 8 and 9 I show a structure wherein a skeleton or framework of metal is formed by end plates 35, cross wires or rods 36 and stay wires 37, these members all being connected together in substantially the same manner as are the members 8, 9 and 10 of Figs. 1 and 4. However, in this case, the transverse wires 36 are spaced farther apart and filler strips 38 are woven through the stay wires 37. These strips 38 may be of wood, split bambo, fiber, rubber, or other suitable material. The skeleton frame may be assembled at the factory and the strips 38 put into place at the field, either with or without the use of staples 39. In the case of wood or rubber, for example, the staples may be driven into the strips at the place of installation. The staples extend through holes in the plate 35 and they, together with the strand wires 40, are held in place by the lacing wire or rod 41. In the arrangement shown, there is a considerable saving of metal, since the strips 38 may be of some other material, and furthermore, shipping weight will be reduced, because the members 38 can be inserted at the field from materials locally available, such as split wood strips. The strand and stay members 36 and 37 serve also as stiffening elements to resist pulling inwardly of the edges of the mat under impacts, particularly where the members 38 are of very flexible material.

Fig. 10 shows an arrangement wherein strand wires 43 and stay wires 44 are employed, these members being assembled with end plates 45 in substantially the same manner as are the panels in Fig. 1, but in this case the strand and stay members are spaced farther apart. Transverse strips 46 are interwoven with the wires 44 and longitudinal strips 47, while the strips 47 are interwoven with the wires 43 and the strips 46. These strips 46 and 47 may be of any suitable flexible material such as flat wood strips, split bamboo or withes. The ends of the strips 46 may be inserted between the plate 45 and the underside of the rod 48 that holds the ends of the wires 43 in place. In this instance, as in the case of Fig. 8, the metal skeleton may be shipped from the factory and strips 46 and 47 of material available at the place of installation can then be slid into position in the frame, and replacements thereof easily made.

Referring now to Figs. 11, 12 and 13, I show a metal framework comprising wires 50, 51 and end plates 52. Hemp rope, rubber, or other suitable material 53 is woven back and forth through the stay wires 51 and at suitable intervals is bent upwardly through holes in the plates 52 as indicated at 54, for the reception of retaining rods 55 that are passed through the loops. Knots 56 are tied in the rope ends to prevent such ends from being pulled back through the holes in the plates. In case of breakage, knots can be tied in the rope at other points and other shorter pieces of rope inserted and knotted into place.

In Fig. 14, the structure is similar to that of Fig. 11, but in this instance, a larger number of strand wires 57 are employed, to give greater stiffness to the structure and thus prevent its edges from being drawn inwardly through weight imposed upon ropes 58 that are of shorter length relative to the single long rope 53 of Fig. 11, and therefore knots 59 have to be provided at a greater number of points. In this case, also, the ropes 58 can readily be replaced when repairs are required. Each rope 58 at its doubled end is deflected upwardly through the holes in the plate, at 60, so that the retaining rod 61 can be inserted therethrough.

Certain of the structures are also suitable for

highway guards. For example, the panels A and B of Fig. 1 could be placed in end-to-end relation and mounted on posts, and the structures of Figs. 5 to 10 similarly mounted.

Structures wherein a considerable amount of non-metallic material, such as wood, cork or fibre, is used, as in Figs. 8 to 14, are suited for use as torpedo nets and beach nets to protect bathers from sharks, when suspended in vertical planes, by floats at their upper edges, or otherwise. As torpedo nets, they would be towed by convoying vessels, to protect merchantmen from the torpedoes of submarines.

I claim as my invention:

1. A jointed mat structure comprising sections arranged end-to-end and each composed of a plurality of panels having hinged connection with one another, along lines extending transversely of the mat section, a second series of mat sections of hinged panels disposed alongside the first-named mat sections, plates secured to the adjacent longitudinal edges of the panels of each series of mat sections, the plates having slots across their ends, means connecting the longitudinal edges of adjacent plates and spiral wires having their turns extending through the slots of adjacent plate ends, to connect the plates.

2. A jointed mat structure comprising sections arranged end-to-end and each composed of a plurality of panels having hinged connection with one another, along lines extending transversely of the mat section, a second series of mat sections of hinged panels disposed alongside the first-named mat sections, plates secured to the adjacent longitudinal edges of the panels of each series of mat sections, the plates having slots across their ends, means pivotally connecting the adjacent longitudinal edges of the sections, and spiral wires having their turns extending through the slots of adjacent plate ends, to connect the plates.

3. A jointed mat structure comprising transversely extending panels each of wire mesh and having a flexible body portion, stiffening bars or the like secured to the ends of each panel across approximately the full width thereof, in directions longitudinally of the mat, the panels being positioned in edge-to-edge relation, and hinge elements connecting the ends of the plates together, at each side of the mat, whereby the panels may be folded against one another.

4. A jointed mat structure comprising transversely extending panels each of wire mesh and having a flexible body portion, stiffening bars or the like secured to the ends of each panel across approximately the full width thereof, in directions longitudinally of the mat, the panels being positioned in edge-to-edge relation, means pivotally connecting the ends of the plates together at each edge of the mat and hinge elements connecting the panels at points between the plates at opposite ends of the panels, whereby the intermediate edge portions of the mesh of adjacent panels are supported against relative deflection and the panels may be folded upon one another.

5. A jointed mat structure comprising a plurality of panels having hinged connection with one another, along lines extending transversely of the mat, a second series of hinged panels disposed alongside the first-named panels, plates secured to the adjacent longitudinal edges of the panels of each series of mat panels, means pivotally connecting the plates of each series, at their ends, and means connecting plates of each series to adjacent plates of the other series, at their adjacent longitudinal edges.

OSCAR F. ARTHUR.