J. E. FREDRICK.

WIRE FENCE FABRIC.

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1,012,347. **Patented Dec. 19, 1911.**

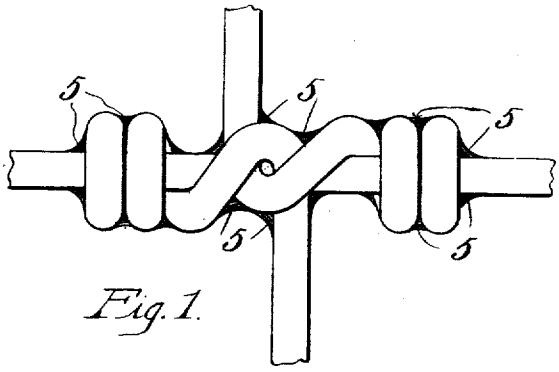

Fig. 1.

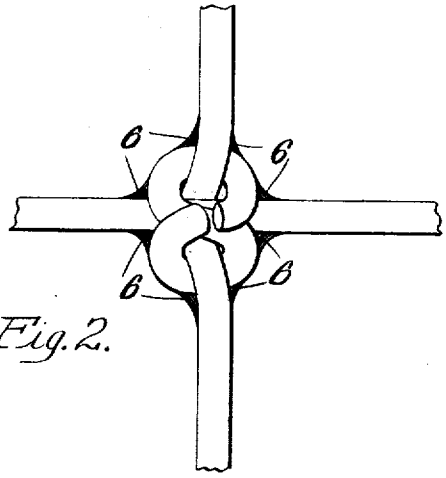

Fig. 2.

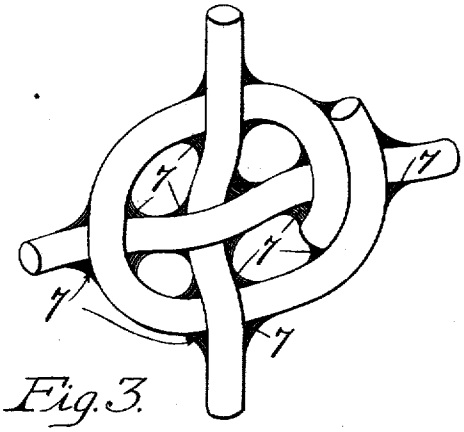

Fig. 3.

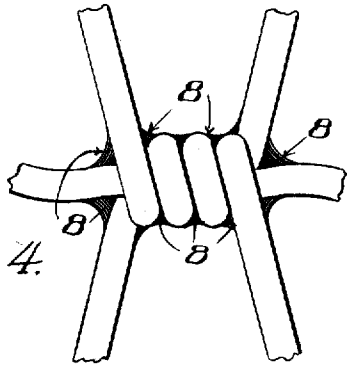

Fig. 4.

Witnesses:
Ephraim Banning
Rose Levitsky

Inventor:
John E. Fredrick.
By Banning & Banning
Attorneys.

UNITED STATES PATENT OFFICE.

JOHN E. FREDRICK, OF KOKOMO, INDIANA.

WIRE-FENCE FABRIC.

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To all whom it may concern:

Be it known that I, JOHN E. FREDRICK, a citizen of the United States, residing at Kokomo, in the county of Howard, State of Indiana, have invented certain new and useful Improvements in Wire-Fence Fabrics, of which the following is a specification.

At the present time, there are being manufactured a number of different kinds of wire fence fabric for heavy service. In general these fabrics are comprised of continuous longitudinal strand wires and vertical stay wires attached to the former either by being coiled around them or by means of short tie wires which hold the stay and strand wires together at the points where they cross.

Owing to the fact that wire fence fabrics are now being made for very heavy service, they must be made from iron or steel wires of comparatively large diameter in order to secure the necessary tensile strength.

In order to protect the fence fabric against deterioration by rusting, it is customary to galvanize the individual wires before they are woven together into the completed fabric. During the weaving process the stay wires must be tightly coiled around the strand wires and this is usually done by means of pins rotating in circles of small radius which press against the stay wires to bend them and coil them around the strand wires. It is found that the weaving process deteriorates the galvanizing of the stay wires in two ways: The pins abrade the galvanizing by pressing and rubbing against it, and the bending of the stay wires sharply around the strand wires tends to crack the galvanizing off from the body of the wire. When the galvanizing has once been cracked or otherwise injured, it is found that moisture gets into contact with the body of the wire and that rusting then sets in so that finally the body portion is completely destroyed, leaving only a thin shell of galvanizing. In manufacturing some forms of fence use is made of short stay wires which have their ends coiled around the strand wires. When these ends are not protected by galvanizing they afford points for the commencement of rusting with results similar to those already discussed. It is found that when comparatively large wires are twisted very sharply they crystallize. This reduces their strength and elasticity so much that it has been found necessary to use very large stay wires in order to ultimately secure the necessary strength in the complete fence fabric.

Some forms of fencing are woven in such way that it is difficult to prevent longitudinal movements of the wires with respect to each other at the points where they cross. This is particularly true of those forms of fencing in which the strand and stay wires are joined together merely by the use of tie wires. It has thus been found difficult to produce fencing of this type having sufficient permanency for heavy service.

I have found that the first difficulty enumerated, viz: the deterioration of the fence by rusting, can be overcome by galvanizing the wires after they have been woven into the fabric. This insures that they shall be completely protected at all points. I have also found that by annealing the wire after it has been woven the crystallizing strains can be removed. This annealing involves the heating of the fabric to a comparatively high temperature and then allowing it to cool. I have further discovered that by dipping the woven fabric into a fused galvanizing agent the wires will be completely galvanized in all their parts and at the same time they will be heated sufficiently to anneal them and thus remove the crystallizing strains from them. Therefore, by dipping the woven fabric in a molten galvanizing agent or by passing it through a tank or trough of such agent the fabric will be completely galvanized and the crystallizing strains will be removed from the wires and at the same time the wires will be soldered together at the points where they cross, thus overcoming the third difficulty enumerated because the stay wires will be soldered or welded to the strand wires at all the points where they cross.

In order to show more clearly the advantages to be derived from passing the woven fabric through a molten galvanizing agent I will describe more in detail the nature of the cracking or checking which takes place in the galvanizing if the wires are bent after they have been galvanized, and the nature of the crystallizing strains which occur in the wires by bending them sharply, particularly large wires. It is found that the galvanizing checks or cracks where wire is bent especially on the inner and outer faces of the curve. This seems to be due to the fact that the galvanizing is not elastic enough to stretch on the outer surface of the bend

sufficiently to cover said surface after the bend occurs, and to the fact that the galvanizing will not compress enough to properly cover the inner surface of the curve after the wire is bent. This causes the galvanizing to crack or check and peel off at these points thereby exposing the iron or steel wire beneath. Rusting will then set in at these cracked points and the wire very soon wastes away until it is worthless.

The crystallizing strains which occur when the wire is bent are fairly well understood. They seem to be due to the fact that the inner and outer surfaces of a wire of comparatively large diameter are compressed and stretched respectively beyond their elastic limit when the wire is sharply bent, thus seriously reducing the strength of the wire at these points. The larger the diameter of the wire and the sharper the bend the more serious is the reduction of its strength so that a wire which originally has great strength is seriously weakened by being sharply bent. Therefore in order to obtain a woven fence fabric of a given strength it is necessary to use larger wires than would be the case if these crystallizing strains did not occur or if they were removed. Therefore the wires of a fabric treated according to my process, that is, galvanized by submerging in a molten galvanizing agent after the fabric is woven, do not possess the checks or cracks in the galvanizing, and the crystallizing strains are removed from the wires so that a fabric results which is perfectly galvanized all over and in which all of the wires are restored to their original tensile strength by removing the crystallizing strains from them. A fabric is thus produced having better wearing qualities and better able to resist weather conditions than one which is woven from wires previously galvanized but not subjected to a subsequent galvanizing treatment, and smaller wires can be used to produce a completed fabric of given strength than is otherwise possible. This last feature results in a considerable reduction of first cost because smaller wires which contain a less number of pounds of material can be used in the production of a completed fence fabric having a certain strength. Also a more desirable fabric results because it is lighter and therefore easier to handle and string than otherwise.

In order to more clearly show the manner in which the joints of a woven wire fence fabric are soldered or welded together reference may be had to the accompanying drawing, in which—

Figure 1 illustrates one joint of a fence fabric comprising continuous longitudinal strand wires and sectional stay wires linked together at the joint and having their ends coiled around the strand wire; Fig. 2 illustrates one joint of a type of fabric comprising continuous strand wires and continuous stay wires provided with kinks for engaging the strand wires and tied to the latter by means of one form of tie wire; Fig. 3 illustrates one joint of a type of fabric which comprises continuous strand wires and continuous stay wires, strand and stay wires being provided at the joint with kinks for engaging each other and being held together by means of another form of tie wire; Fig. 4 illustrates one joint of a fence fabric which comprises continuous strand wires and continuous stay wires together coiled around the strand wires.

Referring to Fig. 1 it is seen that the stay wires in this case must be very sharply bent, thus setting up large crystallizing strains in them and greatly deteriorating the weather-proofing coat in case they are galvanized before the fence fabric is woven. It is also seen that no provision is made for holding the stay wires from longitudinal movement along the strand wires except the friction which originally exists between them. Therefore this type of fabric is greatly improved as regards all of the features heretofore mentioned by treating it in the manner herein set forth to produce a fabric which is completely galvanized and annealed and soldered together after completing the weaving process. The coating of weather-proofing, soldering, and annealing material is shown in outline on the joint, and is designated by the numeral 5.

Referring to Fig. 2 it is seen that both the stay and tie wires will be greatly deteriorated in the weaving process because of the crystallizing strains cracking and checking the weather-proofing when the wire is previously galvanized. In this case also the friction alone holds the stay wires in fixed longitudinal position on the strand wires. In this case the weather-proofing, annealing, and soldering material is shown in outline, and is designated by the numeral 6.

In Fig. 3 all of the wires are deteriorated in the weaving process and any looseness in the tie wire will allow abrasive movements between the different wires. Such abrasive movements will not only serve to wear through the galvanizing where it has not already been cracked and checked but it will actually tend to cut the wire thus reducing its mechanical strength. The weather-proofing, galvanizing, and soldering material 7, shown in outline, serves to bind the stay wires and strand wires together, and also to bind the tie wire to both the stay and strand wires.

In Fig. 4 conditions are very similar to those of the fabric of Fig. 1. In this case the weather-proofing, annealing, and soldering material is shown in outline, and is designated by the numeral 8.

It is thus seen that the treatment of any

of the herein-described types of fabric to produce a new fabric which is completely galvanized or weather-proofed in every part and which is completely annealed to restore its strength and soldered together in all its joints will greatly improve the fabric, and in fact a new fabric having new properties and greater strength, weather resisting qualities, and stiffness will result.

Although I have herein shown and described only four types of fabric treated according to my process to produce a new and better fabric still I do not limit my invention to such fabrics except as defined in the claim, but I include in the scope of my invention any form of wire fence fabric woven from relatively large wires which would be deteriorated by the weaving process as heretofore described, and which fabric is subsequently treated to a complete galvanizing or weather-proofing, annealing, and soldering treatment as hereinbefore described.

Where in the specification and claim I speak of stay wires I do not limit myself to a fabric in which the stay wires are perpendicular to the strand wires, nor to a fabric in which the stay wires are vertical, but I include also all forms of stay wires passing from strand wire to strand wire.

Where in the specification and claim I use such terms as "coilingly attached," "coiled about," etc., I include not only mesh fencings in which the stay wires as such are coiled about the strand wires, but I also include in my meaning fencings in which tie wires are coiled about the strand and stay wires in such a way as to hold them together; for it is evident that in either of these two cases the advantages of my invention will accrue because in either of these cases galvanizing material applied to the wires before weaving them is deteriorated, and crystallizing strains are set up in the wires by bending them sharply, both of which defects are remedied by treating the fabric according to my new process to produce my new product.

I claim:

A wire fence fabric comprising strand and stay wires of relatively large size connected by a coiled medium, and a coating of metal applied in molten condition and fully covering the joints, thereby serving to counteract the strains due to the distortion of the grain of the wires in the connecting operation.

JOHN E. FREDRICK.

Witnesses:
EPHRAIM BANNING,
THOMAS A. BANNING, Jr.