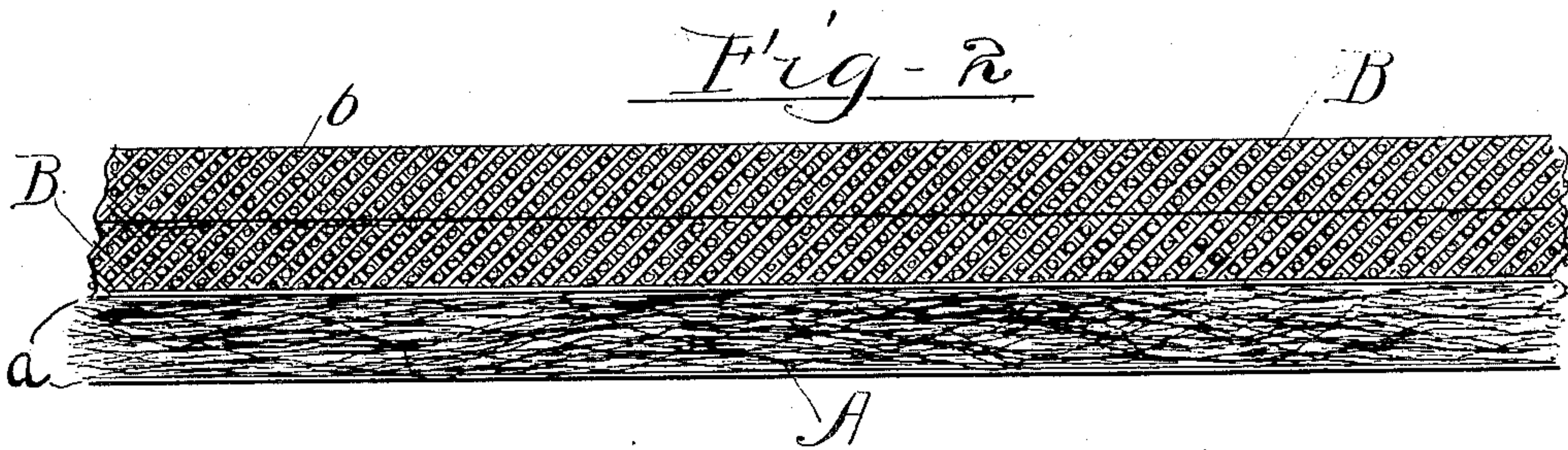
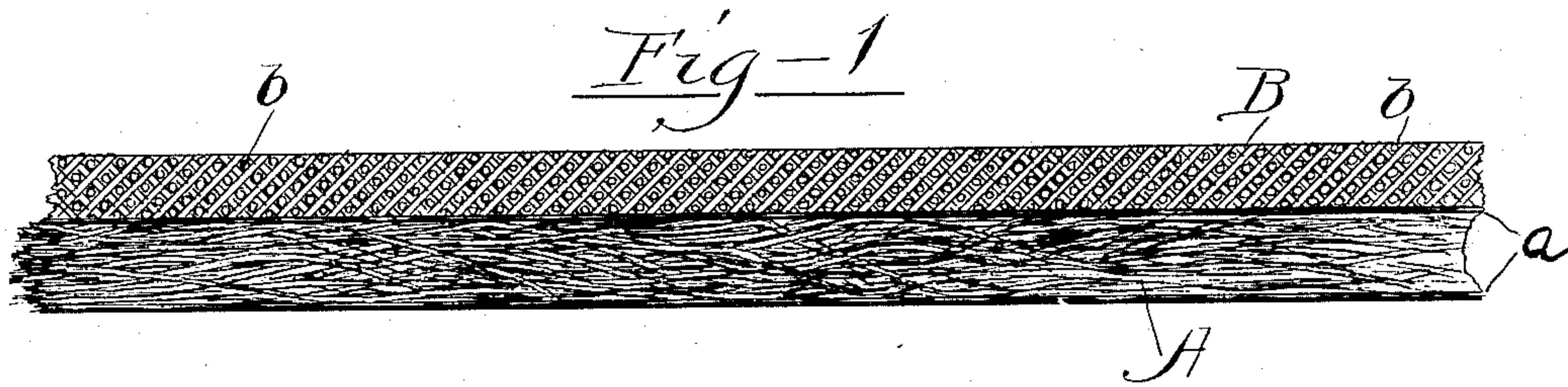


(No Model.)

C. ZEGLER.  
BULLET PROOF FABRIC.

No. 604,870.

Patented May 31, 1898.



Witnesses

*Harold G. Barrett.*  
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# UNITED STATES PATENT OFFICE.

CASIMIR ZEGLEN, OF CHICAGO, ILLINOIS.

## BULLET-PROOF FABRIC.

SPECIFICATION forming part of Letters Patent No. 604,870, dated May 31, 1898.

Application filed May 14, 1897. Serial No. 636,443. (No specimens.)

*To all whom it may concern:*

Be it known that I, CASIMIR ZEGLEN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful  
5 Improvements in Bullet-Proof Fabrics; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked  
10 thereon, which form a part of this specification.

This invention relates to bullet-proof shields, and more especially to an improved composite elastic fabric adapted to resist penetration of projectiles and cutting or thrusting instruments by cushioning or absorbing the impact of the same.

The object of the invention is to provide a relatively light fabric and of such flexibility  
20 that it may be made into suitable garments and worn without serious inconvenience or discomfort to protect the body of a person, and which may also be used for various other purposes.

The fabric herein set forth is of the general nature of the fabrics illustrated and described in my prior patents, Nos. 577,999 and 578,000, granted to me on the 2d day of March, 1897. The fabrics of said patents consist, essentially, of layers of strong cords or strands, preferably of silk, the strands in each layer being laid parallel with each other, while the strands of the different layers are laid transversely with relation to each other. Upon  
30 one side of said transverse layers is applied a layer of unwoven hair or wool, the different layers being bound together by stitching. The fabric described in said Patent No. 577,999 embraces the same materials above  
40 set forth and in addition thereto a reinforcement of pasteboard and an outer layer of cushioning-felt, said layers being bound together by stitching. I have found in practice that these fabrics effectually resist projectiles  
45 from the smaller class of arms and very satisfactorily resist penetration of projectiles from the modern rifles, such as the Krag-Jorgensen and the like, as well as the larger projectiles from the Springfield or Winchester  
50 rifles. I have found, however, that in the last two classes of arms named, if the projectile strikes between the strands or cords,

while the force of its impact will be absorbed and it will be prevented from penetrating the fabric, still the projectile will act to break or  
55 cut the stitches which are used to bind the different layers and the individual strands of each layer together, and that this has the effect of destroying the compactness of the fabric, and therefore diminishing its power  
60 to resist penetration as well as shorten its period of usefulness.

The present invention is designed to obviate the above-stated objections; and it consists in the matters hereinafter set forth, and more  
65 particularly pointed out in the appended claims.

Figure 1 of the drawings represents in cross-section, somewhat enlarged, the fabric constructed in accordance with my invention; 70 and Fig. 2 is a similar view of a modification thereof.

Referring to said drawings, A designates one of the layers of the fabric, which consists in the present instance of a layer of fine fibers 75 either placed parallel with each other or in any manner and will desirably be confined within a covering or bag *a* of silk or other suitable material. As before mentioned, it is unnecessary that the fibers of this layer be  
80 placed parallel or in any regular order with relation to each other; but the fibers may be superposed upon each other in any manner, it being only desirable to secure a uniform and compact thickness thereof. While it is  
85 desirable to confine said layer A in a suitable covering, it may be secured to the layer B in any manner which will retain the said fibers. The layer A is designed as a cushioning layer and is placed in the inner side of the fabric  
90 or the side opposite that against which the projectile strikes.

The second layer B, or that against which the projectile strikes, is composed of one or more thicknesses of relatively large strands 95 or cords *b*, of strong material, each composed of a number of fibers spun or wrapped together, as distinguished from the layer A just described, which is composed of a mass of unwrapped fiber. Said strands of the  
100 layer B instead of being arranged parallel with each other and secured together by stitching, as in the construction of my said prior patents, are woven or braided together



in such manner as to form a continuous and compact fabric. The particular style of weaving or braiding said layer B is not essential; but any arrangement may be employed by which the strands forming the same will be brought very compactly together and will be held closely upon each other by their woven or braided construction, as distinguished from stitching and like securing means.

The cords or strands constituting the layer B are tightly twisted to form hard compact strands and are laid closely upon each other in the process of weaving or braiding, so as to present a hard unyielding surface, against which the projectile strikes. Such construction also gives great lateral rigidity to the fabric and insures against the displacement of the strands.

The fabric composing the second layer B may be made either by hand or machinery.

In practice I have found that both layers A and B are best constructed of silk, which, owing to its strength, and doubtless to the peculiar characteristics of silk, furnishes the most satisfactory results. Said layers may, however, be made of any other material found suitable for the purpose. The number and thickness of the layers B will be regulated in accordance with the use to which the fabric is to be put, it being obvious that a heavier or a greater number of layers, such as is shown in Fig. 2, will be required for heavier than lighter classes of arms.

In practice the layer A will usually be made of a thickness equal to about twice the thickness of the layer B; but this proportion will depend upon the use to which the fabric is to be put. It being the purpose of the layer A to cushion the impact of the projectile, it follows that for the larger projectile a thicker layer will be required. The thickness of said layer B may be increased by making the strands *b* of greater diameter or by making this portion of the fabric of two or more separate layers, as shown in Fig. 2. The layers A and B just described may be secured together in any convenient manner, as by stitching or otherwise. It will be understood, however, that stitching will not be required to bind the parts of the layer B together, as in the construction of my said prior patents, but

only to secure the different layers upon each other.

I have found that a fabric constructed in accordance with my present invention successfully resists the penetration of projectiles from all classes of what are known as "small-arms," as distinguished from ordnance, as well as from the penetration of hand cutting and thrusting instruments, while at the same time the wear upon the fabric is imperceptible, and it is therefore capable of long and continued use. The use of closely woven or braided cords or strands enables me to secure the same power of resistance with a much lighter and more flexible fabric than that afforded by the transverse arrangement of the strands of the separate layers of the construction of my said prior patents. The fabric is also more flexible than are the fabrics of said prior patents and may be worn without any inconvenience whatever. Moreover, the fabric may be employed for making shields for other uses, and its thickness may be increased as desired.

What I claim as new is—

1. As a new article of manufacture, a bullet-proof fabric comprising an inner or cushioning layer of unwoven fibers and one or more outer layers of closely woven or braided silk cords or strands, which consists of a number of fibers tightly wrapped or twisted together, said layers being suitably secured together.

2. As a new article of manufacture, a bullet-proof fabric composed of an inner cushioning layer of unwoven or loose silk fibers compactly inclosed within a suitable covering, and one or more outer layers, each composed of closely woven or braided silk cords or strands, which consists of a number of fibers tightly wrapped or twisted together, the whole being secured together by stitching or otherwise.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 12th day of May, A. D. 1897.

CASIMIR ZEGLER.

Witnesses:

ANDREW SPETZ,  
WILLIAM L. HALL.