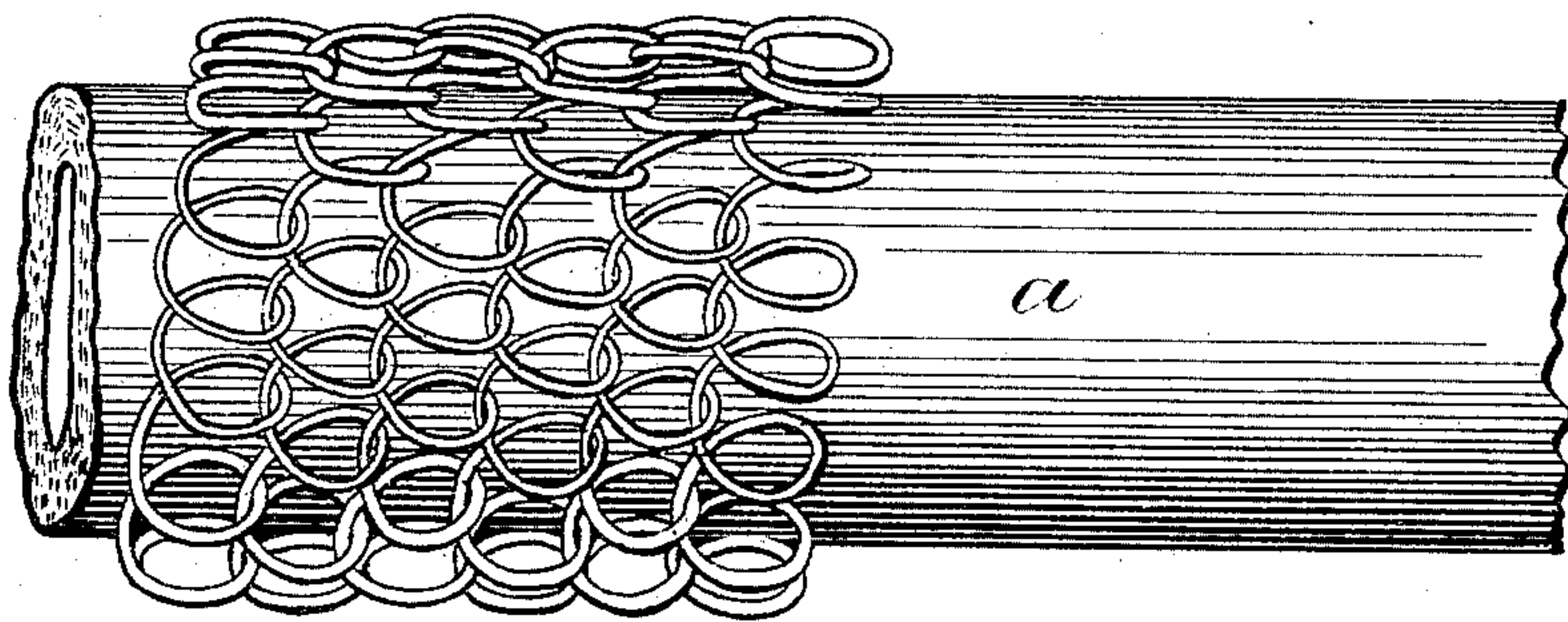


H. WAKEMAN.  
Armor for Flexible Tubing.

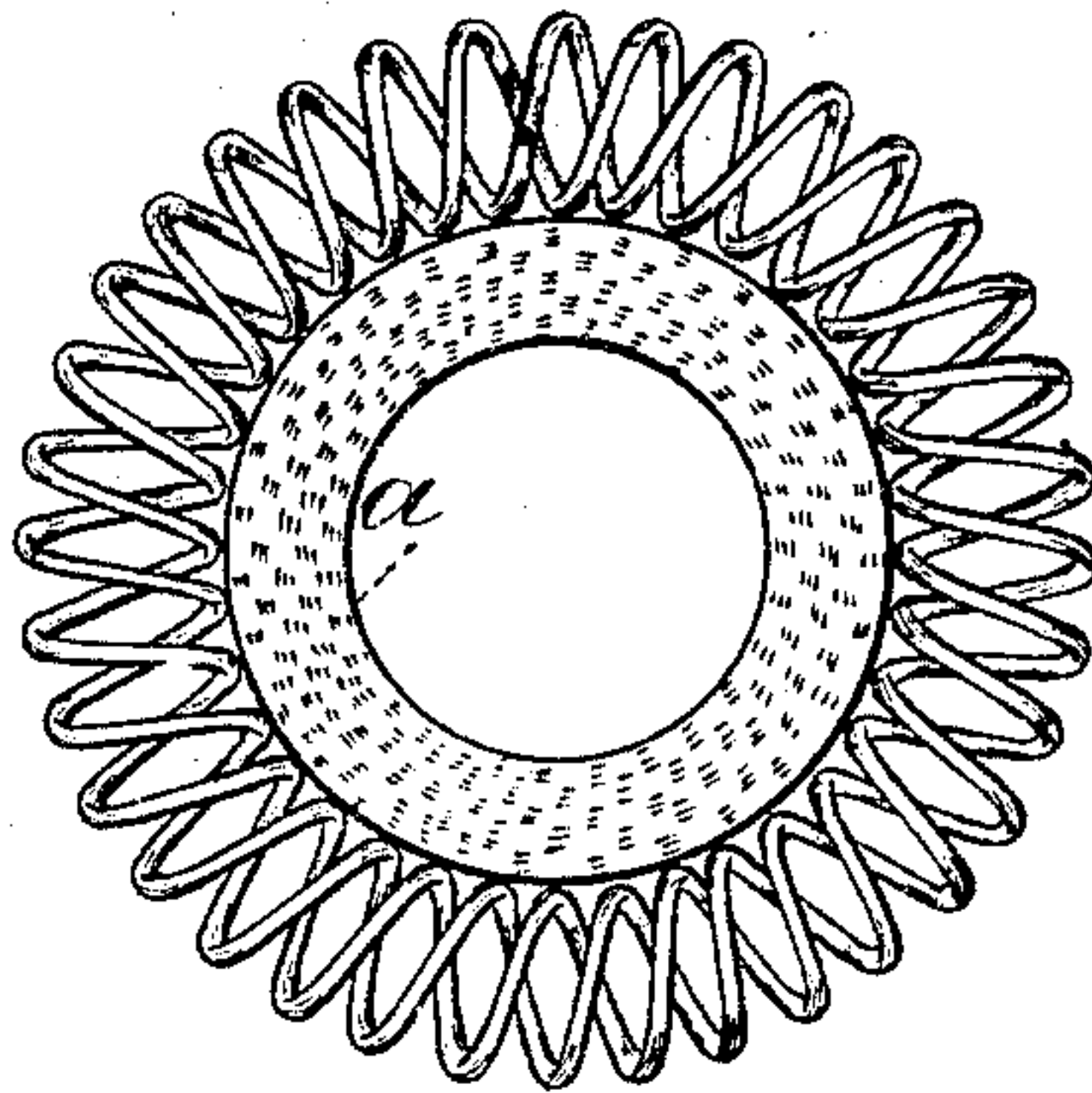
No. 223,262.

Patented Jan. 6, 1880.

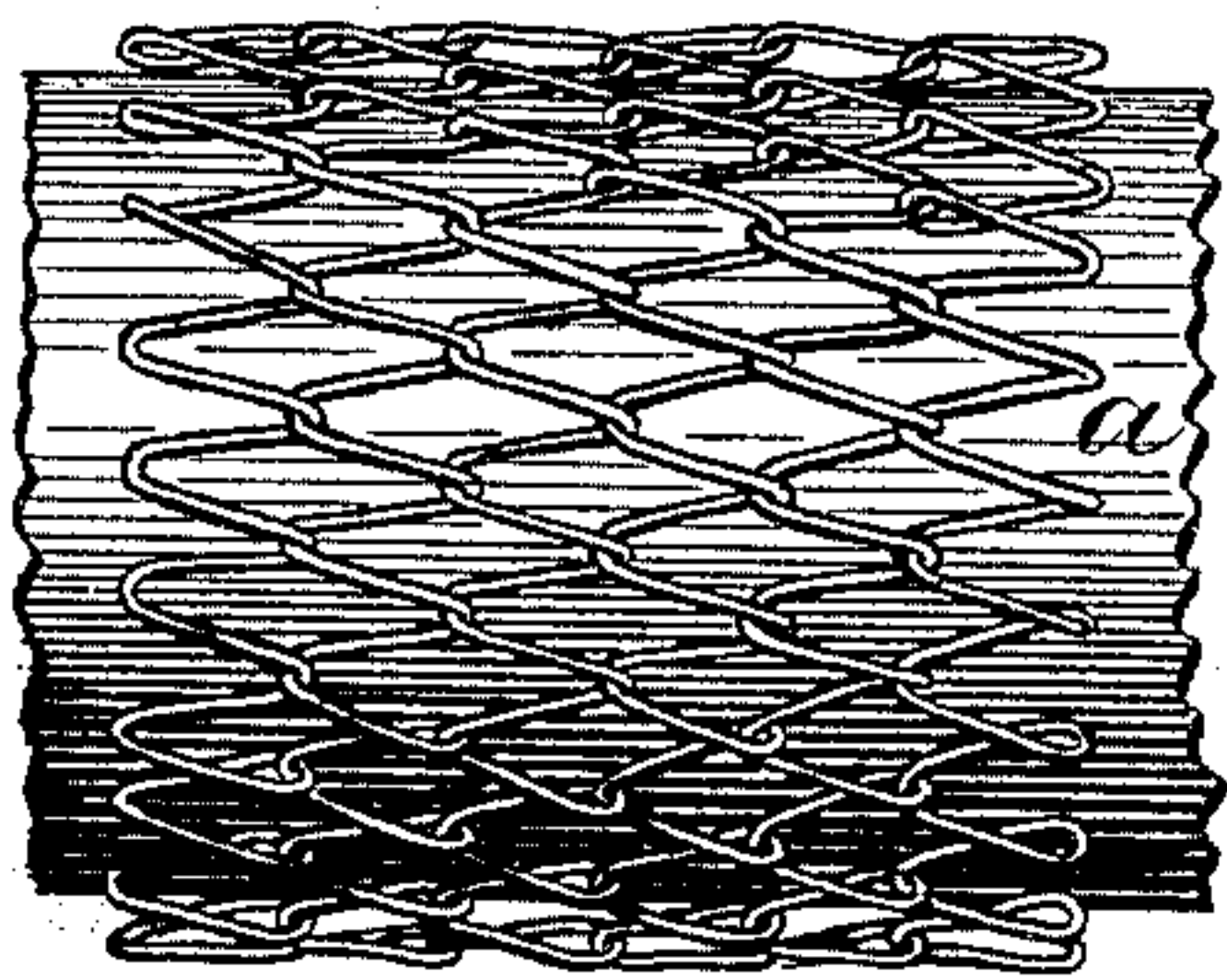
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



Witnesses

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per Lemuel W. Serrell

att'y.



# UNITED STATES PATENT OFFICE.

HARWOOD WAKEMAN, OF NEW YORK, N. Y.

## ARMOR FOR FLEXIBLE TUBING.

SPECIFICATION forming part of Letters Patent No. 223,262, dated January 6, 1880.

Application filed March 18, 1878.

*To all whom it may concern :*

Be it known that I, HARWOOD WAKEMAN, of the city and State of New York, have invented an Improvement in Armor for Flexible  
5 Tubing, of which the following is a specification.

In Letters Patent No. 188,446, heretofore granted to me, a flexible tube is represented as inclosed in an armor made of interlaced  
10 helices running longitudinally of the tube, and the edges of the armor united by interlaced wire. In this instance the wire helices do not run around the tube, and hence the tube may become flattened partially, and the tube, when  
15 it is bent, causes the helices to stretch on the outside of the arc and compresses the helices upon the inside of the arc. A single wire has also been wound around the tube in a helical form; but there is nothing to prevent the  
20 convolutions becoming misplaced as the tube is bent; or the tube may be cut with a knife between the wires.

The object of the present invention is to make use of a helix or helices that run circumferentially around the tube, thereby forming a cylindrical armor that keeps the flexible tube from becoming flattened. The circumferential helices are interlaced or connected in such a manner that the necessary looseness  
30 or play exists between one helix and the next to permit of the flexible tube bending to the necessary extent, and also to prevent the coils of wire from opening too far or overlapping one another to crowd one upon the other.

In the drawings, Figure 1 is a side view representing a piece of hose with the armor applied thereto. Fig. 2 is an end view of the hose with the helix thereon, and Fig. 3 is a side view of the helix flattened after being interlaced.  
40

The flexible tube *a* is adapted for use with air-brakes for railway-cars, rock-drills, and in mining, and wherever the tube is liable to injury from wear or pressure, and the improved  
45 armor serves to protect and strengthen such tube.

The helices surrounding the tube are of wire, and laid around such tube circumferentially.

50 The helices in my aforesaid patent were connected by revolving one into the coils of the next; and, as my present invention does not relate to any particular manner in which the helices are laid together or connected, I

remark that the helices are interlaced, interlocked, or connected, so as to run circumferentially around the flexible tube.

After the armor has thus been laid up it is preferable to flatten the helices by a suitable roller or presser that bends the helices down  
60 so that they lie flat, or nearly so, upon each other, thus occupying but little space, and the wires of the helix running around the tube are thus laid in lines similar to a cycloidal curve and linked into the similarly-shaped  
65 wires of the next helix, and this armor is to be drawn over the flexible tube, and it maintains its cylindrical form, but allows the tube to be bent to whatever extent is required, because the looseness of the wires in the interstices  
70 allows the coils of helices to be moved endwise of the tube.

It will be apparent that the armor may be made of the interlaced helices passing circumferentially of the tube, as aforesaid, but each  
75 helix of a length to reach around the tube, and united at the ends by an interlacing of wire or otherwise.

The helices may be applied around the elastic or flexible tube without being flattened; 80 or they may be flattened upon the tube itself; or the armor may be made by any suitable machinery, either upon the tube or as a cylinder to receive the tube.

In Fig. 3 the armor is represented as of 85 flattened helices, in a form similar to wire wound around a flat blade, so as to lie closely upon the flexible tube. In all instances the direction of the helices or flattened helices is circumferential, and the lacing or wires that  
90 connect such helices secure them in the cylindrical form.

The helix may consist of a single wire, or of wire cord or rope wound up into the helical form, or wound around the tube and the coils  
95 connected together.

I claim as my invention—

The armor for flexible tubes, composed of a helix or wire helices running circumferentially around the tube and interlaced or connected,  
100 substantially as set forth.

Signed by me this 8th day of March, A. D. 1878.

HARWOOD WAKEMAN.

Witnesses:

GEO. T. PINCKNEY,  
CHAS. H. SMITH.