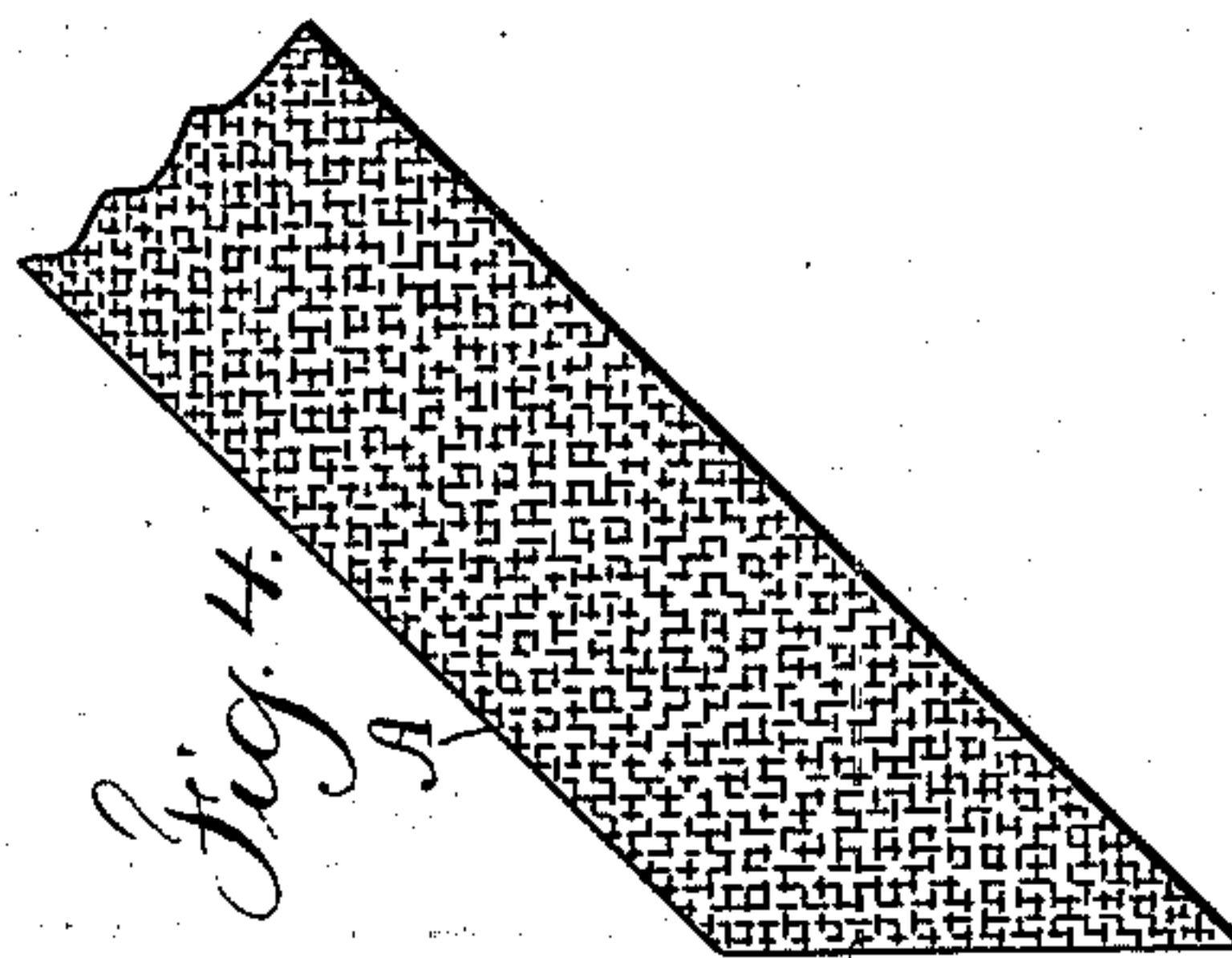
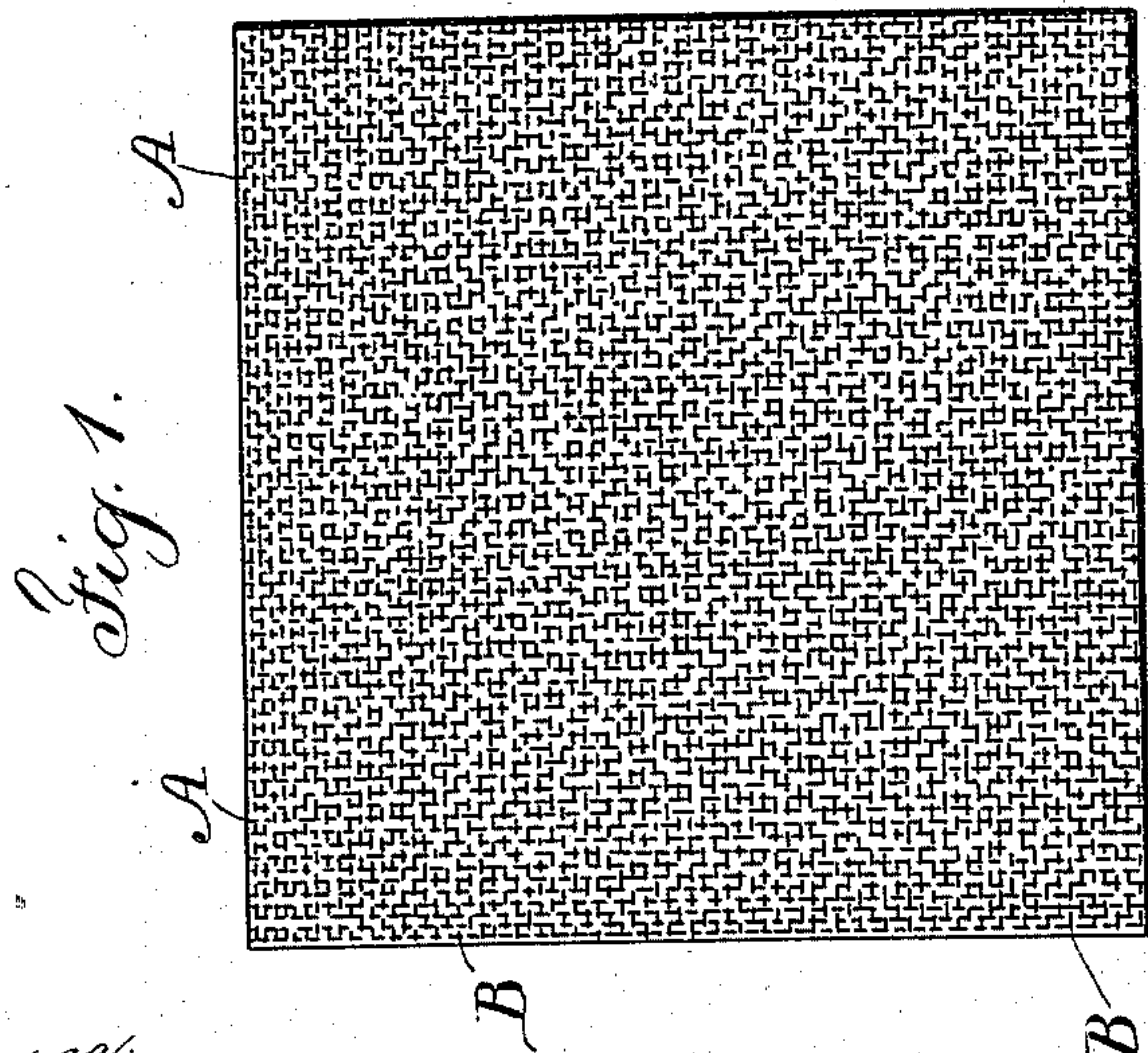
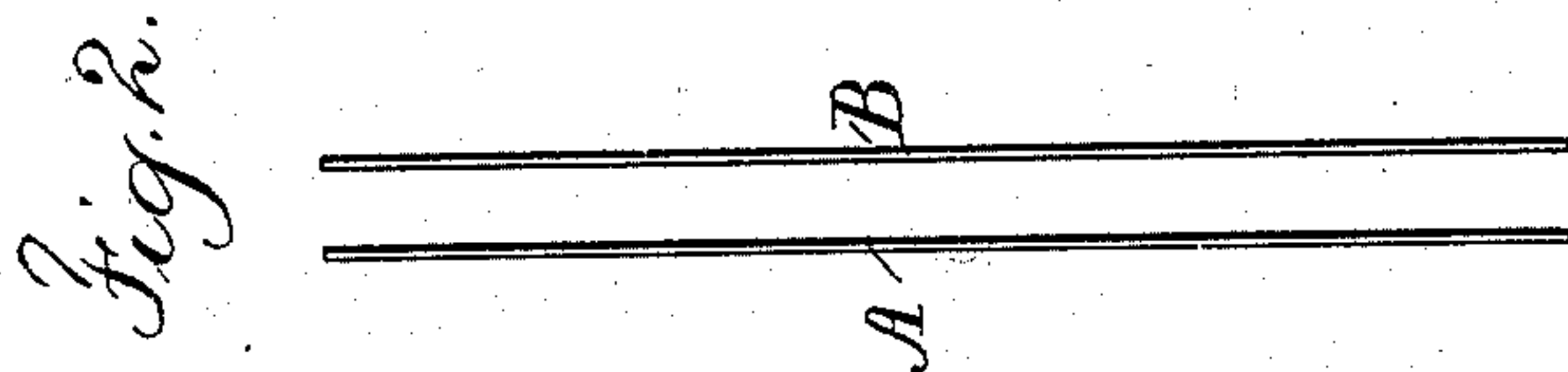
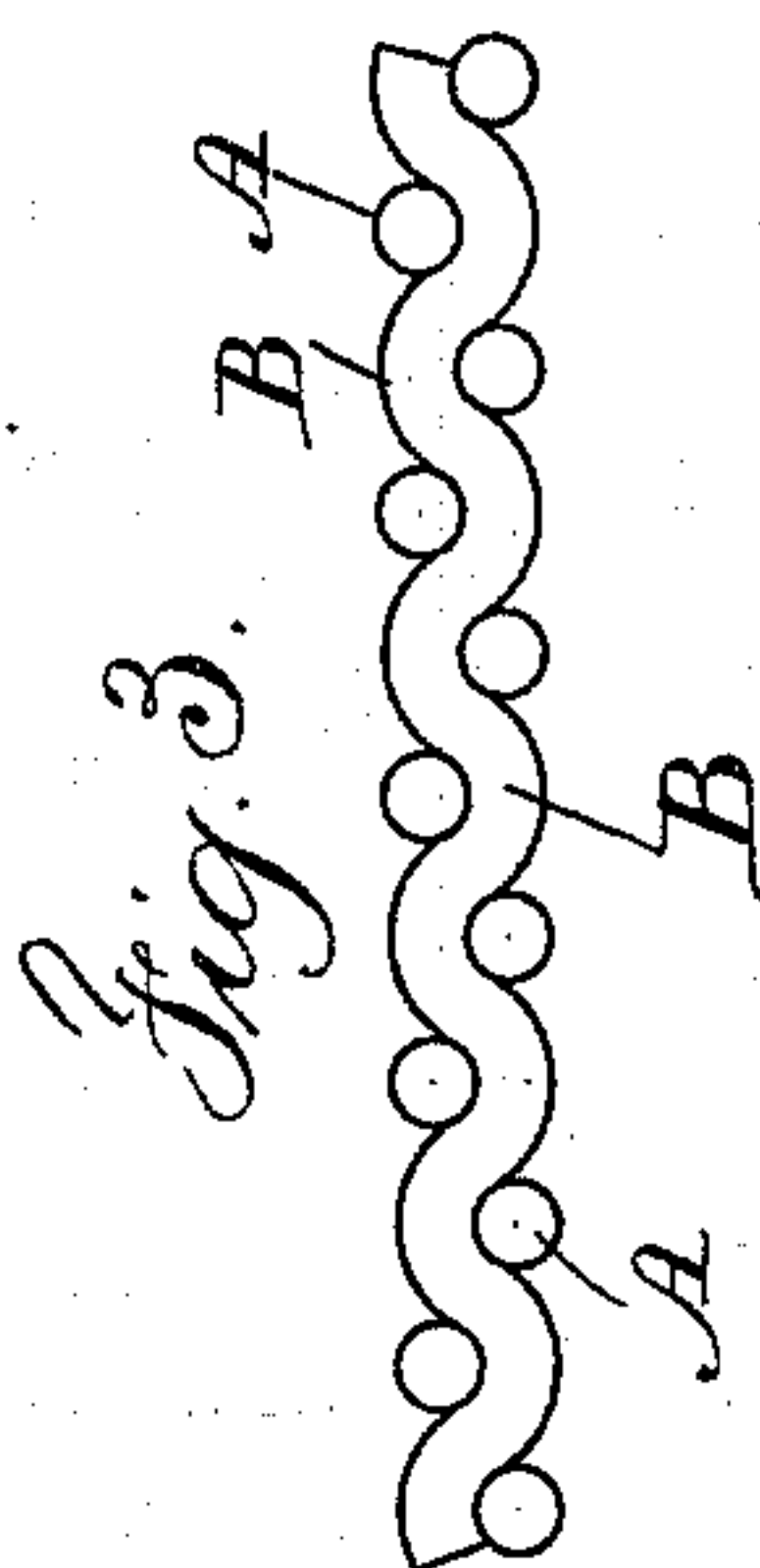
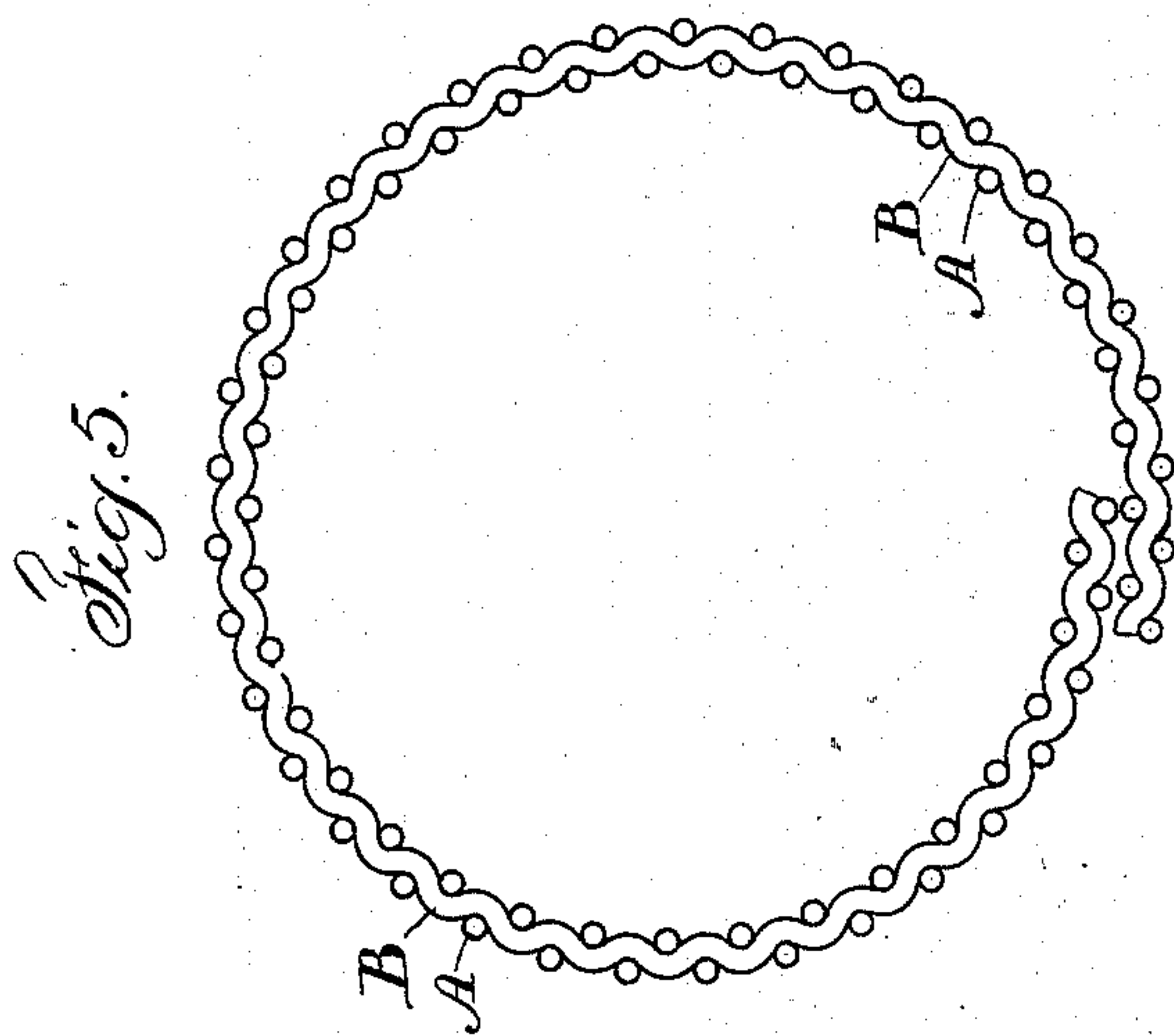


(No Model.)

J. LYALL.  
FABRIC FOR TUBULAR ARTICLES.

No. 562,312.

Patented June 16, 1896.



Witnesses

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# UNITED STATES PATENT OFFICE.

JAMES LYALL, OF NEW YORK, N. Y.

## FABRIC FOR TUBULAR ARTICLES.

SPECIFICATION forming part of Letters Patent No. 562,312, dated June 16, 1896.

Application filed December 1, 1893. Serial No. 492,464. (No specimens.)

*To all whom it may concern:*

Be it known that I, JAMES LYALL, a citizen of the United States, residing in the city, county, and State of New York, have invented an Improvement in Foundation Fabrics for Tubular Articles, such as Hose and Wheel-Tires, of which the following is a specification.

In the manufacture of heavy fabrics, such as sail-cloth and duck, difficulty has been experienced in crinkling the weft-threads to the same extent as the warp-threads are crinkled in the act of weaving. The consequence has been that the fabric is liable to stretch to a greater extent in one direction than in the other, and if a square of cloth is cut out and threads unraveled from the edges the weft-threads are found to be considerably shorter in length than the warp-threads.

Efforts have been made to employ foundation fabrics, such as duck, for the manufacture of india-rubber hose and for the manufacture of tubular tires for bicycles and tricycles. In these efforts it has been usual to cut strips of fabric at an angle of forty-five degrees to the line of weaving and of the proper width for the desired diameter of tubular hose or tire, and in the fabric thus cut bias, if threads are unraveled, such threads will be found of unequal length; that is to say, those threads which have been laid up as warp are longer than the weft-threads, because in the weaving of this heavy fabric the warp-threads bend to a greater extent in crossing the weft-threads than the weft-threads are bent by the tension of the warp-threads. The consequence is that when diagonally-cut strips of such fabric have been laid up in india-rubber hose, the pressure of water in the hose is equal upon the warp and weft threads; but the warp-threads being longer than the weft-threads, they yield to such tension and the tendency is to rotate one end of the hose about its longitudinal axis, the opposite end being held stationary. When diagonally-cut strips of such foundation fabric have been used in the tires of wheels, the inflation of the tire brings tension upon the threads, and the warp-threads being the longest yield to a greater extent than the weft-threads. The consequence is that the weft-threads are more liable to be broken,

both by the pressure and by the concussion of the wheel upon the pavement; and in addition to this the difference in tension in the warp-threads and in the weft-threads tends to distort the tire upon the felly of the wheel, and if unrestrained would produce a partial rotation of one part of the tire upon its tubular axis in relation to another part of the tire. In consequence of these recognized defects in the foundation fabric for tubular articles, such as hose and wheel-tires, I have by careful manipulation and experiment succeeded in producing a heavy fabric similar to duck or sail-cloth, in which the warp-threads and weft-threads are substantially equally crinkled, so that by cutting out a square of the fabric and unraveling warp and weft threads and drawing them out straight they will be found of identically or substantially identically the same length, and hence they will be under the same tension in the fabric during the calendering operations and in the application of rubber to the surfaces of such fabric, and when cut into the strips by incisions at an angle of forty-five degrees to the lines of warp and weft threads, such warp and weft threads will occupy the proper angular positions of forty-five degrees to the axis of the tubular hose or tire, and the threads being of substantially the same length are exposed to a uniformity of tension and they possess a uniformity of strength and there is no tendency for the tubular hose to occupy a crooked or undulatory position either when laid out or while exposed to the internal fluid-pressure employed in such hose, and such fabric when used in a wheel-tire is much stronger to resist the tension of the inflation of the tire as well as to resist wear and concussion than the fabrics heretofore made use of.

In the drawings I have represented, in Figure 1, a square of the fabric cut out, and in Fig. 2 a warp-thread adjacent to a weft-thread drawn out straight so as to indicate that they are of the same length. In Fig. 3 I have represented by a diagram the warp and weft threads as equally crinkled. Fig. 4 shows part of a strip of fabric cut out on the bias. Fig. 5 is a section of the same as bent up into a tubular form for a hose or wheel-tire.

From the foregoing statements and description it will now be understood that the warp-



threads A in the square of fabric are the same length as the weft-threads B and they are hence equally crinkled and exposed to the same tension during the calendering operation and in the application of the rubber to the surfaces of the fabric, and they are also under the same tension when laid up into a tubular hose or into a tubular wheel-tire; and I remark that in weaving this fabric I find it advantageous to employ the positive-motion loom patented by me August 11, 1868, No. 80,982, and to lay the weft-threads in between the warp-threads with as little tension as possible upon such weft-threads and to apply to the warp-threads a sufficiently heavy tension to cause the same to crinkle the weft-threads after they have been laid in between the warp-threads, and the reed made use of in the loom has its wires at a sufficient distance apart, so that after the fabric has been woven the tension that remains upon the warps and the woven fabric between the take-up roll, the breastbeam and the point of weaving will cause the fabric to draw in narrower than it is at the point of weaving, and this operation is carefully attended to, so that when the cloth is complete and wound upon the take-up roll the warp and weft threads will be equally crinkled so as to be of uniform length in a

square that may be cut out from the fabric as aforesaid.

By this improvement the fabric is of the same strength and elasticity in the direction of the warp-threads that it is in the direction of the weft-threads, and perfect uniformity in strength and elasticity is obtained.

I claim as my invention—

1. The fabric for the foundation of tubular articles, consisting of a strip of canvas cut at an angle of forty-five degrees from a fabric woven with the warp and weft threads equally crinkled, so that the warp and weft threads in such strip are of equal length and under the same tension when made up into the tubular article, substantially as set forth.

2. A canvas fabric, for the foundation of tubular articles, woven with warp and weft threads of the same strength and equally crinkled so as to be of the same length and elasticity in the direction of the weft-threads as in the direction of the warp-threads, substantially as set forth.

Signed by me this 27th day of November, 1893.

JAMES LYALL.

Witnesses:

GEO. T. PINCKNEY,  
A. M. OLIVER.