

No. 728,829.

PATENTED MAY 26, 1903.

J. ARKELL.

ROLLS FOR COMPOUND INDENTING OF SHEET FABRICS.

APPLICATION FILED JULY 31, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1

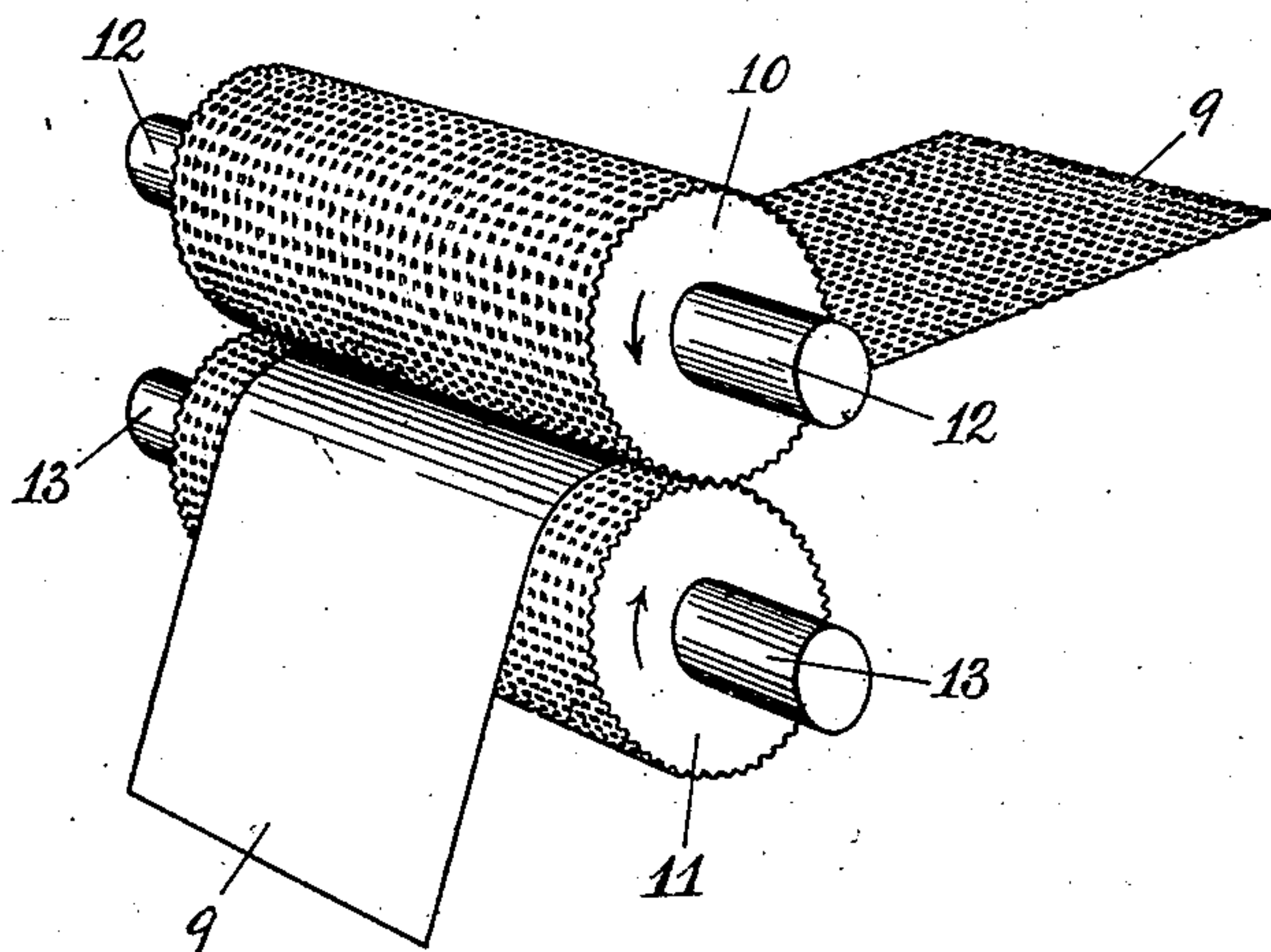


Fig. 2

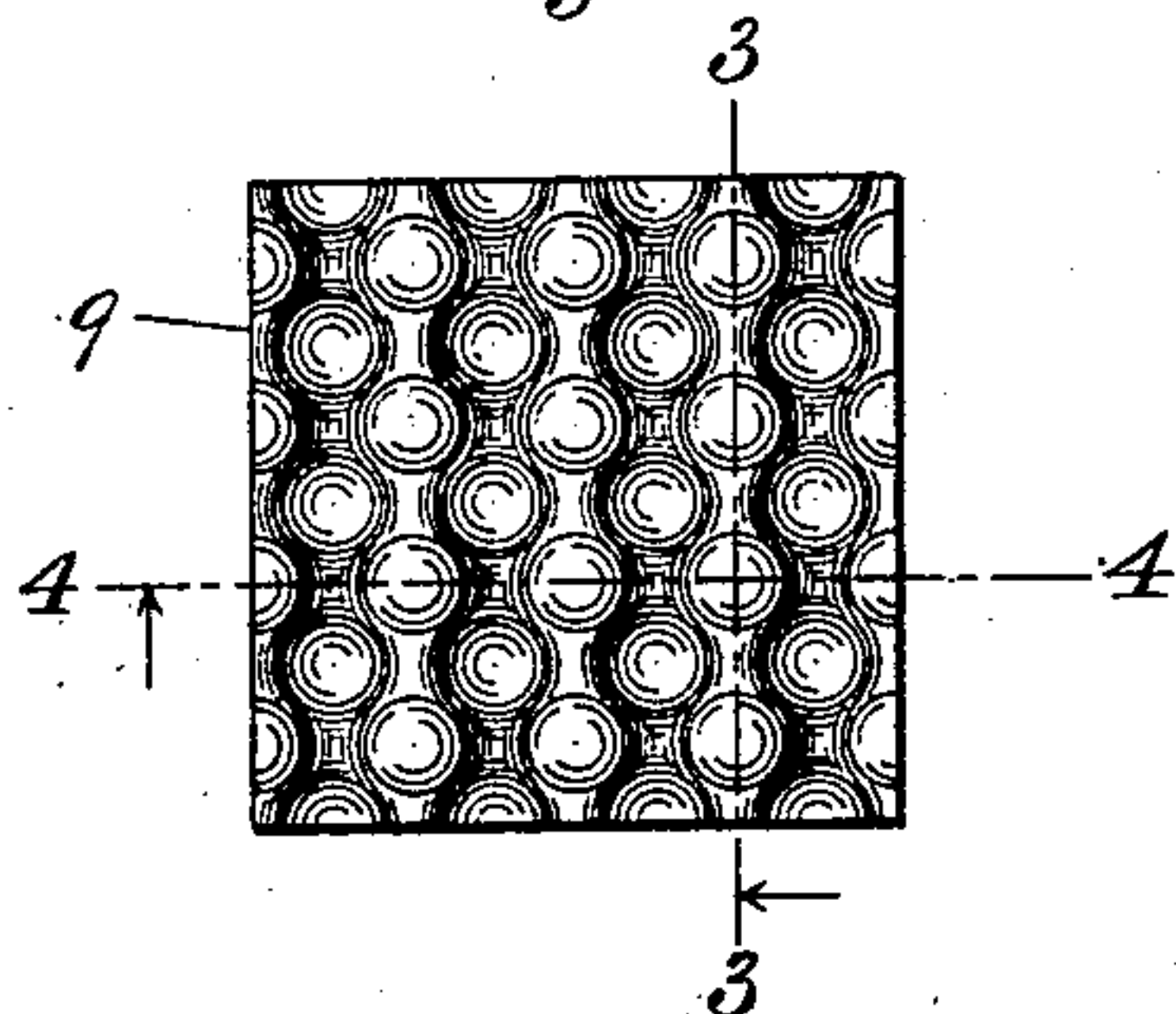


Fig. 3



Fig. 4



Witnesses:

H. Mallon
Joseph Merritt

Inventor

James Arkell
By *W. H. Himes*, Att'y.

J. ARKELL.

ROLLS FOR COMPOUND INDENTING OF SHEET FABRICS.

APPLICATION FILED JULY 21, 1902.

NO MODEL.

2 SHEETS—SHEET 2.

Fig. 7

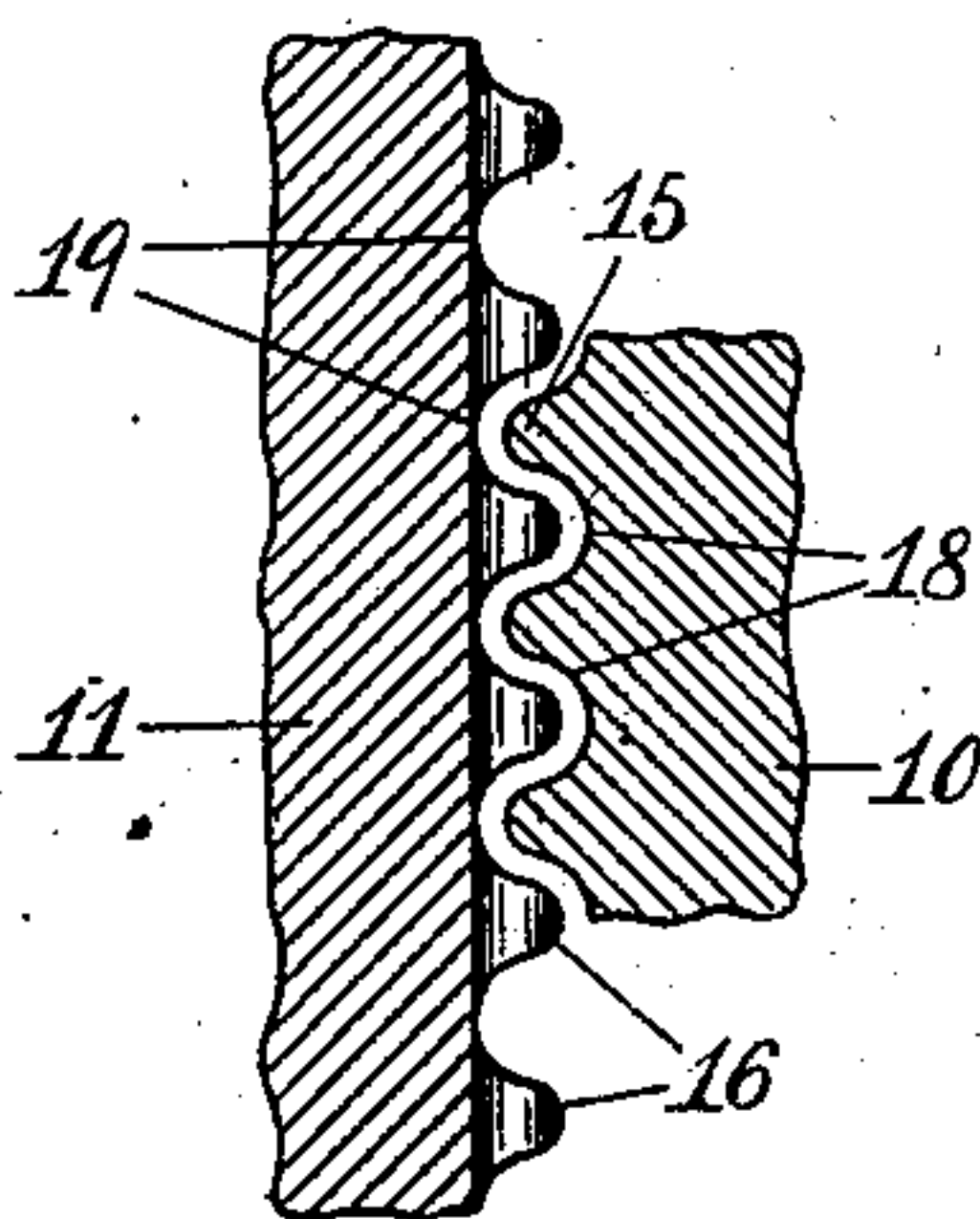


Fig. 6

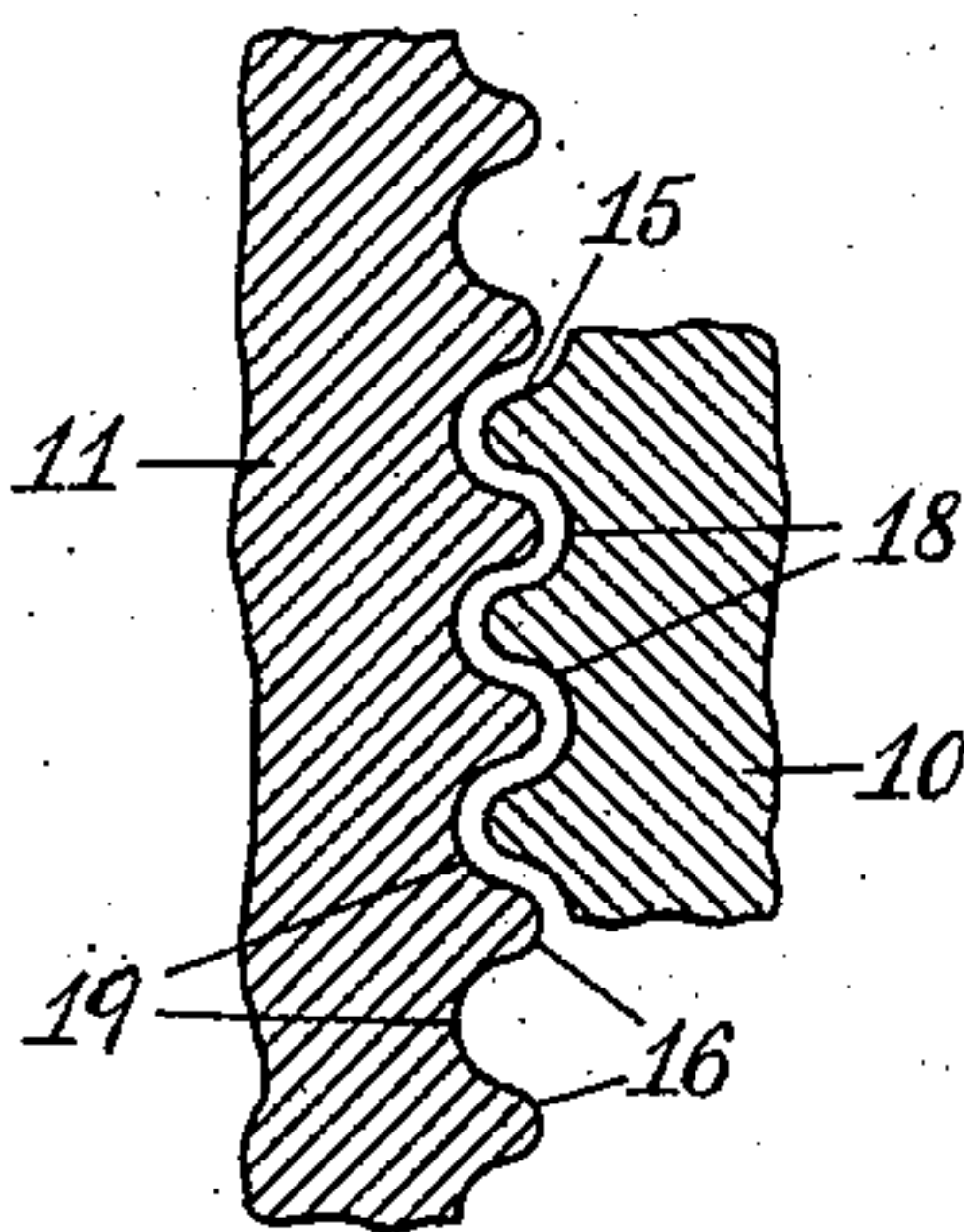


Fig. 5

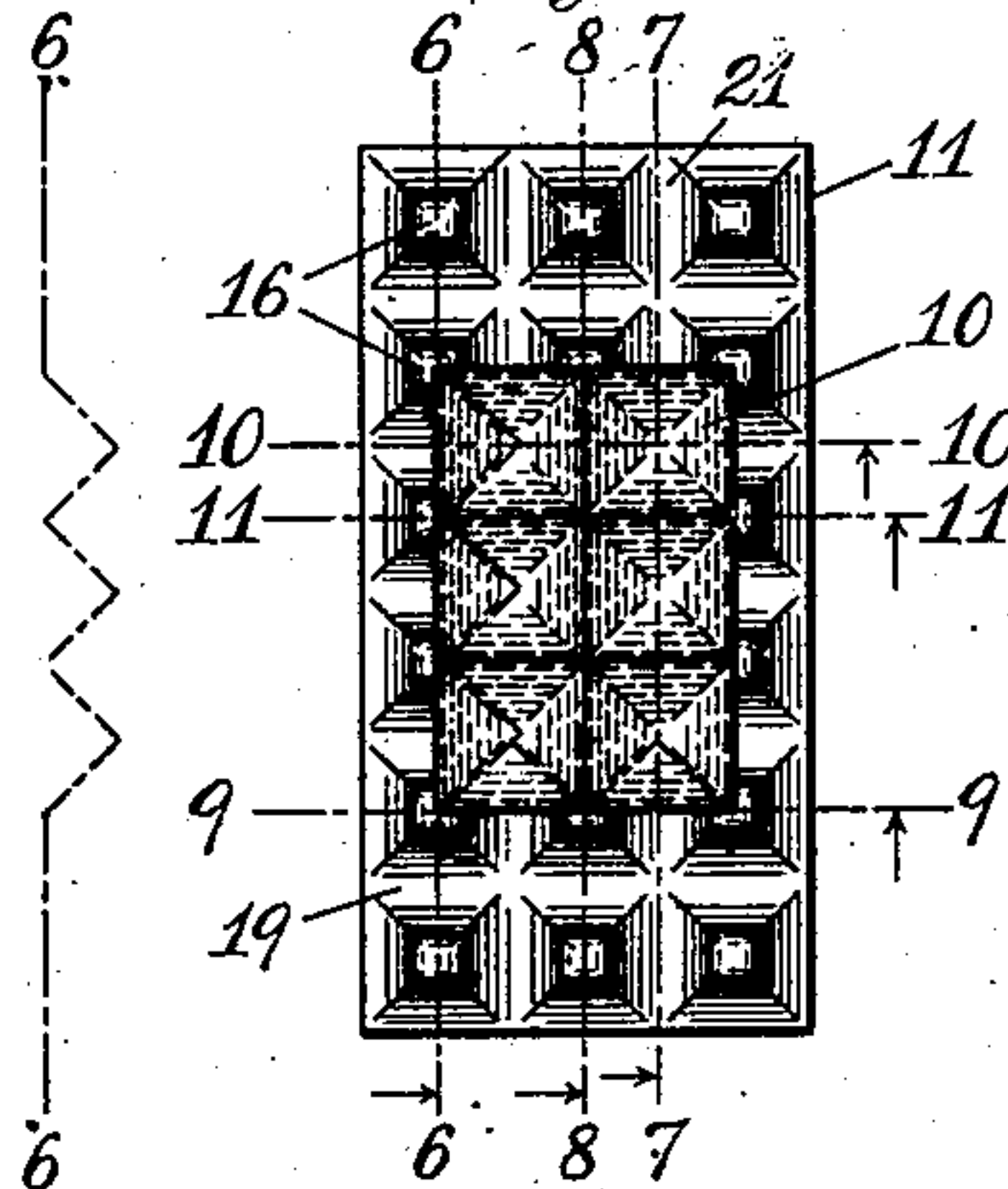


Fig. 8

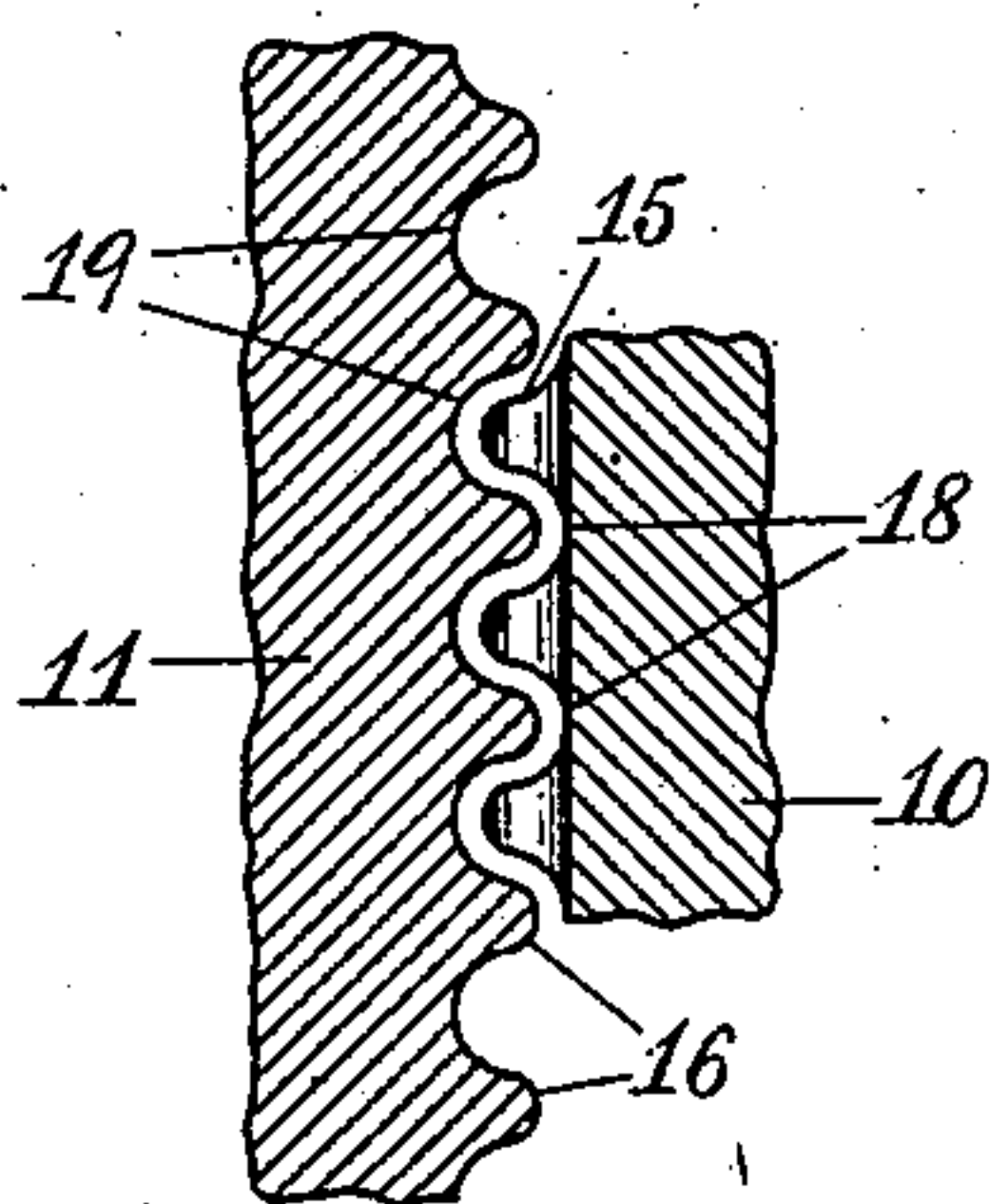


Fig. 9

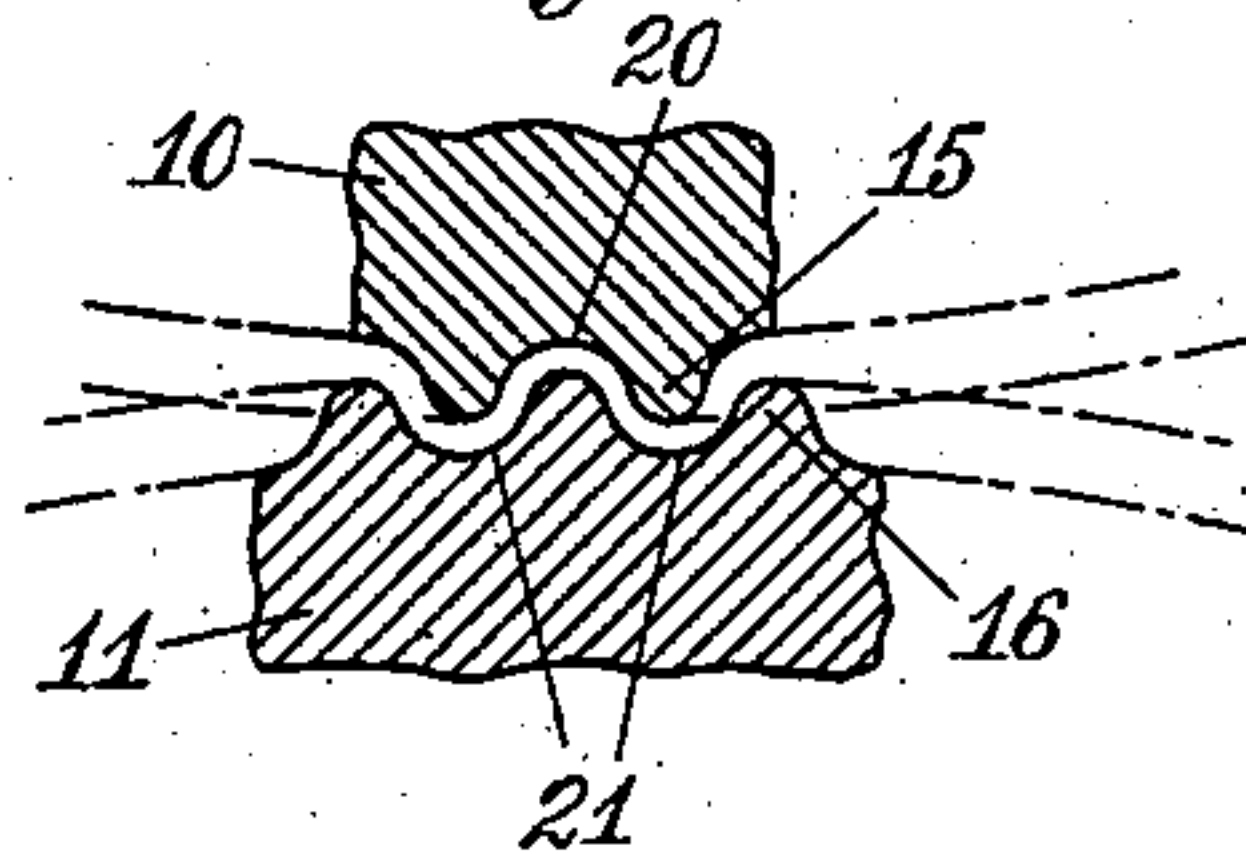


Fig. 13

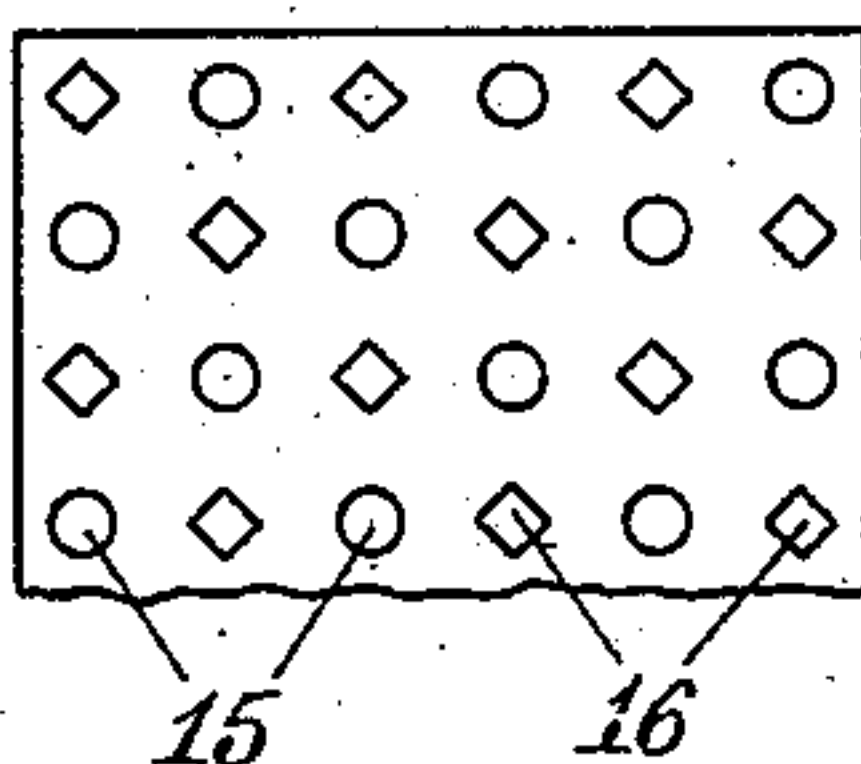


Fig. 10

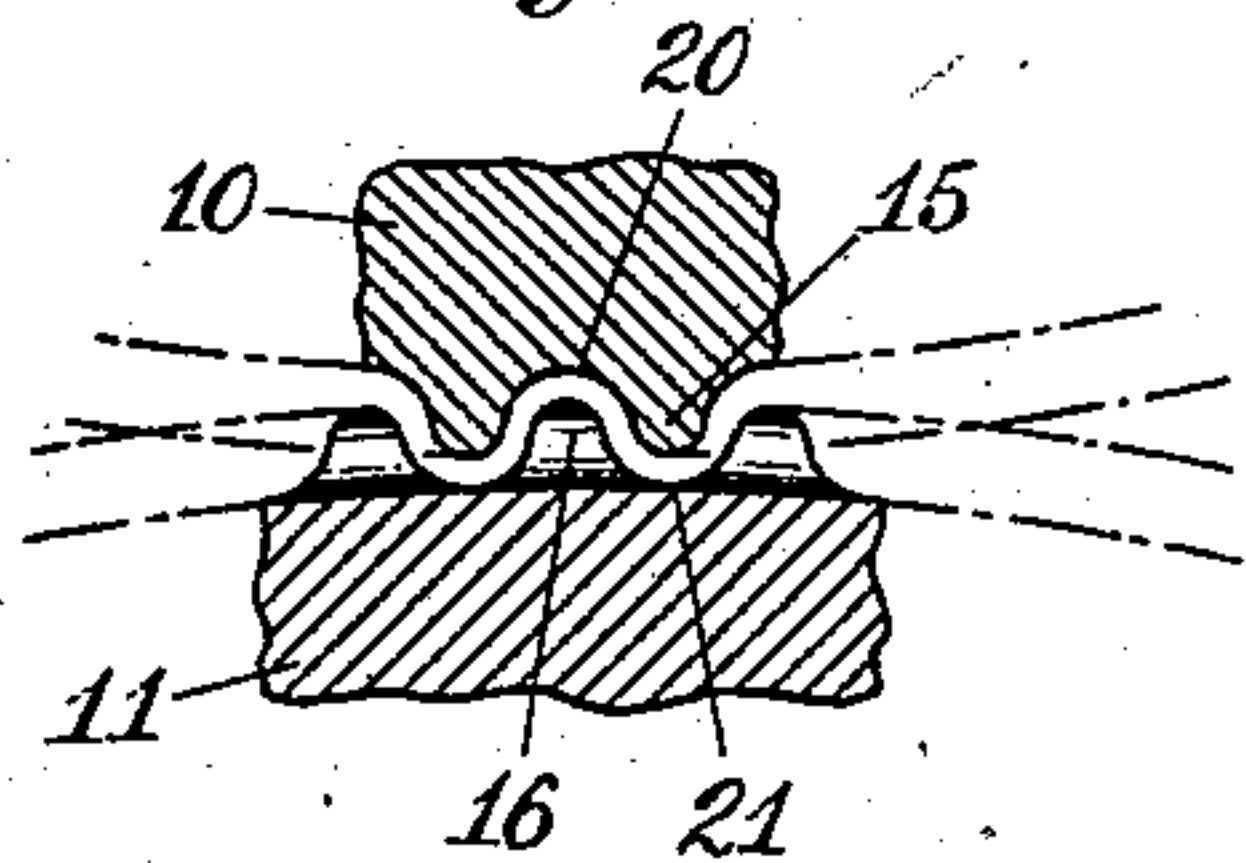


Fig. 12

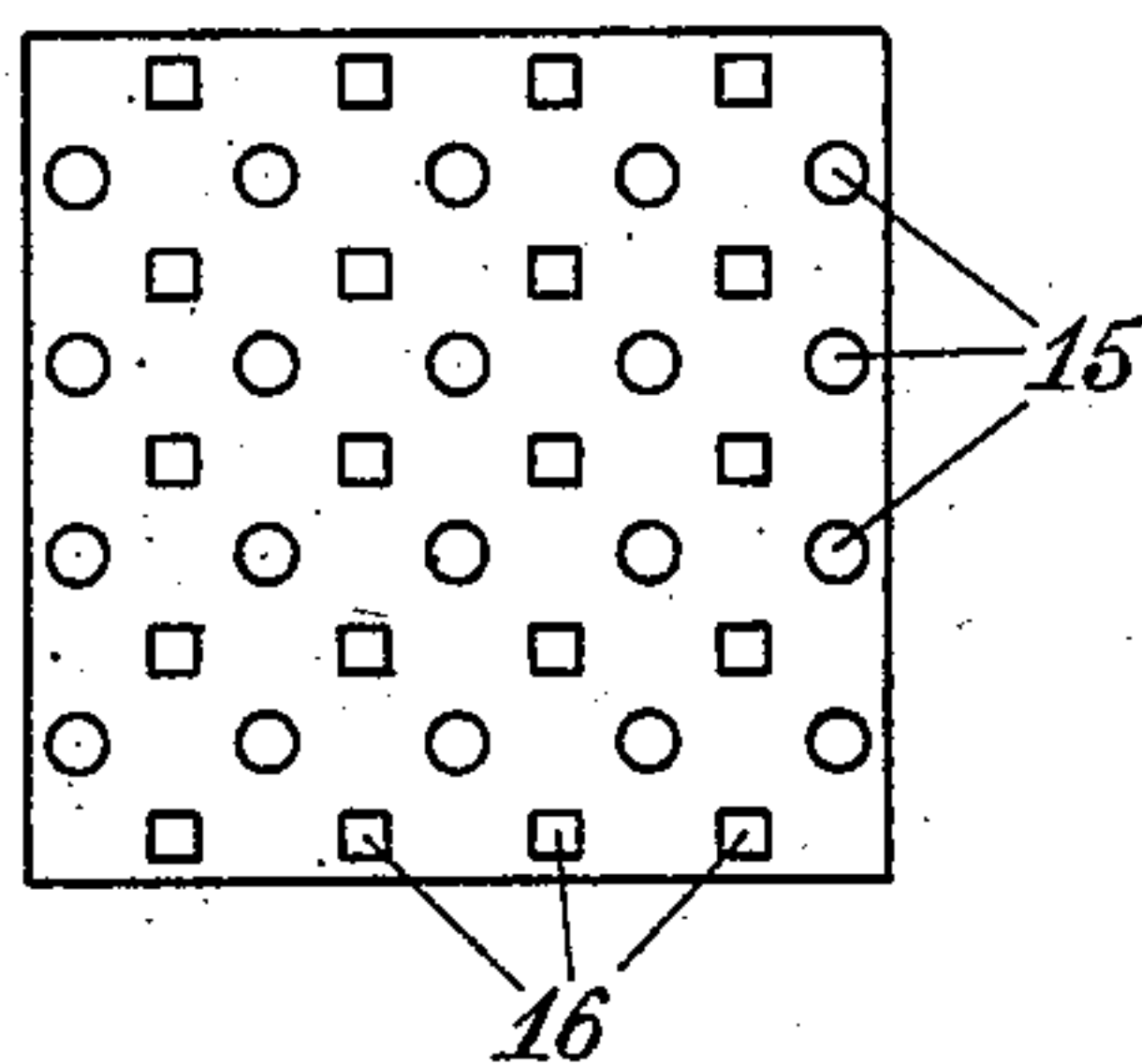
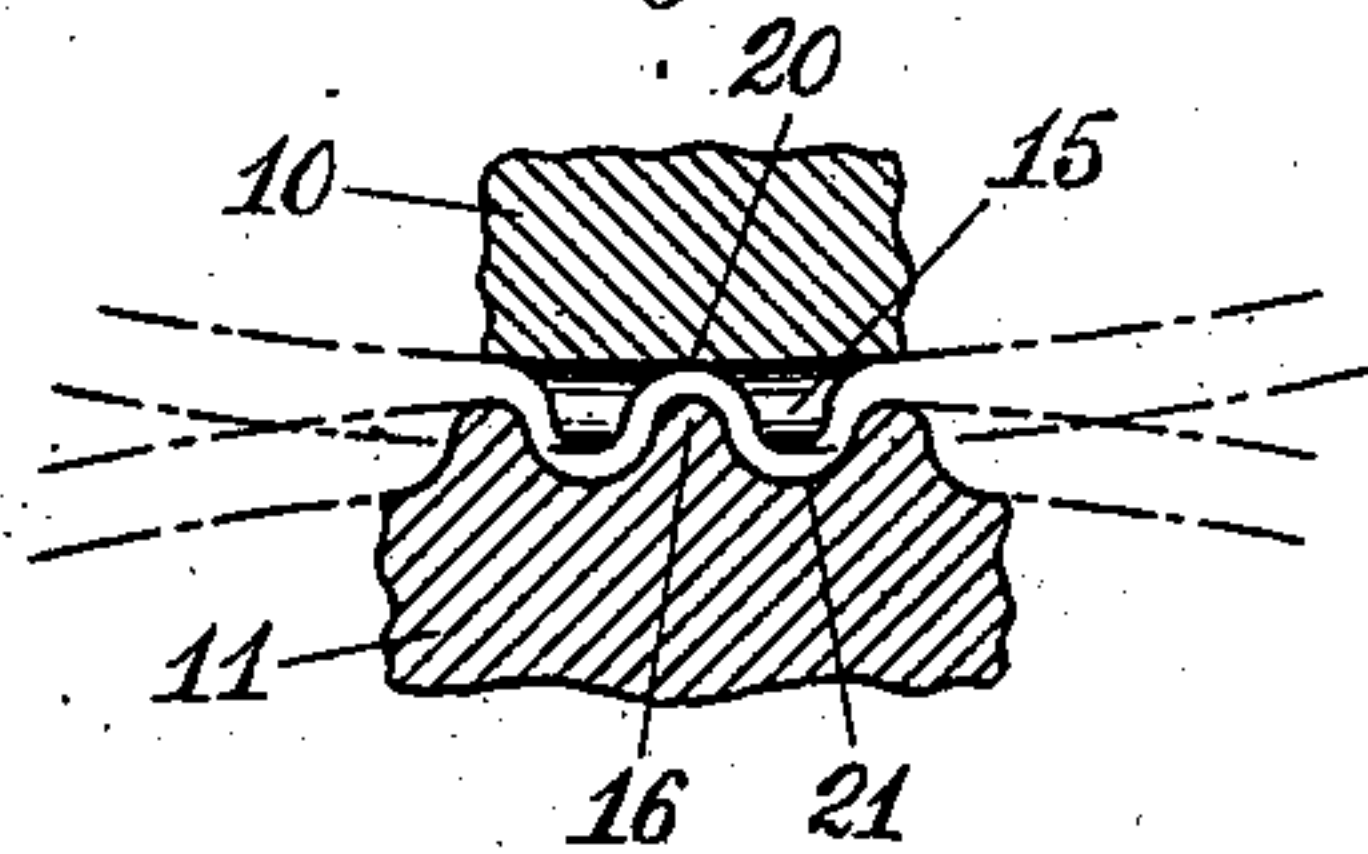


Fig. 11



Witnesses:

H. Mallory
Joseph Merritt.

Inventor

James Arkell
By W. H. Honiss, Atty.

UNITED STATES PATENT OFFICE.

JAMES ARKELL, OF CANAJOHARIE, NEW YORK, ASSIGNOR TO SARAH HALL ARKELL, OF CANAJOHARIE, NEW YORK.

ROLLS FOR COMPOUND INDENTING OF SHEET FABRICS.

SPECIFICATION forming part of Letters Patent No. 728,829, dated May 26, 1903.

Application filed July 21, 1902. Serial No. 116,833. (No model.)

To all whom it may concern:

Be it known that I, JAMES ARKELL, a citizen of the United States, and a resident of Canajoharie, in the county of Montgomery and State of New York, have invented certain new and useful Improvements in Rolls for Compound Indenting of Sheet Fabrics, of which the following is a full, clear, and exact specification.

This invention is an improved apparatus for forming a compound contour in paper and similar fabrics; and it comprises a pair of rolls provided on their peripheral surfaces with intermeshing projections arranged in rows in two directions, the projections of one roll intermeshing in both directions between the projections of the other rolls and by their coöperation defining a quincunx pattern, each projection of each roll serving to push the fabric outwardly between four adjacent and coöperating projections of the other roll, the result being a fabric formed in the contour of two or more series of waves or undulations crossing each other at an angle, the waves of each series partaking of the undulatory form of the waves of the other series, so that the continuity of the waves of each series is preserved and the compound undulatory contour of the fabric is maintained in different directions, thereby enabling the fabric to be subsequently stretched in all directions.

Figure 1 of the drawings is a perspective view showing a pair of those improved rolls in operation upon a sheet or web of fabric. Fig. 2 is a plan view, in a scale enlarged from that of Fig. 1, of a small piece of fabric after it has been operated upon by the rolls. Fig. 3 is an edge view in section taken on the line 3 3 of Fig. 2, showing the undulations of the fabric in one direction, while Fig. 4 is an edge view in section taken on the line 4 4 of Fig. 2, showing the undulations of the fabric in the other direction. Fig. 5 is a plan view, also in a scale considerably enlarged from that of Fig. 1, of a small portion of the surface of each of the two rolls, showing their coöperating relation. Figs. 6, 7, and 8 are side views in section taken on the lines 6 6, 7 7, and 8 8, respectively, of Fig. 5. Figs. 9, 10, and 11 are end views in section taken on the lines 9 9, 10 10, and 11 11, respectively, of Fig. 5. On account of the zigzag character of the

lines 6 6 and 9 9 and the consequent difficulty of tracing them upon Fig. 5 they are each repeated at the sides of that figure. Figs. 12 and 13 are diagrammatic views showing the interrelation of the projection of the two rolls in forming the desired pattern and a modification thereof. In these figures the projections of the rolls are conventionally indicated, those of the roll 11 being indicated by small squares, while the projections of the roll 10 are indicated by small circles.

The compound character of the contour of the fabric after being indented by these rolls is shown in Figs. 2, 3, and 4, in which the undulations or waves which are cut by the line 3 3 are seen to follow the cross-undulations of the waves which are cut by the line 4 4. Therefore the contour of the fabric is compound not only in the sense that its undulations extend in two directions superficially of the sheet, but they also extend in two directions from the original plane of the sheet, so that the fabric presents a raised appearance on both sides, that appearance being exactly the same on both sides when both the rolls are exactly alike in contour and in the spacing of their respective projections. This treatment of the fabric not only enhances its surface appearance on both sides, but confers upon it peculiar properties of flexibility and elasticity in all directions, thereby enabling the fabric to yield either locally or as a whole by strains or blows incident to its subsequent use, which by virtue of these properties are distributed and dispersed in all directions.

The rolls 10 and 11 are provided with suitable journals 12 and 13, mounted in suitable bearings, (not herein shown,) which should preferably be made adjustable to facilitate the ready adjustment of the rolls into proper intermeshing relation. These rolls are preferably geared together in the ordinary way, so that they rotate in the direction of the arrows shown in Fig. 1.

The peripheral surfaces of the rolls 10 and 11 are provided with projections 15 and 16, respectively, which when the two rolls are working together intermesh, as shown in the diagrammatic views of Fig. 12 or Fig. 13, the projections 15 of the roll 10 being in these di-

agrammatic views shown by small circles, so as to readily distinguish them at a glance from the projections 16 of the roll 11, which in these views are shown by small squares.

5 Thus when these two rolls are working together their projections intermesh in a quincunx pattern, each projection of each roll defining the center of a quincunx figure the four corners of which are defined by the four
10 adjacent projections of the other roll. Therefore the paper while being indented by a projection 15 of one roll is supported by four adjacent and surrounding projections 16 of the other roll, each of which latter projections simultaneously indents the paper in the other
15 direction, cooperating with four surrounding projections 15 of the first roll. Hence the compound contour-waves are formed in the fabric in all directions at the same time, so
20 that neither series of waves tends to interrupt or remove or in any degree to re-form the waves of the other series. The actual relation of these rolls, which are shaped to produce the pattern of Fig. 12, is best shown in
25 Fig. 5, in which a fragment of the roll 10 is superimposed upon a fragment of the roll 11.

A convenient way of forming the pattern contour in the rolls to produce the pattern of Figs. 5 to 12, inclusive, is to turn or grind
30 the body of the roll to the form of a plain cylinder having the desired diameter of the points of the projections 15 and 16 and then form the projections by turning or milling or planing the series of circumferential grooves
35 18 and 19 and the series of longitudinal grooves 20 and 21. The same spacing is followed on both rolls, so that the rows of projections of one roll register in a corresponding
40 groove of the other roll, this being true both of the circumferential and longitudinal grooves and rows of projections, as is most clearly shown in Figs. 5, 6, and 9, respectively. By these views also it will be observed that either of the rolls may be rotated
45 or moved longitudinally from its proper working position, shown in the said figures, without moving the other roll, thus differing in this respect from the arrangement of the ordinary fluting or corrugating rolls, neither of
50 which can thus be moved in both directions without also moving its associated roll, for the reason that the projecting flutes or corrugations in one roll interlock with those of the other roll, which is not true in the present
55 case.

In adjusting these rolls to their proper cooperating relation they should be left open, as shown in Figs. 6 to 11, inclusive, far enough to avoid all possibility of pinching or cutting
60 the paper or other fabric which is being treated, since the desired action of these rolls is not that of ordinary embossing-rolls, in which the two rolls work together as male and female dies, fitting each other closely, and
65 thus stamping the pattern in the fabric. Some forms of fabric may be sufficiently tough to serve as a driving connection be-

tween the two rolls, and for the treatment of some such fabrics it may not be necessary to gear the two rolls together; but for the generality of work and for the best and most uniform results I prefer to gear the two rolls positively together, so that they will, independently of the intermeshing fabric, always preserve the proper working relation and distance between the intermeshing projections of the two rolls. 70 75

When these rolls are in operation, as shown in Fig. 1, their tendency is to contract the fabric from its original width or length, or both, according to the character of the projections. When the latter are of the character shown in Figs. 5 to 11, inclusive, the tendency is to shorten the sheet or web to the greatest extent longitudinally of the web, since the action of the longitudinal grooves and rows of projections is to form the sheet in corrugations running transversely of the web and then to indent these corrugations longitudinally of the web by means of the circumferential rows of projections. Thus although the longitudinal and transverse waves are simultaneously completed upon reaching the plane of the axes of the rows, which is their closest point, the rolling action has a tendency to form the waves which run transversely of the sheet slightly in advance of the formation of the longitudinal waves of the sheet. 80 85 90 95

By employing a pair of these rolls in connection with a series of the rolls shown in my United States Patent No. 623,696, of April 25, 1899, and by arranging the width and pitch of the corrugations of the entire series so that the corrugations of the succeeding rolls are multiples of the preceding rolls the sheet or web may be narrowed in width as well as in length, thus providing for the subsequent stretch of the fabric in both directions, as may be desired, according to the subsequent use to be made of the fabric. In these ways this invention may be utilized to produce a compound indented fabric, which is made elastic or stretchable in any or all directions by correspondingly contracting the original sheet in those directions instead of stretching the original flat sheet locally to produce the compound undulatory contour. I thus avoid the local stretching of the fabric with the consequent weakening of the fiber. 100 105 110 115 120

The fabric to be treated may be run through these rolls either in a dry or dampened condition, according to the character of the fabric or according to the depth or other characteristics of the contour to be produced or according to the use to be subsequently made of the fabric, these things being matters of degree and within the ordinary knowledge, skill, and judgment of those familiar with this art. 125 130

It is not essential that the height of the projections shall be the same on the two rolls or in the two series of each roll. By varying the height greater prominence can be given

to the indentations of one side as compared with those of the other side of the fabric, or greater prominence can be given to the longitudinal waves of the fabric as compared with the transverse waves thereof, and vice versa. The pitch or distance between the projections may also be varied and may be greater in one series of projections than in the series which crosses it, thus producing a figure longer one way than the other.

The disposal of the pattern upon the fabric may be also modified to suit the subsequent conditions of use or to suit other considerations which may appear. For example, one or both of the series of rows of projections may extend in a spiral direction around the roll, as indicated by the diagrammatic view of Fig. 13, instead of being arranged circumferentially and longitudinally thereof, as indicated in the preceding figures. In this and in other respects the details of this invention may be modified and its application extended without departing from the essential features of the invention.

I claim as my invention—

1. The combination of a pair of rolls provided on their peripheral surfaces with inter-

meshing longitudinal and circumferential corrugations.

2. The combination of a pair of rolls provided on their peripheral surfaces with projections intermeshing in quincuncial relation, for the purpose specified.

3. The combination of a pair of rolls provided on their peripheral surfaces with intermeshing projections arranged in rows in two directions, each projection defining the center of a quincunx pattern, the four corners of which are defined by corresponding projections of the other roll.

4. The combination of a pair of rolls provided on their peripheral surfaces with projections arranged in longitudinal and circumferential rows, the projections of one roll intermeshing in both directions between the projections of the other roll.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 15th day of July, 1902.

JAMES ARKELL.

Witnesses:

HELEN E. MURRAY,
E. B. BURNAP.