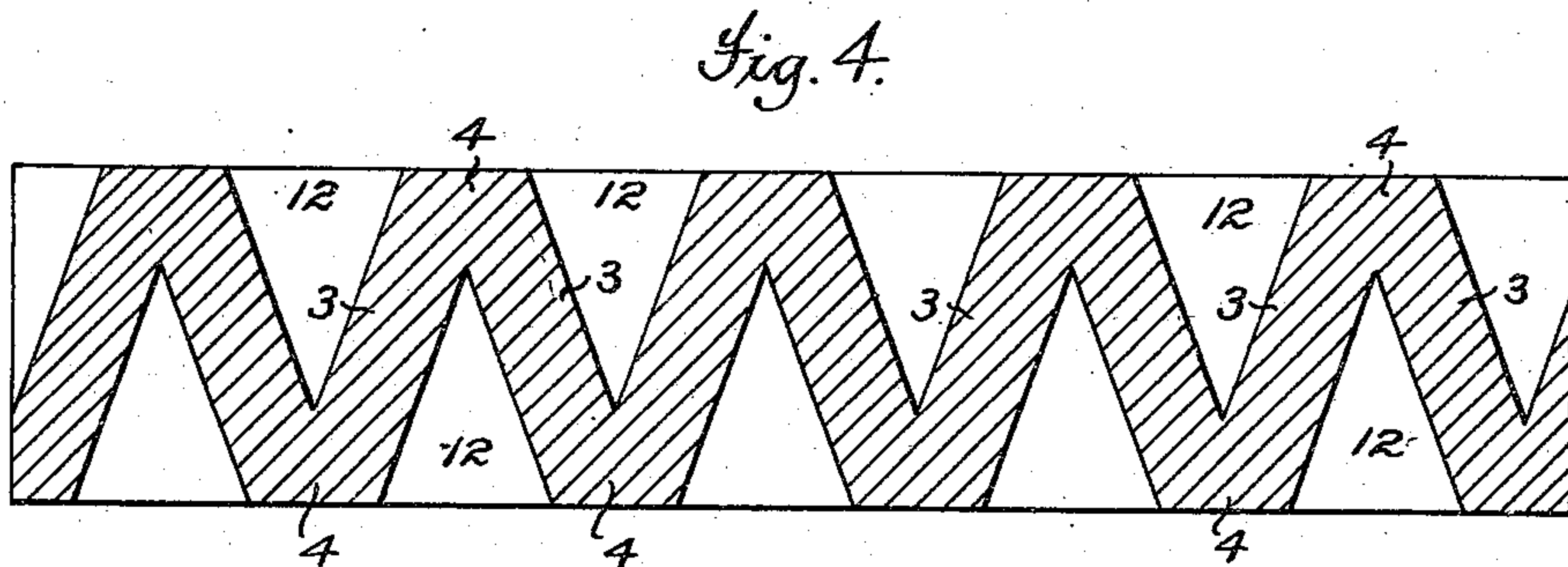
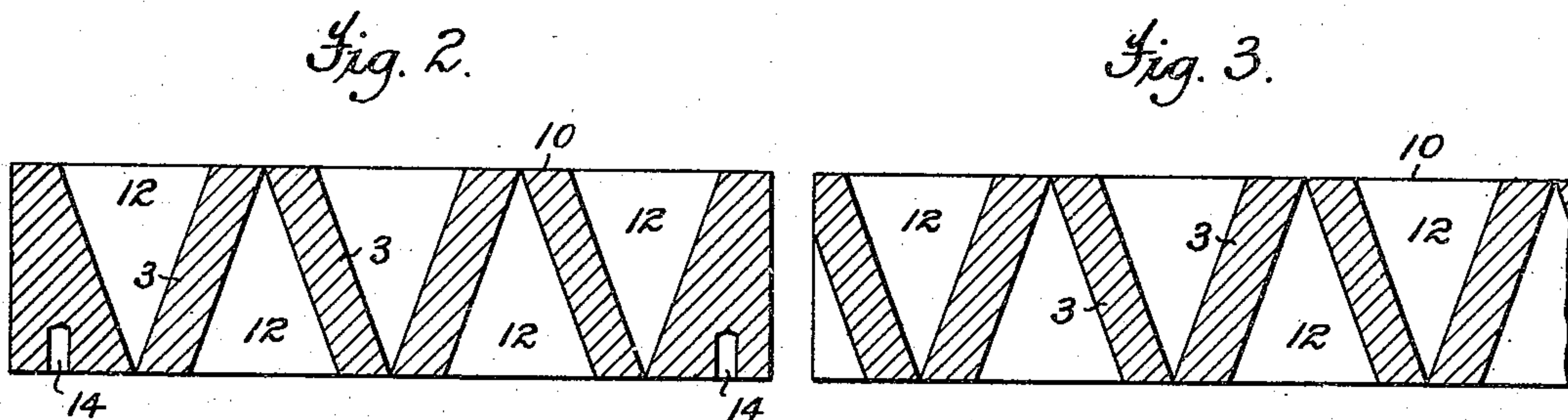
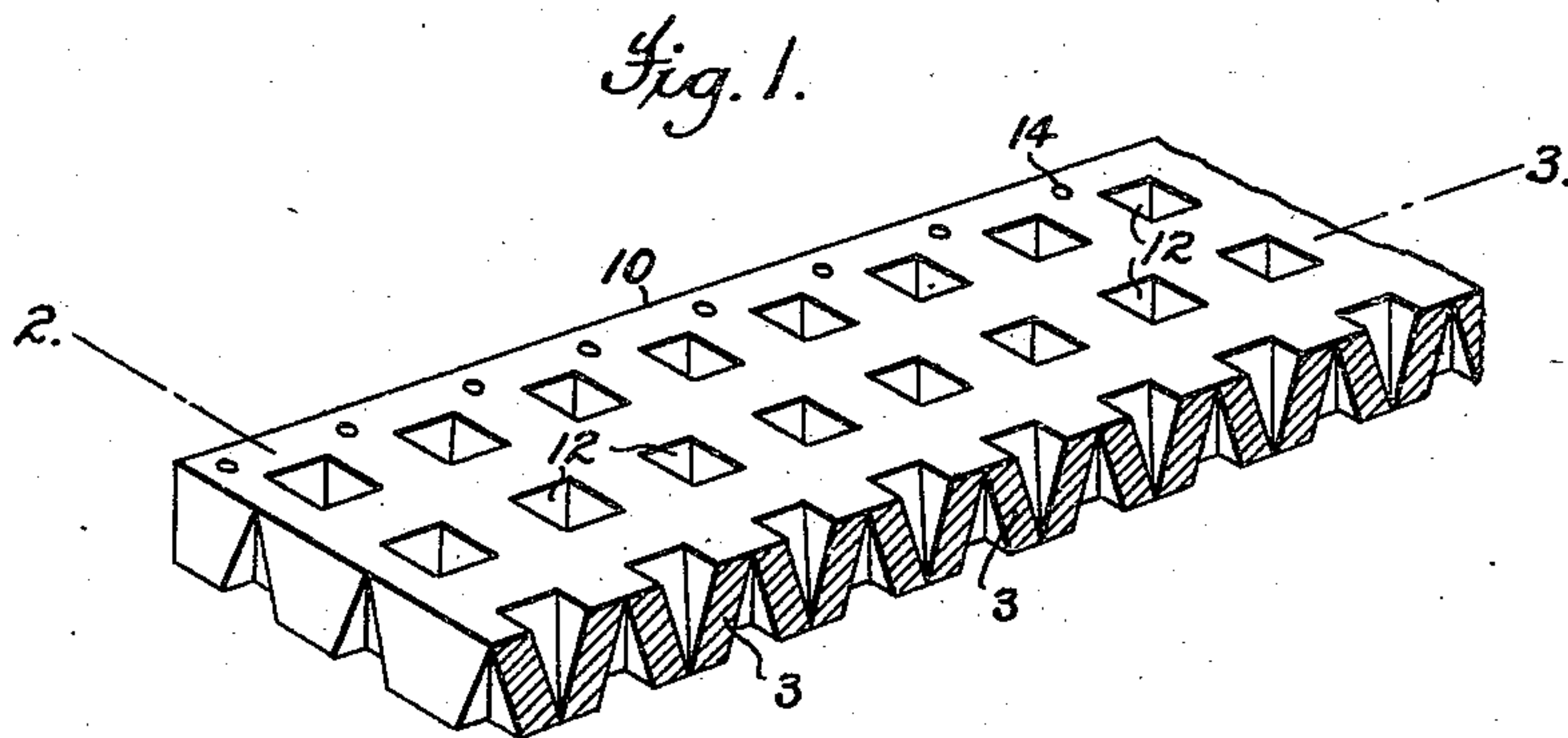


H. MAXIM.
SMOKELESS POWDER GRAIN.
APPLICATION FILED MAR. 31, 1905.

930,979.

Patented Aug. 10, 1909.

2 SHEETS—SHEET 1.



Witnesses:

Wm. B. Kerrigan
Gustave R. Thompson

Inventor,

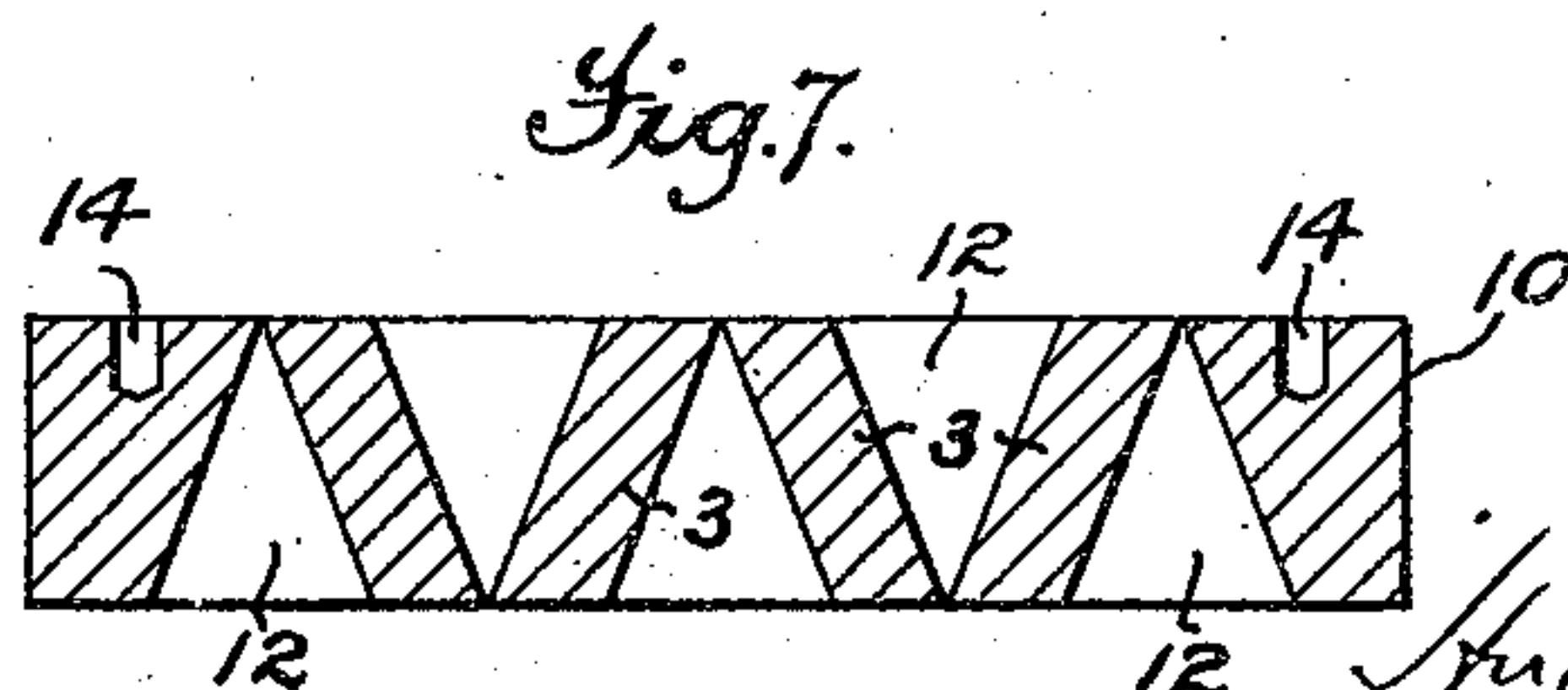
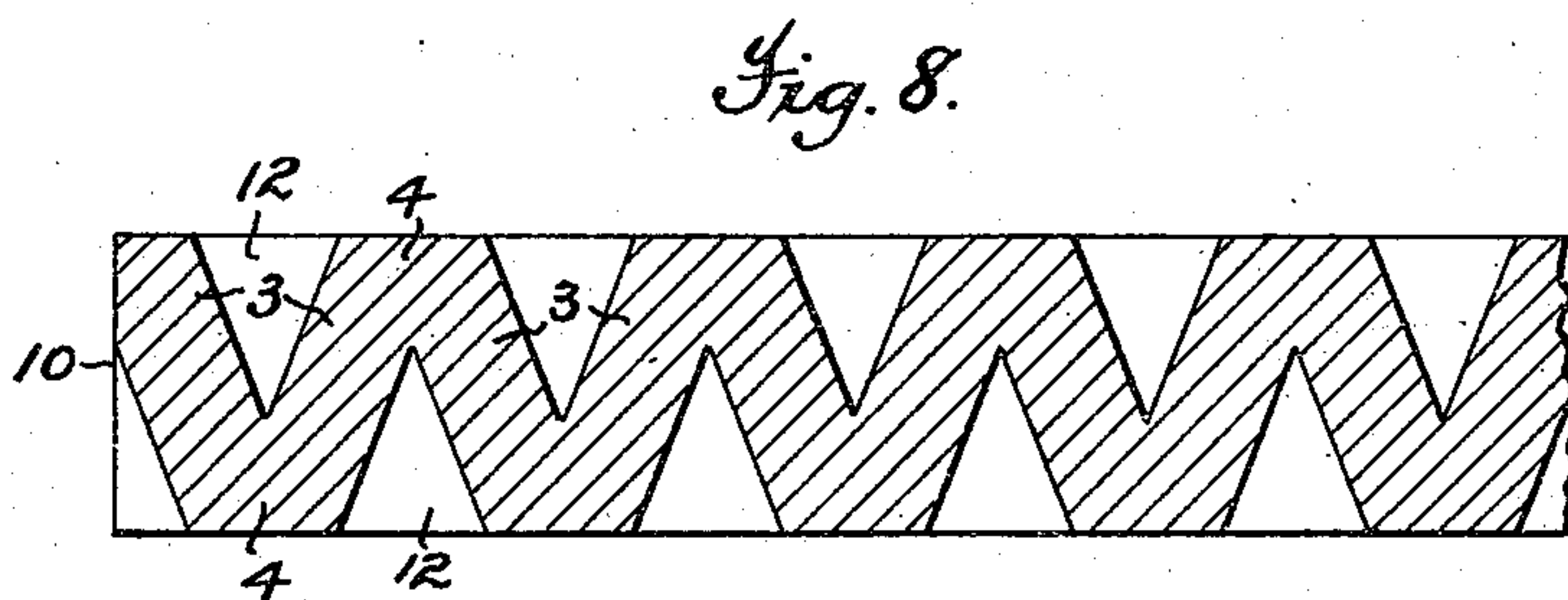
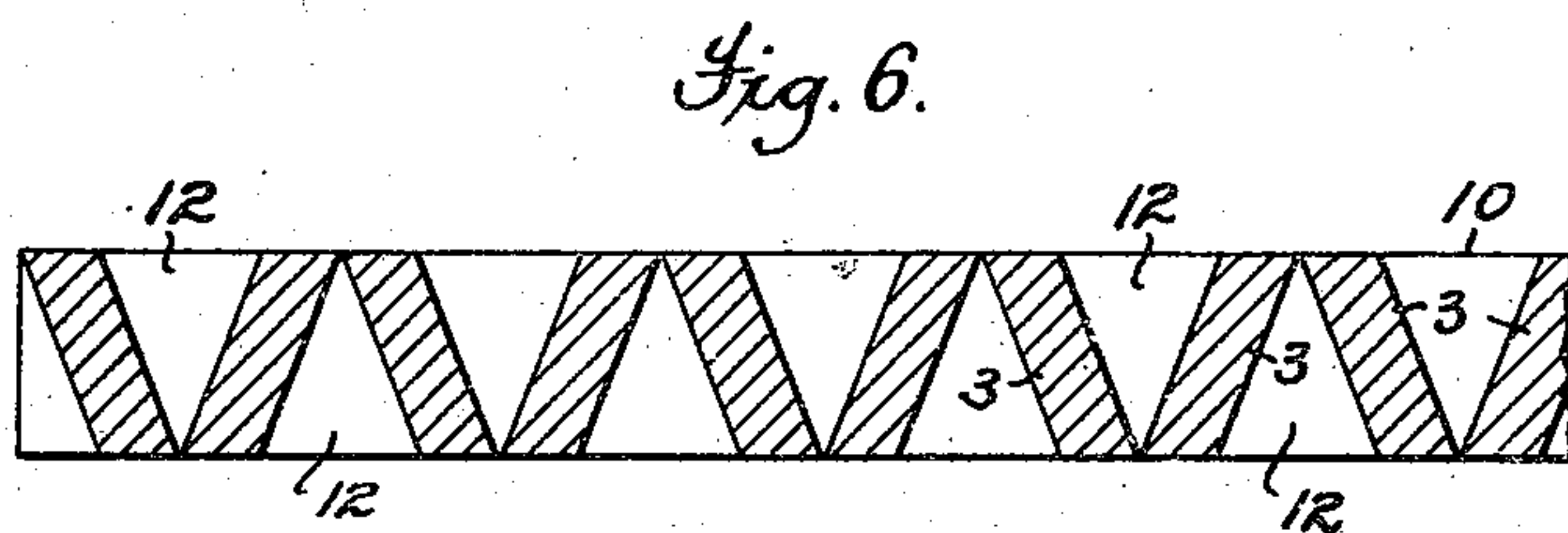
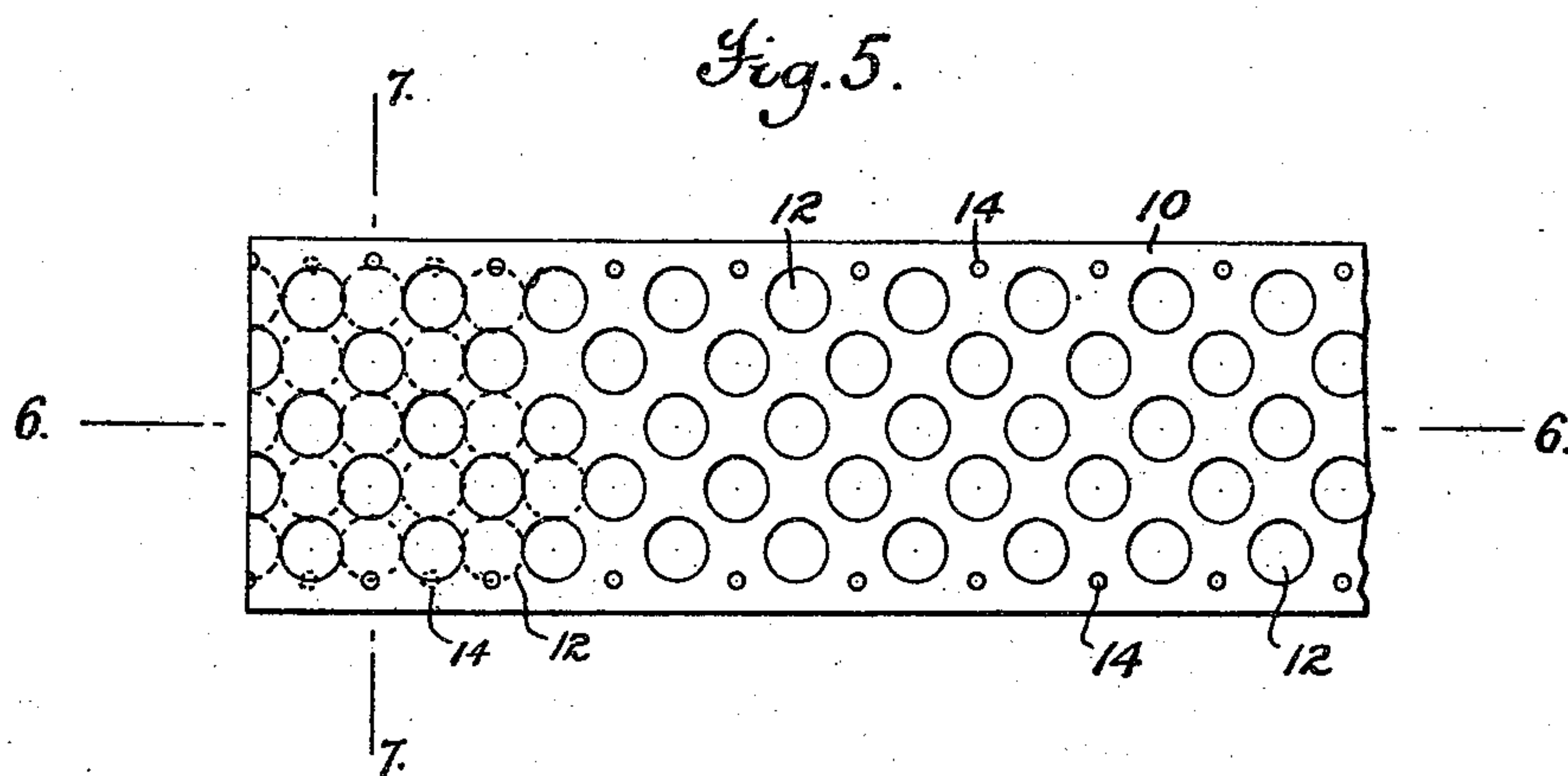
Hudson Maxim,
by
Nauro, Cameron, Lewis & Massey,
Attys.

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2 SHEETS—SHEET 2.



Witnesses:

Wm B. McKim,

Gustave R. Thompson.

Inventor,

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by Mauro, Cameron, Lewis & Mossie,
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UNITED STATES PATENT OFFICE.

HUDSON MAXIM, OF NEW YORK, N. Y.

SMOKELESS-POWDER GRAIN.

No. 930,979.

Specification of Letters Patent.

Patented Aug. 10, 1909.

Application filed March 31, 1905. Serial No. 253,134.

To all whom it may concern:

Be it known that I, HUDSON MAXIM, of the borough of Brooklyn, city of New York, State of New York, have invented a new and useful Improvement in Smokeless-Powder Grains, which invention is fully set forth in the following specification.

This invention relates to improvements in smokeless gunpowder grains and in methods of manufacture.

The object of the invention is to make a powder grain which shall be somewhat less dense per unit of weight than simple, plain flat strips, so as to enable the charge to be better distributed in the gun, than would unperforated or non-cellular flat strips, and which powder grain shall be consumed in the gun with a considerable degree of acceleration, that is to say, the burning surface of which shall increase instead of decreasing, as it is consumed, or at least remain constant and not decrease.

It is not desired, with the improved form of powder grain, to obtain the greatest amount of acceleration of combustion, but to obtain a slight acceleration of combustion, and to secure at the same time and by the same means less density of loading and consequent better distribution of the charge throughout the powder chamber of the gun.

A further object of the invention is to provide a form of perforated grain, the web of which, between the perforations or cells may be made of greater or less thickness to adapt the grain for larger or smaller guns by the simple expedient of varying the depth of the cells or depressions to increase or diminish the thickness of web of powder between the cells and between the ends of the cells and the opposite surfaces of the grain.

In practice, the material is first rolled into sheets of the desired thickness, and these sheets are passed through perforating rolls, which are made adjustable for the purpose, or the sheets are placed between molding dies and pressed into the desired shape. After being perforated or molded the sheets are then cut into strips or pieces of any desired length or breadth, or the sheets may be first cut in strips of equal widths and these strips passed through the perforating rolls.

The accompanying drawings illustrate

practical embodiments of the invention, in which:

Figure 1 is a perspective view of the improved powder grain, one longitudinal edge being in section. Fig. 2 is an enlarged cross section on the line 2 of Fig. 1. Fig. 3 is an enlarged longitudinal section on the line 3 of said figure. Fig. 4 is a similar section of a thicker powder grain in which the cells do not extend through to the opposite surface. Fig. 5 is a plan view of a powder grain with a modified form and arrangement of the cells or depressions, some of the cells entering from the opposite side being indicated by dotted lines. Fig. 6 is an enlarged longitudinal section of the same on the line 6 of Fig. 5. Fig. 7 is an enlarged cross section of the same on the line 7 of Fig. 5; and Fig. 8 is an enlarged longitudinal section of a thicker powder grain showing a wider web between the cells.

The improved powder grain consists of a flat strip 10, Figs. 1 and 5, with opposite parallel surfaces and provided with cells or depressions 12, extending inwardly from opposite surfaces of the grain, the cells which extend inwardly from one side being staggered with relation to the cells extending inwardly from the opposite side. Each of the cells is tapered lengthwise, terminating in more or less of a point, and the cross section of the taper may be rectangular as in Fig. 1, so that viewed from the surface of the grain the cells will consist of parallel rows of rectangular depressions, with the rectangular depressions of one surface alternating with the rectangular depressions of the other surfaces, whereby the points or ends of the cells do not meet, but pass one another at equal distances. That is to say, the vertical axes of the cells of each row of cells are equally distant from each other.

Instead of being rectangular the contour of the cells or depressions 12, may be round when horizontally considered, as in Fig. 5, wherein the cells extending inwardly from one surface alternate or are staggered with relation to those extending inwardly from the other surface of the grain. Such perforated powder grains will have their cells or depressions so disposed throughout the length and breadth of the grain as to provide equal web thicknesses of powder between the cells as in all the figures, and in some

instances, as in Figs. 4 and 8, between the ends of the cells and opposite surface of the grain, forming a zig-zag web of powder of equal thickness throughout, so that the grain will burn substantially with a gradual acceleration.

Where the powder grain is of a thickness permitting the cells entering from one surface thereof to pierce, or nearly pierce, the opposite surface, as in Figs. 1, 2, 3, 6 and 7, the webs of powder 3, between adjacent cells will have parallel walls inclined to the surface of the grain and to the long axes of the cells; and where the powder grain is of a thickness where the ends of the cells do not pierce the opposite surface of the grain, as in Figs. 4 and 8, the web of powder 4 unperforated between the bottom of the cells and the adjacent surface of the grain will be of equal thickness with the webs 3 between the cells, so that no matter whether the cells extend entirely through the powder grain or only partially through, equal thicknesses of webs of powder will remain so that accelerated combustion thereof will result and a much less dense grain be obtained.

By making the cells or depressions with rectangular walls, as distinguished from those having round or circular walls, a maximum displacement of the powder mass is obtained and hence a grain of much less density per unit of weight is formed, while the disposition and shape of the cells, whether of rectangular or circular contour, provide equal web thickness of powder between them which permits an accelerated combustion until the grain is substantially wholly consumed.

The cells or depressions 12, Figs. 1 and 5, may be supplemented by a row of small depressions or cells 14, which are also seen in Figs. 2 and 7, following the opposite longitudinal edges of the powder grain, the cells in the rows in one surface alternating with those in the opposite surface, so that unduly wide portions of powder, say between the outer row of cells 12 and the longitudinal edges will be reduced in thickness so as to be consumed simultaneously with the equal web thicknesses of powder between the cells 12.

It is to be noted that the same cell-making device or mold will operate to produce the cellular structures of Figs. 3 and 4 and of Figs. 6 and 8, the variation in the thickness of the webs of powder between the cells being obtained by varying the extent to which the cells extend within the powder grains.

A machine adapted to produce the cellular powder grain herein described is the subject matter of another application for Letters

Patent filed by me in the United States Patent Office on the 29th day of March 1905, to which reference may be had.

What is claimed is:

1. A powder grain consisting of a cellular flat strip of powder material the cells or depressions of which are tapered and extend from the opposite sides inwardly, with those of one side staggered in relation to those of the opposite side, said grain having a slightly accelerated rate of combustion.

2. A powder grain consisting of a cellular flat strip of powder material the cells thereof being rectangular tapers.

3. A powder grain consisting of a cellular flat strip of powder material, the cells of which are tapered and extend inwardly from the opposite sides thereof, and providing equal web thicknesses between them.

4. A cellular powder grain, wherein tapered cells extend inwardly from opposite sides of the grain and provide equal web thicknesses between them and between the ends of the cells and the surface of the grain.

5. A flat cellular powder grain, wherein the powder between adjacent cells consists of an imperforate web inclined with respect to the surface of the grain said grain having a slightly accelerated rate of combustion.

6. A flat cellular powder grain, wherein the powder between adjacent cells consists of imperforate oppositely inclined webs of equal thickness, said grain having a slightly accelerated rate of combustion.

7. A cellular powder grain wherein the cells or depressions from the opposite surfaces of the grain provide a zig-zag imperforate web of powder of uniform thickness.

8. A cellular powder grain, the cells or depressions of which extend from the opposite sides inwardly with those of one side staggered in relation to those of the opposite side and a marginal row of cells of less dimensions than the other cells.

9. A powder grain consisting of a flat strip of powder material having cells of a regularly decreasing cross-sectional area from the surface of the strip inward, said cells being uniformly distributed over the opposite faces of the strip, those on one face being in staggered relation to those on the other face.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

HUDSON MAXIM.

Witnesses:

H. I. BERNHARD,
W. H. HARTING.