

Jan. 5, 1932.

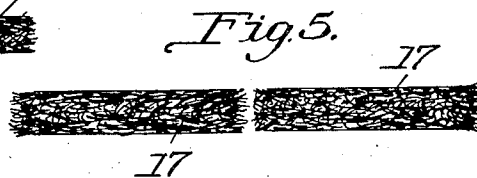
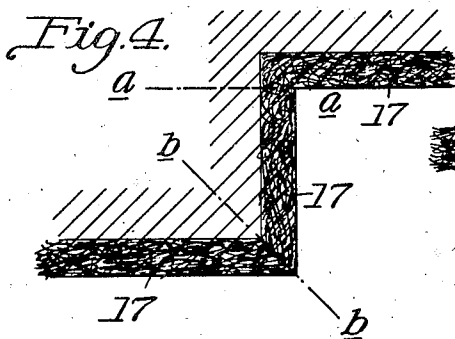
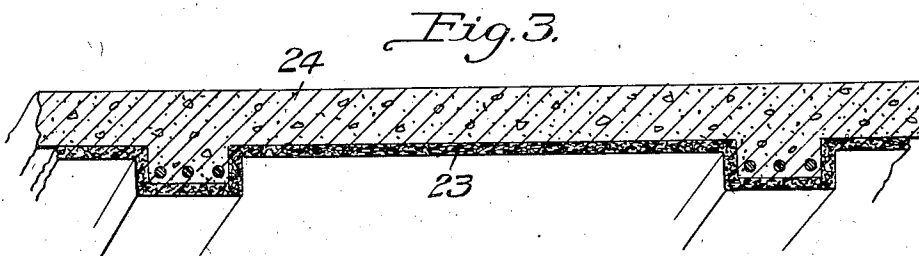
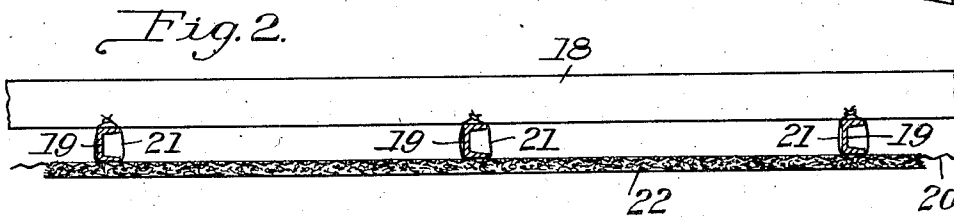
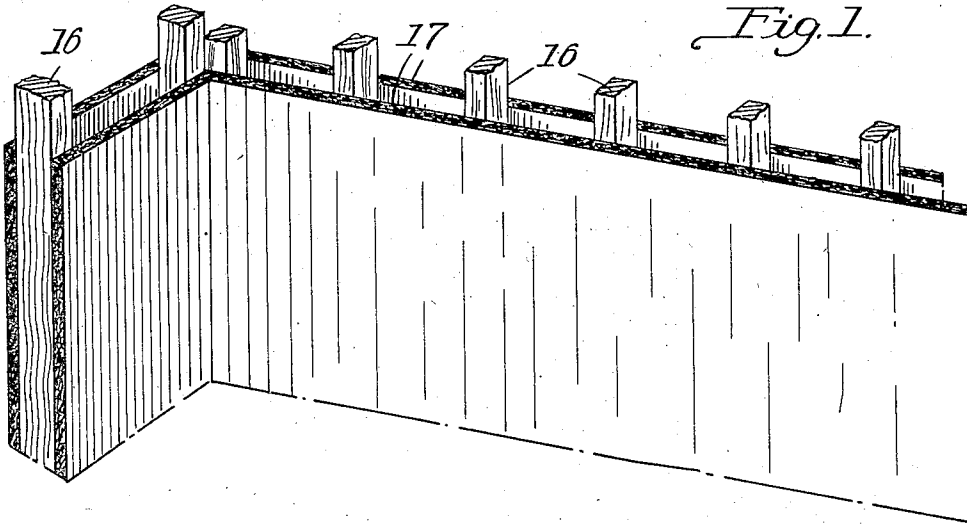
J. MAZER

1,839,404

WALL FORMING MATERIAL AND METHOD OF MAKING THE SAME

Filed Jan. 4, 1928

2 Sheets-Sheet 1



INVENTOR
Jacob Mazer
By Archworth Martin
Attorney

Jan. 5, 1932.

J. MAZER

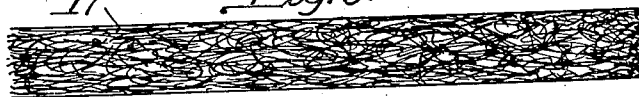
1,839,404

WALL FORMING MATERIAL AND METHOD OF MAKING THE SAME

Filed Jan. 4, 1928

2 Sheets-Sheet 2

17 Fig. 6.



17^a Fig. 7.



20^a Fig. 8. 17^b



17^a Fig. 9. 22^a



Fig. 10. 22

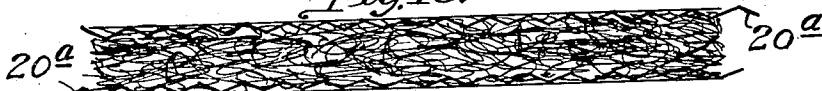


Fig. 11.

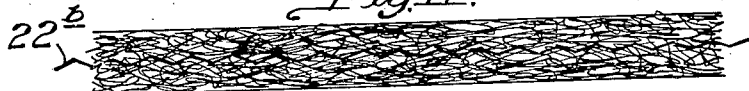


Fig. 12.

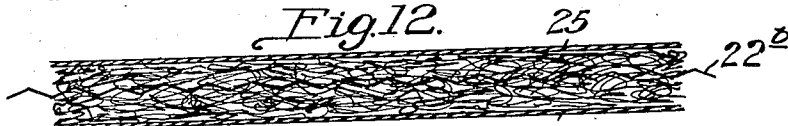
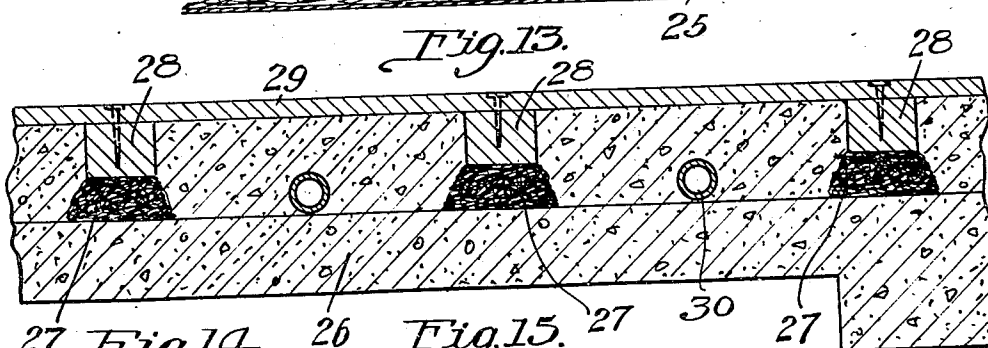
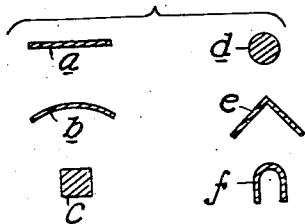
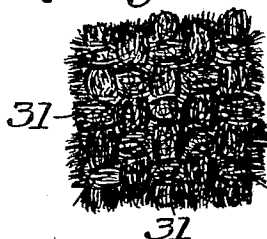


Fig. 13.



27 Fig. 14.



INVENTOR
Jacob Mazer
By Archworth Martin,
Attorney.

UNITED STATES PATENT OFFICE

JACOB MAZER, OF UPPER DARBY TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA

WALL-FORMING MATERIAL AND METHOD OF MAKING THE SAME

Application filed January 4, 1928. Serial No. 244,431.

My invention relates to materials for facing the interiors of buildings, and which also possess desirable acoustical and insulating characteristics, and more particularly to materials of a fibrous nature.

Heretofore, it has been common practice to employ animal hair or vegetable fiber, where a sound-absorbing medium of a fibrous nature was desired. In applying any sheet of sound-absorbing material to a wall or ceiling it is always necessary to make the sheet very much smaller than the area to be covered. In the course of many years in the practice of acoustical engineering, my own experience was that a sheet of hair felt (one of the most commonly used materials) could be handled and applied to best advantage if it were about two and one half square feet in area. (The maximum thickness of sound-absorbing material generally used is about one inch.) It is clearly seen that even though the sheets used were larger in area than that found most practical, there would of necessity be many seams at the edges of the sheets where they abut one another. In order to obtain a finished surface which is uniform in appearance, without visible lines, seams or joints, it would be necessary to in some way eliminate the seams at the edges of the sheets where they abut. This is necessary because architects, decorators and the general public object in most instances to ceiling and wall surfaces which are divided into units of the sizes required by the limitations of the absorbing materials heretofore used; one of the most serious limitations being that of size of sheet which can be applied as a unit.

Materials composed of manufactured fibers, as hereinafter described, are of such nature that they readily intermesh when pressed together by hand and adjoining sheets may be made to have the appearance of a single sheet and a large wall or ceiling surface covered with many sheets may be made to have a comparatively smooth uniform appearance without visible lines, seams or joints. This important quality would alone justify its use.

Another important quality is that it may

be painted with plastic or other forms of water or oil paint without absorption of the paint into the fiber itself, since the materials used are not porous, in contrast to the porous nature of hair, vegetable fiber and the like, which take up much paint, forming a hard heavy surface, so much so that the painted surface tends to separate from the balance of the mass. The painted surfaces of my material may be of almost unlimited type and texture, at low cost as the labor and quantity of material required is much less than required for other forms of fibrous surface.

Aside from the higher acoustical value due to the lighter, softer and more yielding surface, the material is one which, for the same reasons, is less liable to crack and which can be used anywhere that a light low cost, fire-resisting wall or ceiling surface is desired, which can be painted in water colors or with washable oil colors, which material may be used over plaster or other surface or in place of it or even in place of a plaster and lath wall. In the latter case the fibrous layer receives the paint or plaster finish coat and has the decided advantage of flexibility which prevents cracking and crazing.

The hair and vegetable fibers referred to have been open also to the objection that they decay, lose their elasticity, and tend to become infested with vermin. Furthermore, the fiber has been usually applied to walls, ceilings or the like, by workmen who are not skilled in acoustics, in accordance with some general directions as to the thickness of the material, with the result that only an approximate result in the way of percentage of sound absorption has been secured. While a given total absorption in a given room might be approximated, there would be lack of uniformity of absorption as between surfaces at different locations in the room.

My invention has for one of its objects the employment of materials, preferably of manufactured fiber, such as mineral wool, steel wool, copper wool, spun glass, etc., in such manner and of such character as to secure the above-enumerated advantages and the elimination of various objectionable fea-

tures referred to as incident to the use of materials heretofore commonly employed.

Another object of my invention is to provide a fibrous body of such nature that it
 5 can be formed into units of predetermined and substantially non-variable sound-absorbing capacity, and of such character that its efficiency will not be materially affected during handling, and which can be readily
 10 applied to walls, ceilings, and irregular surfaces by the average workmen, in such manner that a definite uniform sound-absorbing capacity is secured at all desired locations on walls, ceilings, etc., and which will further
 15 permit of a more uniform and neatly finished surface than in the case of some of the materials heretofore employed.

Still another object of my invention is to provide a fibrous sound-absorbing medium
 20 that will embody in a common unit, the properties of comparatively great tensile strength, high capacity of sound absorption, permanency as to physical composition, etc., and which is of light weight.

25 While I hereinafter describe my invention more particularly in connection with manufactured fibers, such as metallic wools, spun glass, etc., it will be understood that various of the results which I describe may be secured by other fibers of various kinds.

The use of materials composed of hair, or other products of an animal or vegetable source, in contrast to those that are manufactured, limits the result obtained to the
 35 extent to which the qualities of the raw materials are limited. Such limitations are very great and do not permit of predetermined values, except to a very narrow degree. It is obvious that in the manufactured fiber,
 40 even the very chemical composition and the physical characteristics of each fiber can be predetermined.

Fibers of steel, copper, or other manufactured fiber have a very important fundamental advantage in that the strength, size,
 45 and particularly the resiliency and elasticity, can be predetermined, and sheets or other units made of such fiber, in whole or in large part, can also be accurately made to have a
 50 definite and predetermined "yielding" quality. This quality is given to the material so that it will yield to a much greater extent than other of the usual materials of construction, in response to the impact of a
 55 sound wave. It is usually desirable, in the regulation of the acoustic properties of an auditorium or other enclosure, to use a material which has very high sound-absorbing value. However, it is very much more im-
 60 portant, and in fact essential, to definite results to be able to accurately create a material of a known coefficient of absorption. Often, it is necessary to have a material of lower sound-absorbing value than is avail-
 65 able in a natural state, so that the total

amount of material used, on the areas it is desirable to treat acoustically, does not exceed the total number of units of absorption required to properly regulate the conditions for hearing in the room. 70

Units made from the mineral fibers referred to can be so formed as to possess great tensile strength, since the fibers can be made in such forms when assembled, that they intermesh with one another and are of such
 75 nature, as compared to animal or vegetable fibers, that they cannot readily be torn apart, as can be determined by attempting to separate a mass of curled steel fibers, for example. To still further bond together the fibers, I
 80 may galvanize them, as in the case of steel fibers, in which case minute welds will form at the points of contact of the various fibers. This galvanized fiber may, in some cases, constitute substantially the entire sound-absorb-
 85 ing or facing unit or may be employed as a backing of relatively great tensile strength for a facing of fine mesh ungalvanized fiber. It may also serve as metal lath to be placed over the framework of walls or ceilings. 90

The fibrous body may have its exposed surface covered by a thin plaster coating or a coating of paint which may be applied with a brush or by spraying. Tests have shown that the surfacing material will not crack in
 95 use nor even in handling, owing to the flexibility of the body.

Some of the ways in which my invention may be employed are shown in the accompanying drawings, wherein Figure 1 shows
 100 a portion of a building structure to which sound-absorbing units embodying my invention have been applied; Fig. 2 is a view showing the material as applied to metal lath on a ceiling or wall structure; Fig. 3 shows another
 105 manner in which the material may be applied to a ceiling; Fig. 4 shows a manner in which the material may be applied to a column; Fig. 5 shows units that may be installed as in Figs. 1 to 4; Fig. 6 is a view
 110 showing a sound-absorbing unit in its simplest form; Fig. 7 shows a sound-absorbing unit composed of an inner coarse layer and an outer fine layer of fiber; Fig. 8 is a view similar to that of Fig. 6, but showing
 115 the upper exposed surface of the units as covered by reinforcing material that may also serve as a finish cover; Fig. 9 is a view similar to Fig. 7, but showing a wire mesh or metal lath reinforcement on the rear surface of the unit, and by which the unit may
 120 be attached to a supporting framework; Fig. 10 is a view showing the front and rear coverings of Figs. 4 and 5, combined in a single unit; Fig. 11 shows the unit of Fig. 6, with
 125 an internal reinforcement of wire mesh or the like; Fig. 12 shows the unit of Fig. 11, with facings of plaster or other smooth material; Fig. 13 shows one manner in which the sound-absorbing units may be placed in a floor or 130

wall; Fig. 14 shows fibers assembled in loosely woven form, and Fig. 15 is a view, on an enlarged scale, showing some of the various cross-sectional forms which may be given to individual fibers.

While I herein refer more particularly to the matter of absorbing and dissipating sound waves in connection with the acoustics of an auditorium or the like, my invention is not so limited, because the invention will be utilized as sound and heat insulating materials in the walls, floors and ceilings of buildings; as a wall facing material, as metal lath, and in various other ways, where sound control is not an essential or important factor.

Referring to Fig. 1, I show walls having studding 16 to which is applied fibrous sound-absorbing material 17. This material may be made in the form of units such as indicated in Figs. 5, 6 and 7 for example; which can be glued to the studding, or secured thereto in any other suitable manner. The edges of adjacent units may be pressed together so that their projecting fibers interlock. In the case of metallic fibers, this interlocking effect is very pronounced, by reason of the hook-like and curly form given to the fibers, so that when pressed together the joint will ordinarily not be discernible, and the units cannot be readily pulled apart. If desired, the fibers at the edges of the panels or units can be brushed slightly to enhance the unitary effect produced by the panels when assembled in a wall. The exposed surface of the fibrous body may be coated by a coating of paint or a coating of plaster, as heretofore explained.

In Fig. 2, I show a floor sill 18 and joists 19 that may be of somewhat the usual form. In this arrangement, sheets 20 of wire mesh or fabric such as expanded metal are secured to the joists 19 by tie wires 21 that are passed through strands of the wire mesh and whose ends are twisted around the joists. The fibrous material 22 can be attached to the mesh 20, either before application of the mesh to the joists or after the mesh has been attached thereto, by pressing such material firmly against the mesh, so that the fibers will project through the openings in the mesh and become interlocked with the strands thereof, as shown more clearly in Fig. 9. If desired, the tie wires 21 or other wires or staples can be passed at least partially through the fibrous body, to serve also as means for holding it in place against the mesh 20, or projecting fibers may be twisted about strands of the wire fabric.

In Fig. 3, the fibrous material is represented by the numeral 23 and is shown as applied to a beamed ceiling structure 24. The fibrous material is secured to the ceiling 24 by gluing or otherwise attaching it thereto and is shown as conforming to the irregu-

larities of ceiling surface that result from the presence of the beamed effect. The flexibility and tensile strength of the fibrous body is such that units thereof may be simply placed against the ceiling and bent around the beam-like portions thereof, without danger of cracking or tearing apart of the fibers containing the fibrous units. Here, as in Fig. 1, the exposed surface of the fibrous body 23 may be coated with paint or plaster as indicated in Fig. 12.

In Fig. 4, I show still another manner whereby fibrous units 17 may be made to conform to the contour of non-plane surfaces. In this arrangement, certain of the units may terminate at the lines *a-a* and *b-b*, and adjacent edges thereof pressed into engagement to form an unbroken connection between the edges of the various units. As in the case of Fig. 3, the units could be merely bent to conform to the shape shown in Fig. 4 and could also be bent to conform to columns or the like that are of circular or other contour.

In Fig. 6, the invention is shown in its simplest form, as comprising a sheet or layer made of interwoven or interlocked manufactured fibers of predetermined specifications in the way of character of material, as copper, steel, etc., length of fiber; thickness or diameter of fibers cross sectional form thereof, and galvanized or ungalvanized. Furthermore, the unit may be made of a thickness suitable for absorbing the desired percentage of sound. In the case of the shorter fibers, the body will be denser but have less tensile strength and elasticity than a body composed of longer fibers and a body composed of thinner fibers can be compacted more than a body of thicker fibers, but may have less tensile strength. Also, fibers that are flat or are non-circular in cross section will have a greater tendency to curl than those which are circular, thus producing a greater intermeshing or interlocking of the fibers.

In Fig. 7, I show a unit composed of a layer 17a of fine texture fiber and a layer 17b of coarser texture. The fibers at the adjacent faces of these layers are of course interlocked so as to form a unitary structure. In this unit, the coarser fiber has greater tensile strength than the finer fiber, and not only serves as a support for the fine fiber, and perhaps also as a metal lath, but possesses the capacity of sound absorption. The fine texture layer has relatively great sound-absorbing capacity, and also presents a smoother and more finished surface than would the coarser fiber, and lends itself more readily to decoration.

The unit of Fig. 7, therefore, possesses greater strength and is cheaper than if it were composed entirely of the fine mesh fiber, and possesses greater sound-absorbing

capacity and is of neater appearance than if formed entirely of the coarser fiber.

Instead of providing a reinforcement mesh of woven wire or expanded metal upon the inner surface of the fiber, as shown in Figs. 2 and 9, mesh 20a may be placed upon the outer or exposed surface of a fibrous body 22a, as shown in Fig. 8, or upon both sides thereof as in Fig. 10. Still another arrangement would involve the placing of reinforcement 22b within the fibrous body, as shown in Figs. 11 and 12. In the latter instance, a facing of paint or plaster 25 is provided upon each surface of the fibrous body. In this case, the body could serve as a partition with both sides of finished appearance and be sufficiently stiffened and strengthened by the mesh 22b.

In Fig. 13, 26 represents a base, such as a concrete slab. Strips 27 of fibrous material are placed upon the slab, while sleepers or sills 28 are placed upon the strips. Flooring 29 is nailed to the sleepers, and the space between the flooring and between the sleepers may be left open or filled with concrete, dry sand, etc., and pipes or conduits 30 may be conveniently placed between the flooring and the slab. The fibrous strips 27 serve as cushions to absorb vibrations, as when machinery is located upon the floor, and to decrease transmission of sound. In Fig. 14, I show a fibrous body of woven-like form, composed of strands 31 of metallic fibers twisted to rope-like form and interwoven. Such a body could be conveniently employed where much greater tensile strength is desired than in the case of the body of Fig. 6, for example, and where it is desired that the fibers be more firmly interwoven so that the body is less subject to distortion.

If still further sound-modifying or insulating properties are desired in the fibrous body than is conveniently obtainable by the use of metallic fibers of various sizes and materials, other fibers such as asbestos, mineral wool, etc., may be interspersed with the metallic fibers, to any desired extent, the composite fibrous body thus formed possessing the various advantages in the way of tensile strength, permanency, etc., of the metallic fibers, and also possessing various characteristics of the other fibers referred to, besides being perhaps less expensive than a body composed entirely of manufactured or metallic fibers.

In addition to varying the thickness and length of fibers to suit certain conditions, I will also vary the chemical composition of the metal entering into the manufacture of such fibers, to secure a desired degree of strength, flexibility and elasticity. For example, in the case of steel fibers, I will increase the carbon content thereof, where relatively great tensile strength and resilience is required in the fibrous body. A

smaller percentage of carbon will be employed where it is desired that the fibers and the body composed thereof shall be more easily bent than a fibrous body of higher carbon content, and which fibers are less elastic and will tend to remain "set" in bent or compacted positions, or assembled relation, as would fibers of mild steel, copper, aluminum, etc., as when a denser mat-like body is desired. Alloys of copper and aluminum or other metals would be similarly provided for the purpose of securing these various characteristics.

Furthermore, the fibers may severally be of various cross-sectional forms, as shown in Fig. 15. Thus a flat fiber *a* would tend to curl more than the fibers *b*, *c*, *d*, *e*, and *f*, but would also be susceptible of being employed for forming a more compact mat. Employment of fibers *b*, *e*, or *f*, would result in a greater amount of air space in a mat formed thereof, while fibers *c* and *d* possess greater tensile strength and less elasticity than some of the other fibers. These comparisons are merely illustrative, and do not exhaust the possibilities in the way of flexibility, tensile strength, porosity, etc., of a body containing any one, or various combinations of these or other forms of fibers.

While the term "wall" is employed in the appended claims, it will be understood that the term is used in its broad sense to include ceilings, floors, columns, beams, and any other structure to which the material may be applied. The term "plastic material" is employed to designate broadly any liquid or semi-liquid substance such as paint or plaster, for coating the surfaces of the fibrous body.

I claim as my invention:—

1. The method which comprises assembling metallic fibers into inter-meshing relation to form a self-sustaining mat-like body, placing a plurality of said bodies upon a support to form a wall structure, and causing the fibers at the edges of each body to intermesh with the fibers of adjacent bodies to form a composite whole.
2. A sound-absorbing body for use on exposed wall surfaces, composed of loosely-matted metallic fibers of a hardness not substantially greater than that of mild steel.
3. A sound-absorbing body for use on exposed wall surfaces, composed of a plurality of layers of loosely-matted metallic fibers, one layer being of a hardness not substantially greater than that of mild steel.
4. A sound-absorbing body for use on exposed wall surfaces, composed of loosely-matted metallic fibers of different thickness, part of the fibers being of a hardness not substantially greater than that of mild steel.
5. A sound-absorbing body for use on exposed wall surfaces, composed of loosely-matted fibers, a substantial number of which

are of metal and have a hardness not substantially greater than that of mild steel.

6. A sound-absorbing body for use on exposed wall surfaces, composed of loosely-matted metallic fibers, and containing a thin coating of plastic material on one side thereof which partially imbeds some of the fibers.

7. A sound-absorbing body for use on exposed wall surfaces, composed of loosely-matted metallic fibers, and containing a thin coating of plastic material on one side thereof which partially imbeds some of the fibers, the fibers being of a hardness not substantially greater than that of mild steel.

8. A sound-absorbing body for use on exposed wall surfaces, composed of loosely-matted fibers, a substantial number of which are of metal, and having a thin coating on one side thereof which partially imbeds some of the fibers.

9. A sound-absorbing body for use on exposed wall surfaces, composed of loosely-matted metallic fibers, and containing a thin flexible facing in adhering relation to one side of the body.

In testimony whereof I, the said JACOB MAZER, have hereunto set my hand.

JACOB MAZER.