

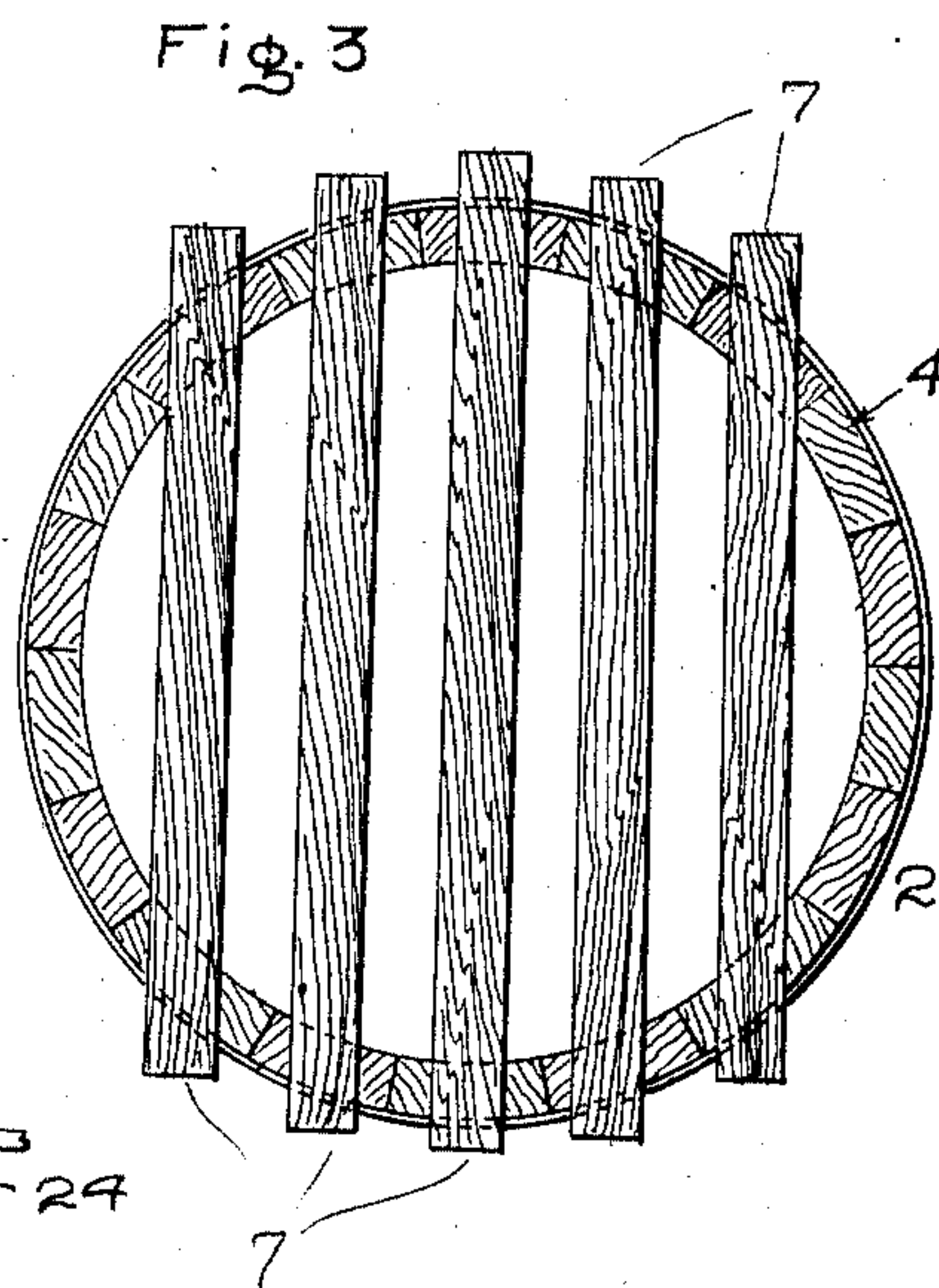
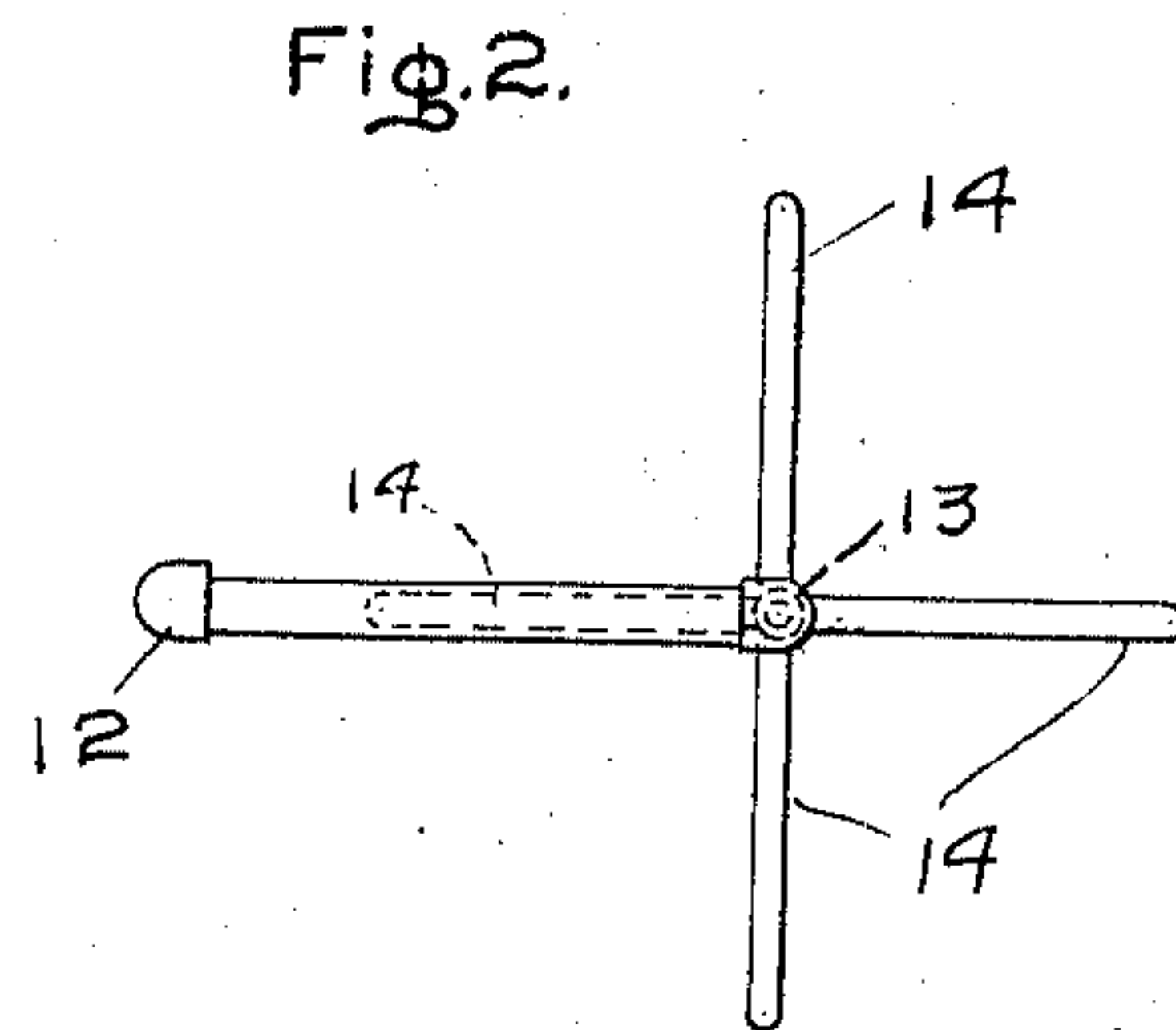
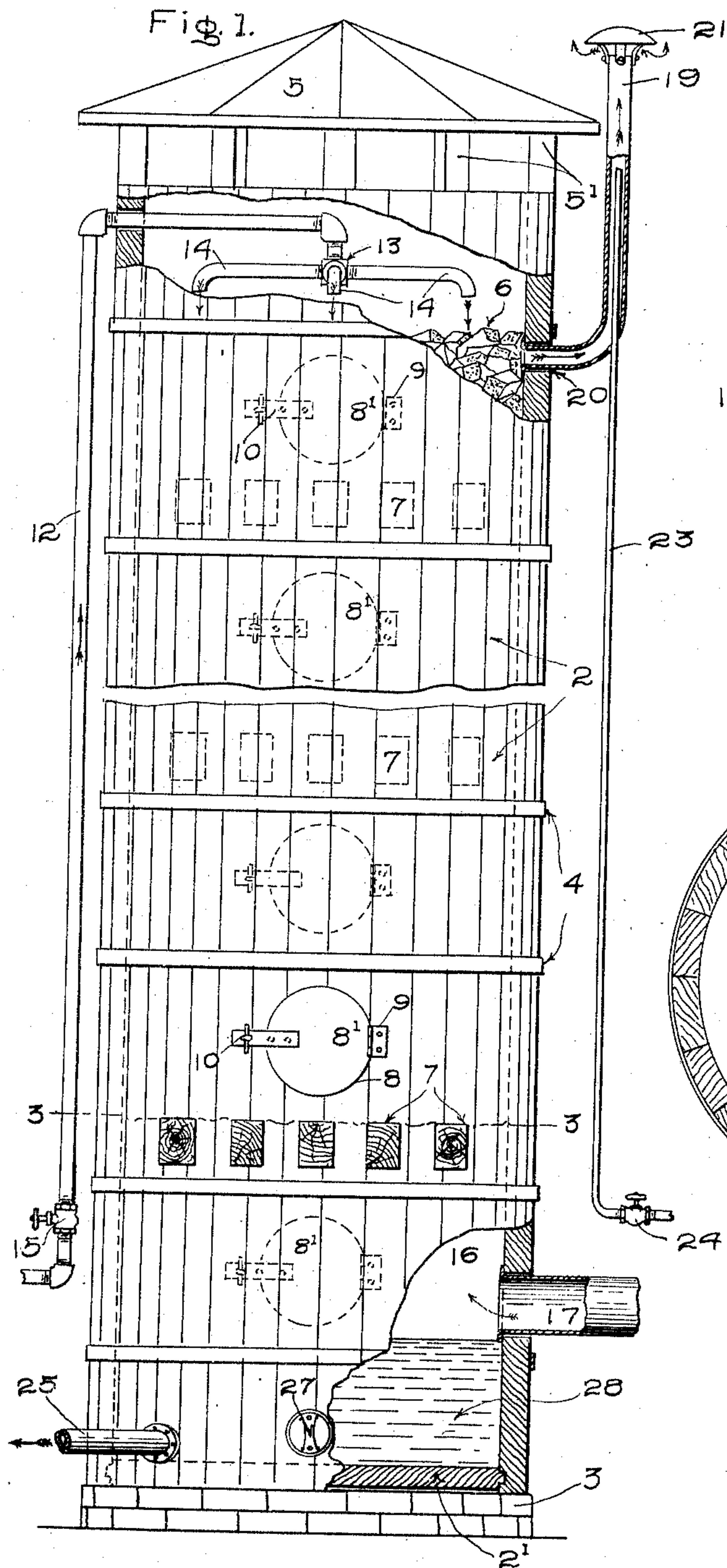
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J. BISHOP.

TOWER FOR MAKING BISULFITE LIQUOR.

APPLICATION FILED MAY 3, 1907.



Witnesses:
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UNITED STATES PATENT OFFICE.

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TOWER FOR MAKING BISULFITE LIQUOR.

No. 864,881.

Specification of Letters Patent.

Patented Sept. 3, 1907.

Application filed May 3, 1907. Serial No. 371,722.

To all whom it may concern:

Be it known that I, JAMES BISHOP, a citizen of the United States, residing at Carthage, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Towers for Making Bisulfite Liquor, of which the following is a specification.

This invention relates to improvements in tower acid systems, designed for use in making bisulfite liquor, which is employed extensively in connection with the manufacture of paper.

The tower and other systems heretofore employed for the production of bisulfite liquor, or paper maker's acid, have invariably been of massive and complicated construction, the majority of which have been built and afterwards operated at a very great cost.

The object of this invention is to provide an apparatus of the class which is simple and of comparatively light and inexpensive construction, and wherein the amount of labor required for, and the expense of operating the system may be greatly reduced, as compared with the older methods and appliances.

The invention consists principally in providing a hollow wooden tower or part, preferably tubular in form, of suitable diameter and height, and having a clear or unobstructed interior for the greater part of its length, or at least throughout the length of each of a number of regularly arranged compartments disposed one above the other.

The invention further consists in filling the interior of the tank or tower with blocks of wood or other material, of such size and form as will prevent close packing or clogging of the tower, the said blocks preferably consisting of a light material which will not waste or deteriorate during the making of the bisulfite liquor.

The invention further consists in providing suitable piping for conducting lime-water to the top of the tower and discharging it upon the blocks, from whence it may find its way through the mass of loosely and irregularly packed blocks to the bottom of the tower by means of gravity, the said blocks being disposed in the tower in such manner as to retard the descent or flow of the lime-water, but not to allow it to accumulate in any part of the tank except at the bottom, where it is collected in the form of acid and conducted thence to suitable storage tanks.

The invention further consists in providing means for introducing the cooled fumes of burnt sulfur, or sulfur dioxide gas in a suitable manner at or near the bottom of the tower from whence it may rise or be forced upwardly through the baffle-blocks to the top of the tower, in such manner that the greater portion or all of the gas in ascending, as described, will become

absorbed or taken up by the descending lime-water and thereby convert the latter into bisulfite liquor, or paper maker's acid.

The invention further consists in providing series of grates and disposing them transversely through the tower as shown, for the purpose of supporting the wooden blocks.

A further feature consists in providing a series of manholes or like openings cut through the wall of the tower at intervals between the top and bottom, for use in inserting and removing the blocks, and a further feature consists in providing means for creating a draft to assist the gas in its ascent through the tower, and also for carrying off the unused gas at the top of the tower.

Other features and parts of the invention will be understood from the detail description which follows, and by reference to the accompanying drawing, which forms a part of this specification, and in which—

Figure 1 is an elevation and part section of my acid tower, showing the construction and arrangement of the principal parts. Fig. 2 is a detail view of the lime-water discharge pipes located in the top of the tower. Fig. 3 is a horizontal section substantially on the line 3—3 of Fig. 1, showing location and arrangement of one tier of the wooden grates.

Similar characters of reference are assigned to corresponding parts throughout the several views.

In the drawing, 2 represents my tower complete, which is preferably constructed tubular in form, of wooden staves or like timbers of suitable dimensions, and is provided with a tight fitting wood bottom and an open top. The tower rests upon a foundation 3, which may be made of rock, concrete or other suitable material.

4 represents a series of metallic bands or hoops which surround and bind the tower at intervals throughout its length.

5 represents a wooden roof or covering which is preferably disposed on top of the tower in a manner to permit a person attending the plant to have access to the interior of the tower immediately beneath the roof, by entering through the spaces or openings formed by a number of extended staves or timbers 5' upon which the roof rests. The openings between the extended staves 5' may be closed by means of swinging or other movable doors (not shown) in order to prevent the escape of gas except through the means hereinafter described.

6 represents a series of wooden or other light blocks or parts used for filling the hollow space inside the tower, for the purpose of retarding the downward flow of the lime-water and also the upward flow of the gas employed

in making the bisulfite liquor. These blocks may be of any suitable form and size, but preferably should be cut square or in irregular shapes, so as not to permit of their becoming too closely packed and thus prevent liquid or gas from having a free progress through the tower. The blocks 6 may be prepared from any variety of sound wood.

7 represents a series of grates or grate-bars, preferably comprising stout timbers of suitable size and strength to sustain the weight of the blocks 6 which rest upon them. These grates are preferably made long enough to pass through the tower and project some distance outwardly beyond the opposite walls, and they should be disposed close enough to prevent any of the blocks 6 from dropping through. One set of grates, as indicated by the full lines in Fig. 1 might answer the purposes of a system of the class, but I prefer to employ a number of such sets or tiers of grates and dispose them at regular intervals between the bottom and top of the tower as indicated by the full and dotted lines in Fig. 1. Under the latter construction, the weight of the entire mass of filter-blocks, instead of being borne by the bottom grates alone, may be divided between the several tiers of grates, neither of which would be subjected to a very great load, and in such case the grates could be made from timbers of lighter dimensions.

8 represents a number of manholes or openings, preferably circular in form, two of which are shown for each subdivision or section occurring between the grates floors 7. These manholes are preferably located, one near the grates to be used for removing the blocks 6, and the other near the upper end of each compartment or section, for use in inserting the blocks. Each manhole is provided with a tight fitting door 8', preferably supported by hinges 9, and held in closed position by a suitable latch or catch 10.

15 represents a lime-water pipe of suitable size, capable of being connected at its lower end with a source of lime-water supply and a force-pump, and then extending the full length of the tower and terminating under the roof, at a point directly over the center of the tower, where by means of a cross-connection 13, the lime-water may be discharged from several arms or nozzles 14, and distributed over the filter-blocks 6 in an even and steady flow.

15 represents a valve connected with pipe 12, for controlling the flow of the lime-water.

The lime-water, or milk of lime, is first prepared in another portion of the plant to the proper consistency, and then forced upwards through pipe 12, by means of a pump or like agent, and as this liquid is comparatively thin—about the consistency of skimmed milk—when discharged upon the blocks at the top of the tank, it will readily flow or course downwardly over and through the blocks till it reaches the hollow compartment 16, located at the bottom of the tower beneath the lower set of grates, where it is collected in the form of bisulfite liquor or acid. Owing to the great length of the tower and the large number of blocks 6 which fill the grate tube in irregular order, considerable time will be required for the lime-water to make the full descent.

Bisulfite liquor, or acid, is produced by a simple chemical process, which consists of saturating or impregnating the lime-water, as it drips or trickles down-

ward through the blocks with sulfur dioxide gas, or the cooled fumes of burnt sulfur, which is applied to the tower at a convenient point below the lower tier of grates by means of a pipe 17, which may be secured at its inner end to the wall of the tower by any suitable connection, the outer end of said pipe adapted to connect with a sulfur burner. The sulfur gas or fumes after having been cooled as required, flows through pipe 17 into and upwards through the tower following the tortuous passages or interstices between and around the blocks 6. In its ascent through the tower the greater portion of the gas will become absorbed by the lime-water and any residue will be carried off above the roof 5 by means of a suitable chimney or pipe 19, which is also preferably made of wood, and connected with the hollow tower at a point 20, a short distance below the upper surface of the mass of blocks 6, where a suitable opening is formed in the wall of the tower to receive it. Pipe 19 is provided with a cap 21 to prevent snow and rain from entering the same. The sulfur gas employed in making the acid is preferably admitted to the tower under its own pressure, and in order to create a proper draft to induce its upward flow through the tower, obstructed as described by the wet blocks 6, a steam pipe 23 is provided. This pipe may be connected at its lower end in any suitable manner with a source of steam pressure, and it then extends upwardly alongside the tower, as shown, where the upper end enters the gas chimney 19, and terminates above the point where the chimney-pipe connects with the tower. By this arrangement of pipe 23, when a jet of steam is discharged in the chimney it will draw the gas, siphon-like, upwardly through the tower. A valve 24 is connected with pipe 23 near its lower end, for use in regulating the draft in the tower.

At a convenient point, preferably near the bottom, an acid discharge pipe 25 is connected with the acid compartment 16 by passing through an opening in the wall of the tower. The outer end of this pipe is intended to connect in a suitable manner with a conductor leading to tanks in which the acid is stored. Still another opening, a clean-out hole 27, is provided and preferably placed on a level with the bottom floor of the tower, and is provided with suitable spout and cap for opening and closing the same. This part is employed for discharging or carrying off any refuse, such as sand and other matter, which may accumulate in the bottom of the tank from time to time, and for getting rid of the water at times when the tower is being washed out. A manhole similar to those hereinbefore described is provided for the acid compartment 16, to permit access to the inside for cleaning out or repairing the same.

Heretofore, in many of the acid plants, raw limestones, coarsely broken, are packed in the towers, and water is discharged over the rocks at the top, and the sulfur gas enters at the bottom of the towers. In all these systems, the towers must be built very heavy and strong, to withstand the great weight of the heavy rocks, and as the lime-rock wears away by the action of the water and gas which converts it into acid the towers must be refilled. This operation entails a great deal of expense and hard work, besides occasioning a considerable loss of production while the towers are out

of service. Frequently these rock-filled towers become clogged up because of the slaking or disintegrating of the limestone, and they must be emptied and cleaned out, which results in additional delay and expense. By the employment of my improved system, most of the difficulties and expense referred to are entirely obviated. The wooden blocks which I employ instead of limestone need to be newly installed but once in several years. They are light and easily and cheaply supplied and handled, and a great saving in the cost of the towers in the first instance may be effected, because lighter material may be employed in the structure, and the work of making the acid need not be suspended, except at long intervals, when the towers require washing-out, or the blocks renewing.

In practice my towers will be built about one hundred feet in height and from four to eight feet in diameter, and preferably constructed entirely of wood, except the metallic bands which hold the staves in place, and the towers throughout are intended to be air and water tight. Generally five or six towers are erected side by side in plants of any considerable size.

To operate my system, the lime-water is first prepared and tested, and then forced upwards through pipe 12 and discharged through the several nozzles 14 into the upper open end of the tower, where it falls upon the baffle-blocks 6. From this point the lime-water begins its downward course trickling through the numerous interstices between the wooden blocks. At the same time the lime-water is turned on, a suitable supply of sulfur dioxide gas is admitted to the lower part of the tank and allowed or compelled to filter upwardly through the mass of blocks, and while ascending this gas comes in contact with the descending lime-water, which takes up or absorbs a sufficient quantity of the gas to convert the liquid lime into acid, and the latter drips or flows into the chamber 16 at bottom of tower and is then ready for use.

It is obvious that some changes or modifications in the parts of my system may be made, without departing from the spirit of my invention, and I therefore do not restrict myself to the precise construction and arrangement as shown and described.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is—

1. A tower for making bisulfite liquor, comprising a tubular wooden tower divided into compartments disposed one above the other and separated by grated floors, and having an acid chamber beneath the lowermost grated floor, a plurality of wooden baffle-blocks disposed irregularly in each of said compartments and supported by said floors, a pipe extending to the top of said tower adapted to connect at its lower end with a source of lime-water supply, its upper end arranged to discharge lime-water upon the baffle-blocks of the uppermost compartment, means for admitting a supply of sulfur-dioxide gas to the lower portion of said tower, a steam actuated siphon to force said gas upwardly through said tower and between and around said baffle-blocks, and means for inserting and removing said baffle-blocks from each of said compartments separately, substantially as described.

2. A tower for making bisulfite liquor, comprising a tubular wooden tower or tank divided by means of wooden grates into a number of compartments arranged one above the other, the lower end of said tower being tightly closed, the upper end thereof being open, a pipe adapted to discharge a volume of lime-water into the open end of said tower, a plurality of wooden blocks filling the upper portion of said tower adapted to baffle or retard the flow of said lime-water downwardly through said tower, a series of grates to hold said blocks in place, a pipe, one end of which is adapted to connect with a source of gas supply, the other end connecting with the interior of said tower beneath said blocks, means for drawing sulfur gas upwardly through the mass of blocks in a manner to effect the absorption of said gas by said lime-water as the latter descends through said tower, and means for collecting an acid resulting from the commingling of said limewater and said sulfur gas in the bottom of said tower, substantially as described.

3. A tower for making bisulfite liquor, comprising a wooden tower, a series of baffle-blocks filling the interior of said tower, a lime-water supply pipe extending to the top of said tower and having a series of discharge nozzles connected thereto, a sulfur gas supply pipe entering the lower portion of said tower beneath said baffle-blocks, and a series of manholes provided with tight fitting doors disposed at intervals between the bottom and top of said tower, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES BISHOP.

Witnesses:

ARTHUR L. CHAPMAN,
HARRY DE WALLACE.