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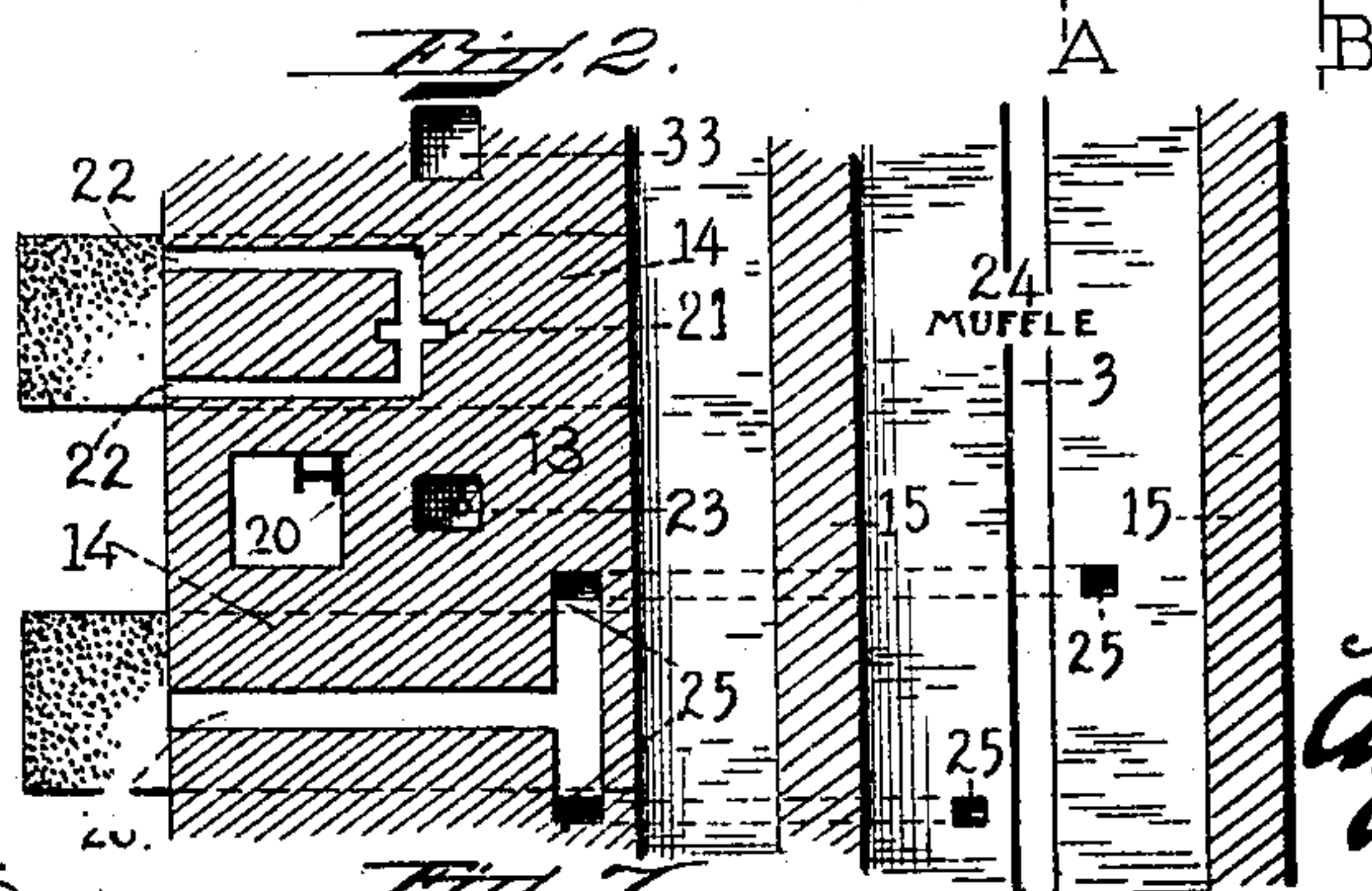
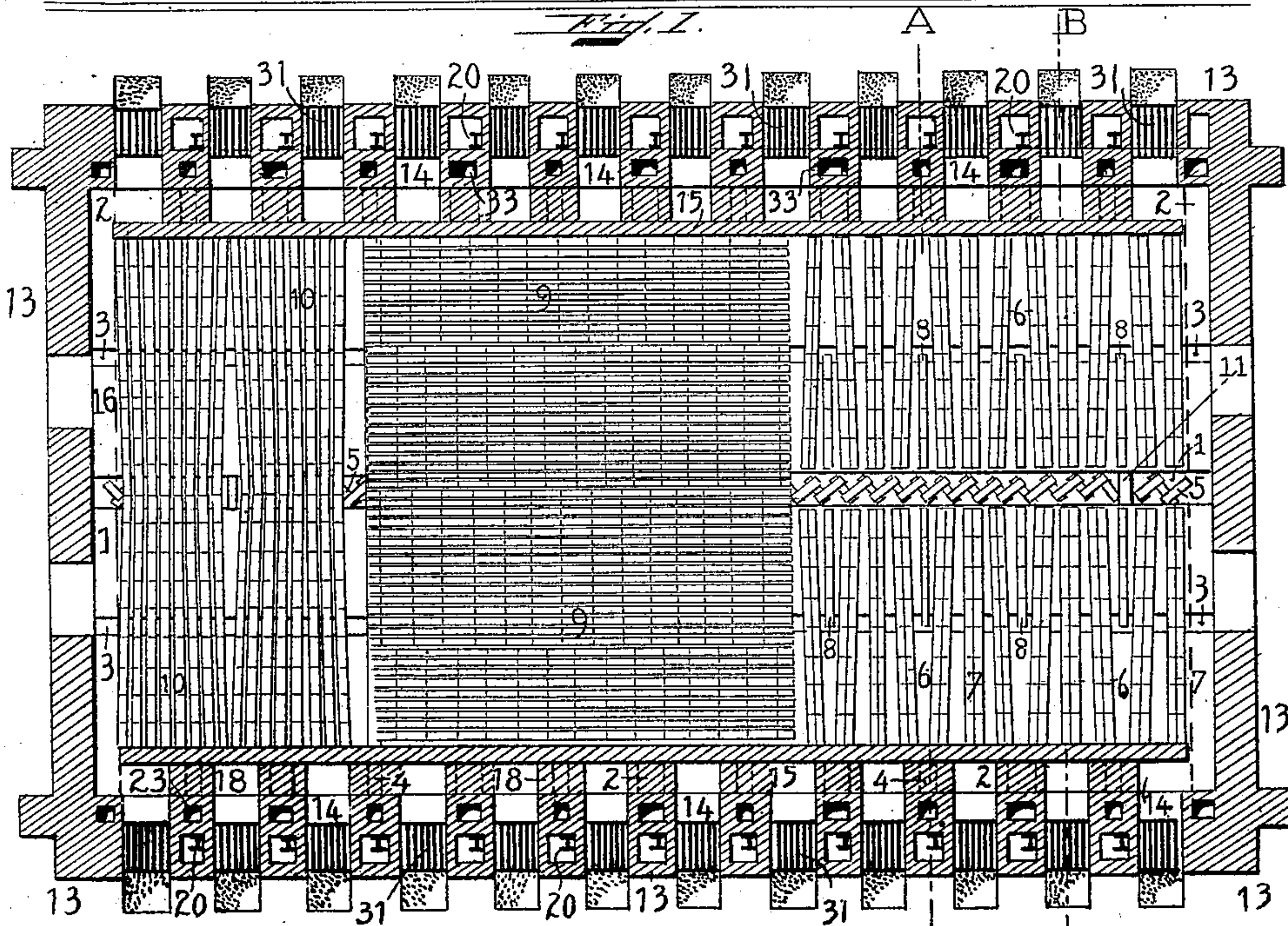
Patented Nov. 7, 1899.

A. YATES.
BRICK KILN.

(Application filed Jan. 23, 1899.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses:
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Inventor:
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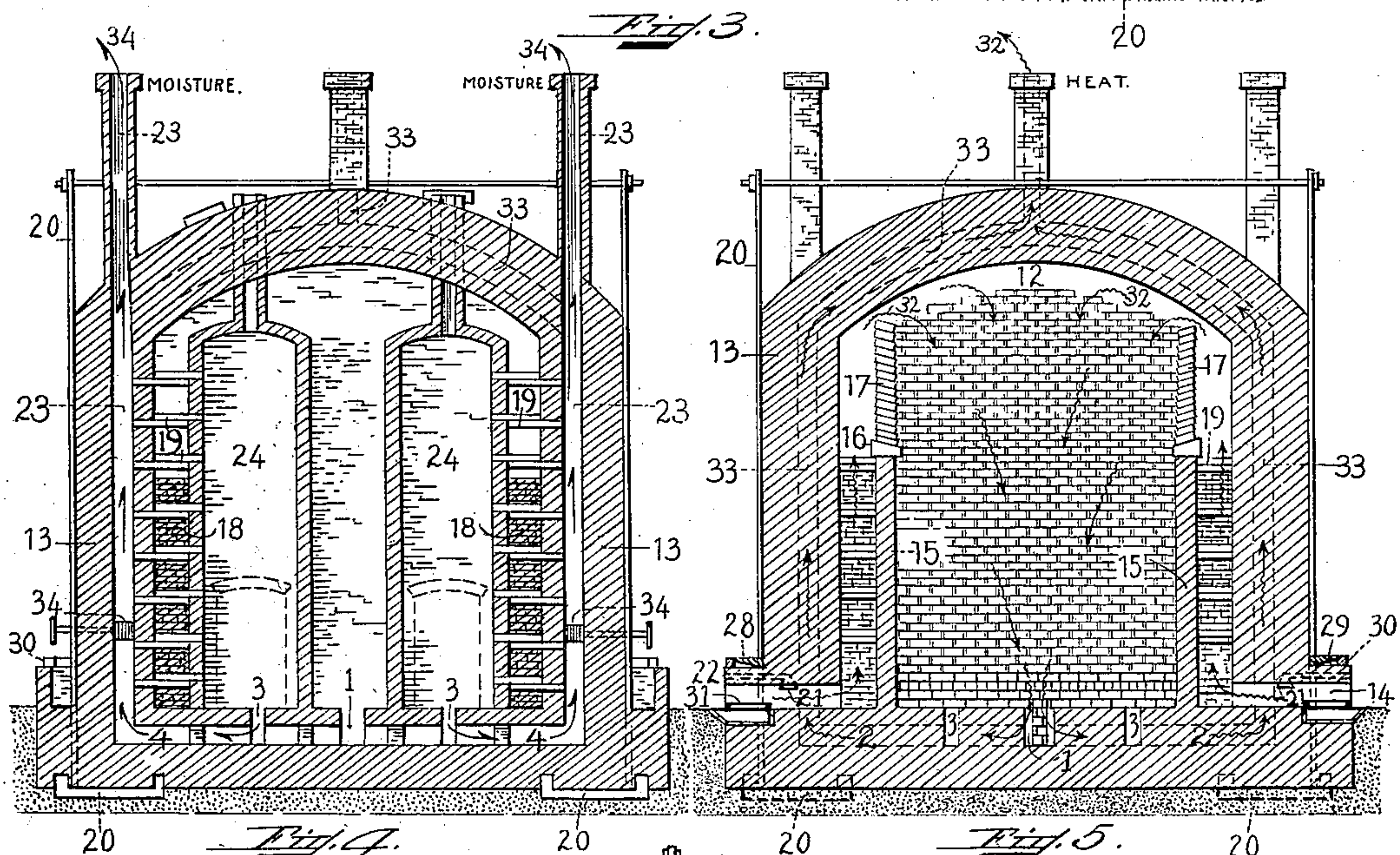
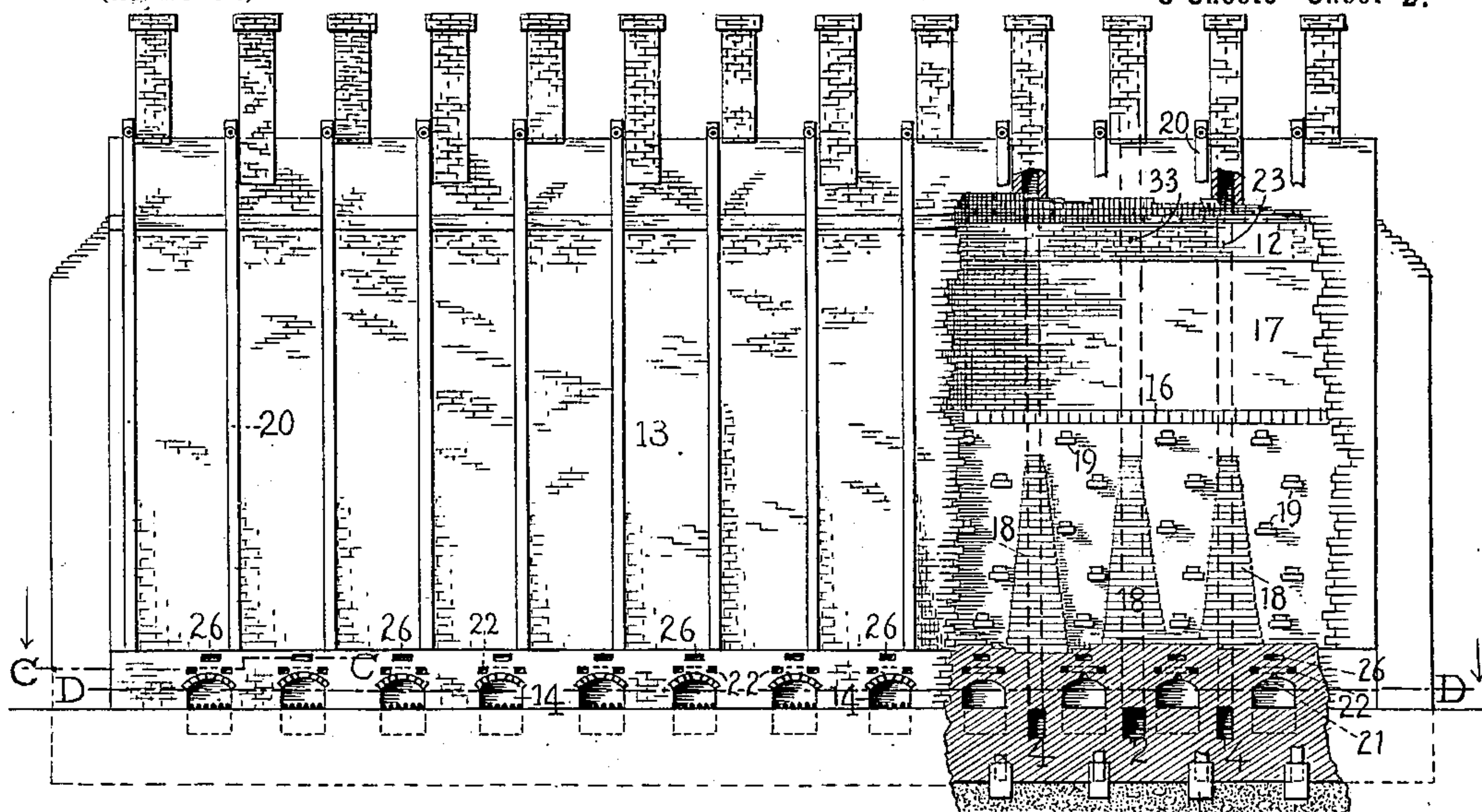
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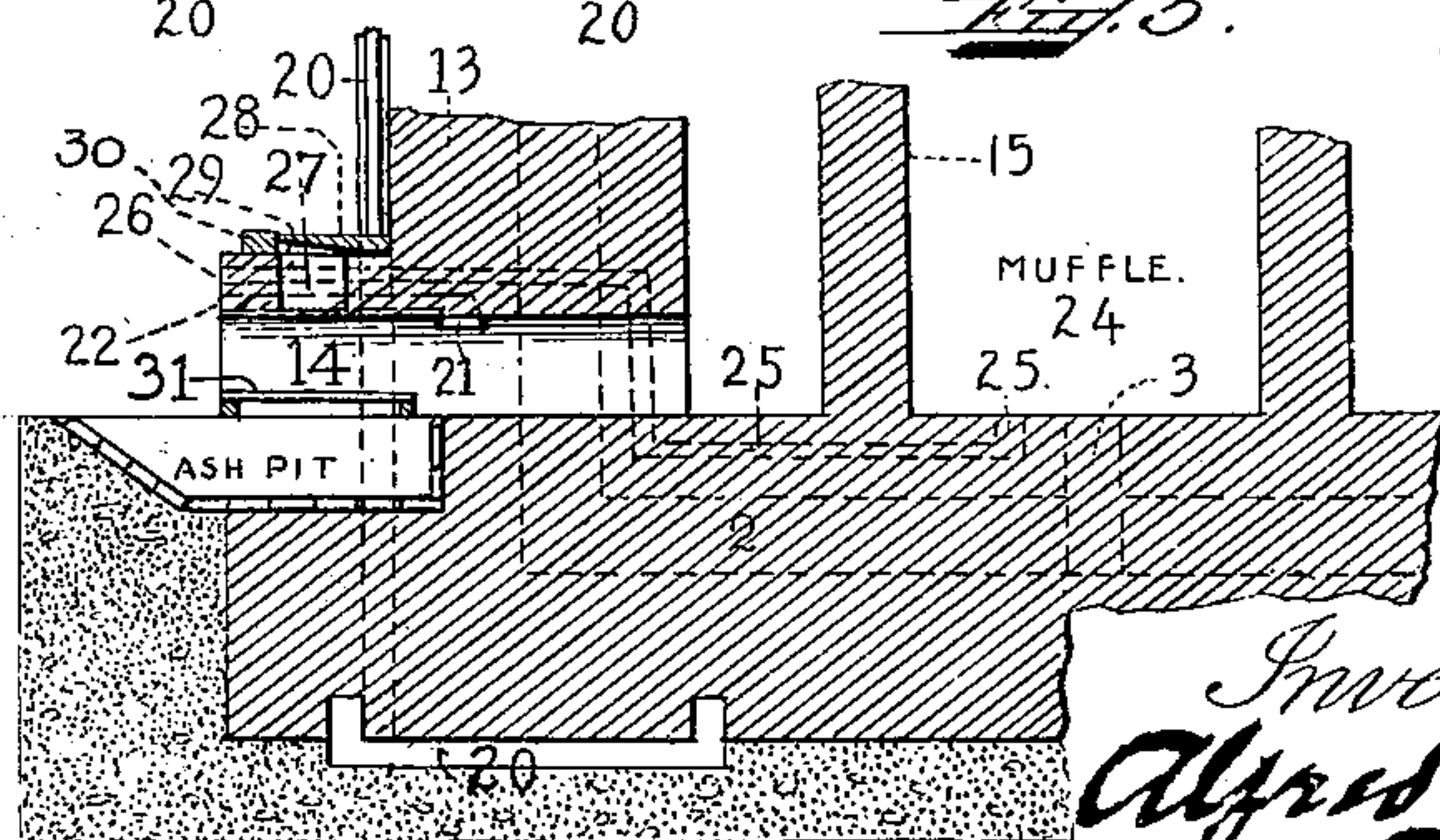
(Application filed Jan. 23, 1899.)

(No Model.)

3 Sheets—Sheet 2.



MOISTURE.
HEAT.



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3 Sheets—Sheet 3.

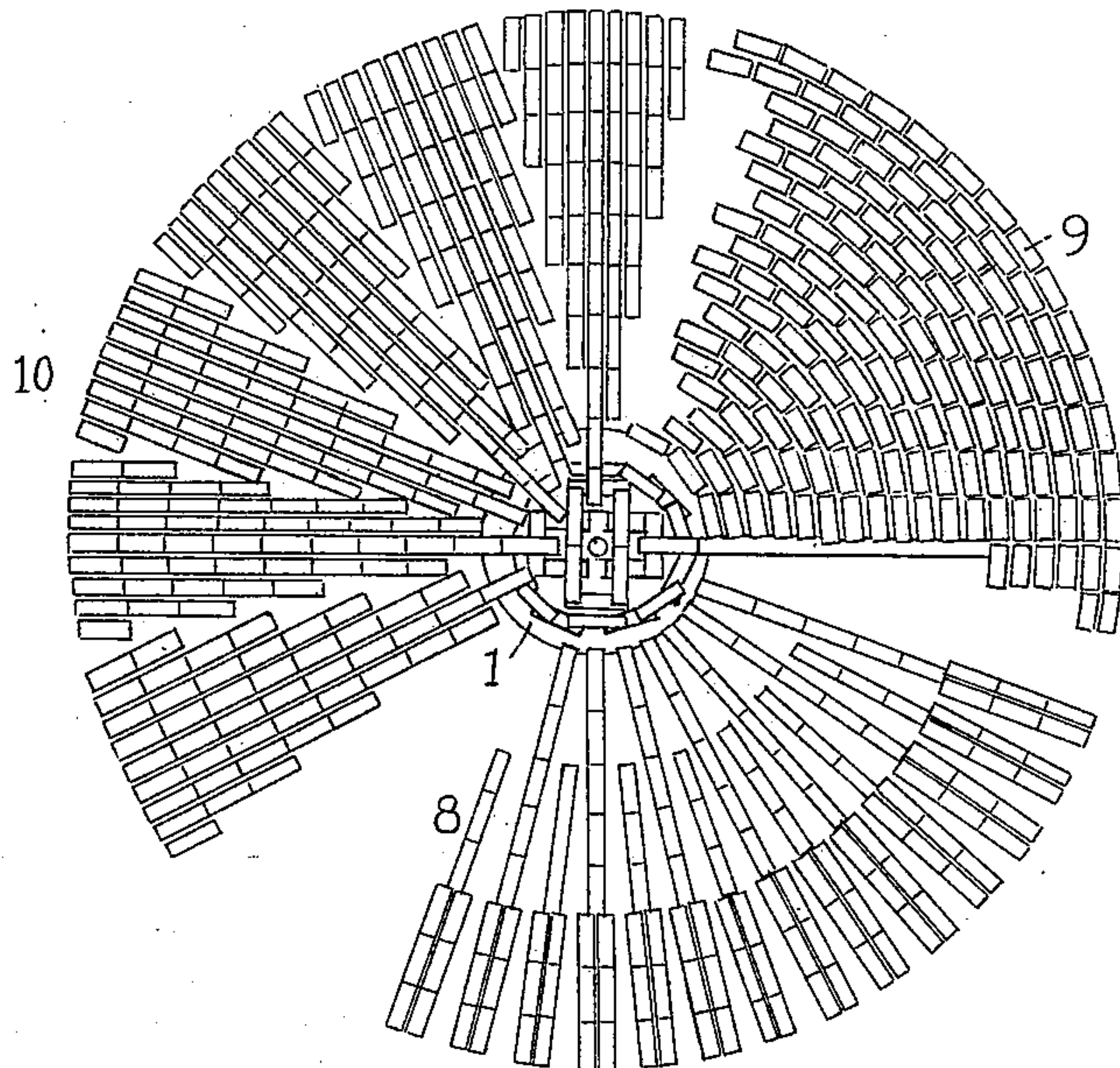


Fig. 8.

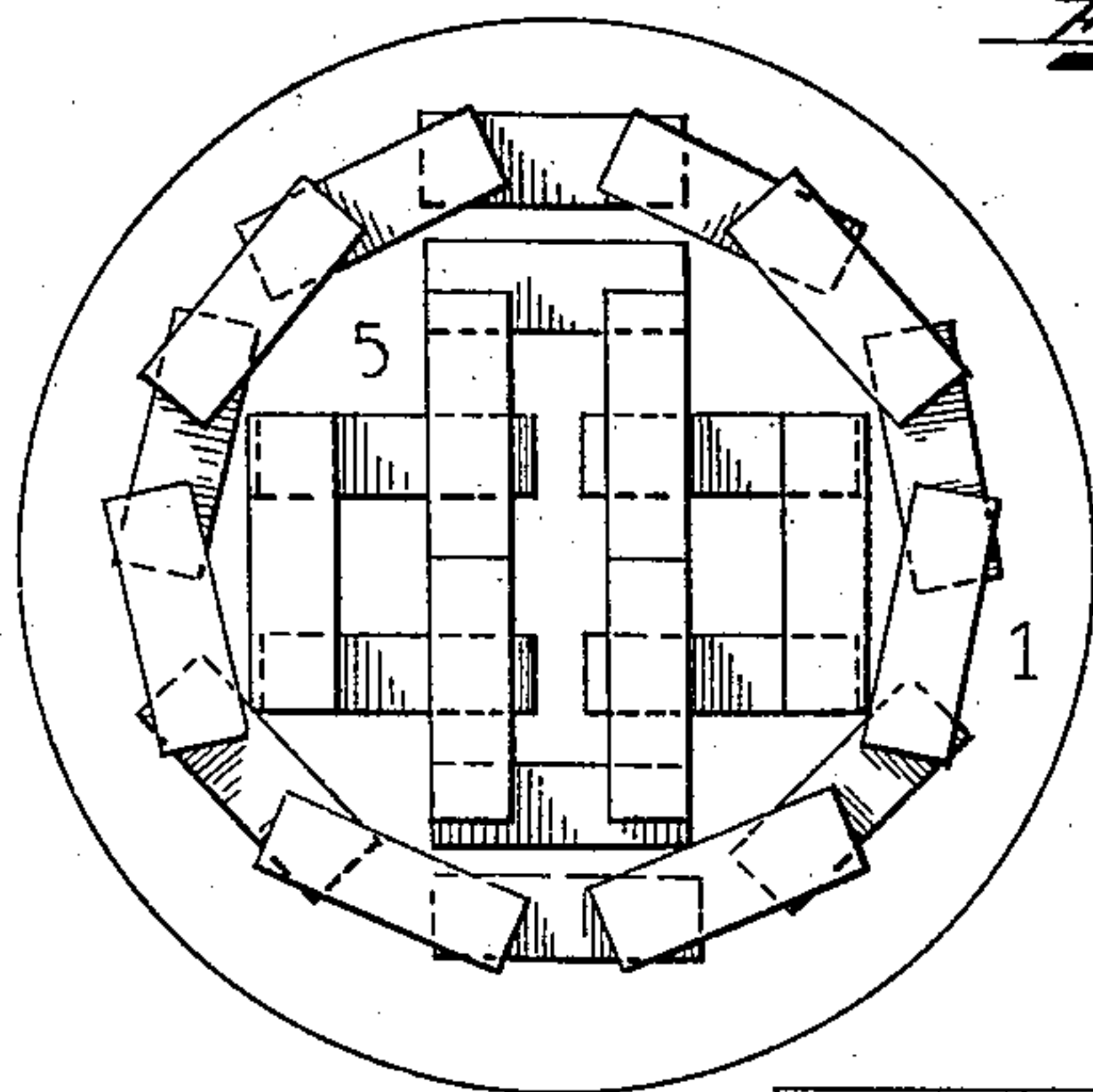


Fig. 9.

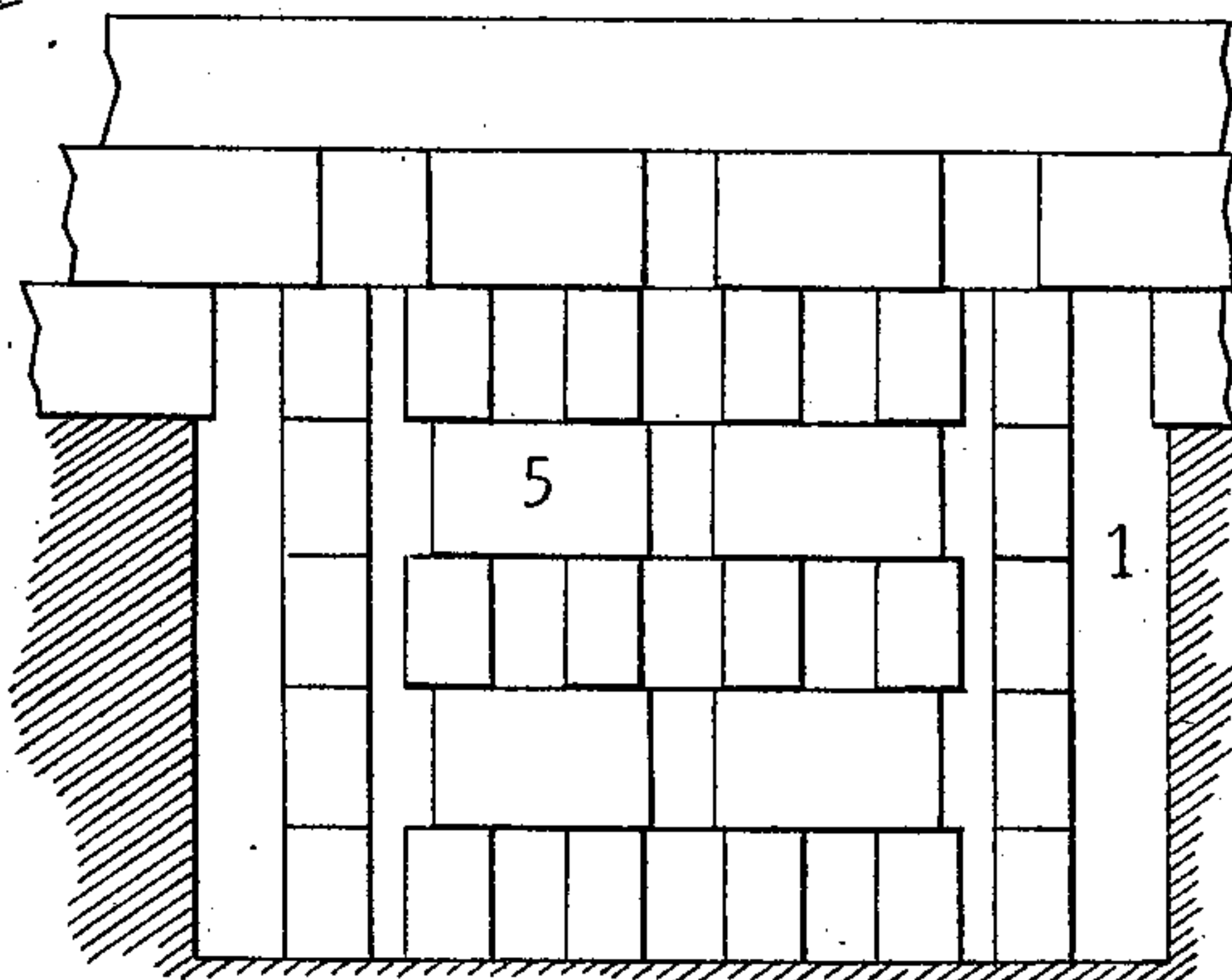


Fig. 10.

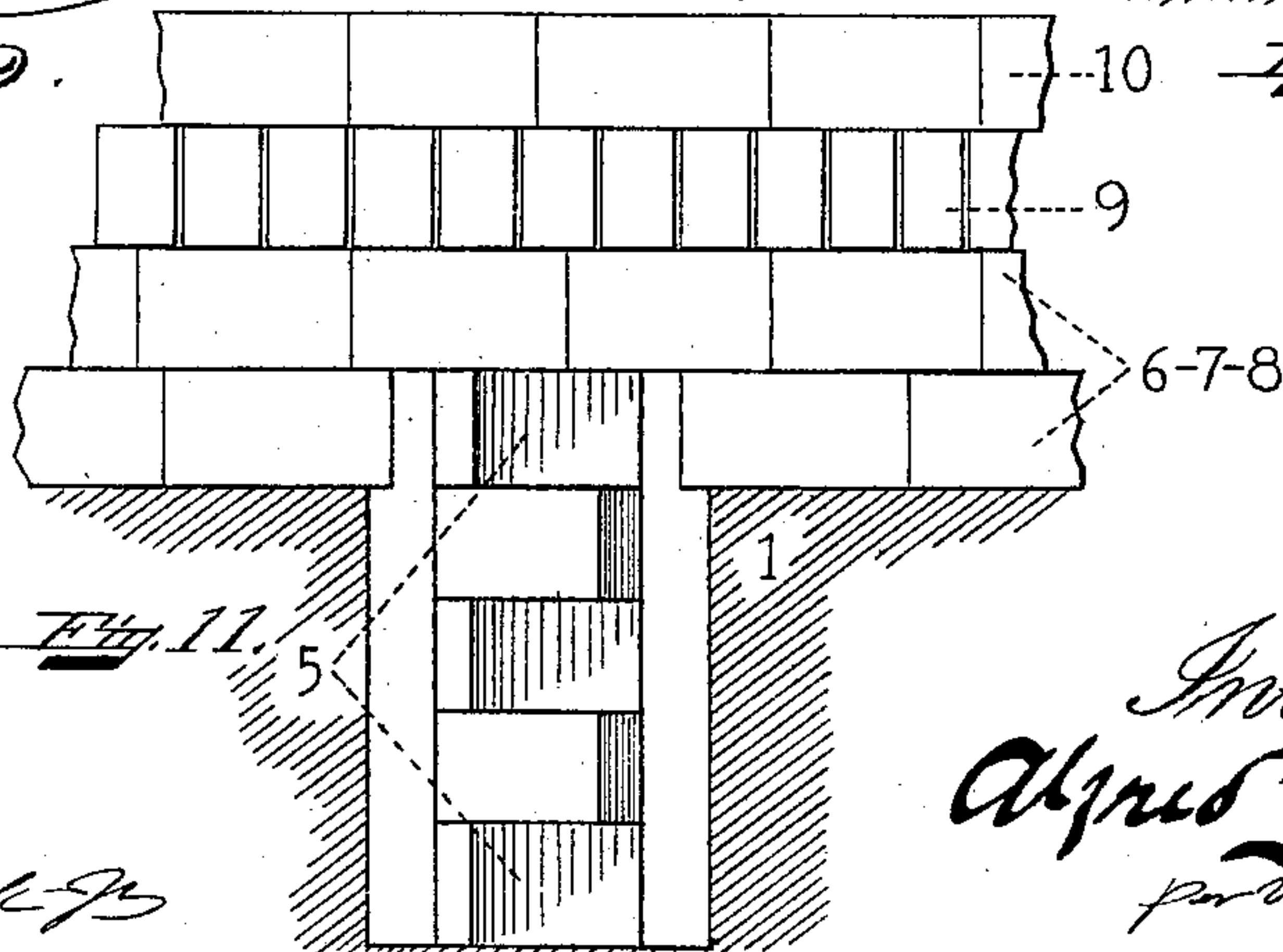


Fig. 11.

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UNITED STATES PATENT OFFICE.

ALFRED YATES, OF SOMERVILLE, MASSACHUSETTS.

BRICK-KILN.

SPECIFICATION forming part of Letters Patent No. 636,310, dated November 7, 1899.

Application filed January 23, 1899. Serial No. 703,110. (No model.)

To all whom it may concern:

Be it known that I, ALFRED YATES, a citizen of the United States of America, and a resident of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Brick-Kilns, of which the following is a specification.

My invention relates to improvements in kilns for burning clayware; and it refers to new and useful features not embraced in my previous patents—viz., No. 264,118, of date of September 12, 1882, and No. 550,707, dated December 3, 1895.

The improved features of my present invention comprise the arrangement of the flues beneath the kiln-floor, the disposition of the bricks on the floor of the kiln in certain courses to conserve the heat and secure effective distribution thereof, the construction of a tight bottom, the use of dampers to control the circulation of the main and transverse quarter-flues, the temporary stop-walls to confine the heated-air currents to the ends of the kiln, the passages admitting air to the interior of the muffles, ducts admitting cold air above the furnace-fires, stops and foot-braces between the walls to obviate inward warping, and in making other radical changes in construction and of addition of new features, hereinafter more fully claimed, which will enable me to operate my improved kiln with a greater degree of efficiency than by my former methods.

A more specific description of the features of my improved invention will be obtained through reference to the drawings forming a part of this specification, wherein—

Figure 1 is a plan of the flues underlying the floor of my improved kiln. Fig. 2 designates a section on dotted line D, Fig. 3, with a plan of the several bond, check, and draft courses of bricks and the method of their laying to diffuse the heated air. Fig. 3 is a side elevation of the kiln with a portion of the exterior wall broken away to exhibit the interior construction thereof. Fig. 4 exhibits a transverse section of the empty kiln on dotted line A of Fig. 2, with two muffles therein. Fig. 5 illustrates a similar view of the kiln on dotted line B of Fig. 2 as would appear (without muffles) when replete with goods and

ready for firing. Fig. 6 is an enlarged transverse section as appears in Fig. 5, Fig. 7 being a similar section longitudinally viewed on dotted line C, Fig. 3. Fig. 8 exhibits the floor-setting of the bricks in bond and check rows and draft courses for a circular kiln. Fig. 9 is an enlarged plan of the "setting" in the well. Fig. 10 is a transverse section through the same. Fig. 11 denotes a transverse vertical section of the bricks, showing the courses and rows in the well of the rectangular kiln, Fig. 5, the system of downdraft being applicable to each form of construction.

Corresponding numerals designate like features throughout the drawings.

Referring to Fig. 1 herein, the flues run longitudinally and transversely in parallel directions and are of two dimensions. 1 denotes the open main center flue or well, (corresponding to the well shown in the plan of the circular setting in Fig. 7.) 2 designates the underground connecting main flues communicating with the upper line of chimneys on the crown of the kiln. The open main quarter-flues are shown at 3 and the transverse underground quarter-flues at 4. The former, 3, are used to hasten the air circulation to obviate "water-smoking," caused by the moisture exuding from the green goods. The latter, 4, communicating with the lower line of chimneys arising from the foot of the crown, are for the purpose of drawing off the moisture from the goods and then closed during burning. Said flues 1 and 3 are below the level of the floor of the kiln, but open to its interior, are intercommunicating, and designed to facilitate the escape of moisture and to conduct the air and heat beneath the bottom of the kiln.

In Fig. 2 the disposition of the bricks on the floor of the kiln immediately above the flues previously described is illustrated in their consecutive order of piling. The "skintle" row is shown at 5, and preferably consists of five courses of bricks, extending the length of the center flue or well 1, laid on edge in diagonal positions or zigzag. The next in order are the "draft" rows 6. These comprise double rows of bricks set on their edges at right and left of skintle row 5, the spaces between said rows converging slightly from one and a quarter inches near

the center to about six inches near the side walls of the kiln. The double rows of brick 7 are piled alike in number and position, as in the rows 6, intermediate to said rows 7, and at right angles with the skintle row 5, while between the double converging rows 6 are shorter single rows 8, extending from the skintle row 5 to the lengthwise main quarter-flues 3 and also at right angles. These, in the aggregate, constitute the first two courses of draft rows. The "bond" course is represented at 9. This consists of single rows of brick laid on edge, extending lengthwise of the kiln, the spaces between the rows gradually increasing from the center, (or over the skintle row,) preferably one-quarter of an inch to one-half inch at side wall of kiln. The above constitutes the third course. The "check" course is shown at 10, and comprises single rows of brick laid edgewise and transversely to the rows 9. The spaces between each row regularly decrease from the side walls of kiln to the center and preferably in the same proportion as the bond course 9, previously described. The above constitutes the fourth course, said courses (shown in enlarged section in Fig. 10) conducing to the uniform radiation and correct checking of heat. The number of the above-described courses may vary in kilns of very great capacity. "Stop-walls" 11 close the center main flue 1, adjacent to the main flues 2 at each end of flue system, permitting the latter to control the heat generated in the end furnaces and prevent it drawing toward the center of kiln. This is a marked improvement over both my former methods, which burned the goods very lightly at the ends of the kiln, while by these devices I burn them uniformly with those in the center of the kiln. With the bottom of the kiln thus prepared the bricks to be treated are piled loosely thereupon, as at 12, Fig. 5, and are then ready for burning. This checker and draft system may be laid down permanently for the production of fine pottery and similar wares and temporarily when desired for brick.

In Fig. 3 the exterior side walls 13 are provided with a series of furnaces 14, discharging their heat within the kiln against and up along the permanent flash-wall 15, which has a capping composed of a single row of "bull-heads" 16, the upper plane of which is sloped toward the center of the kiln. Upon these I erect the movable flash-wall 17, composed of one tier of brick parallel with the flash-wall 15, laid without bond and following the same incline as the bull-heads. This accommodates the shrinkage of the wares. The tendency of the temporary wall 17 is to follow said shrinkage of the burning goods and prevent the escape of heat down the outside of the goods or the inside of the flash-wall 15 to the draft rows and into the stacks 33 to chimneys without passing through the goods. To prevent warping of the permanent flash-wall 15, the "foot-braces" 18 and "stops" 19 are

constructed at proper intervals between the main and flash walls, the heat from the furnaces passing upward between said stops over the flash-walls throughout the goods to be burned, (see Fig. 5,) the integrity of the outer walls being secured by the iron girders along the walls and girder-braces 20 set into the bottom of the kiln. Reverting to the furnaces 14, these are provided each with an air-duct 21, having a divergent orifice where it enters the furnace-dome, (see Fig. 6,) from thence forming into two branches with inlets 22 as it approaches the outer wall. In this manner the introduction of oxygen to unite with the exuding gases from the anthracite fuel greatly promotes combustion.

In Fig. 4 are located the uptake-stacks 23, (leading from the transverse quarter-flues 4,) communicating with the lower line of chimneys, the drafts of which are controlled by dampers 34, accessible from the exterior of the kiln. These are opened at the commencement of burning and accelerate the draft to clear the moisture from the goods, which is expelled through the quarter-flues 4, following arrows 35 to and out through said stacks 23. They are then closed during the continuance of the process.

The muffles 24 (fully described in my Patent No. 550,707) are introduced to illustrate their construction as forming a part of the flash-wall 15, as also to exhibit the passages 25, conveying hot air within said muffles and below the wares to be "fired." The introduction of this heated air facilitates the drying out of the green stock, which should be hastened to prevent water-smoking. Said air-passages 25 unite at the top of the furnaces 14, forming a single duct, with inlets in the outer wall, as at 26. Near the rear of the furnaces they descend below the floor and enter through the bottom of the muffles 24. (See Fig. 7.) By this arrangement both sets of said ducts 21 and 25 are brought into proximity with the fires in the furnaces, so that the additional air-supply is heated to efficiently accomplish its purpose. To feed the furnaces 14, openings 27, Fig. 6, are provided, which are closed temporarily by the flue-covers 28, each provided with a tapering draft-passage 29, which is controlled by the slide-brick 30, the furnace-grates being indicated at 31.

In Fig. 5 the direction of the hot-air currents or flames issuing from the furnaces are indicated by arrows 32, directing the circulation through the body of goods 12 to the bottom of the kiln along the main flues 1 and 2, Fig. 1, and thence through the uptake-stacks 33, communicating with the upper line of chimneys. It will be noted that the main flues 1 2, Fig. 1, conduct all the heat from the furnaces throughout the check and draft rows and subordinately assist the function of the quarter-flues to expel the moisture from the green wares in the early stage of burning.

In the operation of my improved kiln the

preliminary heating disperses the moisture from the green bricks through the transverse quarter-flues 4, leading to the lower line of chimneys, and accelerates the currents of air throughout the entire system of flues. The moisture being expelled in the direction of arrows 35, said dampers are closed, the heat then ramifying throughout the wares to and beneath the floor of the kiln and off through the upper line of chimneys. In the operation of burning, assuming the proper disposition of the bricks forming the skintle, draft, and check courses as previously described in detail, the goods to be fired are loosely piled, as in Fig. 5, within the area bounded by the flash-walls 15 17, the heat from the furnaces ascending upward between said flash-walls and the outer wall of the kiln, filling its dome, thence descending throughout the green wares, draft and check courses to the main flues 1 2 3, again ascending through the uptake-stacks 33, and escaping from the upper line of chimneys, as indicated by arrows 32. In the use of the muffles, Fig. 4, the wares are similarly disposed above corresponding skintle, draft, and check courses, the draft being augmented by the admission of air over the furnaces through the air-ducts 22, leading to the fires, and air-passages 25 26, leading to said muffles, the moisture and latent heat passing off through the uptake-stacks 23, communicating with the upper line of chimneys.

Having described the preferred method of making my improved brick-kiln, I desire not to be confined to a strict interpretation of the construction herein defined, but may employ such fair equivalent therefor as would come within the spirit of my invention.

I therefore claim—

1. In the floor of a kiln, the main flues 1, and 2, communicating with a series of chimneys on the crown of the kiln, the transverse quarter-flues 4, communicating with a series of chimneys at the foot of said crown, the former flues adapted to draw the heat from the furnaces through the kiln, and the latter arranged to carry the moisture out of said kiln substantially in the manner specified.

2. A kiln to burn clayware having a series of furnaces in the outer walls, provided with air-ducts 21 and 22 converging air over and to the fires, the spaces between the walls for passage of heat, the flash-walls 15, and the

capping 16 having its upper side sloping toward the center of the kiln, the movable flash-wall 17 thereon situated and adapted to follow the shrinkage of the burning goods substantially in the manner and for the purpose described.

3. A brick-kiln having the exterior walls provided with a series of stacks 23, the quarter-flues connecting with said stacks, the dampers in said stacks controlling the draft from the quarter-flues, the permanent flash-wall provided with foot-braces and means intervening between, the foot-braces to prevent warping of the walls substantially as set forth.

4. A kiln for burning brick provided with stacks 33, coacting main flues 1 and 2 connected therewith and means in the center flue for diverting the heat from the center of the burning-kiln, in combination with the quarter-flues 4, the stack 23 therewith communicating, and the draft, bond, and checking courses constituting the foundation of a brick-kiln.

5. In a muffle-kiln, a wall provided with air-ducts, 25 and 26 conveying air beneath the floor of the kiln and within the muffles, the said muffles provided with air-inlets through the bottoms thereof connecting with the air-ducts and means for the escape of moisture to the exterior of the kiln substantially as specified.

6. In a kiln provided with a series of furnaces having feed-openings above their grates, the flue-covers 28, the tapering draft-passages 29 in the lower plane of said covers, and means substantially as specified to gage and control the ingress of air to the said furnaces and passages.

7. In a brick-kiln wall having a series of vertical stacks for the elimination of moisture and heat, the combination with the foot-braces 18, the stops 19 and the upright girders along the outer walls, of the girder-braces set into the bottom of the kiln in a manner adapted to preserve the stability of the structure substantially as set forth.

Signed by me at Boston, Massachusetts, this 24th day of December, 1898.

ALFRED YATES.

Witnesses:

WILLIAM E. HUTCHINS,
HARRY I. CUMMINGS.