

No. 769,102.

PATENTED AUG. 30, 1904.

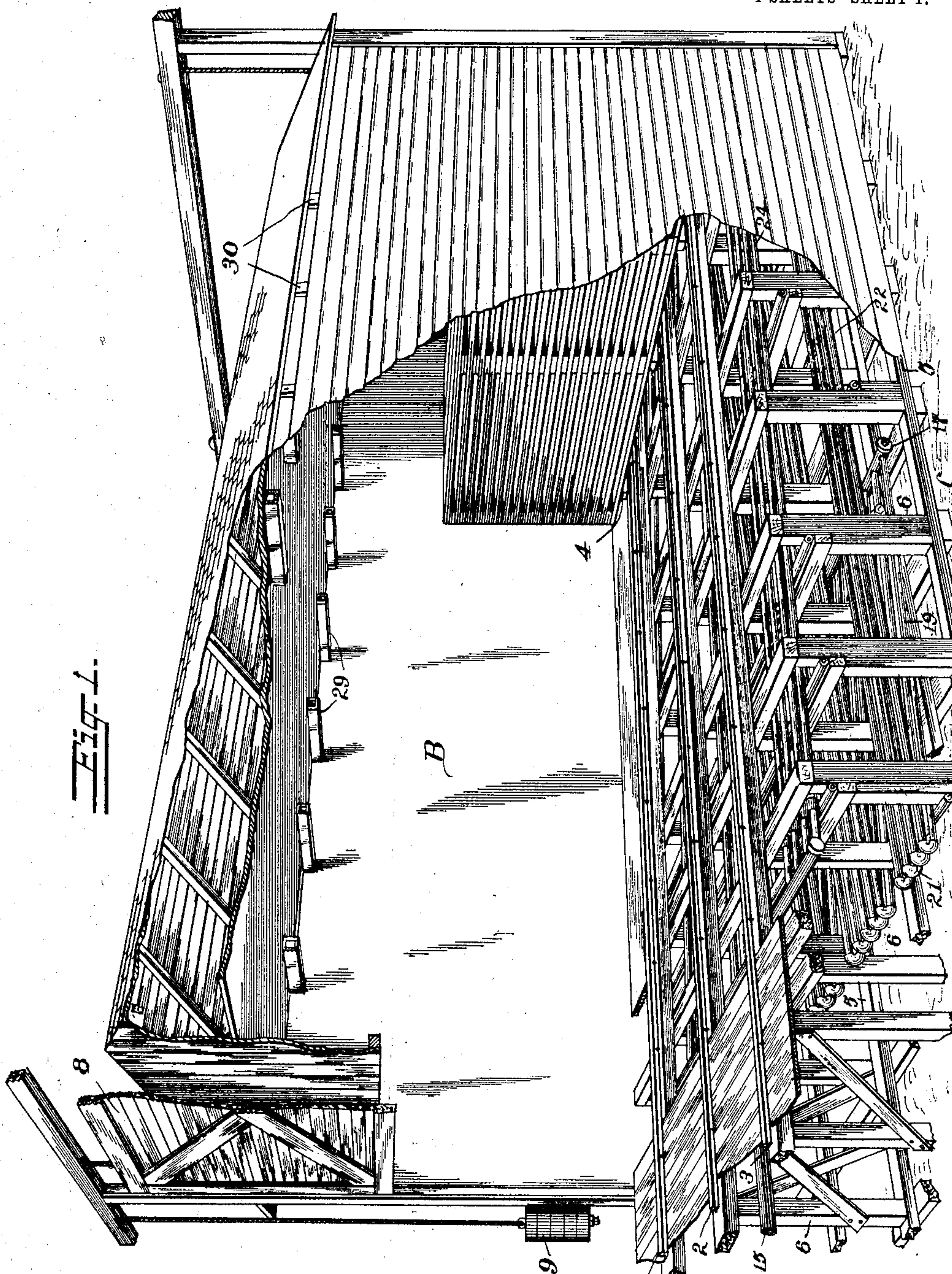
LA FAYETTE MOORE.

DRY KILN.

APPLICATION FILED DEC. 12, 1903.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses
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4 SHEETS—SHEET 2.

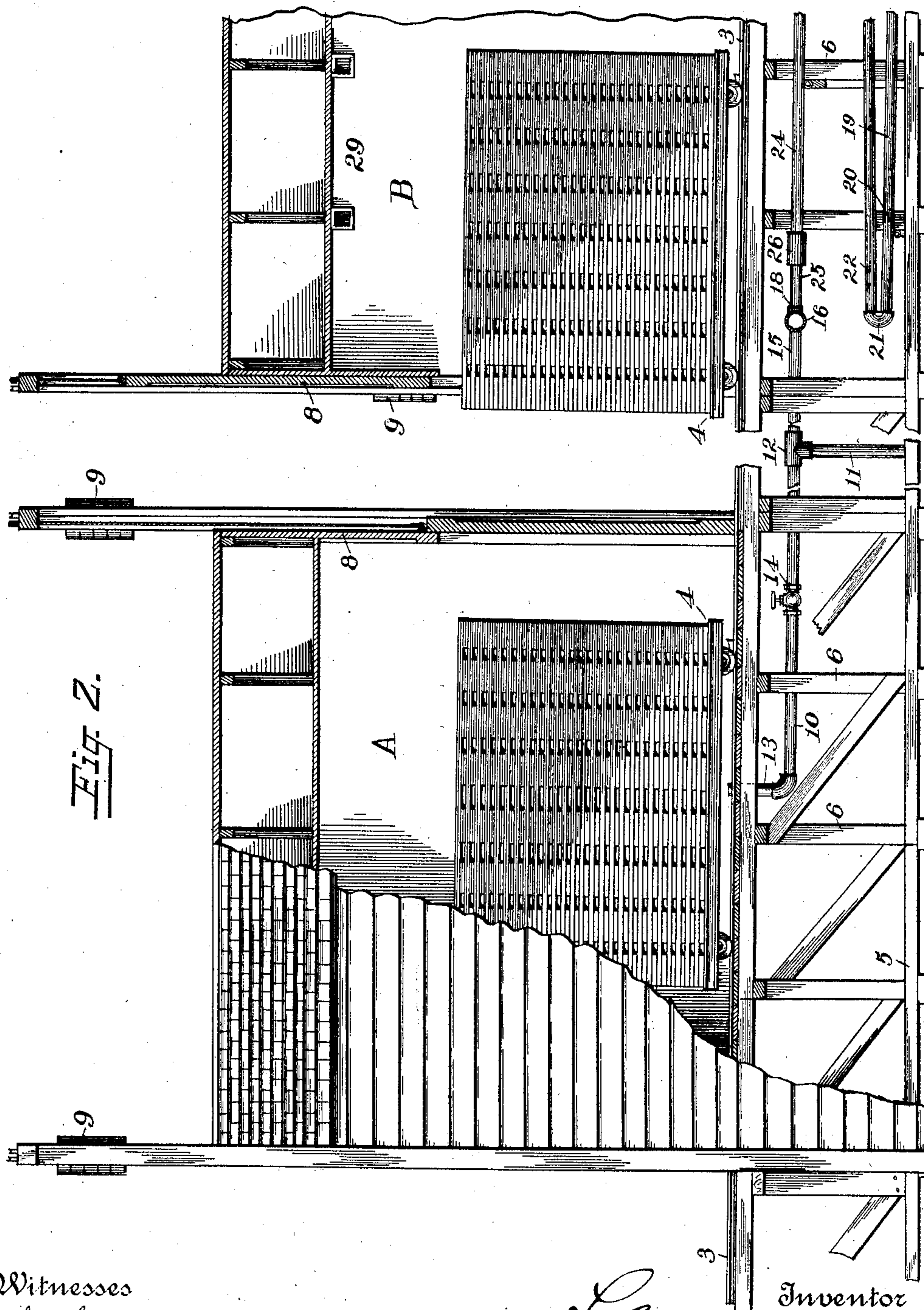


Fig. 2.

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4 SHEETS—SHEET 3.

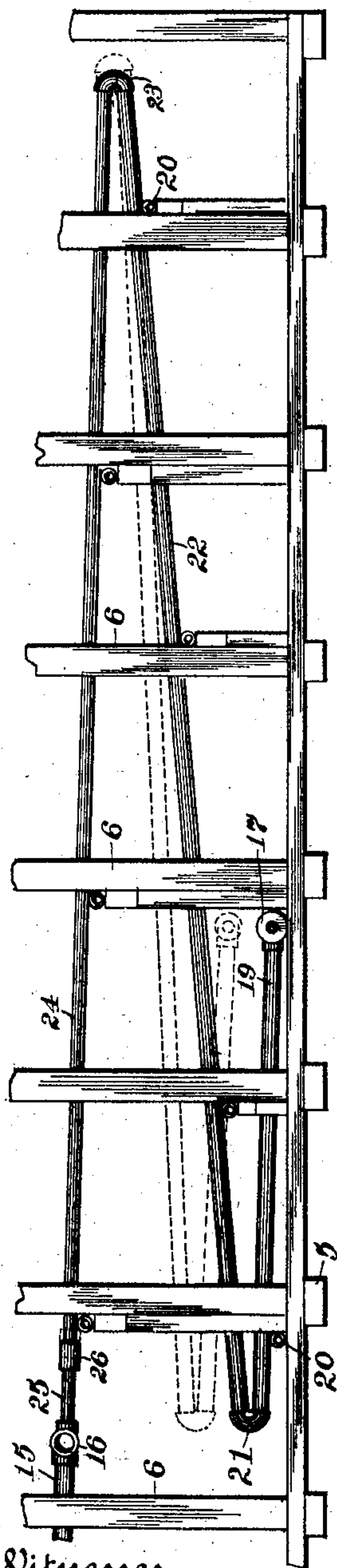


Fig. 4.

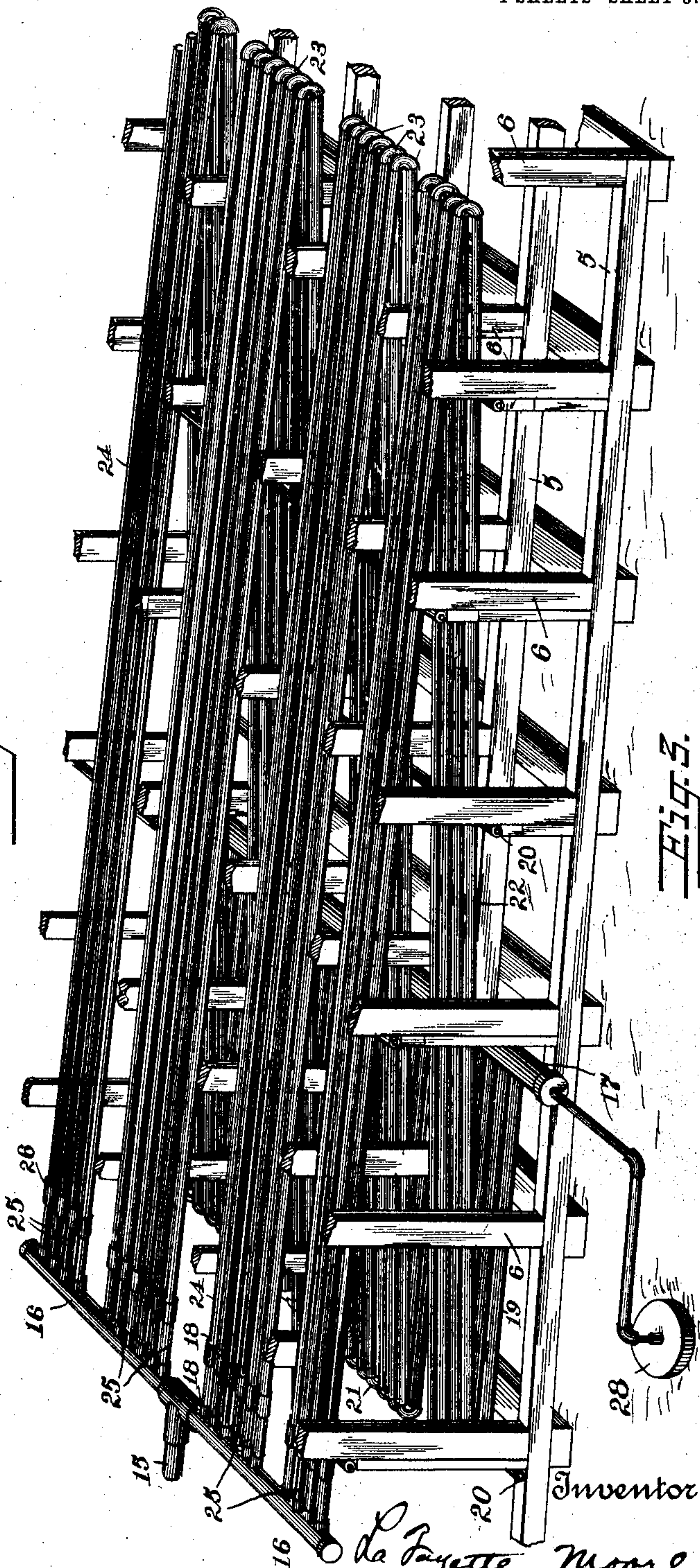


Fig. 5.

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4 SHEETS—SHEET 4.

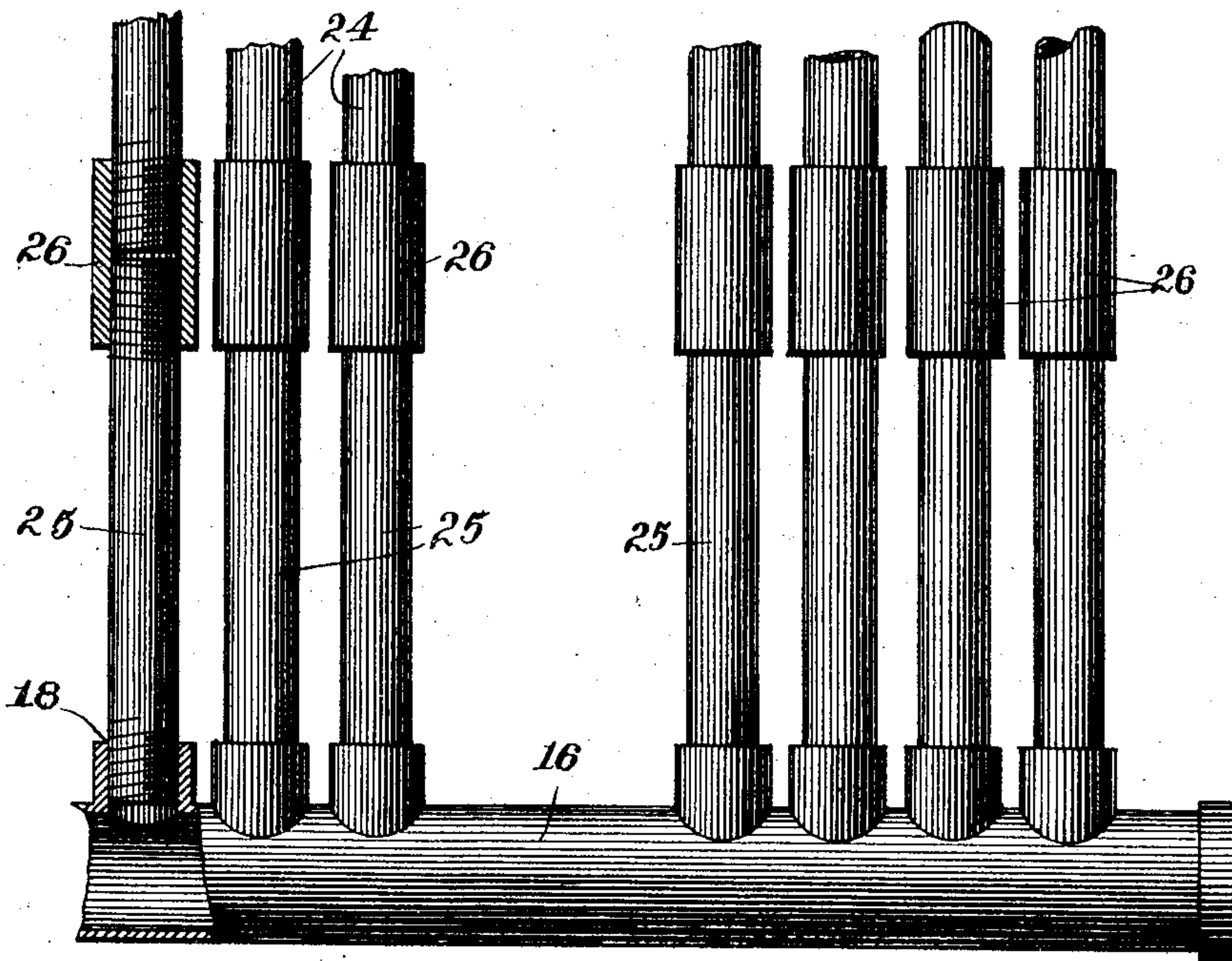


Fig. 5.

Witnesses

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UNITED STATES PATENT OFFICE.

LA FAYETTE MOORE, OF CORDELE, GEORGIA.

DRY-KILN.

SPECIFICATION forming part of Letters Patent No. 769,102, dated August 30, 1904.

Application filed December 12, 1903. Serial No. 184,931. (No model.)

To all whom it may concern:

Be it known that I, LA FAYETTE MOORE, a citizen of the United States, and a resident of Cordele, in the county of Dooly and State of Georgia, have invented a new and useful Improvement in Dry-Kilns, of which the following is a specification.

My invention relates to an improvement in dry-kilns of the class adapted more particularly for drying lumber.

Heretofore various schemes have been adopted for concentrating the heat, and various attempts have been made for maintaining an even temperature throughout the kiln. For instance, it has been proposed to take in air at the bottom and circulate it throughout the interior of the kiln, the entire upper portion of which was air-tight, and then recirculate the air from the top of the kiln by conducting it downward through flues at the sides. It was also proposed to absorb the moisture by providing a layer of absorbent material, such as sand, at the base in a kiln whose top was air-tight and which had air-flues at the base; but my present invention contemplates a kiln-chamber which is practically air-tight at the base and sides and sealed at the top a short distance above the lumber and provided immediately below the ceiling with ventilating-ducts the outlets of which are controlled by pop-valves which are automatically opened and closed by the pressure of the confined gases within, and in my present invention the only air admitted from below is supplied through the cracks or crevices at the doors or between the doors and door-jambs.

Attempts have been made heretofore to allow for the expansion in the steam-pipes to prevent their buckling, and consequently working loose in the joints, and this has been done by inserting in the battery of the pipes a smaller section which would yield and expand more readily than the remainder of the piping, with the idea of thus saving the joints from the vibration and strain which would otherwise be sustained by them. The movement of the heating means is provided for in my present invention by a peculiar piping system which admits of expansion and con-

traction without subjecting the joints and elbows to strain and which also facilitates in the operation of coupling them up to the header in setting up the battery in the original construction or the repair of the kiln.

In this provision of piping and construction of battery there is a still more important object, which is the doubling of the heating surface or capacity at the charging end of the kiln, where the wet and green lumber is first run into the kiln, as contradistinguished from schemes heretofore proposed in which it was the purpose to obtain the maximum heat at or near the discharge end of the kiln.

It is a primary object, therefore, of my invention to obtain and concentrate a maximum amount of heat at the forward end of the kiln.

In connection with the foregoing my present invention also consists in means for heating and ventilating the kiln in such a manner as to hold the moisture expelled from the green and wet lumber in suspension at an even temperature throughout the interior of the kiln, so that all portions of the contents are treated alike and uniformly and at the same time with the greatest economy in the expenditure of heat by applying and utilizing the maximum amount of heat at the entrance of the kiln, where the lumber to be treated is the greenest and the wettest, and in making this provision my invention consists in a battery of pipes so constructed and arranged that expansion is provided for without injury to the joints, which heretofore has weakened them and caused leakage.

It still further consists in a system of heating and ventilating which precludes the possibility of explosion or combustion by the ignition of gases, all of which I accomplish by maintaining a practically even temperature and uniform moisture throughout the entire interior of the kiln, just so much fresh air being supplied as is necessary through the door-cracks, therefore in very limited quantity, and just so much of the heated air and moisture being discharged at the top of the kiln as the uniform integral pressure causes to automatically escape.

My invention further consists in certain novel features of construction and combina-

tions of parts, which will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in perspective looking into the interior of the kiln, portions of the outer wall being removed. Fig. 2 is a view in side elevation and partly in section, showing the relation of the scalding-box and kiln. Fig. 3 is a perspective view of the battery. Fig. 4 is a side view of the same. Fig. 5 is an enlarged detail view of the header 16 and its connected parts.

A represents the scalding-box, and B is the kiln, the two being located in comparatively close proximity to each other—say about two feet apart—to afford sufficient space for a person to pass between them. The scalding-box and kiln are located on a suitable platform, and the tracks 1, 2, and 3 continue right through the two on a gradual incline in order to facilitate the movement of the trucks 4 4 from one to the other and throughout the lengths of the two buildings. These buildings are erected upon a suitable foundation or framework of horizontal and upright timbers 5 and 6, respectively, which affords a suitable space below the track-line for the heating apparatus. The usual doors 8 8 are provided for the scalding-box and kiln, weights 9 9 being provided to counterbalance them and to facilitate in opening and closing them. The purpose of the scalding-box is for steaming hard lumber preparatory to the dry-kiln process, and by the use of this scalding-box the hard lumber is brought to a condition somewhat similar to pine and other soft lumber in readiness to be subjected to the same kiln-drying process for practically the same length of time that the softer lumber requires—say from forty-eight to seventy-two hours. This scalding-box may be heated in any convenient manner, and an approved plan for accomplishing it is to run a branch pipe 10 from the main 11, to which it is coupled by the T-coupling 12. This branch pipe 10 is provided with a discharge-nozzle 13 and a valve 14 for controlling the discharge of steam into the box. Independent pipes could of course extend from the boiler (not shown) to the box and kiln. From the opposite end of the T-coupling 12, a pipe 15 leads into the base of the kiln B to a header 16, through which the steam is distributed into the battery. This battery will now be described, and with the idea of following out its plan of construction, let us commence with the opposite or lower end. A header 17 of the same size and corresponding to the header 16 is laid across the base of the kiln a suitable distance from its forward end—say twenty feet, although, of course, this, like all of the dimensions, is susceptible of infinite variation. The horizontal distance represents, approximately, the aggregate length of two loads or trucks of green and wet lumber, and between them the maximum heat is

generated—namely, at the entrance of the kiln, where the green and wet lumber is first run into it. This header, like header 16, is provided with as many threaded holes 18 18 as there are pipes across the battery, in practice there being about fifty-six of these, although I have not attempted to show so many, since I have no intention of limiting myself to exact numbers. In the construction of the battery the short pipes 19 19 in, say, twenty-foot lengths are first screwed into the holes 18 18 of the header 17, they being supported upon an incline on the transverse bearing-pipes 20 20, a number of which are secured upon the two-by-four cross-beams nailed to the uprights. The return-couplings 21 21 are screwed to the forward ends of the pipes 19 19. Pipes 22 22, in length approximately corresponding to the length of the kiln—say in the neighborhood of eighty feet in length—are let in from the discharge end of the kiln, they being placed upon an incline on the bearing-pipes 20 20 and screwed at their forward ends into the return-couplings 21 21. Similar couplings 23 23 are screwed to the rear ends of these pipes 22 22, and the long pipes 24 24, constituting the upper heating-surface of the battery, are then screwed into these return-couplings 23 23, they resting, like the other pipes, upon transversely-disposed bearing-pipes 20 20. This upper series of pipes 24 24 are purposely made about a foot shorter than the pipes 22 22 or so as to reach within about twelve inches and a quarter of the header 16. Short nipples 25 25, twelve inches in length, of the same sized piping are screwed into the header 16, one for each of the pipes 24 24, they terminating in alignment therewith and about a quarter of an inch therefrom, and the adjacent ends of the pipes 24 and nipples 25 have right and left threads and are fastened together by the right and left unions 26 26. The purpose of this arrangement will now be briefly described. The coupling up to the ends of the nipples is the last thing to be done in the construction of the battery. The pipes are, of course, long and heavy; but when thus constructed, arranged, and supported it is simply necessary to raise the pipes one after another at the joint 21. This causes the upper pipe 24 to pull backward a suitable distance from the end of the nipple to receive the two-inch union 26 26. This union 26, which has right and left threads, is then inserted between the adjacent ends of pipe 24 and nipple 25. The union is then turned and the end of the pipe at joint 21 is gradually lowered until the three leads of pipe become seated on their bearings, when they will have been coupled together.

My object in explaining this method of construction so minutely is primarily to emphasize the fact that the same freedom of movement due to the flexibility of the pipes and their freedom from one another at the joints

21 at the forward end of the kiln permits the expansion which takes place in the introduction of steam to the battery without racking, straining, or warping the pipes, but admitting
 5 of their creeping on the supporting-pipes 20. Others have provided a flexible section to allow for this uneven expansion and bowing of the pipes; but I have provided for it by giving them perfect freedom of movement
 10 throughout their entire lengths from one header to the other, the header 17 acting as a bearing or support from which point the several pipes in expanding may rise, as indicated by the dotted lines, without straining
 15 or weakening their joints and couplings or in any wise injuring the connected parts. This effect will not take place if the pipes are connected together across the kiln by a header, for instance, at the joints 21; but to accomplish the desired end there must be freedom
 20 of movement at that point. While thus providing for the expansion and contraction of the pipes without buckling and straining the joints and couplings, at the same time I provide for maximum heat by greatly increasing
 25 the heating-surface at the entrance of the kiln directly under the green lumber. Also it will be noticed in the arrangement of the battery that an incline is given to the entire
 30 battery in a zigzag from header to header, thus providing for a natural flow of the condensed steam to the lower header 17, whence it escapes to a suitable trap 28 provided therefor.

35 It is hardly necessary to repeat in this application what I have so fully stated in the patent above referred to about the heating up to boiling-point and the creation of steam by heating the sap of the wood to a
 40 point of vaporization. I will merely state in conclusion that my system of ventilation and applying heat is such that the heat is utilized economically, it is concentrated, and the heat and steam generated from the lum-
 45 ber being dried are evenly disseminated throughout the entire interior of the kiln, the moisture being held in a state of suspension in order to protect the outside surface of stock and not precipitated, so that the
 50 lumber is uniformly subjected throughout its entire surface to an even heat and moisture, thus preventing hollow-horn, checking, and case-hardening.

It is evident that slight changes might be
 55 resorted to in the form and arrangement of the several parts described without departing from the spirit and scope of my invention, and hence I do not wish to limit myself to the exact construction herein set forth.
 60 For instance, a number of these kilns and scalding-boxes might be arranged side by side, according to the size of the plant to be constructed and the capacity for work required.

65 Having fully described my invention, what

I claim as new, and desire to secure by Letters Patent, is—

1. The combination in a kiln, of a heat-radiating battery comprising a single inlet and a single outlet header arranged transversely of
 70 the kiln and on different levels, the headers located at the same end of the kiln and at a vertical distance apart from each other equal to the width approximately of two loads of
 75 lumber, a plurality of pipes leading from one header to the other upon zigzag inclines and means for loosely supporting each lead of pipes.

2. The combination with a kiln, of a heating-battery comprising two headers located at the
 80 inlet end of the kiln, and a plurality of pipes leading in a zigzag direction from the inlet end to the discharge end of the kiln, a return lead of pipes extending from the discharge end of the kiln back to the inlet end and a
 85 short lead of pipes connected with the inlet ends of the return-lead and extending part way only toward the rear end of the kiln, the short lead of the pipes connected with the exhaust-header, and means for loosely support-
 90 ing the pipes.

3. The combination with a kiln, of a heating-battery comprising an inlet and an outlet header located at the receiving end of the
 95 kiln and spaced apart from each other, the outlet-header located nearest the center of the kiln, a short lead of pipes connected with the outlet-header and extending toward the receiving end of the kiln, a return lead of pipes
 100 connected with the free ends of the short lead of pipes and extending from the receiving end of the kiln to the discharge end thereof, a second lead of pipes connected to the free ends of the return-lead and extending forward
 105 to a point adjacent the inlet-header, a plurality of nipples secured directly to the inlet-header and extending toward the last-named lead of pipes and in alinement therewith and means for connecting the adjoining ends of
 110 the nipples and pipes.

4. The combination with a kiln, of a supply-header located at the receiving end of the kiln, an exhaust-header located on a plane beneath the plane of the supply-header and at the receiving end of the kiln, a lead of pipes extend-
 115 ing from the supply-header toward the discharge end of the kiln for approximately the entire length of the kiln, a return lead of pipes extending nearly to the receiving end of the kiln, and a short lead of pipes connect-
 120 ing the return lead of pipes and the exhaust-header, a maximum amount of heat being radiated at the receiving end of the kiln and a constant circuit of caloric maintained through
 125 the battery.

5. The combination with a kiln, of a heating-battery comprising supply and exhaust headers, each located at the receiving end of the
 130 kiln and being loosely supported, a plurality of rows of piping extending longitudinally of

the kiln in a zigzag direction between the supply and exhaust headers, the pipes only loosely resting upon suitable supports, and nipples connecting the rows of pipes and the
5 supply-header, to permit movement of either header.

In testimony whereof I have signed this

specification in the presence of two subscribing witnesses.

LA FAYETTE MOORE.

Witnesses:

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WATTS T. ESTABROOK.