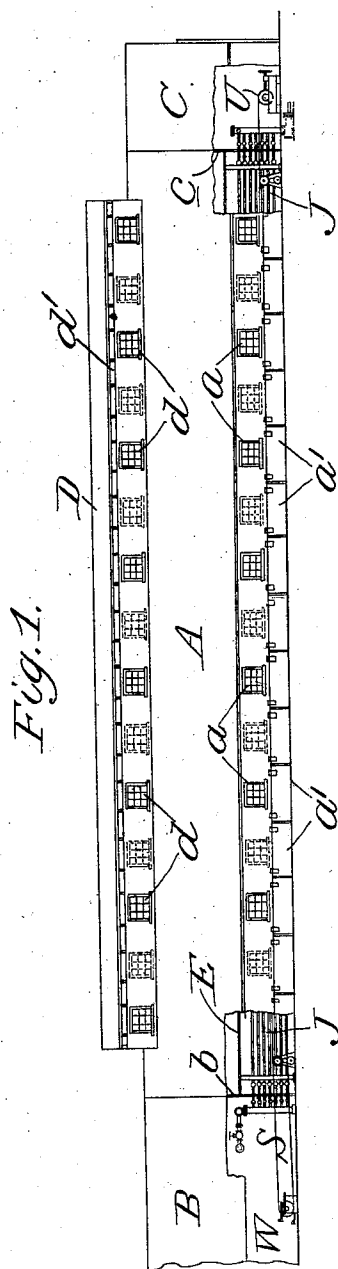


1,011,465.

W. R. MARTIN.
BRICK DRYING PLANT.
APPLICATION FILED APR. 8, 1907.

Patented Dec. 12, 1911.
6 SHEETS—SHEET 1.



Witnesses;
Ole. Burdum
Edward R. Witman

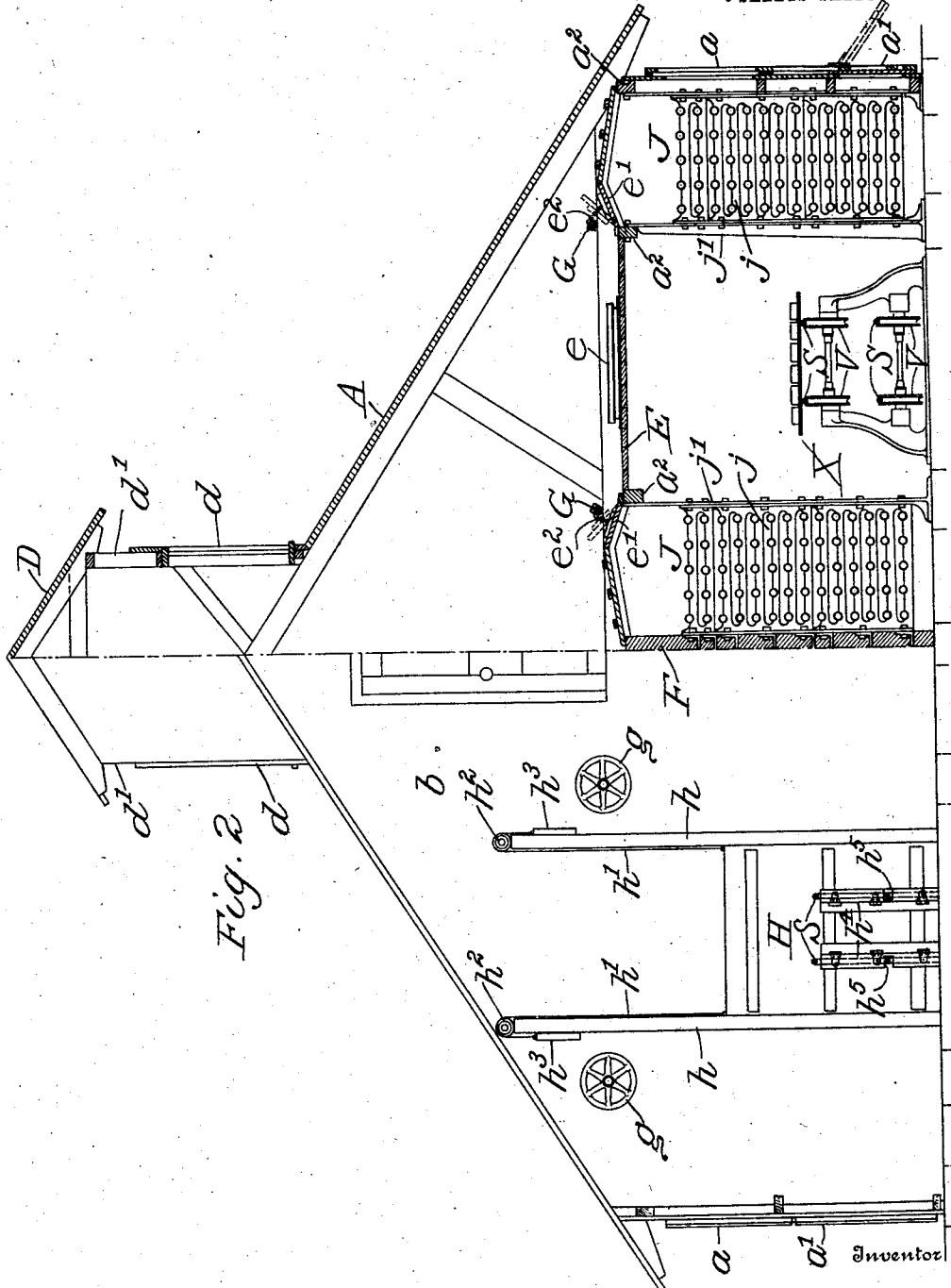
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6 SHEETS—SHEET 2.

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Witnesses
W. R. Burdine
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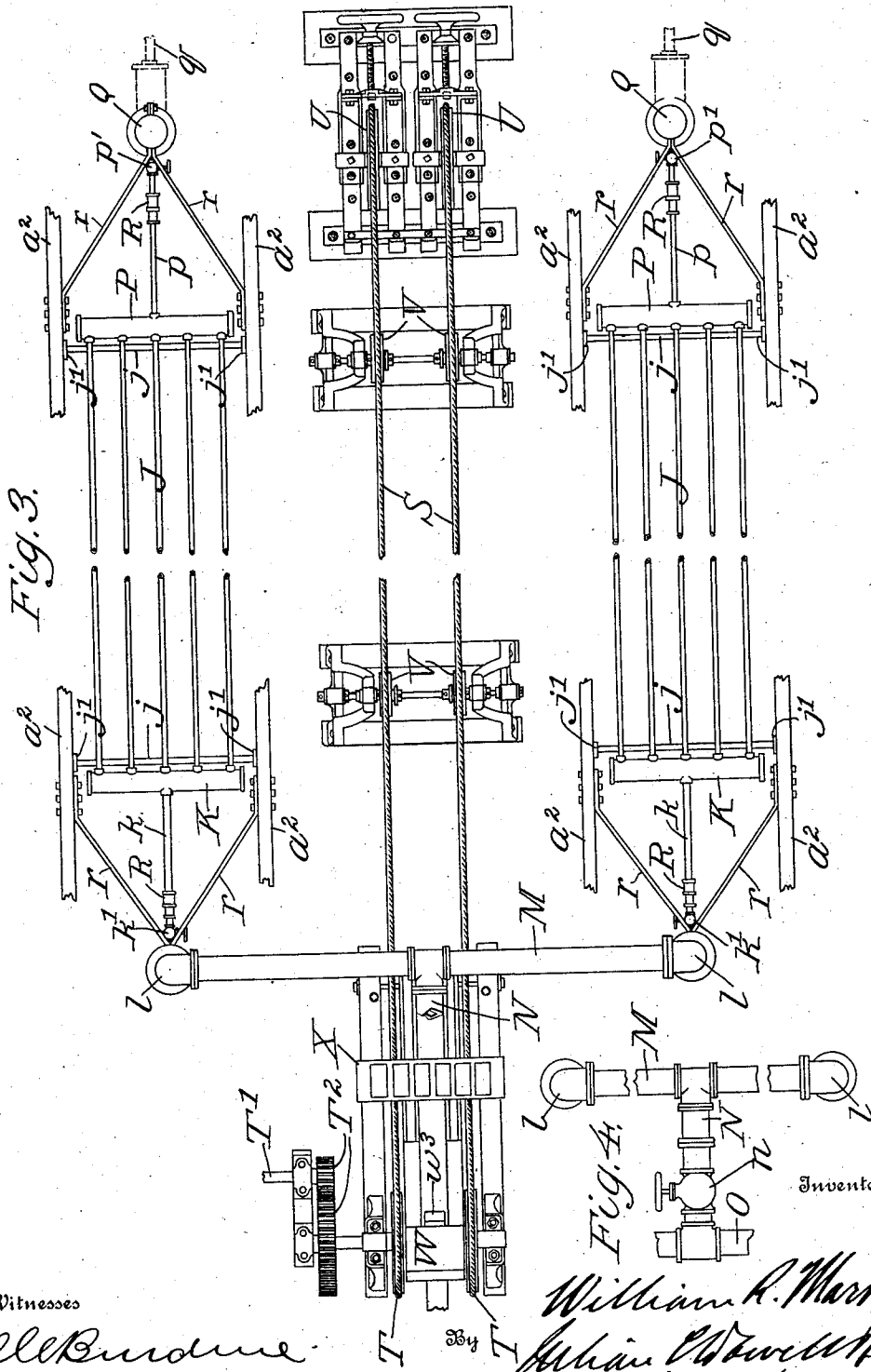
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6 SHEETS-SHEET 3.



Witnesses

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6 SHEETS—SHEET 4.

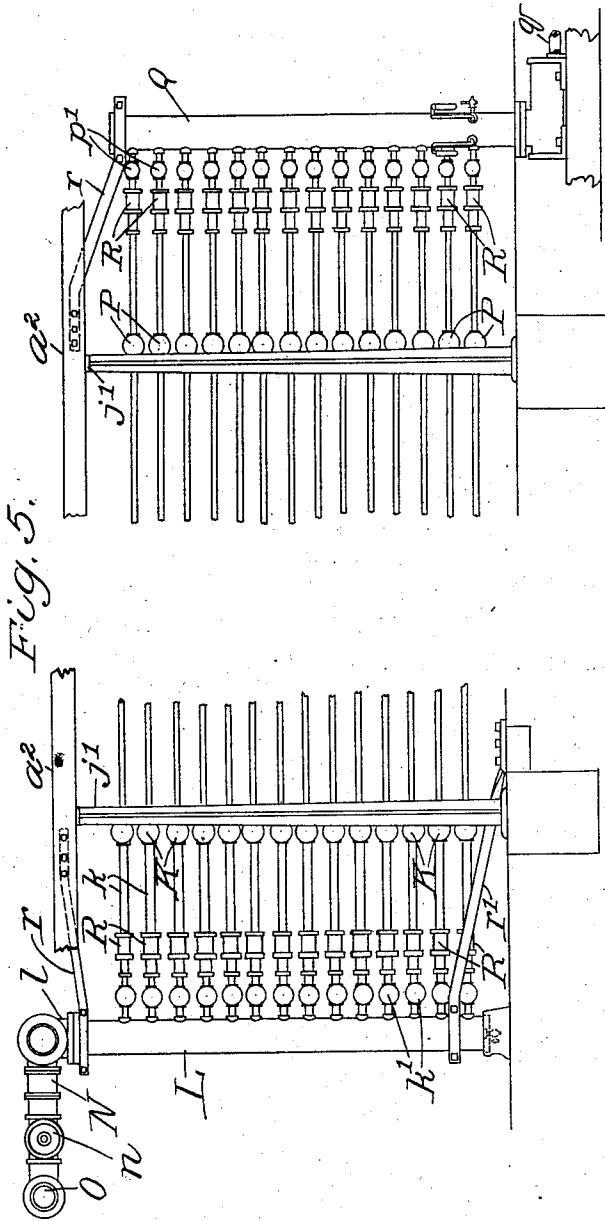


Fig. 5.

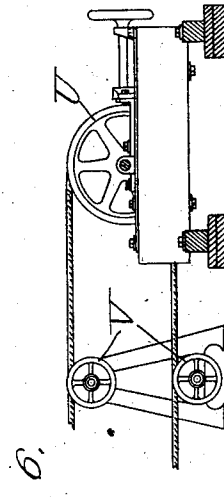
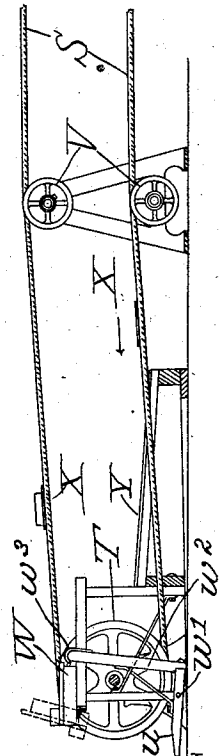


Fig. 6.



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6 SHEETS—SHEET 5.

Fig. 8.

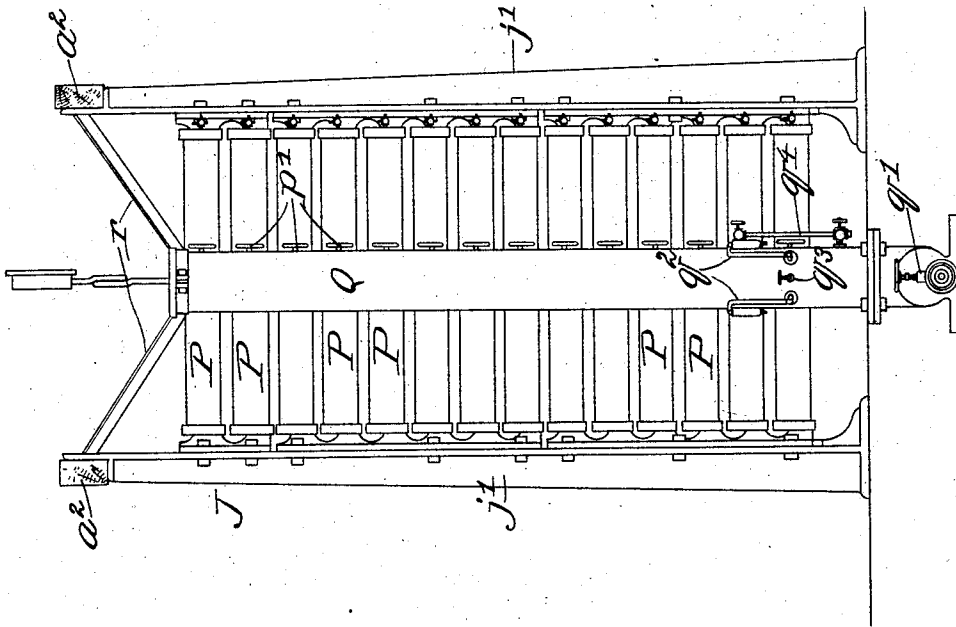
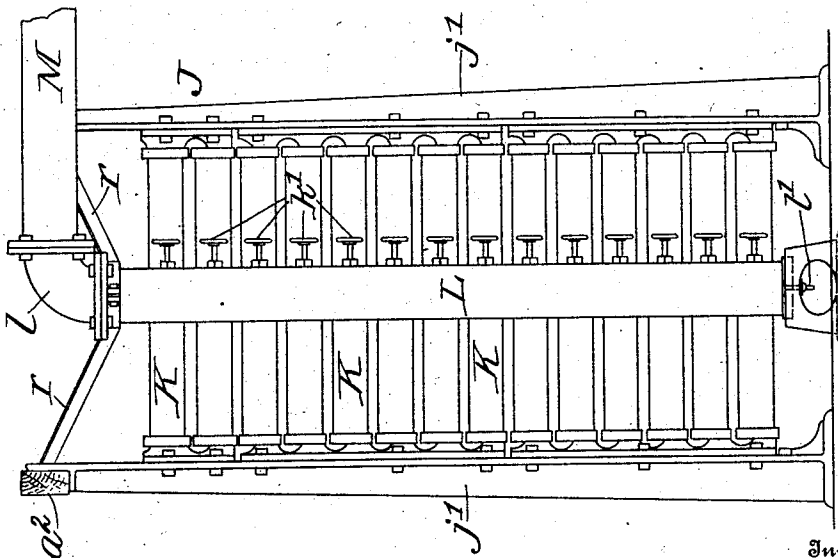


Fig. 7.

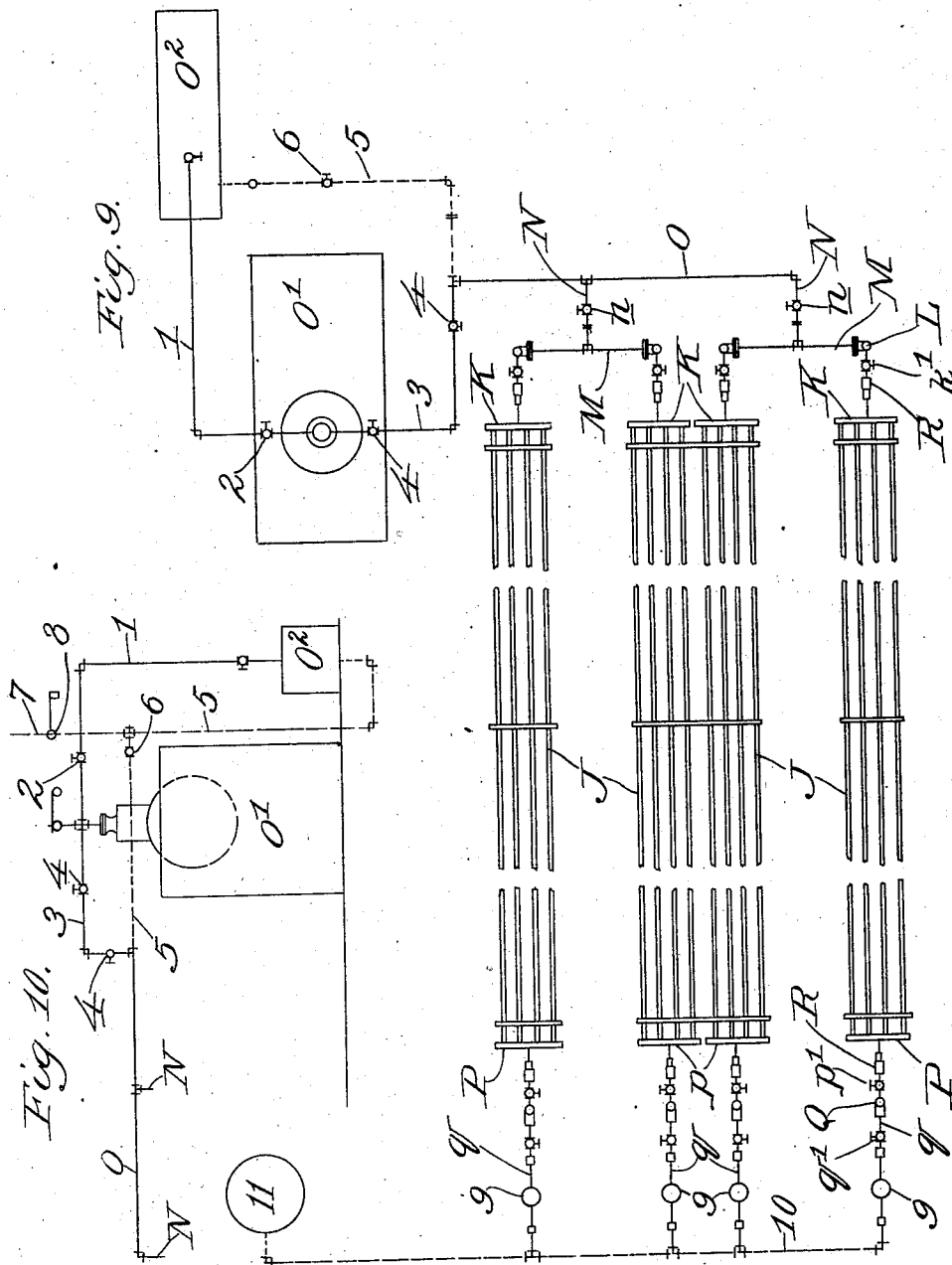


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UNITED STATES PATENT OFFICE.

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BRICK-DRYING PLANT.

1,011,465.

Specification of Letters Patent.

Patented Dec. 12, 1911.

Application filed April 8, 1907. Serial No. 367,045.

To all whom it may concern:

Be it known that I, WILLIAM R. MARTIN, a citizen of the United States, residing at "The Hedges," Lancaster township, just outside of the limits of the city of Lancaster, and in the county of Lancaster and State of Pennsylvania, have invented certain new and useful Improvements in Brick-Drying Plants; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to brick-drying plants, or apparatus, comprising a drying-house or building having suitable drying-rooms or chambers provided with doors or dampers for controlling the drafts and admission of outside air, and containing parallel steam-pipe drying racks (consisting of superimposed layers or shelves of pipes or tubes connected with a source of steam-supply), and with endless cable-conveyers running in or through aisles or passage-ways between the said steam-pipe racks for transporting the bricks into and from the drier, the green bricks to be dried being supported upon steel or metallic pallets which are deposited upon the cables and delivered thereby to workmen inside the drying-rooms who remove such loaded pallets and place them upon the pipe-shelves.

The main objects of my invention are: first, to provide a highly efficient and practicable apparatus for drying the bricks by steam heat, assisted as may be desirable by the weather or by drafts for drawing off or expelling moisture and vapor with means for adequate regulation of these drying agencies as the atmospheric or climatic conditions or the varying state of the bricks may demand; second, to allow for holding the vapor arising from the bricks until the proper period, and then quickly disposing of such vapor, in order to promote rapid drying and to carry out the process in the most beneficial manner in each particular case; third, to afford improved facilities and conditions for carrying on the work; fourth, to dispense with the need of off-bearing boys or barrow men for carrying the loaded pallets of bricks to and from the drying-racks; and fifth, to improve the general construction and increase the efficiency of operation of brick-driers of the steam-pipe rack class.

With the aforesaid objects in view, my invention will hereinafter be fully described by reference to the accompanying drawings, which are to be taken as a part of this specification, and will then be more particularly pointed out in the appended claims.

In said drawings: Figure 1 is a side elevation of a brick-drying-house or plant embodying my invention, the outside walls of the end-portions of the house being shown partly broken away to disclose the inside steam-pipe racks and conveyer. Fig. 2 is an enlarged view of the drying-house, half in end elevation and half in cross-section. Fig. 3 is an enlarged plan view of one of the steam-pipe driers, for one drying-room or chamber, the said drier being in two branches comprising parallel pipe-racks with an intervening aisle or passage-way in which runs an endless cable-conveyer for transporting the pallets of brick between the racks. In this view, only the opposite or front and rear end portions of the steam-pipe racks and conveyer are represented, the intermediate portions thereof being broken away for lack of space in the drawing. Fig. 4 is a detail plan view of parts of the pipes or manifolds for supplying steam to the steam-pipe racks. Fig. 5 is a side elevation of the steam-pipe racks shown in Fig. 3. Fig. 6 is a side elevation of the endless cable-conveyer running in the aisle or passage-way between the pipe-racks, and with a dump-board at the head end of the conveyer for loading the pallets from the brick-molds. Fig. 7 is a front end elevation of one of the steam-pipe drying-racks. Fig. 8 is a rear end elevation of the same. Fig. 9 is a diagrammatic plan of the steam-pipe racks showing connections with a steam boiler and engine. Fig. 10 is an end elevation of the engine, boiler and steam pipe connections.

In Fig. 1 of the drawings, A denotes an elongated house or building, termed the "drying-house," which contains the steam-pipe driers heretofore referred to. As shown, the front end of said drying-house adjoins a separate room B, which may be termed the "machinery-room," as it houses or contains the brick-making machine (not shown) and other mechanisms as the pug-mill, clay conveyers, etc., for operating the plant. Said machinery-room B may be a separate house, but is shown as a continu-

ation of the drying-house A, the latter being partitioned therefrom by its front end-wall *b*. At the opposite end, the drying-house is likewise partitioned by its rear end-wall *c* from a rear vestibule or shed C, housing the tensioning mechanism of the conveyer-cables, as hereinafter explained. The drying-house A is a closed roofed structure. Its sides are provided with a series of lights or windows *a*, arranged preferably in alternating positions at opposite sides of the building, as indicated by dotted lines in Fig. 1. Below said windows are a series of doors *a*¹, which may be either fitted to slide up or hinged as shown so as to be swung outwardly and propped up. The purpose of said doors *a*¹ is to allow the sides of the drying-house to be opened up at the bottom for admission of air and drafts or winds when desired. The roof of the building is shown constructed with a ventilating monitor D, the sides of which below the monitor-roof have longitudinal off-draft openings *d*¹ therein and are provided with a series of lights or windows *d*, arranged similarly to the windows *a* in the sides of the house. A desirable spacing for the windows *a* and *d* would be one at every eight feet.

As shown in Fig. 2, the drying-house A is internally constructed with a horizontal partition E, which is above the side-lights *a* and constitutes the ceiling of the drying-room or rooms. In the illustrated embodiment of my invention, there are two drying-rooms or chambers, extending through the length of the house and separated by an intermediate partition of wall F. The left-hand drying-room is of course not seen in Fig. 2, being behind its front end-wall *b*. Each drying-room contains a steam-pipe drier comprising two parallel branches or racks J, with an intervening aisle or passage-way, as shown at the right hand side of Fig. 2. The ceiling E has a series of sky-lights *e* above said aisle or passage-way, so as to light up the drying-rooms from the windows *d* in the roof of the building, in addition to the lights afforded by the side-windows *a*. The sky-lights *e* for each drying-room are by preference spaced to correspond with the monitor lights *d* at the opposite side of the building; for example, the sky-lights at the right-hand side are respectively placed opposite the monitor-lights *d* at the left-hand side. Only one sky-light is shown in Fig. 2, it being understood however that there are a series extending above the aisle or passage-way between the racks. Above the respective drying-racks, the ceiling or partition E is provided with longitudinally disposed hinged boards *e*¹ constituting draft doors or dampers. These hinged doors *e*¹ are shown closed in Fig. 2, but are adapted to be opened by raising them to the positions indicated by dotted

lines, for the purpose of enabling the moisture and vapor in the drying-room to rise and escape, as will be explained later. Said doors are shown connected by chains *e*² with long shafts or rods G, the ends of which outside the end-wall *b* of the drying-house are provided with hand-wheels *g* for turning said rods in order to open or raise the doors. For access to the aisles or passage-ways between the drying-racks, suitable doors H are provided in the end-walls *b* and *c* at both ends of the drying-house. In this instance, where one of said doors appears at the left-hand side of Fig. 2, it is represented as a vertically sliding door arranged between suitable guide-ways *h* therefor and suspended by ropes *h*¹ passing over pulleys *h*² and having counterweights *h*³. Said door H has in its lower portion vertical slots or openings to allow the door to be raised or lowered without obstruction from the conveyer-cables S, said slots or openings being covered by small supplementary hinged doors *h*⁴, provided with notches *h*⁵ to accommodate the cables, so that upon opening said supplemental doors *h*⁴, the main doors H can be lifted or lowered. Access to the interior of the house above the ceiling E may be afforded, if desired, by a door I.

The drying-racks J, as before noted, comprise superimposed shelves or layers of steam-pipes, upon which are placed the metallic pallets for supporting the green brick to be dried. As shown in Figs. 2 and 5 the steam pipes constituting the racks run longitudinally of the building and are supported in metal frames *j*, the side-standards *j*¹ of which are shown erected upon foundation blocks sunk or buried in the ground. The drying-house is or may be practically constructed upon the rack-frames, the beams *a*² upon which the roof is erected being shown mounted upon the upper ends of the standards *j*¹. The structural formation of the building may be of any suitable character.

The pipe-connections for supplying steam to the drier may be of any competent mechanical construction. As represented in Figs. 3, 5 and 7, the front ends of the pipes of each rack J are connected to a set or series of pipes or manifolds K, shown as horizontal pipes with closed ends, one being provided for each pipe-shelf. The sets or series of manifolds K are respectively connected by pipes *k* to a single supply-manifold L, shown as a vertical pipe having a closed bottom. Both of said vertical manifolds L, that is the manifolds for the two racks of one drier, are shown connected by elbow-joints *l* to an overhead pipe M arching or spanning the conveyer which travels in the aisle between the pipe-racks. The overhead pipes M for both drying-rooms are independently connected by pipes N with a common steam-supply-pipe O, as shown in Figs. 4 and 5.

Said pipe O may be in communication with any suitable source of steam-supply, as a steam-boiler or the exhaust steam of the engine which drives the machinery. The pipes N are shown provided with gate-valves n , or they may be provided with other competent valves, for independently controlling the supply of steam to each drier. In addition to the regulation afforded by said valves n , the supply of steam may also be controlled for each individual pipe-shelf of each rack by means of valves or cocks k^1 placed in the pipes k between the horizontal manifolds K and vertical manifolds L. Drip-cocks l^1 may be placed at the bottoms of the vertical manifolds, in the hollow bases therefor, as shown in Fig. 7. At the rear ends of the pipe-racks, the steam-pipes of the several shelves are likewise shown connected to horizontal exhaust manifolds P, which are connected by pipes p with a vertical manifold Q having a closed top and having its bottom in communication with an outlet pipe q for discharging the water of condensation from the steam-pipes. See Figs. 3, 5 and 8. The outlet pipe q may be provided with a regulating valve or cock q^1 , shown only in Fig. 8. In Figs. 5 and 8, q^2 denotes automatic air-valves provided at the lower part of the vertical manifold Q; the symbol q^3 denotes a vent cock, and q^4 denotes a water glass. In this connection it may be noted that the steam-pipe racks preferably slant downwardly from the front toward the rear of the building, the purpose of which is to give sufficient inclination to allow the water of condensation to pass off readily to the exhaust-manifolds at the rear. This explains why the rear ends of the racks and the conveyer are shown at a lower relative position than the front ends in Figs. 5 and 6. The pipes p between the horizontal exhaust manifolds P and vertical exhaust manifolds Q may be provided with valves or cocks p^1 for controlling the exhaust from each individual pipe-shelf, and to allow holding the steam in the pipe-shelves as desired.

The steam-pipe racks as illustrated and described embody means for allowing for expansion and contraction of the steam-pipes, which will be briefly explained. As shown, the horizontal supply manifolds K at the head-end of the pipe-shelves and the longitudinal exhaust manifolds P at the rear ends are rigidly connected to and carried by the respective pipe-shelves, which may move freely in their supporting frames j ; the ends of the longitudinal steam-pipes being screwed in nipples on the manifolds; and the pipes k and p connecting respectively the said horizontal manifolds K and P with the adjacent vertical manifolds L and Q are provided with steam-tight expansion or slip joints R, which amply allow for expansion

and contraction of the steam-pipe shelves. The vertical manifolds L and Q at the head and exhaust ends of the racks are rigidly-connected by braces r with the supporting structure of the pipe-racks J (either to their standards j^1 or the beams a^2 secured to said standards), whereby the vertical manifolds L and Q are held rigid while the pipe-shelves as a whole may move longitudinally under influence of the variations in temperature to which the steam pipes are subjected.

In Figs. 9 and 10, showing a diagram of the steam-pipe racks and connections with the engine and boiler, the symbol O^1 denotes a steam boiler, and O^2 is the engine which drives the brick-press and other machinery of the plant. The numeral 1 denotes a live steam pipe from the boiler to the engine, said pipe being provided with a regulating cock or valve 2. From the boiler, live steam may be conducted by a pipe 3, provided with valves 4, to the aforesaid pipe O which furnishes the supply to the two driers. Exhaust steam from the engine may also be conducted by a pipe 5, provided with a regulating cock or valve 6, to the same common supply pipe O, said supply pipe O being shown connected by a T-joint with the pipes 3 and 5. The pipe 5 is shown with an extension pipe 7 leading up through the roof of the house, said extension being provided with a back pressure valve 8, of any suitable type, whereby some of the steam may be released when a certain pressure is obtained in the steam-pipe racks. At the exhaust ends of the racks, the outlet pipes q are shown passing through steam traps 9 and to a common return pipe 10 leading to a well or receptacle 11 for receiving water of condensation.

The front and rear end-walls or partitions b and c of the drying-house A are preferably arranged between horizontal manifolds K and P and the expansion joints R. This locates the whole steam-pipe driers within the respective drying-rooms, which may be closed up and the heat turned on, while leaving the steam supply pipes and regulating valves therefor outside the drying-rooms, or in the front machinery room B, and leaving the rear regulating valves p^1 in the rear vestibule or shed C, so that the operators of the plant may regulate the driers without having need to enter the heated drying-rooms and without opening such rooms needlessly during the brick drying operation.

As shown in Figs. 1 and 2, the endless cable-conveyers S run from the machinery-room B and down through the aisles or passage-ways between the parallel steam-pipe racks J of such drier or drying-room. The green bricks to be dried, as they are delivered by the brick-press or brick-making apparatus in the machinery-room are received

or dumped upon metallic plates or pallets, which are placed or deposited upon the cables and carried thereby down the aisles to be taken off by workmen inside the drying-rooms and placed upon the steam-pipe shelves. In the machinery-room, and as shown more clearly in Figs. 3 and 6, the conveyer-cables pass around driving sheaves or pulleys T (to which power is transmitted from the shaft T¹ and gears T²); while at the opposite end, in the shed or vestibule C, the cables pass around tensioning sheaves or pulleys U; intermediate portions of the cables being supported on idle pulleys V mounted in standards therefor at suitable intervals throughout the lengths of the aisles.

For loading the pallets, or dumping the bricks thereon from the brick-molds, I provide at the head-end of each conveyer a hinged or tilting dump-board W, the operation of which is well understood by those familiar with the art to which this invention appertains. As well understood, the bricks are dumped or loaded upon a pallet by turning up the hinged dump-board W to an upright position, as indicated by dotted lines in Fig. 6, then placing a pallet X upon the dump-board, then placing a mold of green brick with its open face against the pallet, then lowering the dump-board to an approximately horizontal position and lifting off the mold, leaving the bricks upon the pallet. In the present case, I have for convenience arranged the dump-board W between the conveyer-cables, so that when the dump-board W is down at its lowest position, as shown in Fig. 6, the pallet X will rest upon the cables and will be thereby carried off. To prevent the cables from taking off the pallet until the mold is lifted off, I provide a treadle *w*, hinged to the supporting-frame of the dump-board as at *w*¹, and carrying an upright bar *w*². When dumping the brick-mold upon a pallet, the operator rests his foot on the treadle *w*, causing the head *w*³ of the bar *w*² to take under and bear up the dump-board to a slight elevation, sufficient to support the pallet out of contact with the conveyer-cables. As soon as the mold is lifted from the brick, the operator releases the treadle *w*, permitting the dump-board to drop down and allowing the loaded pallet to rest upon and be carried off by the cables. After a drying-operation the empty pallets may be returned on the lower runs of the conveyer-cables. The inclined bars Y behind the dump-board are arranged to receive the pallets as they are returned by the lower runs of the cables, as shown in Fig. 6. As to the pallets, steel or metal plates are used, in order to avoid warping of the pallets and consequent injury to the bricks by the steam-heat drying process. The metal pallets rest-

ing on the steam-pipe shelves also transmit the heat in direct contact with the bricks, whose upper sides are closely exposed to the steam-pipes of the shelves immediately above.

In operation, the green bricks, as they are taken in molds from the brick-press (not shown), are placed or received upon the metal pallets by means of the dump-board W (or by such other apparatus as may be desired), and are placed or deposited as aforesaid upon the conveyer-cables S, which carry off the bricks down the aisle and deliver them to the workmen in the drying-room, who take off the pallets and place them side by side upon the steam-pipe racks J at opposite sides of the conveyer; this operation going on until the drier is filled. The drying process may, if desired, be started while the racks are being filled or stored with bricks, or, if preferred, may be delayed until the drier is completely filled: and the process may be variously modified by proper control of the supply of steam, and of the ventilating or draft-doors of the drying room. In this respect, much will depend upon the atmospheric or climatic conditions, and the nature or quality of the clay being worked, etc. In the usual operation, a relatively small quantity of steam, as the exhaust steam from the engine, may advantageously be turned into the steam-pipes while the drier is being filled to heat the drying-room and start the evaporation of moisture from the bricks, the side doors *a*¹ and top trap-doors *e*¹ of the drying-room being left open more or less to allow drafts or winds to drive through the building and carry off the moisture. When the drier is filled, and when the initial moisture is driven off to a sufficient degree, the drying-room is or may be closed or partially closed, and the full steam-pressure is turned into the steam-pipes to force the drying, which practically results in drying the bricks over night. An important advantage of the apparatus is that it affords means for utilizing and controlling the steam heat, drafts and weather drying agencies according as the conditions may dictate. It may be important in many cases to hold the moisture or vapor in the drying-room to a certain period, and quickly expel it. This is accomplished by keeping the drying-room closed until the desired time, then opening the top doors *e*¹ to allow escape of the moisture, assisted as may be needful by opening the bottom doors *a*¹ in the side of the building. In other cases, it may be desirable to use steam heat to a greater or lesser extent in conjunction with weather drying, by leaving the building open and allowing the drafts and winds to drive through and force the moisture to the top. Whatsoever may be necessary or beneficial in particular cases, the

present apparatus affords full regulation and control of the steam-heat, drafts and weather-drying agencies.

In practice, after the completion of one
5 drying operation, the pallets of dried brick are removed from the pipe-shelves (beginning preferably at the head-end of the drier), and are placed upon the conveyer and carried to the rear or vestibule C, while
10 simultaneously the pallets of green brick are being carried from the machinery-room B by the conveyer into the drier and are being placed upon the shelves from which the dried brick have been removed. In the rear
15 of the building, or in the vestibule C, the dried brick are or may be removed from the pallets and carried off for delivery to the kilns, and the empty pallets are placed upon the lower run of the conveyer-cables and
20 carried forward to the front of the building or into the machinery-room; where they are delivered to be used for transporting green brick. Or, if preferred, the cable-conveyer may be extended to the kilns, making a turn
25 if necessary; any suitable construction for changing the direction of travel being provided.

By virtue of the double construction of the building herein illustrated, the two drying-rooms may be used in alternation; that
30 is, when one drier is completely filled or stored with green brick, it may be closed up and left until the completion of the drying operation, while the other drying-room is
35 open and is being filled or stored with green brick, any previously dried brick being simultaneously removed.

I desire to be understood that my invention may be embodied in other forms, and
40 the details of construction and arrangement of parts may be variously modified within the scope of this invention.

I disclaim the specific subject-matter which is set forth as follows, to-wit: in an
45 apparatus for drying bricks, the combination with a main inclosure provided with a ventilated roof and divided by partition members into upper and lower compartments, the lower compartments being provided with longitudinal drying racks along
50 its outer sides, of closable draft devices along said sides, said partition comprising interior inclined water-shedding roofs over the racks, said roofs being composed in part
55 of dampers which control the exit of the air from the lower compartment to the upper compartment.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. An elongated brick-drying house containing a closed drying room having a steam
60 pipe drier comprising superimposed layers of pipes connected with a source of steam-

supply and constituting shelves for supporting pallets of brick, the roof of the house having protected off-draft openings, and one of the side walls of the room and the outer wall of the house being the same and having
70 doors adapted for opening up the sides at or from the bottom whereby the brick can be dried by steam heat assisted as desired by drafts of outside atmospheric air entering at the bottom from the sides of the house. 75

2. A brick-drying house having a closed drying room or chamber containing a steam-pipe brick drier comprising pipe-shelves in connection with a source of steam-supply, and having ventiating or draft-controlling
80 means for permitting or cutting off the direct entrance of atmospheric air; and other ventilating means within the house whereby the moisture and vapor arising during the drying process can be held in said room or
85 chamber as desired and quickly or gradually released or expelled at will.

3. A brick-drying house containing a closed drying room or chamber with a steam-pipe rack therein comprising superimposed
90 shelves for supporting pallets of brick, and provided with damper-controlled draft-passages through its side walls for admission of drafts directly from the atmosphere through the lower part of the drying room and other
95 upper damper-controlled passages to permit exit from the upper part of the same, whereby the building can be adjusted to allow drafts or winds to drive through the rack to carry off moisture or vapors and assist
100 the steam-drying operation, or the moisture can be held in the room and quickly expelled when desired by opening the upper draft-passages assisted by admission of the bottom drafts to lift the vapors. 105

4. A brick-drying house containing a closed drying room, and having a roof above the ceiling of said room provided with off-draft openings, a steam-pipe drying rack in said room comprising superimposed pipe-shelves connected with a source of steam-supply, one of the side walls of the room and the outer wall of the house being the same and said room having longitudinal top and outside ventilating doors for controlling
115 admission of drafts of outside air through the lower portion and out from the upper portion of the room.

5. A brick-drying house inclosing a closed drying room or chamber containing steam-pipe racks arranged along the opposite sides of the room for supporting pallets of brick, the roof of the house above said room having off-draft openings, and the ceiling of the drying room having doors or dampers directly over each rack adapted to be closed or opened for holding heat and moisture in the drying room or allowing its escape. 125

6. A brick-drying house inclosing a closed drying room or chamber containing longitu- 130

dinal steam-pipe racks adjacent its sides, and a longitudinal hinged trap-door or doors in the ceiling of said room directly over the rack or racks adapted for controlling the escape of heat and moisture.

5 7. A brick-drying house having a ventilated roof and containing a closed drying-room or chamber spaced from the roof and one side wall of the house, the outer side
10 wall of the room and one side wall of the house being the same, a longitudinal steam-pipe drying-rack therein connected with a source of steam-supply, closable draft-controlling means along the outer side of the
15 house, the opening of which will admit drafts to the lower part of the drying room or chamber, and closable draft-controlling means along the upper part of said room or chamber, whereby the moisture and vapor
20 arising during the drying process can be held in said room or chamber as desired and quickly or gradually released or expelled at will.

8. A brick-drying house consisting of an
25 elongated building having off-draft openings in its roof, a horizontal partition below the roof, and an intermediate vertical partition, thereby providing opposite closed drying rooms or chambers, parallel steam-pipe
30 drying racks arranged in each chamber with an intermediate longitudinal aisle, and damper-controlled off-draft passages for each room in said horizontal partition.

9. A brick-drying house consisting of an
35 elongated building having off-draft open-

ings in its roof, a horizontal partition below the roof, and an intermediate vertical partition, thereby providing opposite closed drying rooms or chambers, ventilating or draft-controlling means for regulating escape of
40 heat and moisture into the space above the rooms, ventilating means for admitting atmospheric air directly to said rooms and parallel steam-pipe drying racks arranged in each room with an intermediate longitu-
45 dinal aisle.

10. A brick-drying house consisting of an elongated building containing a pair of longitudinal drying rooms, the roof of said house above said rooms having a series of
50 windows arranged in alternating positions at opposite sides, and the ceiling of each room having a series of sky-lights spaced to correspond in position with the roof-wind-
55 dows at the opposite side of the house.

11. In a brick-drying house having a drying room through which an endless cable conveyer passes, means for closing the end of said room comprising a vertically-sliding
60 door having supplementary vertical hinged doors adapted to be opened to allow the main door to pass over the cables, said supplementary doors having notches to accommodate the cables when closed.

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

WILLIAM RICHARD MARTIN.

Witnesses:

H. B. BITZER,

GEO. B. KELLER.