No. 658,957. Patented Oct. 2, 1900.

F. H. C. MEY.

MALTING AND DRYING APPARATUS.

(Application filed Dec. 23, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

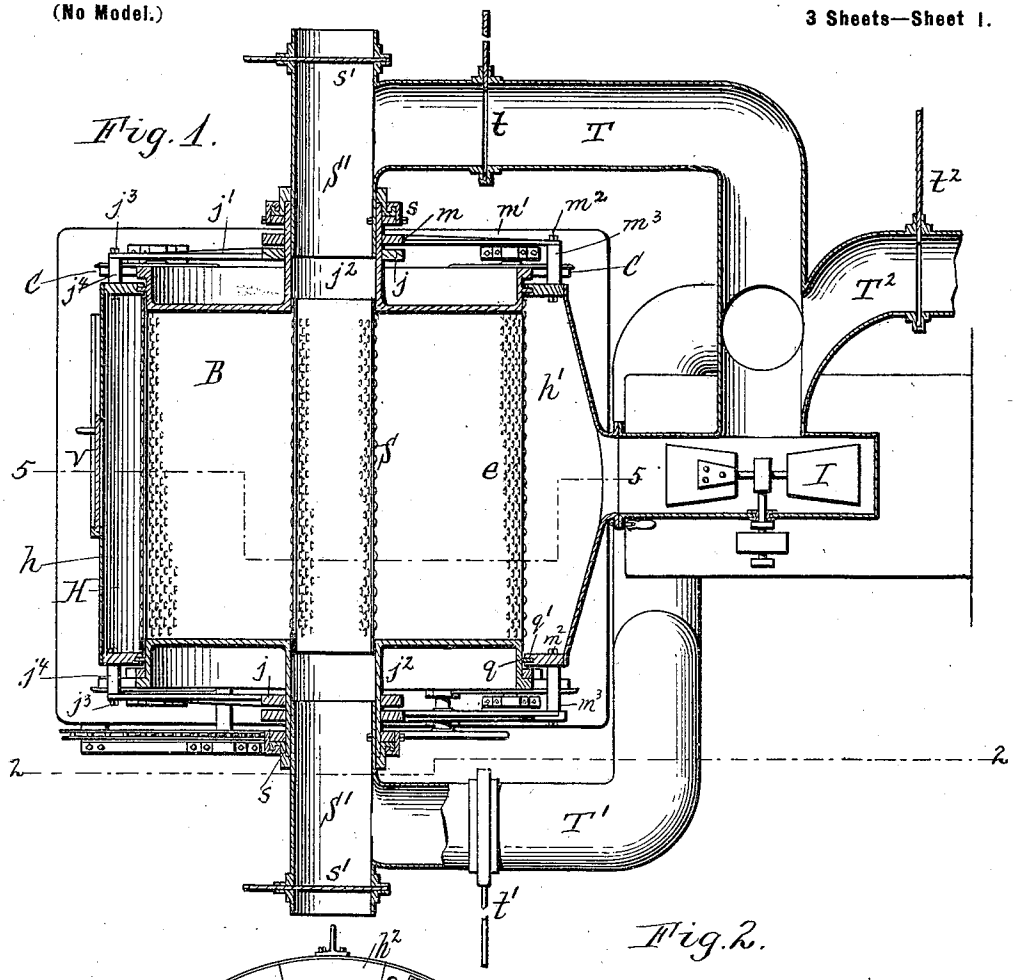

Fig. 2.

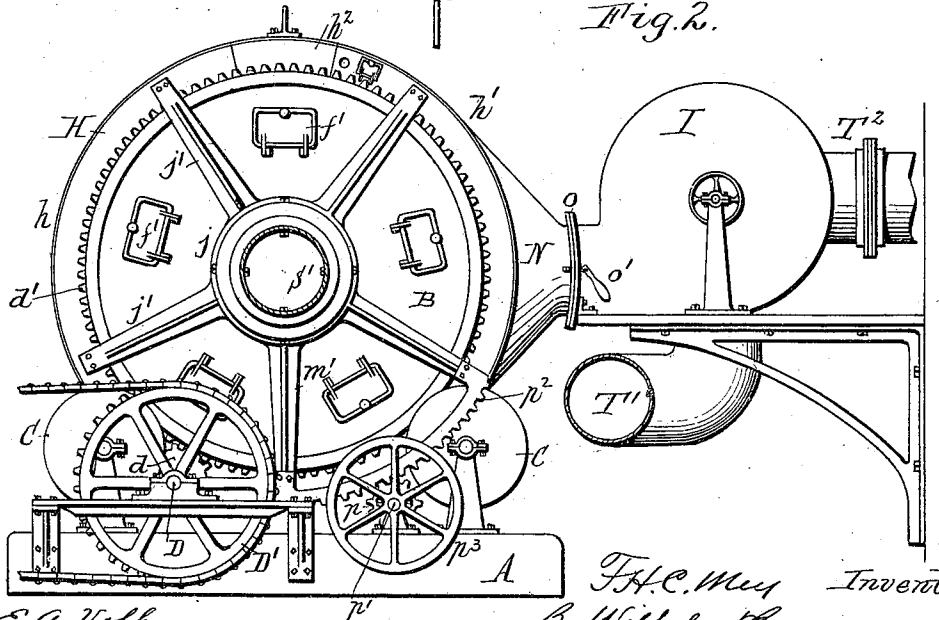

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Fig. 3.

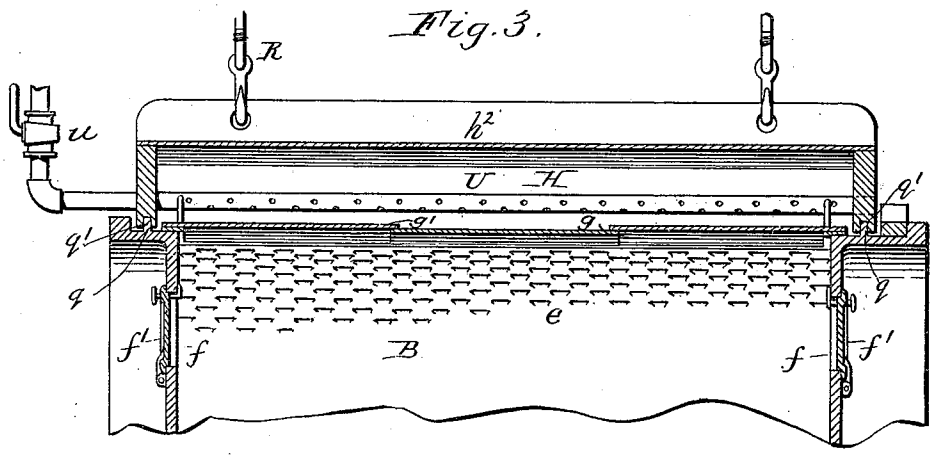

Fig. 4.

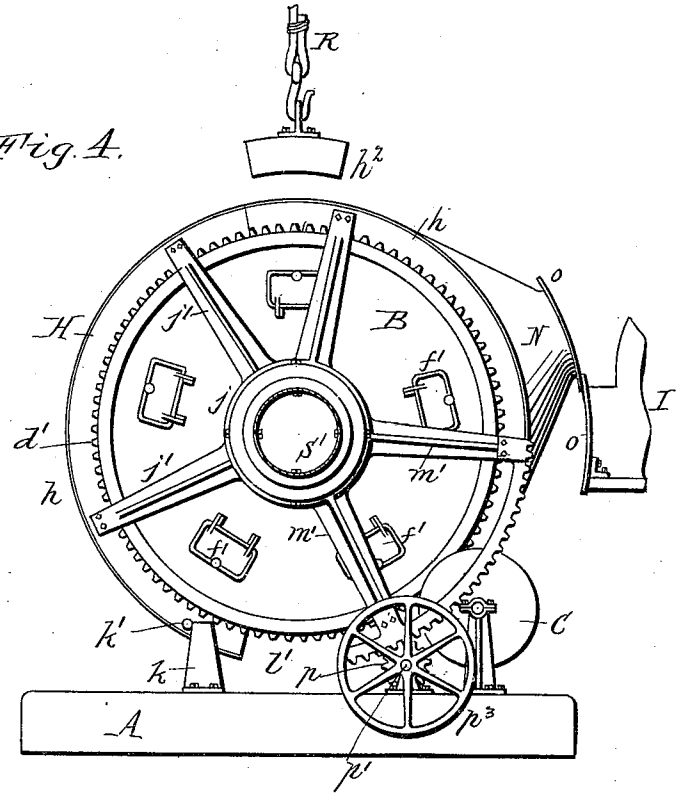

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Fig. 5.

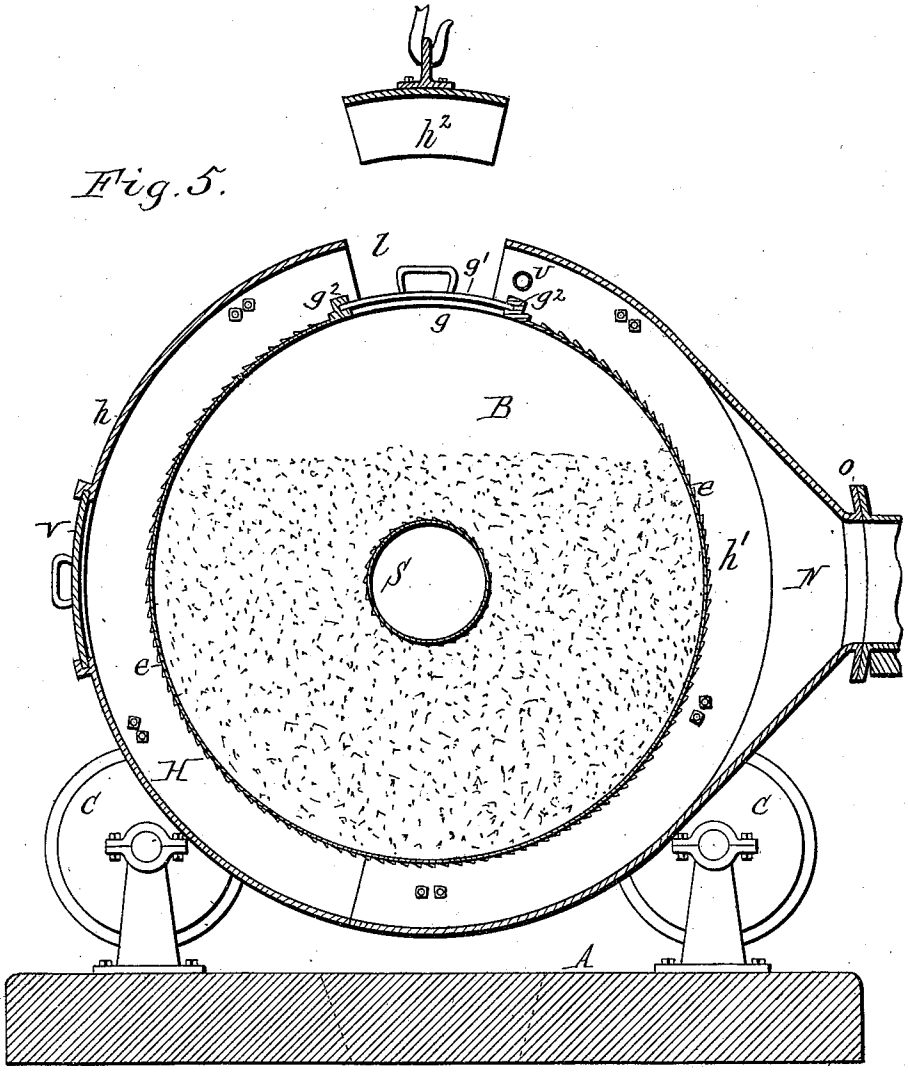
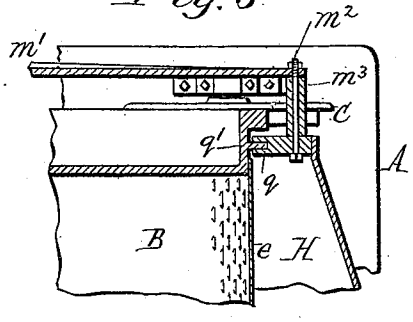


Fig. 6.



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UNITED STATES PATENT OFFICE.

FREDRICK H. C. MEY, OF BUFFALO, NEW YORK.

MALTING AND DRYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 658,957, dated October 2, 1900.

Application filed December 23, 1899. Serial No. 741,427. (No model.)

To all whom it may concern:

Be it known that I, FREDRICK H. C. MEY, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Malting and Drying Apparatus, of which the following is a specification.

This invention relates to an apparatus intended more especially for germinating and drying barley in the manufacture of malt; but the apparatus is also useful for drying various other substances. The apparatus belongs to the class of driers which consist of a perforated drum having suitable means for slowly rotating it and connected with an air-propelling device whereby an air-current is maintained through the drum for carrying off moisture and gases evolved during the germinating stage.

The object of my invention is the production of a machine in which the grain in the drum is subjected uniformly to the action of the air-current practically around the entire circumference of the drum, thereby increasing the capacity of the apparatus, shortening the time required to dry the material, and producing a uniform product.

In the accompanying drawings, consisting of three sheets, Figure 1 is a horizontal section of my improved apparatus. Fig. 2 is a transverse vertical section of the same in line 2 2, Fig. 1. Fig. 3 is a vertical longitudinal section of the upper portion of the apparatus on an enlarged scale. Fig. 4 is a transverse vertical section similar to Fig. 2, with the driving mechanism of the drum omitted. Fig. 5 is a transverse section of the apparatus in line 5 5, Fig. 1, on an enlarged scale. Fig. 6 is a fragmentary longitudinal section of the drum and the surrounding air-chamber, showing the connection between the chamber and its supporting-arms.

Like letters of reference refer to like parts in the several figures.

A is the bed or foundation of the machine.

B is the rotary horizontal drum, which is supported at opposite ends on rollers C, journaled in standards rising from the bed A.

D is the driving-shaft from which the drum is slowly rotated by any suitable mechanism. In the construction shown in the drawings the main shaft D is provided with a sprocket-wheel D′, and the drum is driven from this shaft by a gear-pinion d, secured to the shaft and meshing with a gear-rim d', arranged at the adjacent end of the drum. The body or cylindrical portion of the drum is provided over its entire surface with slits or perforations e, while its imperforate heads are provided with inspection-openings f, which are normally closed by doors f'. The drum is provided in its cylindrical wall with feed and discharge openings g, which are closed by slides or doors g', guided in longitudinal ways g^2, arranged on the drum, as shown in Figs. 3 and 5.

The drum B is surrounded by an annular air-chamber H, which is open at its inner side, so as to communicate with the interior of the drum through the slits or perforations thereof and which is connected with a fan I or other air-propelling device whereby an air-current is created through the chamber and the drum. This air-chamber extends throughout the length of the drum and is closed on all sides except its inner side, which faces the drum, so that the air delivered into the chamber is compelled to enter the drum. This chamber preferably consists of three segmental sections h h' h^2, which together form the complete circular air-chamber. The section h, located opposite that side of the drum on which the fan I is arranged, is stationary and extends nearly around one-half of the circumference of the drum and terminates at the top and bottom thereof. The same is carried by end frames or spiders, which consist of a hub j and arms j', radiating from said hub. These hubs are fitted upon hollow trunnions or journals j^2, projecting axially from the heads of the drum, and the arms j' are secured at their outer ends to the adjacent section h by bolts j^3, which pass through said arms and said end walls and through thimbles or filling-blocks j^4, interposed between said arms and walls, as shown in Fig. 1. The stationary chamber-section h is held against turning in a downward direction by a stop or standard k, projecting upwardly from the bed of the machine at one end of said section and standing in the path of a stop-pin k', projecting from the end of the

section, as shown in Fig. 4. The chamber-section h', arranged on the same side of the drum as the fan I, is movable circumferentially of the drum and extends nearly around the adjacent half of the circumference of the drum. This movable section is adapted to abut at its lower end against the lower end of the stationary chamber-section h when in its normal position, so as to leave an opening or passage l between the upper ends of said chamber-sections, with which the feed-openings g of the drum B are adapted to register for loading the drum, as shown in Figs. 2 and 5. When the movable section is shifted upwardly out of its normal position, so as to abut at its upper end against the upper end of the stationary chamber-section, an opening or passage l' is left between the lower ends of the sections, as shown in Fig. 4, through which passage the material can be discharged by bringing the openings g of the drum into register with said passage. The movable section h' is carried by end frames or spiders similar to the spiders j j' of the stationary section h. The hubs m of said spiders turn on the trunnions j^2 of the drum and are arranged on the outer side of the spiders j j', while the arms m' of these spiders are secured to the end walls of the movable chamber-section by bolts m^2, passing through the arms and said walls and through thimbles m^3, similar to the thimbles j^4, as shown in Fig. 6. The movable chamber-section is provided with a nozzle or spout N, which is adapted to register with the spout of the fan I. The contiguous ends of this nozzle and the fan-spout are provided with flanges o, which are curved concentrically with the axis or pivot on which the movable chamber-section turns, so as to form a close joint between these parts and at the same time permit said chamber-section to be readily shifted from one position to the other. If desired, the flanges o, forming the joint between said section and the fan-spout, may be detachably secured together by any suitable clamping device or fastening o'. The movable chamber-section may be shifted by any suitable means. The devices shown in the drawings for this purpose consist of a pinion p, mounted on a longitudinal shaft p', arranged below the drum and meshing with a gear-segment p^2, secured to the adjacent carrying-arms m' of the chamber-section. The shaft p' has a hand-wheel p^3 for turning it.

The intermediate section h^2 of the air-chamber is adapted to fit into and close the space left between the upper ends of the stationary chamber-sections when the lower ends of these sections abut against each other, as shown in Fig. 2, so as to complete the circle of the annular chamber. The section h^2 consists of end or side walls forming continuations of the corresponding walls of the stationary and movable sections h h' and a curved plate secured to the outer edges of said walls and forming a continuation of the cylindrical body of the drum. This construction forms an open-ended section, which abuts against the adjacent ends of the other two sections h h' and forms therewith a continuous air-chamber extending entirely around the perforated drum. In order to form a tight joint between the drum and the side walls of the air-chamber, the drum is provided with projecting annular ribs or tenons q, which fit into corresponding grooves q', formed in the inner edges of said walls, as shown in Fig. 3.

The removable section h^2 of the air-chamber may be raised out of the way and lowered into place by a suitable tackle R, connected with the section.

S is a perforated circulating or discharge tube for moisture and gases arranged axially in the drum and communicating at its ends with the hollow trunnions j^2 of the drum. S' represents stationary horizontal exit-pipes, which are connected with the trunnions of the drum by union-joints s of any suitable or well-known construction, which permit the drum to turn relatively to said pipes. These pipes are open at both ends and each is provided at its outer end with a slide or damper s'.

T is a pipe or conduit leading from one of the air-pipes S' to the eye of the fan I, and T' is a similar pipe leading from the other pipe S' to the eye of the fan.

T^2 is a pipe connected with the pipe T adjacent to the fan and adapted to open into the atmosphere or be connected with a heater or furnace. (Not shown in the drawings.) The last-named pipe and the conduits T T' are provided with slides or dampers t t' t^2 for changing the course of the air-current through the apparatus.

U is a perforated spray-pipe for moistening the grain in the drum during the germinating stage. This pipe is arranged lengthwise in the upper portion of the air-chamber H, preferably in the movable section h', so that the water delivered by the same drops through the feed and discharge openings g of the drum upon opening the doors g' thereof and bringing them under said pipe. This spray-pipe extends through one of the side walls of said movable section and is connected with a source of supply by a flexible hose. (Not shown in the drawings.) A hand-valve u is preferably arranged in said spray-pipe.

The air-chamber is provided in its cylindrical outer wall with one or more doors v, through which access may be had to the doors g' of the drum for sampling the material in the central portion of the drum.

The operation of my improved machine is as follows: The machine is filled with the material to be treated by removing the intermediate section h^2, of the air-chamber, turning the drum B so as to bring its feed and

discharge openings g into register with the space left at the top of the air-chamber, and opening the feed-doors g'. After loading the drum said doors are closed and the detachable section h^2 is replaced. When the machine is used for malting, the grain is steeped in a well-known manner before being introduced into the drum and the germinating operation is conducted in a manner common to this class of machines, the drum being rotated only from time to time during this stage for turning the grain. Upon setting the fan I in motion the air blast or current produced by the same is diffused throughout the annular air-chamber H and passes inwardly from all portions of said chamber through the perforated wall of the drum and through the mass of grain in the same. After permeating the grain the air-current, laden with the gases evolved in the germinating stage, enters the axial discharge-tube S, whence it passes through the conduits S′ and T T′ back to the fan-case or escapes through the exit-pipes S′ into the atmosphere, according to the adjustment of the dampers in said pipes. It is sometimes desirable to repeatedly circulate the same air through the apparatus. This circulation is effected by closing the dampers of the pipes S′ and the damper of the inlet-pipe T^2 and opening the dampers of the conduits T′, as shown in Fig. 1. When it is desired to allow the air to escape into the atmosphere, the dampers of the exit-pipes S′ are opened. When the germination of the grain is completed, the same is dried by directing hot air through the drum. This is done by connecting the pipe T^2 with a suitable heater or furnace, opening the damper of said pipe and the dampers of the pipes S′, and closing the dampers of the conduits T′. The hot air is now drawn from the heater by the fan and forced into the annular air-chamber H and through the drum and the grain, the air charged with the moisture from the grain escaping through the axial tube S and the pipes S′ into the atmosphere. After drying the material the same is discharged from the drum by removing the intermediate section h^2 of the air-chamber, as shown in Figs. 4 and 5, shifting the movable section h' of said chamber upwardly against the upper ends of the stationary section h, so as to form the discharge-aperture l' between said sections, and then opening the doors g of the drum.

As the air-chamber H extends entirely around the perforated drum, the air delivered into the chamber passes inwardly through the drum over its entire area, thus simultaneously subjecting all sides of the mass of grain in the drum to the action of the air-current. By this extensive exposure of the material to the air the capacity of the machine is increased and a correspondingly-rapid drying of the material is effected. As the air permeates all portions of the material alike, the material is uniformly treated and an even product is obtained.

While I prefer to employ a blast-current which traverses the drum from its periphery to its axial tube S, a suction-current may be created through the drum from said axial tube toward its periphery, or vice versa, if desired.

If desired, the fan I may be connected with the stationary section h of the air-chamber instead of the shiftable section h'.

I claim as my invention—

1. The combination with a perforated rotary drum having an internal discharge tube or conduit, of an annular air-chamber surrounding the drum and communicating at its inner side with the interior thereof, and having a shiftable section which is movable circumferentially of the drum, and a removable section interposed between said shiftable section and the remaining portion of the air-chamber, and an air-propelling device connected with said air-chamber, substantially as set forth.

2. The combination with a perforated drum having an internal air-discharge tube or conduit and provided in its body with a filling and discharge opening, of an annular air-chamber surrounding the drum and communicating at its inner side with the interior thereof and comprising a stationary section covering nearly one-half of the circumference of the drum and terminating at the top and bottom of the drum, a shiftable section arranged opposite said stationary section and movable circumferentially of the drum, and a removable section adapted to be interposed between the upper ends of said stationary and shiftable sections, and an air-propelling device connected with said air-chamber, substantially as set forth.

3. The combination with a perforated drum having an internal air-discharge tube and journals or trunnions projecting axially from its heads, of an air-chamber surrounding the drum and communicating with the interior thereof and having stationary and movable segments, supporting spiders or frames mounted on the trunnions of the drum and secured to the ends of said segments, and an air-propelling device connected with said air-chamber, substantially as set forth.

4. The combination with a perforated rotary drum having a feed-opening in its body, of an air-chamber surrounding the drum and having a movable section or segment, an air-propelling device connected with said chamber, and a spray-pipe arranged in said section and carried by the same, substantially as set forth.

5. The combination with a perforated rotary drum having an axial air-discharge tube connecting with the interior of the drum and hollow journals or trunnions communicating with the ends of said axial tube, of stationary open-ended air-discharge tubes connected

with the ends of said trunnions by rotary joints and provided with dampers, an air-chamber applied to the outer side of the drum and communicating with the interior thereof, an air-propelling device connected with said chamber, pipes or conduits connected with said discharge-tubes on the inner sides of their dampers and leading to said air-propelling device, and dampers arranged in the last-named pipes, substantially as set forth.

Witness my hand this 13th day of December, 1899.

FREDRICK H. C. MEY.

Witnesses:
CARL F. GEYER,
JNO. J. BONNER.