C. E. GEIGER.

DRIER.

APPLICATION FILED APR. 10, 1911.

1,139,663.

Patented May 18, 1915.

2 SHEETS—SHEET 1.

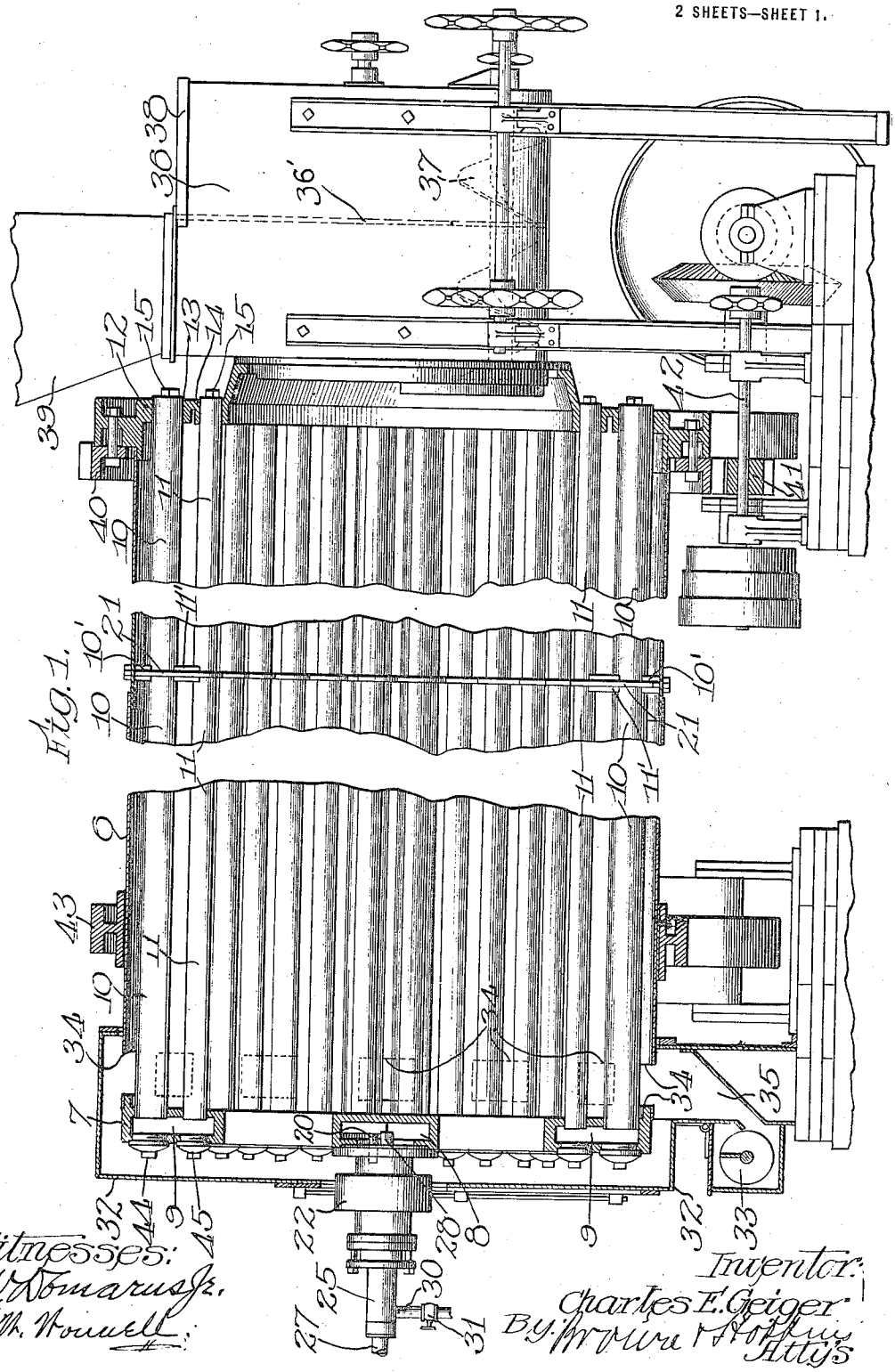

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

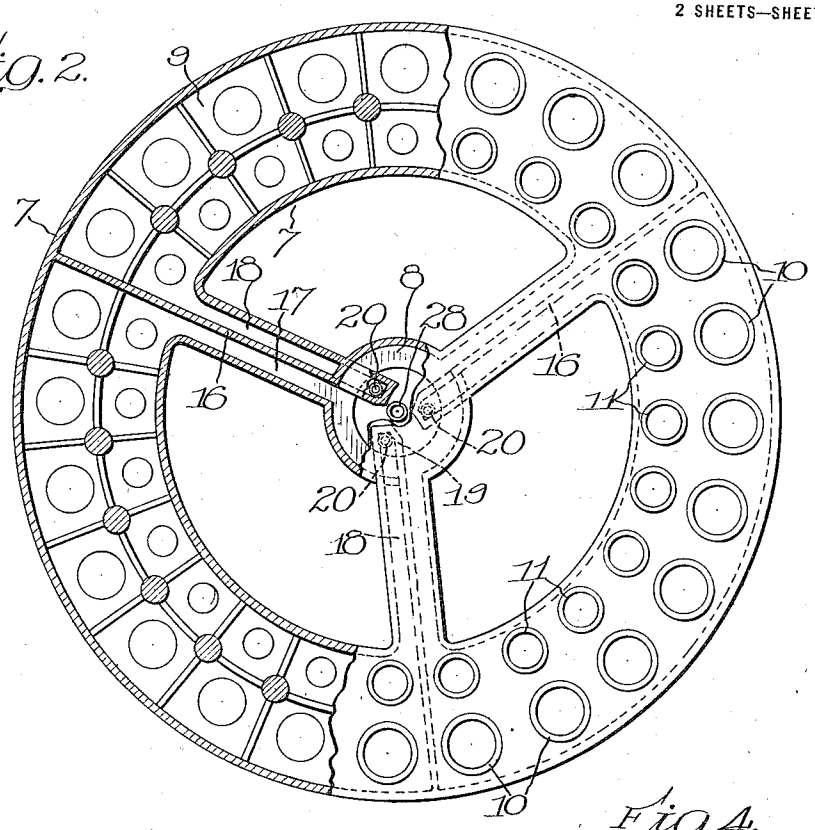
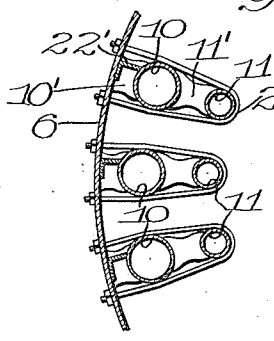


Fig. 4.

Fig. 3.



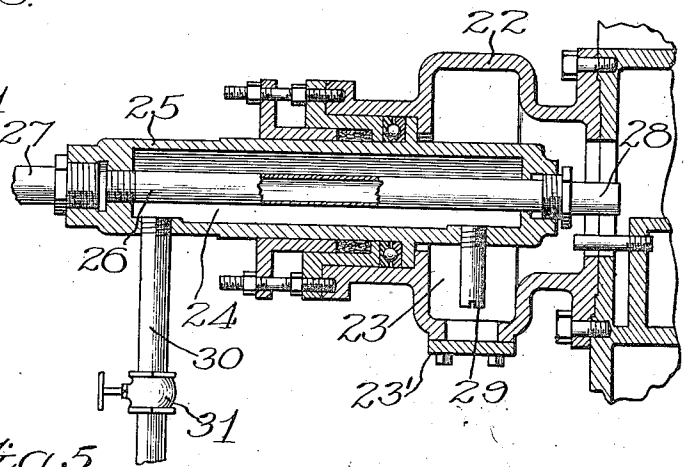
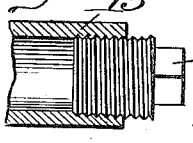


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES E. GEIGER, OF LOUISVILLE, KENTUCKY, ASSIGNOR OF ONE-THIRD TO WILLIAM E. KOOP AND ONE-THIRD TO G. WALTER FISKE, BOTH OF LOUISVILLE, KENTUCKY.

DRIER.

1,139,663 Specification of Letters Patent. Patented May 18, 1915.

Application filed April 10, 1911. Serial No. 619,978.

To all whom it may concern:

Be it known that I, CHARLES E. GEIGER, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Driers, of which the following is a specification.

This invention relates to driers, more particularly designated and described as rotary driers of the class employing steam heated pipes as the heating elements, and the primary object of the invention is to provide an improved, simple and cheap device of the character described which shall be effective and efficient in operation.

Another object of the invention is to provide means allowing the independent expansion of the steam pipes.

A further object is to provide improved means for disposing of the water of condensation.

For the attainment of these ends and the accomplishment of other new and useful objects my invention consists in the features of novelty in the construction and combination generally shown in the accompanying drawings and described in the specification, but more particularly pointed out in the claims.

In the drawings, Figure 1 is a sectional side elevation of the preferred embodiment of my invention. Fig. 2 is an end elevation partly in section. Fig. 3 is a detail view showing the method of spacing of the steam pipes. Fig. 4 is a detail showing the steam supply and discharge connection for the drier. And Fig. 5 is a detail view of the loosely threaded vent plug.

Referring now more particularly to the drawings a rotatable cylindrical shell 6 is provided at one end with a manifold 7 formed with an axial chamber 8, peripheral chambers 9, and passageways connecting the said chambers. Secured to and communicating with the interior of the peripheral chambers 9 are tubes 10 and 11, preferably differing in size and arranged concentrically with the axis of the cylinder, the larger pipes being on the outside. Opposite the tubes 10 and 11 in the outer surface of the manifold are the plugs 44 and 45 which are secured to the manifold in any suitable well known manner. The other ends of the tubes extend to the end of the cylinder opposite the manifold and a supporting member 12 is secured to the end of the cylinder 6, being provided with openings 13 and 14 through which the ends of the tubes 10 and 11 are adapted to extend. The ends of the tubes are closed and provided with removable plugs 15. This end mounting is of such a nature that the pipes or tubes although making a comparatively close fit are permitted to slide freely through the openings. It is evident with this construction that the elongation of each tube is independent of the others and that no strains or stresses will be communicated to any part of the structure by unequal expansion or elongation of the steam pipes.

The tubes 10 and 11 may be supported from the cylinder 6 and spaced apart in any desired or suitable manner, a preferred construction and arrangement being shown by Fig. 3 in which the tube 10 is spaced from the cylinder by means of a spacing member 10′, the tube 11 being spaced from the tube 10 by spacing member 11′, and a threaded U-bolt 21 extending around both tubes and through the wall of the cylinder 6 and secured on the outside of the cylinder by suitable fastening devices. Between the tube 10 and the cylinder there is also positioned an angle iron member 22′ which is adapted to form a sort of a pocket for the retention of the material to be dried as the cylinder rotates.

The preferred construction of the manifold 7 is shown more clearly in Fig. 2 and in this exemplification it is provided with three peripheral chambers 9 and a corresponding number of spokes 16, each of which is preferably formed with two passageways connecting the peripheral chambers with the axial chamber, both ends of each peripheral chamber being connected through different spokes, the forward end of the chamber (referring to the end of the chamber which is in the direction of rotation) having free communication with the axial chamber by means of the passageway 17 and the other end of each chamber hav-

ng communication by means of the passageway 18. This latter passageway 18 is provided with an extended portion 19 in which is inserted a pipe or tube 20 which extends without the axial chamber into a stuffing box chamber hereinafter described.

Secured to the axial chamber of the manifold 7 is a flanged stuffing box member 22 which is provided with an annular chamber 23 and which is adapted to receive the steam supply fitting 24 in the other end. The stuffing box member is rotatable with the manifold and the steam supply fitting is stationary, the two members being provided with suitable packing arranged therebetween to permit of their free rotation with respect to each other. A cleaning opening and plate 23′ is provided for the chamber 23. The steam supply fitting is formed with a chambered member 25 closed at both ends through which a steam supply pipe 26 extends, being provided at its outer end with a pipe 27 to connect it with the source of steam supply and at the inner end with a pipe 28 which extends into the axial manifold chamber 8. Secured to and communicating with the interior of the chambered member 25 is a pipe or tube 29 which projects downwardly into the stuffing box chamber 23, and at the other end of the chambered member is a pipe connection 30 communicating with the interior thereof and provided with a cock 31 or other suitable means to open the said chamber to the atmosphere, to a steam trap, or to other desired connection.

The end of the cylinder adjacent the manifold is preferably designated as the discharge end and in the present exemplification there is provided a housing 32 which encompasses the end and which is provided with a spiral screw conveyer 33 or other suitable conveying means. In this end of the cylinder there are provided openings 34 adjacent the end of the manifold through which the dried material is discharged into a chute 35 which leads to the conveyer 33. The receiving end of the cylinder is provided with a receiving hopper 36, at the bottom of which there is a spiral conveyer 37 operated by a suitable outside connection. This hopper is separated from a vapor chamber 39 by the partition 36′ and is preferably provided with an opening 38 for charging the material to be dried into the receiver. The vapor chamber 39 is adapted to carry off the vapors driven off from the heated material being dried.

The plugs 15 are readily adjustable in the closed ends of the tubes and are adapted to be loosely inserted therein to permit the egress of air from the tubes when steam is first admitted thereto at the other end. These plugs may be retained in position in various ways, preferably by being screw-threaded loosely into screw-threaded openings in the ends of the tubes so that when the steam is first turned on the air will escape through the screw threads because of the loose fitting plugs, but as the steam heats up the plugs they will expand and automatically close the opening between the steam pipes and the outer ends of the tubes; as indicated by the squared heads of the plugs in Fig. 1, they may be turned so as to be adjusted to various positions and may, if desired, be moved to such position as to entirely close the ends of the tubes, particularly after the air has escaped and the tubes have been heated. It will therefore be seen that by proper adjustment of the screw-threaded plugs which fit loosely in the screw-threaded openings in the ends of the tubes, the openings may be automatically closed when the air has been driven out and the steam begins to escape. This arrangement permits the steam to fill the tubes and heat them in a minimum space of time and also prevents the escape of steam and therefore conserves the heat and increases the efficiency of the apparatus. In some instances, if desired, the plugs may fit more loosely initially and then operated manually to close up the openings after the steam begins to escape, or the plugs may be so adjusted as to permit a gradual discharge of steam at all times after the air has been driven out, but I prefer to have the plugs so arranged and adjusted that they will automatically close the openings after substantially all the air has been driven out and at about the time the steam begins to escape.

Suitable driving mechanism is provided for simultaneously rotating the drying cylinder 6 and the screw conveyer 37. This driving mechanism may comprise the gear wheel 40 which meshes with the spur gear 41 on the driving shaft 42 and the sprocket gearing, as indicated on the drawing. The drying cylinder is mounted in an inclined position on roller bearings, the upper end being adjacent the vapor flue. In a well known manner the inner longitudinal fin picks up the material in the drying cylinder and showers it through the draft, and on account of the inclination of the drying cylinder the material is dropped each time slightly nearer the discharge end of the cylinder. To secure the maximum heating surface the steam pipes are arranged radially, the outer pipes being of larger diameter than the inner pipes. In this manner room is provided for as many inner pipes as outer pipes and their concentric arrangement assures uniform distribution of the material being dried and uniform heating effect on the same. There are also constructional advantages in the concentric arrangement of the inner and outer series of steam pipes.

By reason of the inclination of the dry-

ing cylinder the water of condensation in the steam pipes will always flow toward the manifold near the discharge end of the drier. In the embodiment of the invention herein described and as shown particularly in Figs. 2 and 4, the water of condensation will be directed by means of the passages 18 into the chamber 8 through the short pipes 20 and thence into the chamber 22, which has been hereinbefore referred to as the flanged stuffing-box member. This chamber 22 is enlarged circumferentially as shown, in order that the water which enters the same may flow to its lower portion where it will cover the lower end of the tube 29, through which it will be forced by the steam pressure from the manifold, into the tube 24 from which it flows through the discharge pipe 30 when the valve 31 is open. The valve 31 may be opened occasionally or may be left open continuously so that the water of condensation will be discharging automatically when the water in the trap 22 is sufficient in depth to cover or submerge the lower end of the tube 29. It should be understood that when the drying cylinder rotates, the manifold, the axial chamber 8 and the water collecting chamber or trap 22 rotates with the said cylinder. The steam supply pipe 26, the nozzle 28, the depending tube 29, the casing 24, and the water discharge pipe 30 always remain stationary. As shown in Fig. 4, there may be provided a ball bearing between the stuffing-box carried with the water trap 22, and the flanged collar on the water casing 25.

It will be seen from the foregoing description that the construction is such that only a single manifold is necessary, and that the steam pipes are each independently movable or free to expand and contract without placing any undue strain on any part of the apparatus. The loosely fitting plugs may be so adjusted as to permit the air to escape when the steam is turned on, and then automatically close when the steam reaches the same. The steam pipes are concentrically arranged in two circumferential series, thus increasing the heating surface, facilitating construction and increasing the stirring up action of the material in the drier so as to increase the rapidity with which the air absorbs the moisture. The steam is supplied to the manifold and steam pipes in an efficient manner and the water of condensation is collected and carried away with minimum loss of steam because of the steam trap located very closely to the manifold. The stationary protecting casing 32 assures directing the material into the hopper 35 from which the dried material goes into the conveyer box containing the conveyer 33. It will be observed that the discharge openings 34 are located ahead of the manifold so that there will be no banking up of the material before being ejected from the drying cylinder. The stationary casing 32 has an enlarged opening in its center which causes the air draft to be directed through the central portion of the drying cylinder instead of through the openings 34. There are also other advantages in the construction, arrangement and operation of the apparatus hereinbefore described and shown in the accompanying drawings.

It will be seen with this improved construction that only a single manifold is necessary, that the steam pipes are independently movable, and that the discharge means for dried material permit it to be discharged into a conveying apparatus without passing over the manifold.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of my invention as defined by the claims, and I desire therefore not to be restricted to the precise construction herein disclosed.

What is claimed as new is—

1. In a rotary steam drier, the combination with a rotary cylinder, of steam pipes within said cylinder, a manifold connected to said pipes at one end of each, means coacting with said manifold for directing the water of condensation to the axis of said manifold, a cylindrical water collection receptacle connected to rotate with the cylinder, steam pipes and manifold; a steam supply pipe extending into the manifold, a stationary casing forming a chamber around a portion of said steam pipe, and extending outside of the water collection receptacle, an open pipe communicating with the lower portion of said cylindrical collecting chamber and the said casing, and a water discharge pipe connected to the outer portion of said stationary casing.

2. In rotary steam driers, the combination with a manifold, of a stationary steam supply pipe, a stationary casing connected to said steam supply pipe to form a chamber around a portion of the same, a cylindrical receptacle into which the casing extends, partitions and passageways connected to said manifold to convey the water of condensation to said cylindrical receptacle, an open pipe connecting the lower portion of said cylindrical receptacle to said stationary casing, a water discharge pipe connected to the outside of said stationary casing, and a ball bearing stuffing-box connecting the chamber and said casing.

3. In a rotary drier, the combination with a rotary cylinder, of heating pipes or flues within said cylinder, a manifold secured to said flues, the flues being of different sizes radially arranged with the smaller flues nearer the axis of the cylinder, discharge openings in the cylinder near the manifold

but on the side facing toward the receiving end of the cylinder, a shell for receiving the dried material from said discharge openings, and mountings for the flues at the ends opposite the manifold for permitting elongation of said flues due to their expansion when heated.

4. In a rotary drier, the combination with a rotatable cylinder, of heating pipes within said cylinder, a manifold connected to said pipes near the discharge end of the cylinder, discharge openings in the cylinder adjacent the manifold but on the side facing toward the receiving end of the cylinder, means for supporting the tubes freely at the receiving end of the cylinder, and a stationary shell inclosing the manifold and receiving the dried material discharged from said discharge openings in said cylinder.

5. In a rotary steam drier, the combination with a rotatable cylinder, of steam pipes within said cylinder, a steam manifold connected on one side to said steam pipes at one end of the cylinder with openings in the other side opposite the ends of the pipes, an annular plate for receiving loosely the opposite ends of the steam pipes, removable plugs in the last named end of said steam pipes, and removable plugs in the manifold for openings registering with the opposite ends of said pipes.

6. In a rotary steam drier, the combination with a rotatable cylinder, of steam pipes within said cylinder, a plate at one end of said cylinder for loosely receiving one end of each of said steam pipes with the ends exposed, removable plugs in said exposed ends of the pipes, and removable plugs spaced from and registering with the opposite ends of the pipes.

7. In a rotary drier, the combination with a rotatable cylinder having a receiving end and a discharge end, of heating flues within said cylinder, a manifold at the discharge end of the cylinder connected to said flues, means for supporting the opposite ends of the flues at the receiving end of the cylinder, means for cleaning the flues of the water of condensation, said supporting means permitting the tubes to move freely longitudinally relatively to the same, means for simultaneously actuating the feeding apparatus, the flue-cleaning mechanism and the rotary cylinder, apparatus for collecting the water of condensation while trapping the steam closely adjacent to the manifold, and means for supplying steam to the manifold and said flues.

8. In a rotary drier, the combination of a revoluble cylinder having receiving and discharge ends, a manifold in the discharge end formed with an axial chamber, peripheral chambers, and communicating radial passages between said chambers, the said passages arranged and disposed as spokes as many in number as the peripheral chambers, the peripheral chambers each having a passage from the forward end through one spoke for the steam, and a passage for water from the rear end through another spoke, a chambered stuffing box secured to the manifold adjacent the axial chamber, tubes secured to the said water passage to direct the water from said peripheral chambers into the chamber of the stuffing box, and means to direct steam to the axial chamber and to provide a discharge for steam or water from the chamber of the stuffing box.

9. In a rotary drier, the combination of a revoluble cylinder having receiving and discharge ends, a manifold in the discharge end formed with an axial chamber, peripheral chambers and communicating radial passages between said chambers, the said passages arranged and disposed as spokes as many in number as the peripheral chambers, the peripheral chambers each having a passage from the forward end through one spoke for the steam, and a passage for water from the rear and through another spoke, a chambered stuffing box secured to the manifold adjacent the axial chamber, tubes secured to the said water passage to direct the water from said peripheral chambers into the chamber of the stuffing box, and a steam supply fitting comprising a steam passage communicating with the axial chamber of the manifold, and a water passage surrounding said steam passage provided with a pipe extending into said stuffing box chamber and with an outside discharge pipe.

10. In a rotary drier, the combination of a revoluble cylinder having receiving and discharge ends, a manifold in the discharge end formed with an axial chamber, peripheral chambers, and communicating radial passages between said chambers, the said passages arranged and disposed as spokes as many in number as the peripheral chambers, the peripheral chambers each having a passage from the forward end through one spoke for the steam, and a passage for water from the rear end through another spoke, a stuffing box with an annular chamber secured to the manifold adjacent the axial chamber thereof and rotatable therewith, pipes inserted in the said water passages in the axial chamber and projecting into the stuffing box chamber to direct water thereto, and a stationary steam supply fitting projecting into the stuffing box chamber, the said fitting comprising a cylindrical chambered member with a steam pipe, connection extending through the member protruding through the stuffing box chamber into the said axial chamber, a pipe communicating with the interior of said chambered member and extending into the annular chamber, and another pipe on the outside of the stuffing box chamber communicating with said

interior and provided with means to permit the discharge of water and steam from said annular chamber and of steam from said manifold chambers.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 7th day of April, A. D. 1911.

CHARLES E. GEIGER.

Witnesses:
CHARLES H. SEEM,
K. W. WONNELL.