

No. 705,305.

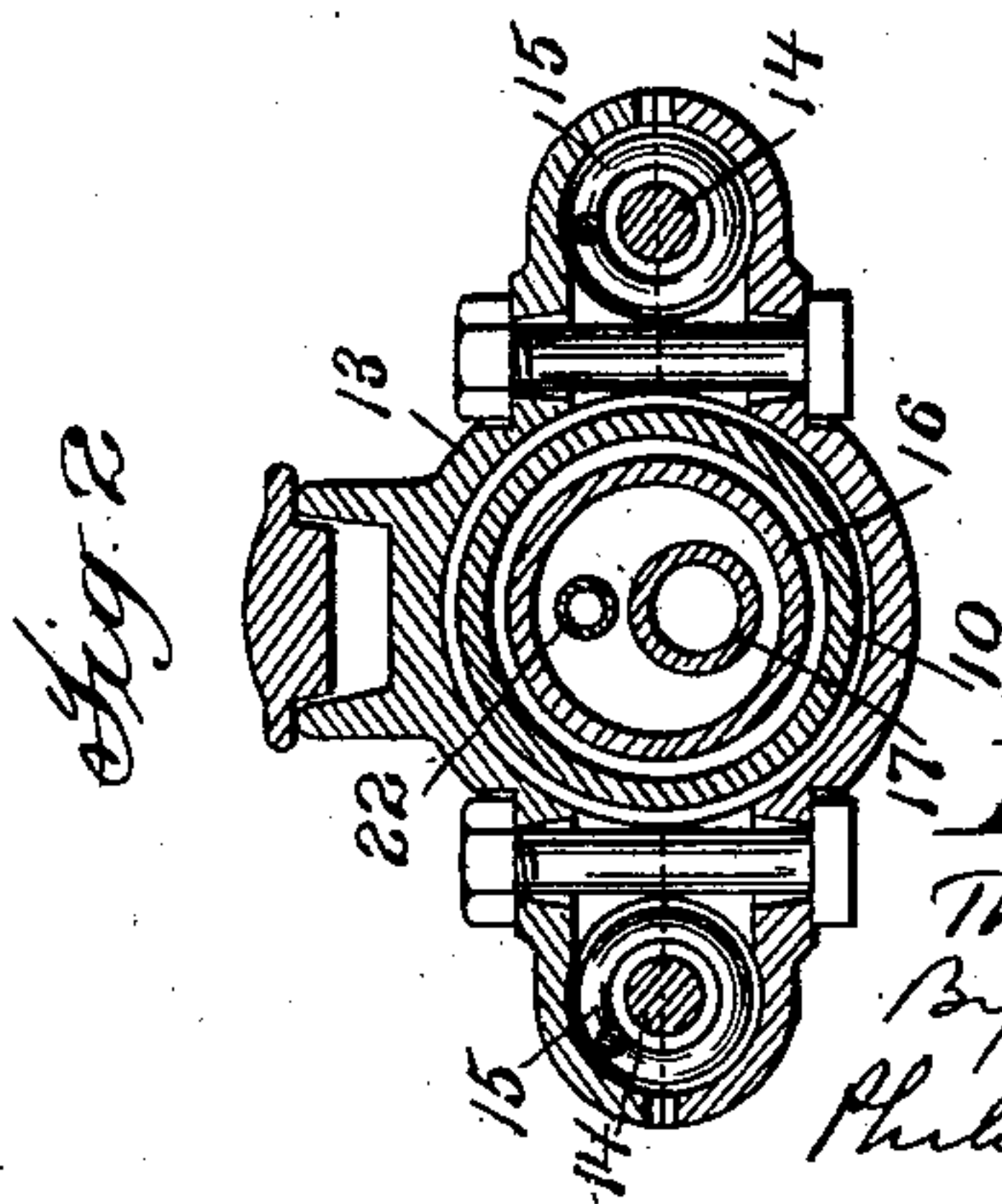
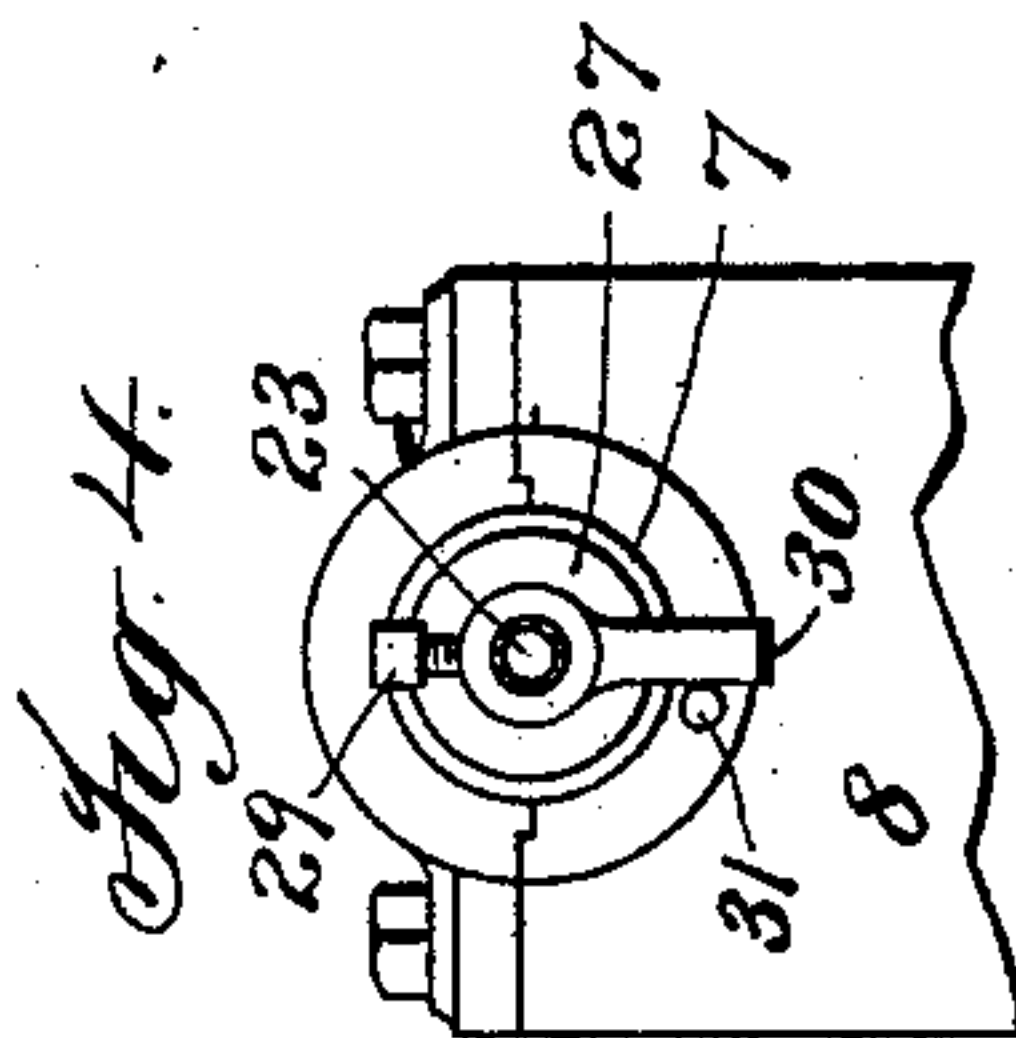
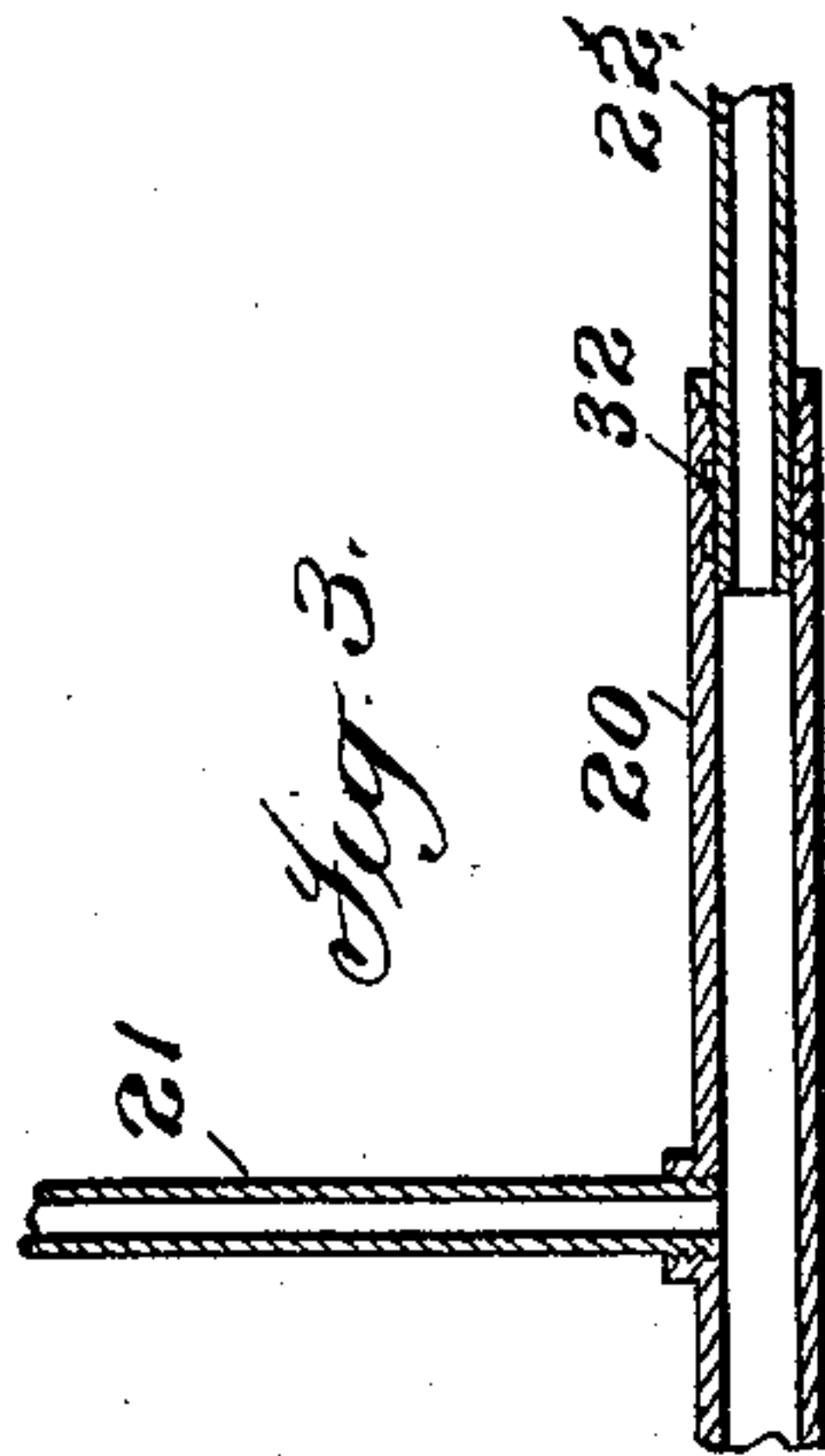
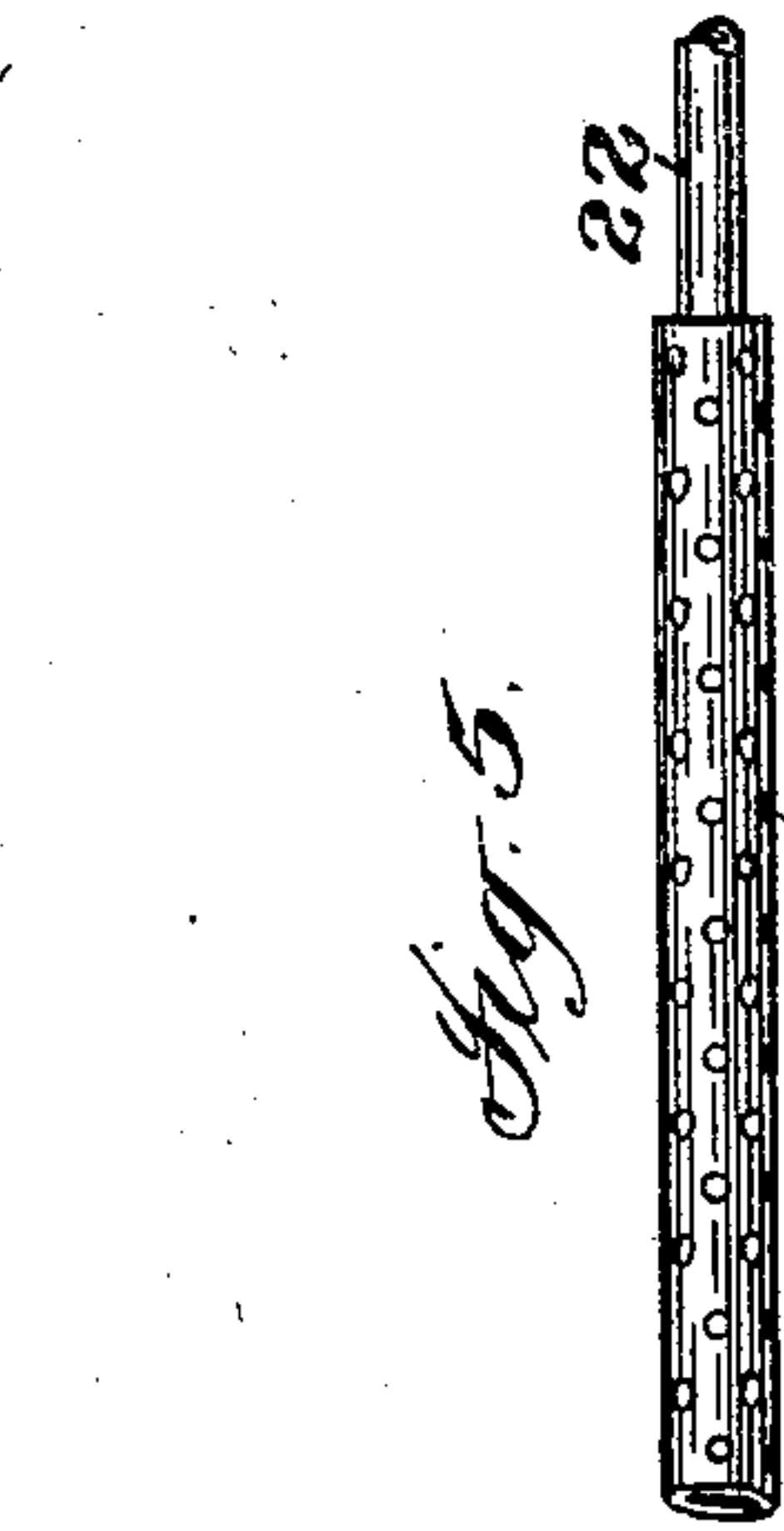
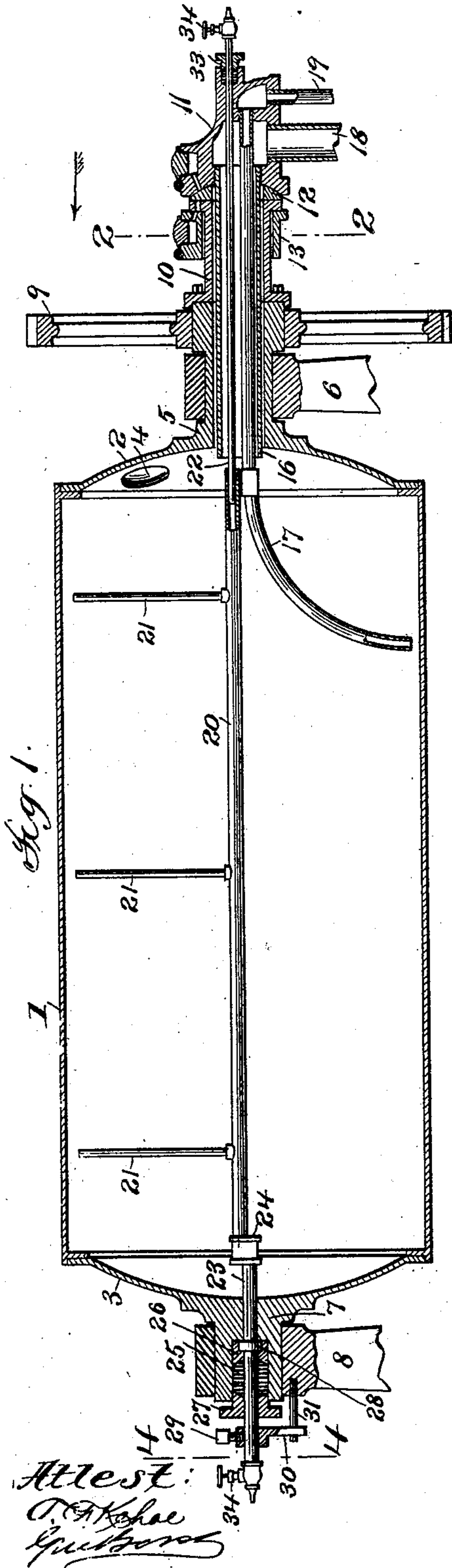
Patented July 22, 1902.

T. H. SAVERY.

AIR EXHAUST FOR REVOLVING STEAM DRYING OR HEATING CYLINDERS.

(Application filed Mar. 3, 1900.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

THOMAS H. SAVERY, OF WILMINGTON, DELAWARE.

AIR-EXHAUST FOR REVOLVING STEAM DRYING OR HEATING CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 705,305, dated July 22, 1902.

Application filed March 3, 1900. Serial No. 7,180. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS H. SAVERY, a citizen of the United States, residing at Wilmington, county of Newcastle, and State of Delaware, have invented certain new and useful Improvements in Air-Exhaust for Revolving Steam Drying or Heating Cylinders or Drums, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to certain improvements in revolving steam drying or heating cylinders or drums.

It has been found that it is difficult to quickly heat up to the proper temperature revolving steam heating or drying cylinders or drums—such, for instance, as the revolving cylinders or drums which are used in bleaching and drying paper-stock—this being due to the fact that air accumulates in these cylinders or drums after the machines have stopped and the cylinders or drums have become cold, and when the steam is again turned on this air prevents it from getting to all parts of the cylinders or drums. Furthermore, more or less air is mixed with the steam which is constantly flowing into the cylinders or drums during the operation of the machine. As the steam condenses this air remains in the cylinders or drums, becoming trapped therein, and operates to prevent the steam from getting to all parts of the cylinders or drums, thus causing the various parts of the same to be unequally heated. This not only reduces the efficiency of the cylinders, but in the handling of paper-stock causes the production of streaky paper, due to the fact that some parts of the stock are dried more than other parts.

It is the object of this invention to provide improved means whereby the air which has accumulated in the revolving steam cylinders or drums from any cause is permitted to escape therefrom, whereby such drums or cylinders may be rapidly brought up to a working temperature when the machines are started and maintained at an even temperature during the runs.

With this object in view the invention consists in certain constructions and in certain parts, improvements, and combinations, as

will be hereinafter fully described and then pointed out in the claims hereunto appended.

In the accompanying drawings, which form a part of this specification, and in which like characters of reference indicate the same parts, Figure 1 is a longitudinal vertical section of the revolving steam drying or heating cylinder or drum. Fig. 2 is a section on the line 2 2 of Fig. 1 looking in the direction of the arrow in said figure. Fig. 3 is a detail illustrating the joint between two of the pipes. Fig. 4 is a sectional view on the line 4 4 of Fig. 1 looking in the direction of the arrow in said figure. Fig. 5 is a detail view of the air-outlet pipe, illustrating a modified form of the same.

Referring to the drawings, 1 indicates a revolving steam drying or heating cylinder or drum—such, for instance, as the drier drum or cylinder commonly used in paper-making machinery. This drum is provided with heads 2 and 3, which are secured to the drum in any suitable manner, the head 2 being provided with a manhole 4, as is usual. Projecting from the head 2 is a journal 5, this journal being mounted in any suitable bearing—such, for instance, as the one indicated at 6. Extending from the head 3 is a journal 7, this journal being mounted in a bearing 8. The journal 5 is or may be provided with a gear-wheel 9, by which the drum is rotated and has secured to it in any suitable manner, as by bolts, a projection 10, said projection extending toward a pipe-support 11, which is mounted in any suitable or desired manner. (Not shown.) Between this pipe-support 11 and the end of the projection 10 is located an annular steam-valve 12, said valve fitting against seats on the projection 10 and the pipe-support 11. The projection 10 is surrounded by a collar 13, said collar being secured to bolts 14, which extend from the pipe-support 11. Springs 15 are located between the bolts and the collar, the purpose of this construction being to yieldingly force together the projection 10, the valve 12, and the pipe-support 11, thus causing the valve to be snugly seated against the seats on the projection and the support.

The construction so far described forms a joint which is steam-tight when the pressure



of the steam in the cylinder or drum is normal, but which will yield when said pressure becomes excessive. This construction is fully shown and described in Patent No. 635,512, granted October 24, 1899, to me, and reference is made to said patent for a fuller disclosure of the construction, the description already given being sufficient for the purpose of this application.

Connected to the pipe-support 11 is a steam-pipe 16, said pipe extending inwardly from said support through the hollow journal 5 and communicating with the interior of the drum or cylinder 1. A curved siphon drain-pipe 17 is also shown as connected to the pipe-support 11 and as extending therefrom through the hollow journal 5 into the drum. A pipe 18, which is connected to any suitable source of steam-supply, admits steam to a chamber in the pipe-support 11, after which it passes into the drum through the steam-pipe 16. A pipe 19 communicates with another chamber in the pipe-support, said chamber being in communication with the siphon drain-pipe 17.

By the construction so far described means are provided for admitting steam to the drum and for removing water of condensation therefrom. It has been found, however, in the practical working of steam drying or heating cylinders or drums such as are herein described that a considerable length of time is required to heat them up to a working temperature, owing to the fact that the air which accumulates in the cylinders or drums when the machines are not running prevents the steam from getting to the surfaces thereof. Furthermore, more or less air is mixed with the entering steam, and as the steam is constantly condensing the air is left in the drums and accumulates therein, being trapped or pocketed in different parts of the drums. The result of this is, particularly in paper-making machinery, that different parts of the drums are differently heated, and a streaky product results, because the parts of the drums which some portions of the product come in contact with are much hotter than other parts. In order, therefore, to permit the air which for any reason has accumulated in the drums or cylinders to escape, the drums or cylinders are provided with air-outlet pipes. These air-outlet pipes may be variously constructed, located, and arranged. In the construction shown, however, the outlet of air is effected by a pipe 20, which in the preferred form of the construction extends across the cylinder from end to end. This pipe 20 may be provided with any suitable means for admitting into it the air which is accumulated in the cylinder. In some instances the air may be admitted through perforations in the pipe, and such a construction is shown in Fig. 5. A pipe having a long slot or slots therein might also be used. Preferably, however, the construction will be that illustrated in Figs. 1 and 3. The pipe 20 is pro-

vided with a plurality of pipes 21, which extend from it toward the surface of the cylinder. In some instances practical working of the cylinders has shown that the air seems to accumulate in zones throughout the length of the cylinder, said zones apparently lying near the surface of the cylinder. The pipes 21 will be sufficiently numerous to tap these zones and carry the accumulated air out of the cylinder.

The pipe 20 is preferably, though not necessarily, arranged near the axial center of the cylinder, and while it might be continued outward through the journals of the cylinder it is preferably connected to and supported by two pipes 22 and 23. The pipe 23 is connected to the pipe 20 by any suitable form of coupling, one being indicated at 24, and this pipe extends through a perforation in the journal 7. In order to provide for a tight joint between the pipe 23 and the journal 7, a suitable recess or chamber is formed in the journal, and this recess is filled with packing 25, the said packing lying between two collars 26 and 27, the whole forming a stuffing-box of ordinary description. In order to prevent any longitudinal movement of the pipe 23, it is provided with a collar 28, which is preferably located in a recess in the collar 26.

Any suitable means may be employed when necessary to prevent the pipe 23 from rotating with the journal. In the construction shown this pipe has secured to it, by means of a set-screw 29 or in any other suitable manner, an arm 30, said arm being in contact with a pin or projection 31, extending from the bearing 8.

The connection between the pipe 22 and the pipe 20 is preferably formed by means of a sliding joint. The construction will preferably be that shown in Fig. 3, in which the interior of the pipe 20 is provided with a plurality of circular recesses 32, said recesses forming a water-joint of ordinary construction. By means of this joint expansion and contraction and the movement of the pipes, due to the movement between the pipe-support 11 and the projection 10 when the steam in the boiler is above normal, are provided for, and the pipes may be properly adjusted when the machine is installed by reaching through the manhole 4.

The pipe 22 preferably passes through the journal 5 and also preferably through the steam-pipe 16, which is located in said journal. Said pipe 22 also passes through a perforation in the support 11, a suitable stuffing-box 33 being provided, if necessary, between said pipe and the support to form a tight joint.

Any suitable means—as, for instance, valves 34—may be provided to control the escape of air from the pipes 22 and 23.

The operation of the construction is obvious. When steam is admitted to the drum or cylinder at the time of starting the machine, one or both of the valves 34 are opened,



and the air is permitted to escape from the cylinder. When the air has been driven out by the entering steam, the valves 34 may be closed. In some instances, however, when it is found that air is accumulating in the cylinder during the run of the machine either one or both of the valves 34 may be left partly open, so as to allow the accumulated air to escape.

Changes and modifications may be made in the construction herein shown, and it will be understood, therefore, that the invention is not confined to the specific details of the construction which has been herein shown and described.

What is claimed is—

1. The combination with a revolving steam drying or heating cylinder or drum, of means for admitting steam thereto, an air-outlet pipe extending substantially across the cylinder or drum, and a plurality of pipes connected therewith and extending toward the surface of the cylinder, substantially as described.

2. The combination with a revolving steam drying or heating cylinder or drum, of means for admitting steam thereto, an air-outlet pipe extending substantially across the cylinder or drum, means for supporting said pipe near the axial center of the cylinder or drum, and a plurality of pipes connected to said outlet-pipe and extending toward the surface of the cylinder or drum, substantially as described.

3. The combination with a revolving steam drying or heating cylinder or drum, of means for admitting steam thereto, means for removing the water of condensation, an air-outlet pipe extending substantially across the cylinder or drum, and a plurality of pipes connected therewith and extending toward the surface of the cylinder or drum, substantially as described.

4. The combination with a revolving steam drying or heating cylinder or drum having a hollow journal, of means for admitting steam to the cylinder or drum, an air-outlet pipe, a pipe passing through the hollow journal to which one end of the outlet-pipe is connected by a sliding joint, and means for supporting the other end of the outlet-pipe, substantially as described.

5. The combination with a revolving steam drying or heating cylinder or drum having a hollow journal, of means for admitting steam to the cylinder or drum, an air-outlet pipe, a plurality of pipes extending from the air-outlet pipe toward the surface of the cylinder, a pipe passing through the hollow journal to which one end of the outlet-pipe is connected by a sliding joint, and means for supporting the other end of the outlet-pipe, substantially as described.

6. The combination with a revolving steam drying or heating cylinder or drum having a hollow journal, of a steam-inlet pipe passing through said journal, an air-outlet pipe ex-

tending substantially across the cylinder or drum, a pipe with which one end of the air-outlet pipe is connected by a sliding joint, said pipe passing through the steam-inlet pipe, and means for supporting the other end of the air-outlet pipe, substantially as described.

7. The combination with a revolving steam drying or heating cylinder or drum having a hollow journal, of a steam-inlet pipe passing through said journal, an air-outlet pipe extending substantially across the cylinder or drum, a pipe with which one end of the air-outlet pipe is connected by a sliding joint, said pipe passing through the steam-inlet pipe, means for supporting the other end of the air-outlet pipe, and a plurality of pipes connected to the air-outlet pipe and extending toward the surface of the cylinder, substantially as described.

8. The combination with a revolving steam drying or heating cylinder or drum having a hollow journal, of a steam-inlet pipe passing through said journal, a pipe for removing the water of condensation extending through the steam-pipe, an air-outlet pipe extending substantially across the cylinder, a pipe with which one end of said air-outlet pipe is connected by a sliding joint, said pipe passing through the steam-pipe, and means for supporting the other end of the air-outlet pipe, substantially as described.

9. The combination with a revolving steam drying or heating cylinder or drum having a hollow journal, of a steam-inlet pipe passing through said journal, a pipe for removing the water of condensation extending through the steam-pipe, an air-outlet pipe extending substantially across the cylinder, a pipe with which one end of said air-outlet pipe is connected by a sliding joint, said pipe passing through the steam-pipe, means for supporting the other end of the air-outlet pipe, and a plurality of pipes connected to the air-outlet pipe and extending toward the surface of the cylinder, substantially as described.

10. The combination with a revolving steam drying or heating cylinder or drum, of a steam-inlet pipe, an air-outlet pipe extending substantially across the cylinder or drum, and means whereby the air is permitted to escape from the air-outlet pipe at each end of the cylinder, substantially as described.

11. The combination with a revolving steam drying or heating cylinder or drum, of a steam-inlet pipe, an air-outlet pipe extending substantially across the cylinder or drum, and a pipe connected to each end of said air-outlet pipe and extending outside the cylinder or drum, the joint between one of said pipes and the air-outlet pipe being a sliding joint, substantially as described.

12. The combination with a revolving steam drying or heating cylinder or drum, of a steam-inlet pipe, an air-outlet pipe extending substantially across the cylinder or drum, a pipe connected to each end of said air-outlet pipe



and extending outside the cylinder or drum, the joint between one of said pipes and the air-outlet pipe being a sliding joint, and a plurality of pipes connected to the air-outlet pipe and extending toward the surface of the cylinder, substantially as described.

13. The combination with a revolving steam drying or heating cylinder or drum, of a steam-inlet pipe, an air-outlet pipe, a pipe to which one end of said air-outlet pipe is connected by a sliding joint, and means for supporting the other end of said outlet-pipe, substantially as described.

14. The combination with a revolving steam drying or heating cylinder or drum provided with journals, of a steam-inlet pipe, an air-outlet pipe, a pipe to which said air-outlet pipe is connected, said pipe passing through one of the journals, suitable packing whereby a tight joint is formed between the pipe and the journal, means for preventing said pipe from turning with the journal, and a plurality of pipes connected to the air-outlet pipe and extending toward the surface of the cylinder, substantially as described.

15. The combination with a revolving steam drying or heating cylinder or drum provided with journals, of a steam-inlet pipe, an air-outlet pipe, a pipe to which said air-outlet pipe is connected, said pipe passing through one of the journals, suitable packing whereby a tight joint is formed between the pipe and the journal, an arm secured to said pipe, and a projection on the journal-bearing with which the arm engages, substantially as described.

16. The combination with a revolving steam drying or heating cylinder or drum provided with journals, of a steam-inlet pipe, an air-outlet pipe, a pipe to which said air-outlet pipe is connected, said pipe passing through one of the journals, suitable packing whereby a tight joint is formed between the pipe and the journal, an arm secured to said pipe, a projection on the journal-bearing with which the arm engages, and a plurality of pipes connected to the air-outlet pipe and extending toward the surface of the cylinder, substantially as described.

17. The combination with a revolving steam drying or heating cylinder or drum having journals, of a steam-inlet pipe, an air-outlet pipe, a pipe passing loosely through one of the journals, the air-outlet pipe being connected at one end with said pipe by a sliding joint, a pipe passing through the other journal with which the other end of said air-outlet pipe is connected, suitable packing for forming a tight joint between said pipe and the journal, and means for preventing said pipe from turning with the journal, substantially as described.

18. The combination with a revolving steam drying or heating cylinder or drum having journals, of a steam-inlet pipe, an air-outlet pipe, a pipe passing loosely through one of the journals, the air-outlet pipe being con-

nected at one end with said pipe by a sliding joint, a pipe passing through the other journal with which the other end of said air-outlet pipe is connected, suitable packing for forming a tight joint between said pipe and the journal, means for preventing said pipe from turning with the journal, and a plurality of pipes connected to the air-outlet pipe and extending toward the surface of the cylinder, substantially as described.

19. The combination with a revolving steam drying or heating cylinder or drum having journals, of a steam-inlet pipe passing through one of the journals, a support to which said pipe is connected, a yielding joint between said support and the journal, an air-outlet pipe extending substantially across the cylinder, a pipe passing through the support and the steam-pipe, said pipe being connected to the air-outlet pipe by a sliding joint, a pipe passing through the other journal, and a suitable connection between said pipe and the air-outlet pipe, substantially as described.

20. The combination with a revolving steam drying or heating cylinder or drum having journals, of a steam-inlet pipe passing through one of the journals, a support to which said pipe is connected, a yielding joint between said support and the journal, an air-outlet pipe extending substantially across the cylinder, a pipe passing through the support and the steam-pipe, said pipe being connected to the air-outlet pipe by a sliding joint, a pipe passing through the other journal, a suitable connection between said pipe and the air-outlet pipe, and a plurality of pipes connected to the air-outlet pipe and extending toward the surface of the cylinder, substantially as described.

21. The combination with a revolving steam drying or heating cylinder or drum having journals, of a steam-inlet pipe passing through one of the journals, a support to which said pipe is connected, a yielding joint between said support and the journal, a pipe for removing water of condensation, said pipe passing through the steam-pipe and being connected to the stationary support, an air-outlet pipe extending substantially across the cylinder, a pipe passing through the stationary support and the steam-pipe, said pipe being connected to the air-outlet pipe by a sliding joint, a pipe passing through the other journal, and a suitable connection between said pipe and the air-outlet pipe, substantially as described.

22. The combination with a revolving steam drying or heating cylinder or drum having journals, of a steam-inlet pipe passing through one of the journals, a support to which said pipe is connected, a yielding joint between said support and the journal, a pipe for removing water of condensation, said pipe passing through the steam-pipe and being connected to the stationary support, an air-outlet pipe extending substantially across the cylinder, a pipe passing through the sta-



tionary support and the steam-pipe, said pipe  
being connected to the air-outlet pipe by a  
sliding joint, a pipe passing through the other  
journal, a suitable connection between said  
5 pipe and the air-outlet pipe, and a plurality  
of pipes connected to the air-outlet pipe and  
extending toward the surface of the cylinder,  
substantially as described.

In testimony whereof I have hereunto set  
my hand in the presence of two subscribing 10  
witnesses.

THOMAS H. SAVERY.

Witnesses:

WILLIAM H. SAVERY,  
HOWELL S. ENGLAND.