Dec. 23, 1941. J. B. ADT 2,267,259

ROTARY DRIER

Filed Jan. 11, 1939 3 Sheets-Sheet 1

Fig. 1.

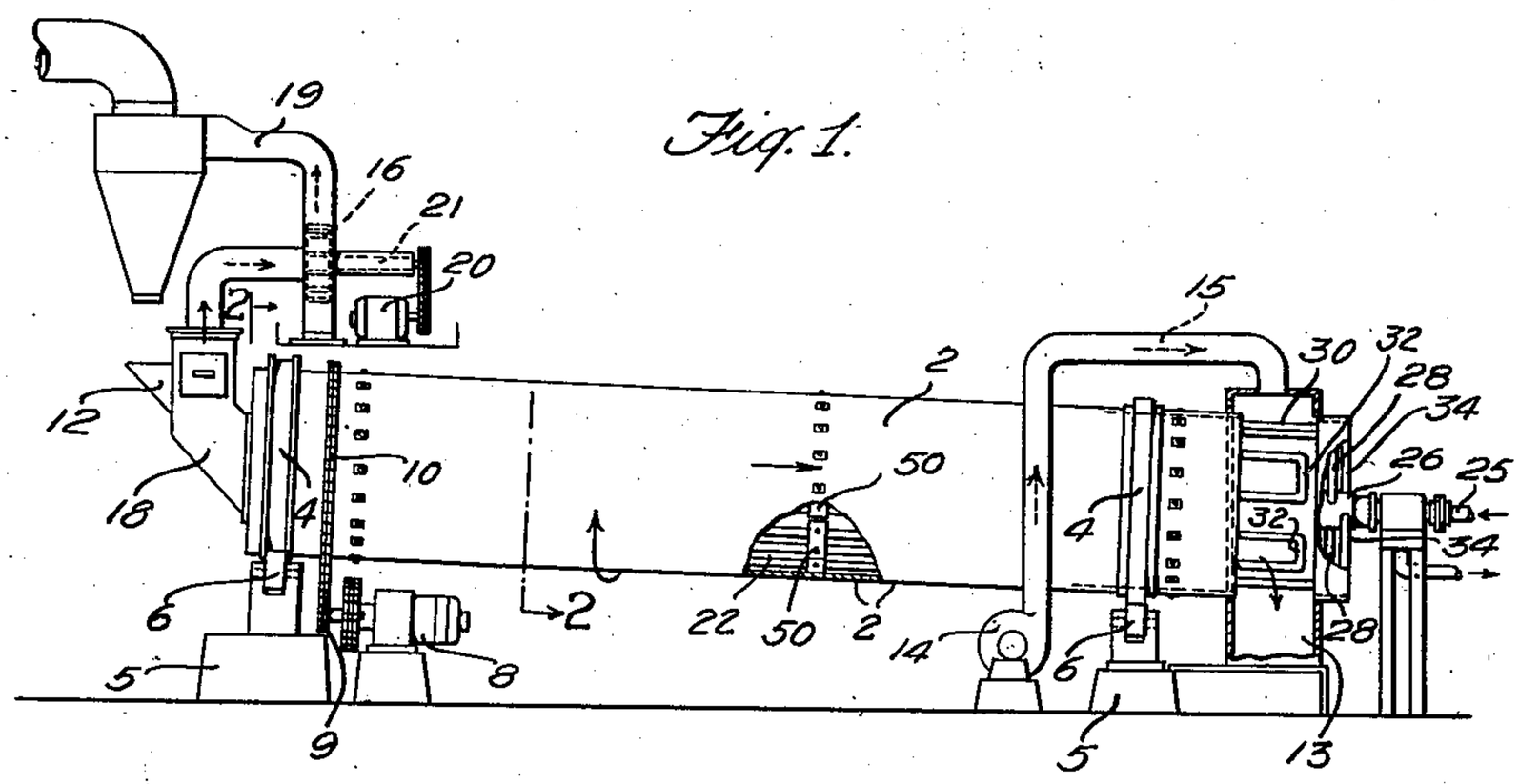
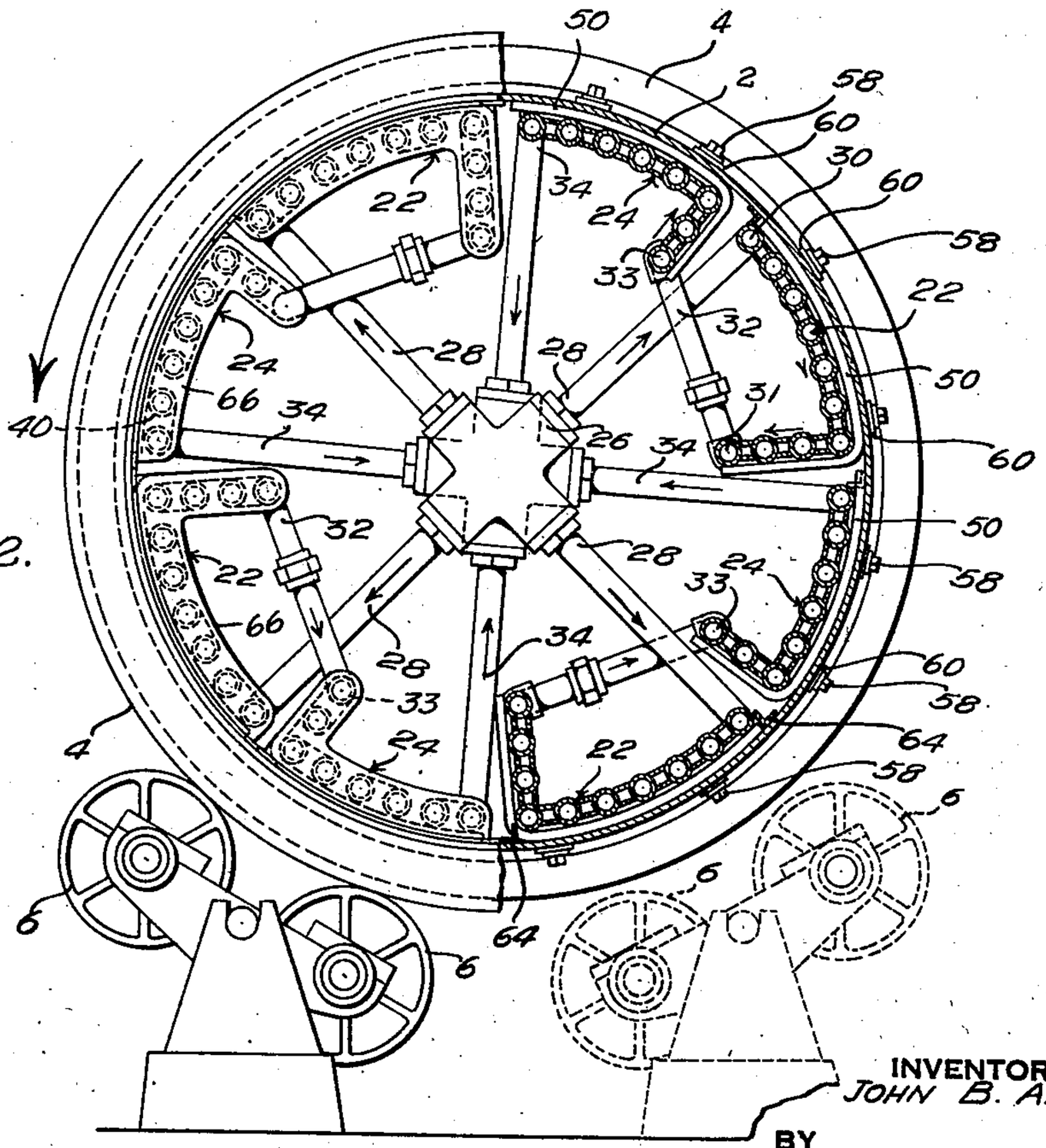


Fig. 2.



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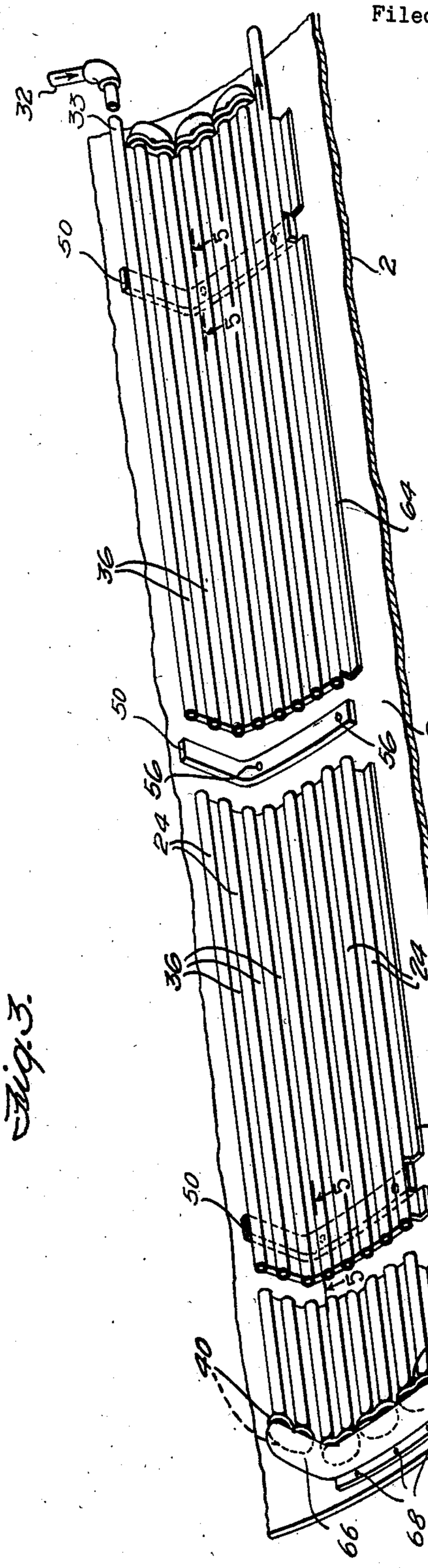

Fig. 3.

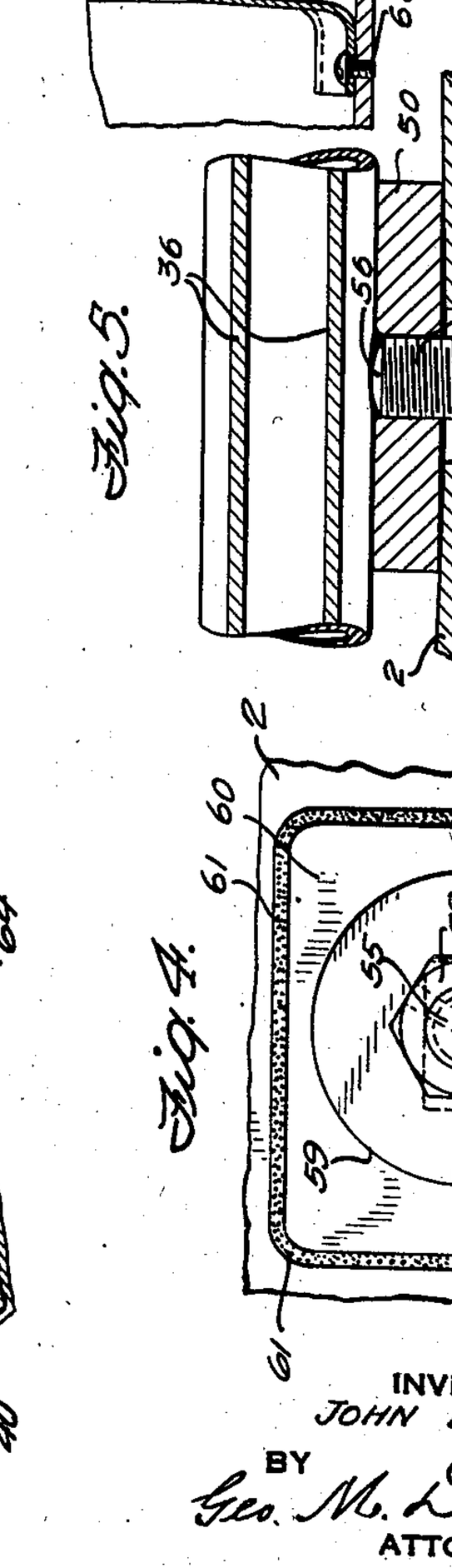

Fig. 6

Fig. 5.

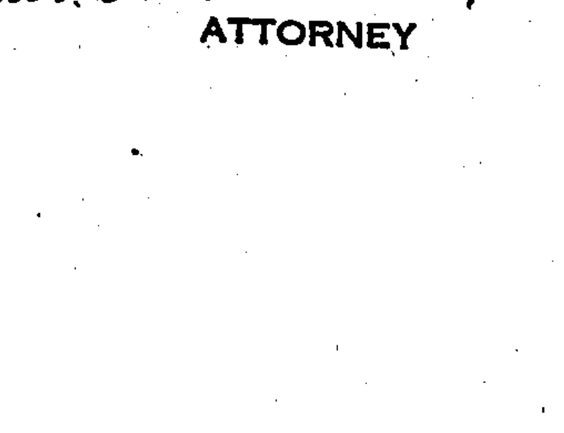

Fig. 4

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Fig. 7.

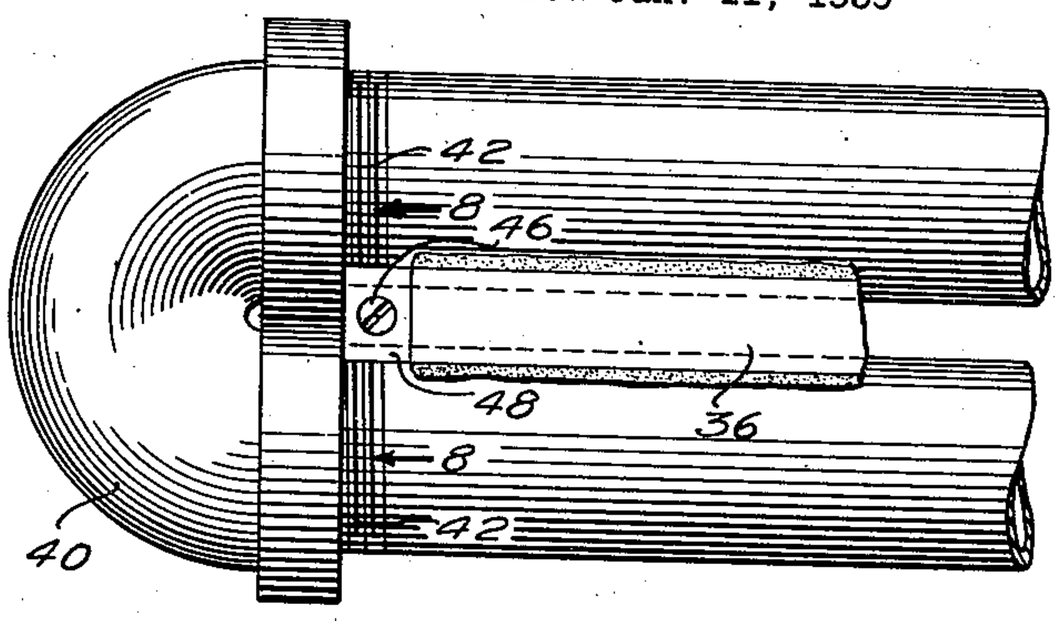


Fig. 8.

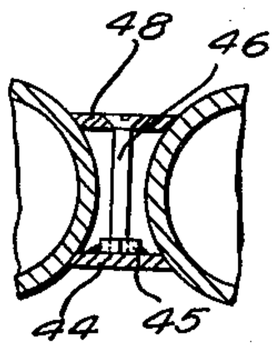
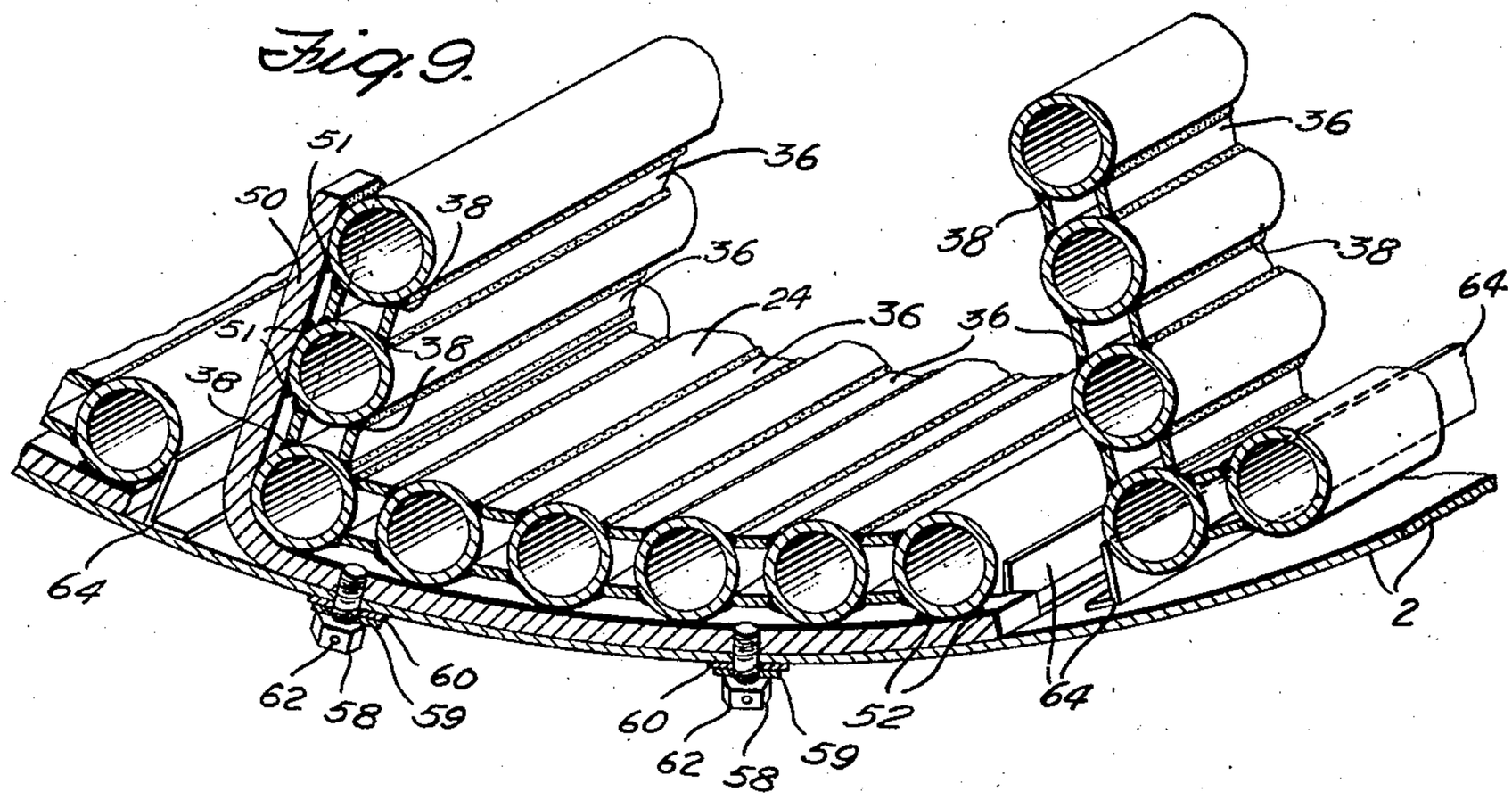


Fig. 9.



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Patented Dec. 23, 1941

2,267,259

UNITED STATES PATENT OFFICE

2,267,259

ROTARY DRIER

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Application January 11, 1939, Serial No. 250,293

4 Claims. (Cl. 257—92)

This invention relates to rotary driers and more particularly to driers of this type adapted to be used in drying smoking tobacco and tobacco to be used in the making of cigarettes.

In driers for this purpose at present in commercial use, a rotating cylinder is provided having gangs of steam conducting pipes on its interior. It is customary to arrange the pipes of each gang in groups, the pipes of one group extending in proximity to the cylinder surface and the pipes of another group extending therefrom at approximately a right angle. As the cylinder revolves, the tobacco is picked up by the gangs of pipe near the lower portion of the cylinder and carried upwardly to a position where the tobacco drops down to be again raised by the gangs of pipe with which it may come into contact, thus drying the tobacco to the desired degree. Steam is passed through the pipes at a suitable temperature in order that the drying may be sufficiently rapid and air is circulated through the cylinder.

When the cylinder is rotated at the usual rate which is from 10 to 15 R. P. M. and the tobacco does not remain long in contact with any pipe even though the temperature of the steam in the pipe is relatively high, there is usually little danger of heating the tobacco to a point where it may scorch or burn. If, however, any portion of tobacco becomes caught during its progress through the drier so that it remains in contact with any pipe for any great length of time, there is danger of scorching the tobacco to an undesirable extent.

It is quite desirable also that the tobacco be handled as little as possible, otherwise small pieces may break off which are technically known in the art as "shorts." In the processing of smoking and cigarette tobacco, the leaves are subjected to a cutter which cuts them into relatively narrow strips or shreds and from the cutting machine the tobacco is fed into the drier. Due to the fact that driers as at present constructed, require the use of bolts and brackets for the support of the steam carrying pipes, the "shorts" produced in the drier are frequently a source of trouble.

One of the objects of the present invention therefore, is the elimination of bolts or other rough projections which tend to cause the formation of "shorts."

Another object of the invention is to eliminate the possibility of burning or scorching the tobacco due to the fact that in the driers at present in commercial use tobacco is sometimes caught between pipes or hangs against some of the projecting portions of the pipes or fittings and remains in contact with the hot surfaces a sufficient time to injure the product.

In the attainment of these objects, a feature of the invention consists in providing a gang of pipes whose contour, which comes into contact with the tobacco, is relatively smooth.

A further feature of the invention relates to the formation of the gangs of pipes or steam conduits as an integral metal structure whereby the amount of radiating surface which comes in contact with the tobacco is not reduced over that in the driers at present in commercial use.

A still further feature relates to the manner of forming the gangs of pipes so that the radiating surfaces exposed to contact with the tobacco is presented in a more efficient manner and without the possibility of any tobacco being caught or held in contact with the hot surfaces long enough to become burnt or scorched.

Further features and advantages of the invention will become apparent from the following description and claims when taken in connection with the accompanying drawings in which:

Figure 1 is an elevation more or less diagrammatic, showing the type of drier to which my improvements are applied;

Figure 2 is a sectional view on the line 2—2 of Figure 1 looking towards the discharge end of the cylinder, the figure being on a much larger scale than Figure 1;

Figure 3 is a perspective view of a gang of pipes showing their general arrangement along the cylinder wall;

Figure 4 is an enlarged detail of the means for securing a gang of pipes to the cylinder;

Figure 5 is a section taken on the line 5—5 of Figure 4 and along the lines 5—5 of Figure 3;

Figure 6 is a part section and part elevational view of a portion of the left hand end of the gang of pipes shown in Figure 3;

Figure 7 is an elevation showing the coupling end of two pipes;

Figure 8 is a section on the line 8—8 of Figure 7; and

Figure 9 is a perspective view of a portion of a gang of pipes with a few pipes of the gangs immediately adjacent.

Referring to the drawings, the cylinder 2, Figure 1, is provided with a bearing ring 4 near either end thereof by which it is supported by base members 5, anti-friction rollers 6 being interposed between the base members and the cylinder (see also Figure 2). The bearing ring 4

shown at the left in Figure 1 is grooved while the ring 4 at the other end of the cylinder is not, thereby permitting the cylinder to expand in a longitudinal direction without change of position at its left hand end. Thrust bearings (not shown) may also be provided if desired.

Rotation of the cylinder may be effected in any suitable manner and for purposes of illustration, I have shown a motor 8 having a sprocket 9 driven from the motor shaft. The cylinder is also provided with a sprocket and a sprocket chain 10 passed around both sprockets.

The tobacco to be dried is fed into the cylinder through a chute 12 and since the cylinder is slightly inclined the tobacco will be gradually fed through the cylinder during its rotation and be discharged at the lower or right hand end at 13.

In order that drying may advantageously be effected and the moisture evaporated from the tobacco effectively removed, air may be circulated through the cylinder and exhausted therefrom. For this purpose a blower, conventionally shown at 14, forces air through a pipe 15 into the cylinder at its discharge end, such blower being suitably driven in any desired and well known manner. The exhaust may be effected merely by means of a stack, but preferably a fan 16 draws the vapors from the feed end of the cylinder through a conduit 18 and delivers them to an exhaust 19. The fan 16 is driven by motor 20 suitably connected to shaft 21 to which the fan 16 is attached.

The interior of the drier is provided with gangs of pipes 22 and 24, the gangs of pipes 22 preferably consisting of ten pipes some of which extend along the inner surface of the cylinder while other pipes extend substantially radially. The gangs of pipes 24 preferably consist of eight pipes. For different sized driers the number of pipes in the different gangs would of course be varied.

These gangs of pipes are supplied with steam for heating them to the desired temperature, the steam entering at 25, Figure 1, and passing thence to a spider 26, Figures 1 and 2 from which it is distributed, as more clearly shown in Figure 2. Steam from the spider passes to each of the pipes 28 which extend from the spider radially to a point near the inner surface of the cylinder where each pipe 28 is connected to a pipe 30 at one end of a gang of pipes 22. It then passes back and forth through the various pipes until it reaches the pipe 31 when it passes thence into cross over pipe 32 which connects the pipe 31 of a gang of pipes 22 with the pipe 33 of a gang of pipes 24. One gang of pipes 24 is shown in perspective in Figure 3 and a portion of the cross-over pipe 32 is shown in the upper right hand portion of this figure. Steam from the pipe 32 enters the pipe 33 and passes back and forth through the gang of pipes 24 and the exhaust steam and condensate is returned through one of the pipes 34 to the spider 26, the pipes 34 alternating with the pipes 28.

It is to be noted that the spider 26 and distributing and return pipes 28 and 34 are situated beyond the discharge 13 so that the tobacco does not come in contact with these distributing and return connections.

The pipe 25 through which the steam is supplied does not rotate and suitable packing is provided between this pipe and the spider and its connections whereby these may rotate with the cylinder.

The construction and operation of the device so far described is, in its main features, similar to the construction disclosed in the patent to John B. Adt (my grandfather) #1,057,912, April 1, 1913.

It will be noted that in order to support the various gangs of pipes in the drier disclosed in said patent, a number of brackets and bolts are employed and these projecting within the cylinder detract from the smoothness of the surfaces which come into contact with the tobacco and may be a source of trouble not only in increasing the number of "shorts" but also offering the possibility for lodgement of tobacco and permitting it to remain sufficiently long in contact with the relatively hot surface to cause sufficient scorching and impairment of the product.

It has heretofore been proposed to cover the steam heating pipes of a drier with a sheathing. Such a sheathing, somewhat loosely covering the pipes, necessitates the presence of a layer of air between the sheathing and the pipes which layer of air greatly reduces the rate of heat transfer from the pipes. Also small pipes, not steam pipes, have been located between the large steam pipes with the object of preventing the material to be dried from being caught between the steam pipes, or in the case of tobacco, to prevent the shreds of tobacco from wrapping around the steam pipes. These small pipes being cold relatively to the steam pipes resulted in loss of heat transfer and would sometimes permit tobacco shreds to lodge in the crevices between the pipes thus scorching the tobacco.

The present improvements provide not only for a plurality of gangs of heating pipes having surfaces which come in contact with the tobacco of relatively smooth contour, but this result is accomplished without the great loss of heat transfer necessarily resulting from constructions heretofore proposed.

In the present construction each pipe of a gang is integrally connected with an adjacent pipe as shown most clearly in Figure 9 by a strip of metal 36 each of which strips being welded to the pipes along their abutting edges 38 thus forming an integral structure of substantially homogeneous metal.

By this construction the effective radiating surface is substantially the same as though the strips 36 were not present and at the same time a relatively smooth contour is attained.

As the cylinder revolves in the direction of the arrow shown in Figure 2, the tobacco is picked up by those gangs of pipes which happen to be in the lower portion of the cylinder at the time being, and is carried upwardly to a position where the tobacco drops down to be again raised by the gangs of pipes with which it may come into contact. For the purposes of description and in the claims, those surfaces with which the tobacco comes into contact are referred to as the forward surfaces, while the opposite surfaces are referred to as rearward surfaces.

Since it may be desirable not to carry the weld to a point within the threaded portion of each pipe and at the same time prevent the creation of any cavity wherein the tobacco might lodge, I employ the construction shown in detail in Figures 7 and 8.

In Figure 7 two pipes and their coupling piece 40 are shown. The portion of the welded strip 36 is also shown and it will be noted that this is stopped short of the threaded portion 42 of each pipe. The space between the end of the strip 36 and the coupling piece 40 is filled in as

is more clearly shown in Figure 8. A small plate 44 is provided with a threaded nut 45 suitably secured thereto. A threaded screw 46 passes through a counter-sunk hole in a plate 48 similar to the plate 44 and is screwed into the nut 45.

To provide for the necessary expansion of the pipes and at the same time to secure them to the cylinder in such manner as will avoid objectionable projecting parts within the tobacco zone, I provide the following means.

Angular strips 50, Figure 3, are secured to the cylinder wall and are welded to the steam heating pipes or to some of them at their rearward surfaces only. In Figure 9 a strip 50 is shown welded to the upper two radial pipes at 51 and to the right hand pipe at 52. It is not necessary to weld all of the pipes to the attaching strip. Preferably there is one of these strips 50 situated near the center of the cylinder and one at each end thereof.

Not only are the pipes connected to the cylinder by means which are attached to the pipes at their rearward surfaces only but the attaching means also permits a longitudinal yielding of the pipes relative to the cylinder. This may be effected in various ways, the following being a suitable form.

Referring to Figures 3, 4 and 5, the end strips 50 are each provided with projecting studs or pins 54 which studs are secured against turning in a strip plate 50. This may be done by having the stud threaded, as at 55, and after the stud has been screwed into the strip 50, its inner end may be peened at 56 or welded into place. The other end of the stud is screw-threaded for engagement by a nut 58, a washer 59 being interposed between the nut and a metal pad 60 which is welded as at 61 to the cylinder 2, Figure 5. The opening in the cylinder wall and in the pad through which the stud 54 passes is elongated longitudinally and the nut 58 is screwed up fairly tight but nevertheless sufficiently loose to permit relative movement between the strip 50 and the cylinder.

The center plate 50 may be secured in the same manner as above described but in this case the nut 50 would be screwed up as tightly as possible or other means for securely fastening the center plate 50 to the cylinder may be provided. In order that the correct position of the nut 58 may be maintained, the stud 54 is provided with a tapered opening and a tapered pin 62 is inserted so that the nut will not change its position after the correct tension has been established.

To prevent the tobacco from passing beneath the pipes, small angle irons 64 are provided and are located as shown in Figures 2 and 9.

To prevent the tobacco from getting under the coil at the feed end of the cylinder, I provide a cover plate 66 shown in Figures 3 and 6. This plate is secured to the cylinder wall by fastening means 68 which may be screws or rivets engaging the cylinder. The plate is soldered at suitable points along one edge to the coupling pieces 40 as indicated at 70, Figure 6.

From the foregoing it will be apparent that I have provided a drier having gangs of steam conducting pipes, each gang being formed as an integral structure of generally smooth exterior contour, and while I have shown and described the attainment of this result by welding strips of metal between adjacent pipes, I do not wish to be limited to the exact construction and means shown since variations may be resorted to without departing from the spirit of the invention.

What I claim is:

1. In a rotary drier for drying tobacco, said drier having a rotatable cylinder through which the tobacco passes during the drying operation, said cylinder having gangs of steam conducting pipes attached to the inner wall thereof and revoluble therewith, the forward surfaces of said gangs adapted to engage the tobacco to be dried as the cylinder rotates; each of said gangs of pipe formed as an integral metallic structure, the surfaces of each of said gangs having a generally smooth contour free from crevices into which the tobacco might find lodgement thereby preventing overdrying or burning of the tobacco, said surfaces supplying substantially uniform heat throughout to effect efficient drying of the tobacco during its passage through the drier.

2. In a rotary drier for drying tobacco, said drier having a rotatable cylinder through which the tobacco passes during the drying operation, said cylinder having gangs of steam conducting pipes attached to the inner wall thereof and revoluble therewith, some of the pipes of each gang extending inwardly from the inner wall of the cylinder, the forward surfaces of said gangs adapted to engage the tobacco to be dried as the cylinder rotates; the pipes of each gang being so connected as to form an integral metallic structure, the forward surfaces of each gang of pipes having a generally flat smooth contour free from crevices into which tobacco might find lodgement, thereby preventing overdrying or burning of the tobacco, said surfaces supplying substantially uniform heat throughout to effect efficient drying of the tobacco during its passage through the drier.

3. In a rotary drier for drying tobacco, said drier having a rotatable cylinder through which the tobacco passes during the drying operation, said cylinder having gangs of steam conducting pipes attached to the inner wall thereof and revoluble therewith, some of the pipes of each gang extending along the inner wall of the cylinder, other pipes of each gang extending towards the center of the cylinder; the forward surfaces of said gangs adapted to engage the tobacco to be dried as the cylinder rotates, the pipes of each gang being so connected as to form an integral metallic structure, the forward surfaces of each gang of pipes having a generally flat smooth contour free from crevices into which the tobacco might find lodgement, thereby preventing burning of the tobacco, said surfaces supplying the necessary heat units to effect efficient drying of the tobacco during its passage through the drier.

4. In a rotary drier for drying tobacco, said drier having a rotatable cylinder through which the tobacco passes during the drying operation, said cylinder having gangs of steam conducting conduits attached to the inner wall thereof and revoluble therewith, the forward surfaces of said gangs adapted to engage the tobacco to be dried as the cylinder rotates, some of the conduits of each gang extending towards the center of the cylinder; each of said gangs formed as an integral structure of substantially homogeneous metal, the forward surfaces of each of said gangs having a generally flat smooth contour free from crevices into which the tobacco might find lodgement thereby preventing burning of the tobacco, said surfaces supplying the necessary heat units to effect efficient drying of the tobacco during its passage through the drier.

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