

R. R. WATTERS.

DRIER.

APPLICATION FILED NOV. 14, 1907

907,925.

Patented Dec. 29, 1908.

2 SHEETS—SHEET 1.

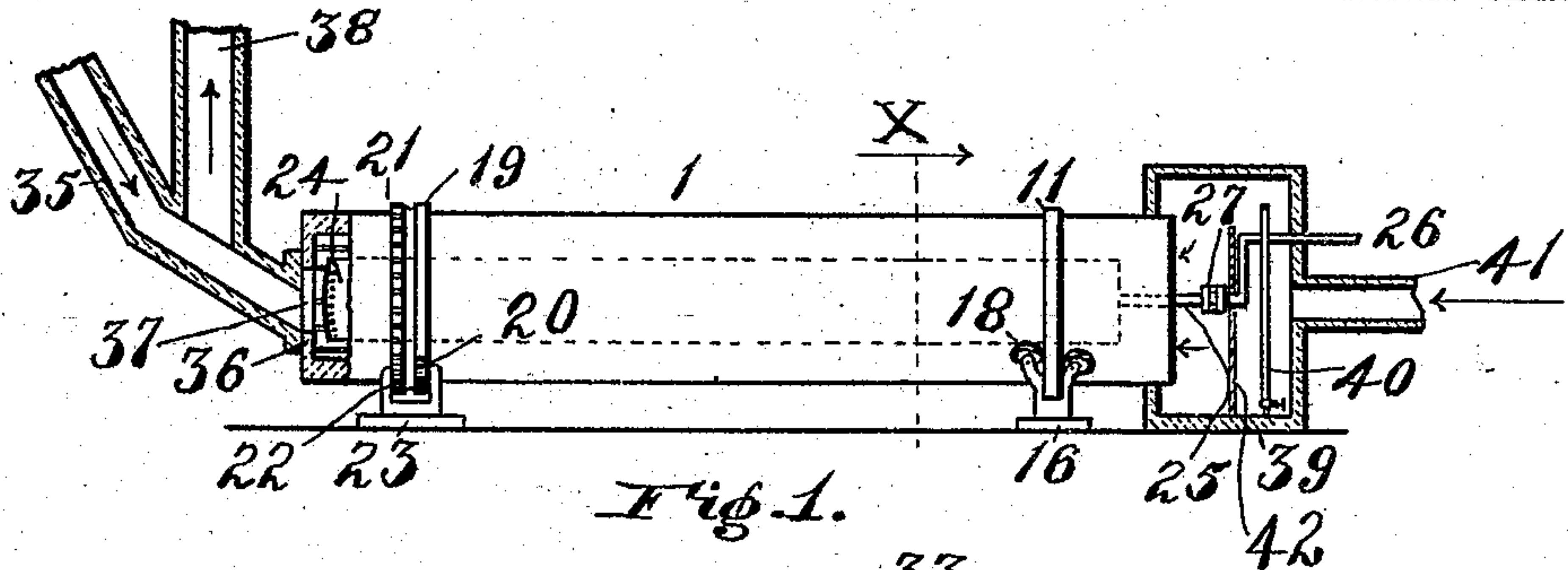


Fig. 1.

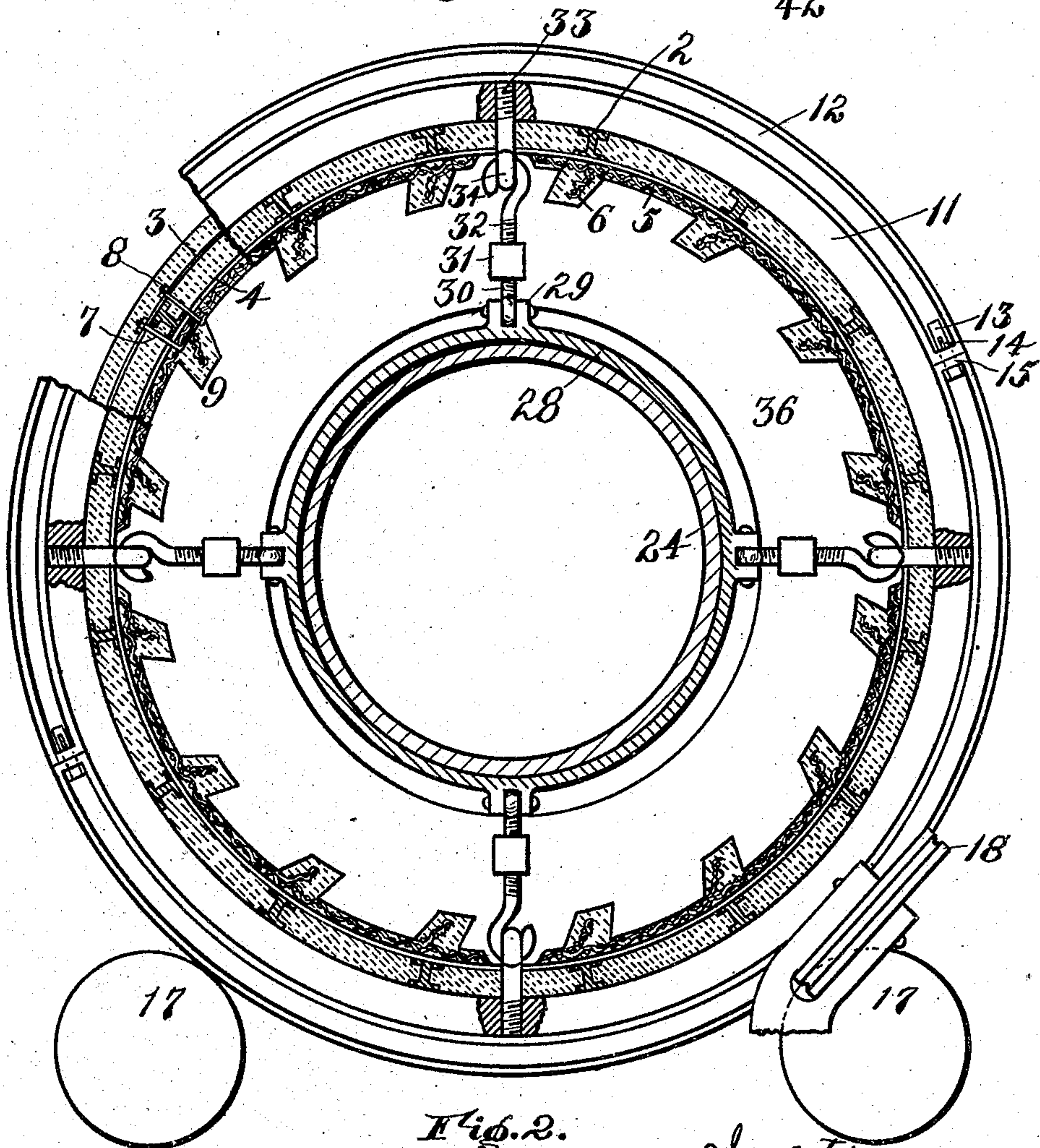


Fig. 2.

Witnesses  
Elyna Blinn  
Minara Fox

Inventor,  
Rama R. Watters  
by C. E. Humphrey  
Atty.

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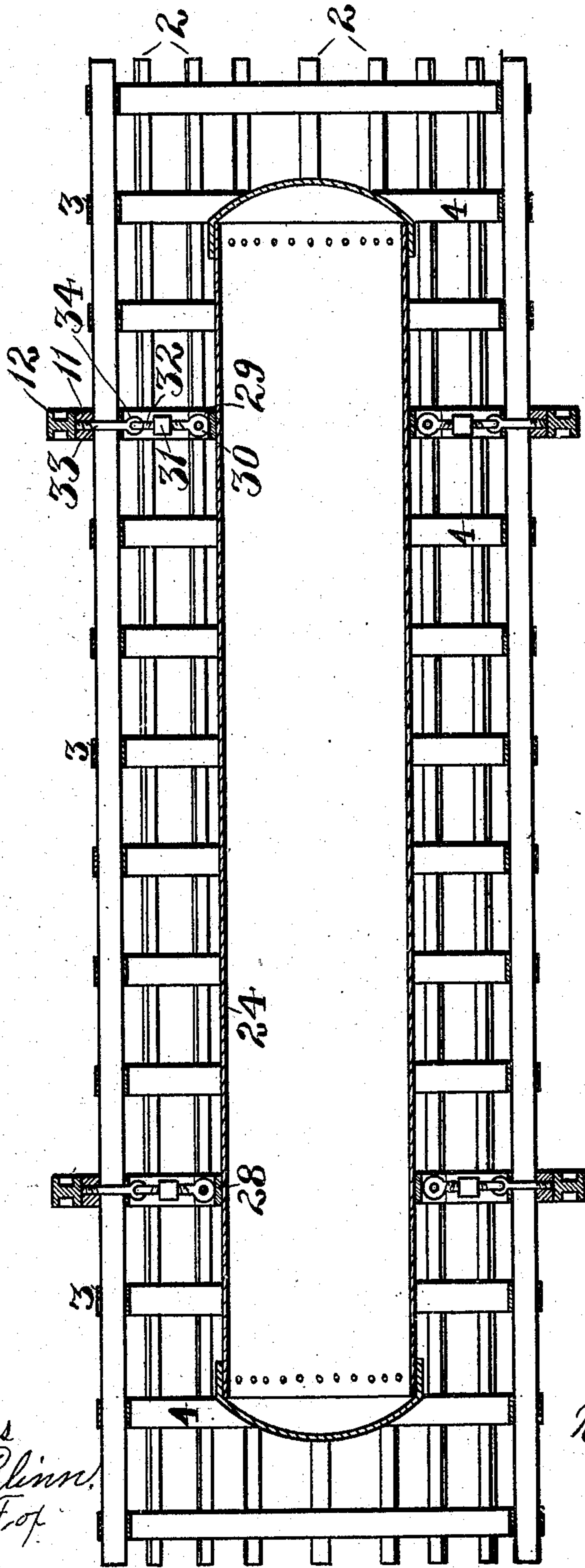


Fig. 3.

Witnesses  
Evelyn Blinn  
Alenara F. of

Inventor,  
Rama R. Watters  
by  
C. E. Humphrey  
Atty.



# UNITED STATES PATENT OFFICE.

RAMA R. WATTERS, OF AKRON, OHIO.

## DRIER.

No. 907,925.

Specification of Letters Patent.

Patented Dec. 29, 1908.

Application filed November 14, 1907. Serial No. 402,161.

*To all whom it may concern:*

Be it known that I, RAMA R. WATTERS, a citizen of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented new and useful Improvements in Driers, of which the following is a specification.

This invention has relation to mechanical driers, more especially driers adapted to extract moisture from materials which in drying have a deleterious effect upon metals, and the object thereof is to construct a drier of a cementitious compound provided with means to permit a blast of air, especially heated air, through the material during the drying process and which in addition embodies an auxiliary heating instrumentality to more readily accomplish the drying process.

A further object is to provide the device with means for feeding the material to be dried to the drier and further provided with a receptacle to receive the same, said drier being provided with means for constantly stirring or agitating the material during the exhausture of moisture therefrom.

A still further object is to construct the drier of a material which is not affected by ordinary chemicals or by chemical reaction during the drying of the material therein.

Other advantages constituting objects of this invention will more fully appear in the subjoined description.

A practical embodiment of my invention is illustrated in the accompanying drawings in which similar reference numerals indicate like parts in the different figures.

In the drawings, Figure 1 is a side elevation of my improved drier on a greatly reduced scale with certain portions thereof in section to better illustrate the construction thereof; Fig. 2 is a transverse section of my improved drier on line X of Fig. 1, and, Fig. 3 is a vertical, longitudinal, central, sectional view of the frame-work of the drier shown in Fig. 1.

Broadly speaking, this invention consists of a hollow cylinder of cementitious material provided with reinforcing means embodied in the wall thereof adapted to be revolved and containing a steam heated drum for effecting the drying of the material fed to the drier.

Specifically describing the device illustrated in the drawings, the reference numeral 1 designates a hollow cylinder of cementitious material having embedded therein a

plurality of longitudinally-arranged I-beams 2. These I-beams are held in position with respect to each other by means of a series of annular bands on which said I-beams rest, said series being composed of a plurality of individual annular bands 4 spaced apart longitudinally from each other sufficiently to support the I-beams and also to permit a cementitious material to unite around them. Surrounding the I-beams and preferably placed in transverse alinement with the members 4 of the inner series of bands is a second series of bands, the members of which are designated by the reference numeral 3. These bands 3 surround the I-beams and serve to hold them in the space intervening between these two series of bands. From this it will be seen that the members 3 and 4 of each series of bands are arranged in pairs, the inner bands 4 and the outer bands 3 being in alinement transversely with each other and also concentric with respect to each other and all the members of each series are in longitudinal alinement with the other members of their respective series.

Extending longitudinally of the drier 1 and abutting against the inner bands 4 is placed a layer 5 of a coarse wire cloth to assist in uniting the cementitious material to the bands, maintaining the same rigidly in position and to stiffen the general structure of the device. At intervals preferably opposite to the position occupied by the I-beams 2 are longitudinally inwardly-extending strips 6 of coarse mesh wire cloth adapted to extend a short distance inwardly from the layer 5 and bent in the form of an obtuse angle with the outer portion thereof lapping the layer 5. In order to maintain the inwardly-extending strip 6, the layer 5 of wire cloth, the I-beams 2 and the bands 3 and 4 in proper relation with respect to each other and to the general structure, I employ a plurality of clip bolts 7, shown in Fig. 2 which consist of a head portion and two legs. These bolts are positioned by passing the two leg portions thereof through the lapping portions of the layer 5 and inwardly-extending strip 6 where the latter laps the former and through suitable openings in the bands 3 and 4 from the inside outwardly in such a manner as to inclose the I-beams 2. The ends of the legs of the clip bolts which project outwardly through the bands 3 are provided with nuts 8 which clamp the parts held by the bolts 7 securely in position.



From the foregoing it will be seen that a metallic structure is set up composed of two concentric series of bands between which are a plurality of longitudinally-arranged I-beams the inner ends serving to maintain a coarse mesh wire structure from which extends a plurality of strips of wire cloth having the portions thereof which lap the main layer of wire cloth held in position by means of clip bolts which extend through the portions of wire cloth and straddle the I-beams serving to compress the two series of bands 3 and 4 upon the I-beams while at the same time firmly clamping the woven wire structure securely in position against the inner series of bands 4. Surrounding the inwardly-extending strips 6 of wire cloth are a plurality of longitudinally-arranged flights 9 of cementitious material integral with the main body or shell of the cylinder of the device and preferably inclined in the same direction which the device would be revolved and employed for the purpose of agitating or carrying upward the material to be dried which is fed to the interior of the drier.

In order to support the device and permit the revolution thereof there is placed at a point, where one of the bands 3 would ordinarily occur, a thickened band 11 adapted to rest on the outer faces of the I-beams 2 and extend outwardly beyond the normal surface of the cementitious portions of the cylinder 1. Mounted on this band 11 is a second band 12 preferably made in two halves with their ends abutting and held in contacting relation to each other by means of bolts 13 extending from one half to the other and secured by drift pins 14 driven through suitable openings in the bolts 13. It will be stated that the band 12 is preferably constructed so as to have incut hollow sides with full ends, the hollow portions of the sides terminating in flanges 15 through which the bolts 13 are passed as shown in Fig. 2, so that the exterior of the band 12 is provided with a smooth contour. Below the cylinder 1 is an upright bracket 16 in which are mounted a pair of idler rollers 17 on which the band 12 rolls, thereby permitting the free rotation of the cylinder. In order to prevent longitudinal motion I provide a pair of end thrust grooved rollers 18 arranged to be supported by upwardly-extending portions of the brackets 16 which bear on the side edges of the band 12 and prevent any shifting motion of the cylinder during its revolution. Near the opposite end of the cylinder 1 I provide a band similar to band 11 already described, on which is mounted a split band 19 adapted to rest and be revolved upon a pair of idlers 20 corresponding in all respects to the rollers 17 used for supporting the band 12, thereby supporting the opposite end of the cylinder. In order to revolve the cylinder 1, I fixedly secure to the band 19 or form integral there-

with a spur gear 21 meshing into which is a pinion 22 properly supported in a bearing 23 which also supports the idler rollers 20. Motion is communicated to the pinion 22 by any preferred means such as a second gear from an engine shaft or a belt and pulley. From the foregoing it will be seen that the revolution of the pinion 22 will cause a simultaneous but slower revolution of the cylinder 1.

In order to heat the interior of the cylinder 1, I place therein a steam drum 24 arranged to be supplied with steam by means of a pipe 25 united to a fixed pipe 26 from a source of steam supply by means of a joint 27 which permits of the revolution of the pipe 25 without the escape of steam. The drum 24 is held centrally within the cylinder 1 by means of a plurality of bands 28 which inclose the drum and are each provided with a plurality of pairs of ears 29 between which are pivotally mounted threaded eye-bolts 30 bearing nuts 31 provided with interiorly-arranged right and left handed threads. Extending from the nuts 31 and engaging the opposite threads therein from the threads engaged by the bolts 30 are hooks 32 having threaded shanks to engage in the nuts 31. Projecting inwardly at approximate points from the bands 11 are a plurality of threaded bolts 33 provided with eyes 34 into which the hooks 32 engage.

It will be seen from the foregoing that as the drum 24 is inclosed at proper points by means of the bands 28 the drum is supported within the cylinder 1 and it may be accurately positioned therein by means of the nuts 31 which permit the movement of the bands 28 in any direction necessary to centralize the position of the drum 24. In order to feed material to the interior of the cylinder 1 around the space occupied by the drum 24 I provide a chute 35 preferably constructed of cementitious material and at such an inclination as to cause the material to be dried to feed by gravity to the interior of the cylinder. This chute 35 will be so positioned as to bear against the cylinder 1 which is provided at this point with an inward turned flange 36 which provides a suitable opening 37 for the inlet of the material. I prefer to construct the chute 35 with an uptake stack 38 by which the moisture driven from the cylinder 1 may escape. The discharge end of the cylinder 1 is preferably inclosed by a box-like structure 39 containing a coil of steam pipe 40 and an air inlet 41. Within the box-like structure 39 and preferably positioned between the pipe coil 40 and the end of the cylinder 1 is a baffle plate 42 extending from the bottom of the structure 39 upwardly a distance approximately equivalent to the height of the pipe coil 40. The object of this baffle plate 42 is to compel the current of air entering by means of the



air inlet 41 to pass upwardly and around the top of the structure 39, thereby driving the air heated by the pipe coil 40 into the cylinder 1. If these baffle plates were not employed the body of hot air existing in the top of the structure 39 might escape the action of the air blast and only air moderately heated would enter the cylinder.

The operation of the device is as follows: Motion being communicated to the pinion 22 by any suitable means, the cylinder 1 is revolved at a definite speed and is kept from shifting motion by means of the end thrust rollers 18. Steam is communicated through the fixed pipe 26 to the interior of the drum 24 thereby heating the same.

In order to further aid the action of the drum 24 in drying the product fed to the cylinder a blast of air is driven into the air inlet pipe 41 past the steam coil 40 which passes into the end of the cylinder 1, as indicated by the arrows, and it passes outward through the opening 30 and from thence through the uptake flue 38. Material such as salt is then fed upon the chute 35 and into the interior of the cylinder 1 which constantly dries the same during its passage from the end containing the opening 37 until it emerges into the box-like structure 39 in a perfectly dried condition.

It will be noted that if any material being dried by this device is of such a nature that the moisture carried away by the blast of air also carries certain portions of the product into the uptake flue 38 and incrusts therein it may be cleansed by any suitable means and the incrustations will fall from the uptake flue 38 into the chute 35 to be again carried through the drier and deposited in the box 39.

It will be apparent from the foregoing description that this device affords a simple and effective means for drying materials such as salt and other chemicals, the action of which during the drying process will be deleterious to driers constructed of metal, thereby offering a drier which will be substantially everlasting and will not wear out by chemical action. This indestructible feature of the drier is also exceedingly useful where material such as grain, etc., is being dried, which constantly tends to wear through the shell of a drier composed of metal although it has little or no effect upon a drier composed of cementitious material, which under the action of heat employed for drying the material fed therein constantly becomes harder and the inner surface becomes more polished and glazed, thus rendering the use of the same free from the objectionable features of carrying portions of the drier away with the dried product.

What I claim and desire to secure by Letters Patent, is:—

1. The combination in a drier, of a hollow

cylinder of cementitious material having embedded in the wall thereof a reinforcing structure comprising a series of annular bands the members of which are arranged in longitudinal alinement, a second series of bands the members of which are arranged in transverse alinement with the members of said first series of bands and concentric therewith, a plurality of separated I-beams extending longitudinally of said structure positioned between the members of said first and second series of bands, a tubular layer of woven fabric within said first series of bands, holdfast devices for holding the members of said reinforcing structure together, means to heat the interior of said cylinder, means for creating a driven current of air through said cylinder, a plurality of rollers for supporting and revolving said drier, and a split, annular wear-resisting band mounted on one of said outer series of bands and engaging said rollers, substantially as shown and for the purpose described.

2. The combination in a drier, of a hollow cylinder of cementitious material, a reinforcing structure embedded in the wall of said cylinder comprising a plurality of annular bands arranged in longitudinal alinement with each other, means for feeding material into one end of said cylinder, means for heating said cylinder, means to create a driven current of air through said cylinder, a plurality of rollers for supporting and revolving said cylinder, and a split, annular, contractible, wear-resisting band mounted on one of said first mentioned bands engaging said rollers, substantially as shown and for the purpose described.

3. The combination in a drier, of a hollow cylinder of cementitious material, a reinforcing structure embedded in the wall of said cylinder, said reinforcing structure comprising a series of annular bands the members of which are spaced apart and arranged in longitudinal alinement, means to revolve said cylinder, a plurality of bands positioned in the interior of said cylinder at points remote from the wall thereof, a plurality of contractible means each pivotally connected with one of said bands and with said reinforcing structure whereby said bands are suspended within said cylinder, and a heating drum provided with means to receive a heating medium sustained by said bands.

4. The combination in a drier provided with means for heating and revolving it, of a hollow cylinder of cementitious material having embedded in the wall thereof a reinforcing structure comprising a series of annular bands the members of which are arranged in longitudinal alinement, a second series of bands the members whereof are arranged in transverse alinement with the members of the first series of bands, a plurality of separated I-beams extending longitudinally of



said structure disposed between the members of the first and second series of bands, a tubular layer of wire cloth carried by the members of the first series of bands, a plurality of separated inwardly-extending strips of fabric on said tubular layer, holdfast devices each arranged to simultaneously unite said bands to said I-beams and hold said tubular layer and inwardly-extending strips in position, and a covering of cementitious material for said inwardly-extending strips carried by the wall of said cylinder, said strips and their coverings constituting flights for agitating material fed to the interior of said cylinder.

5. The combination in a drier, of a hollow cylinder of cementitious material, a reinforcing structure embedded in the wall of said cylinder comprising a plurality of annular bands arranged so that their axes are in alignment, a second series of bands of greater diameter than the first series of bands positioned in longitudinal alinement with each

other and each member thereof in transverse alinement or surrounding the members of said first series of bands, a plurality of longitudinally-extending separated members held between the members of each series, a drum-supporting structure mounted within the hollow of said cylinder and comprising a plurality of bands of such a diameter that the peripheries thereof will be remote from the wall of the cylinder, pivotal, contractible means extending to and engaging the reinforcing structure of said cylinder, substantially as shown and described and for the purpose stated.

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

RAMA R. WATTERS.

Witnesses:

C. E. HUMPHREY,  
GLENARA FOX.