No. 636,928. Patented Nov. 14, 1899.

B. B. SNYDER & J. J. SELDNER.

DRIER.

(Application filed Mar. 11, 1899.)

(No Model.) 2 Sheets—Sheet 1.

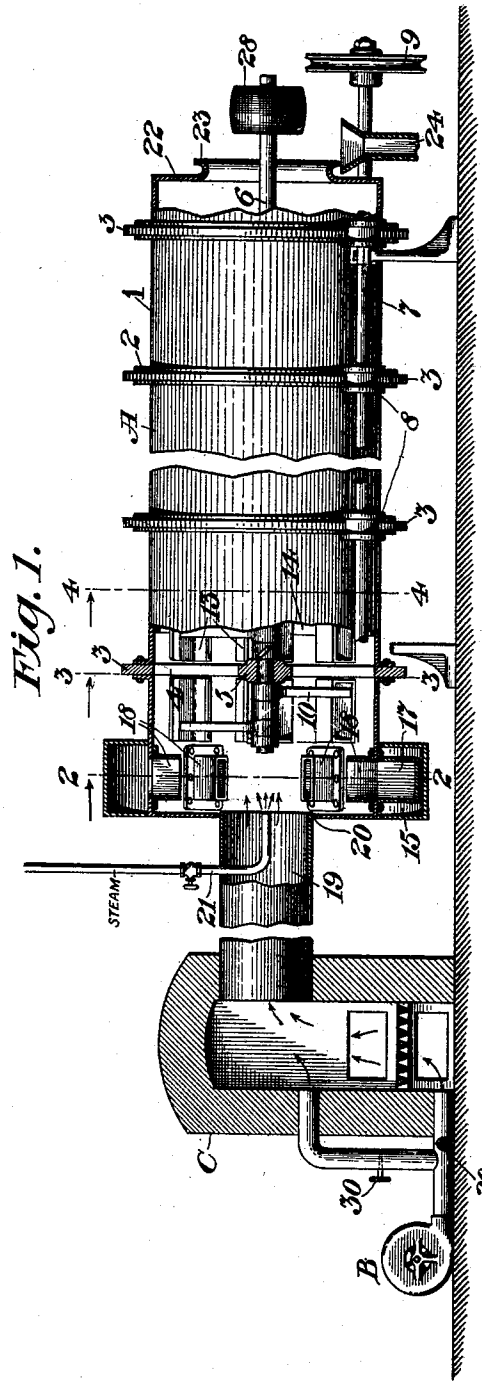


Fig. 1.

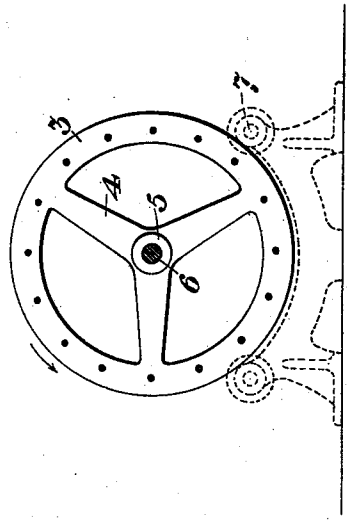


Fig. 3.

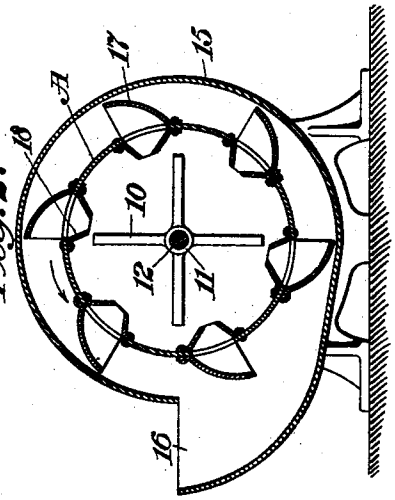


Fig. 2.

Witnesses
C. W. Smith
William E. Steffs

Inventors
B. B. Snyder 2nd
J. J. Seldner
By Watson & Watson Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 636,928. Patented Nov. 14, 1899.

B. B. SNYDER & J. J. SELDNER.

DRIER.

(Application filed Mar. 11, 1899.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 5.

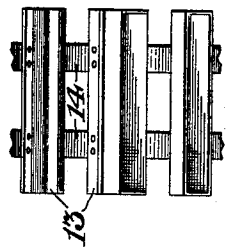


Fig. 4.

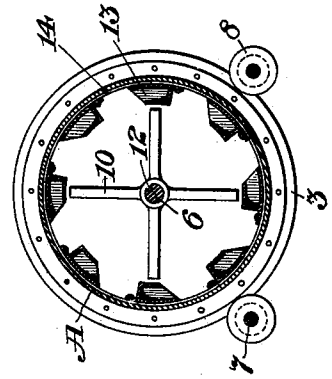
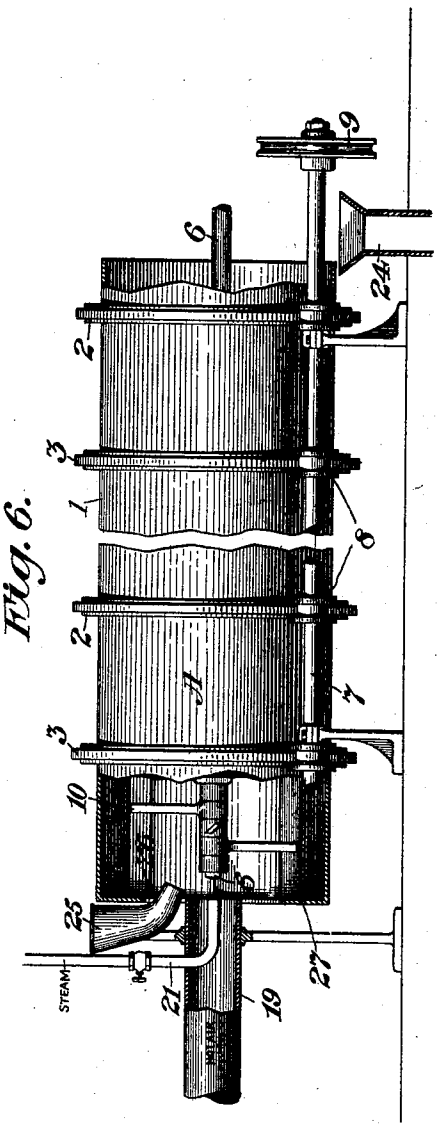


Fig. 6.



Witnesses
C. W. Smith
William E. Steff

Inventors
B. B. Snyder
J. J. Seldner
By Watson & Watson Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

BENJAMIN B. SNYDER AND JONAS J. SELDNER, OF BALTIMORE, MARYLAND.

DRIER.

SPECIFICATION forming part of Letters Patent No. 636,928, dated November 14, 1899.

Application filed March 11, 1899. Serial No. 708,739. (No model.)

To all whom it may concern:

Be it known that we, BENJAMIN B. SNYDER and JONAS J. SELDNER, citizens of the United States, residing in the city of Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Evaporators and Driers, of which the following is a specification.

Our invention relates to machines for evaporating fluids and drying semifluid material.

The invention comprises a rotatable cylindrical casing in which is mounted a central shaft carrying arms or beaters. The shaft is hung in bearings within the casing and is designed to be rotated rapidly independently of the casing. The interior of the casing is provided with buckets by means of which the material is raised and discharged upon the rotating paddles or beaters, which serve to break it up into a fine spray or mist. The beaters preferably have their faces inclined to the axis of the shaft, so that besides breaking the material operated on into fine particles they serve to feed the material gradually from one end of the cylinder to the other. A current of hot dry air or furnace-gases is simultaneously forced through the cylinder and being intimately mingled with the comminuted fluid it takes up and carries off the moisture very rapidly.

Our invention is also designed as a desiccating apparatus in which materials may be thoroughly cooked, dried, and pulverized at a single operation.

The invention will be more fully described in connection with the accompanying drawings, in which—

Figure 1 is a side view, partly in section, illustrating one form of our apparatus. Figs. 2, 3, and 4 are sections on the lines 2 2, 3 3, and 4 4 of Fig. 1, respectively. Fig. 5 is a detail of the buckets, and Fig. 6 is a view illustrating a modified form of the invention.

Referring to the drawings, A indicates a rotatable cylinder, B a blower, and C a furnace. The blower and furnace are shown on a smaller scale than the balance of the apparatus to bring them within the limits of the drawings. The cylinder A is composed of short sections 1, provided at their ends with flanges 2. Between the flanges of adjacent sections of the cylinder are situated frames or spiders 3, which are provided with internal arms or spokes 4, supporting central bearings 5, in which a beater-shaft 6 is mounted. The cylindrical sections and spiders are firmly secured together by bolts or rivets passing through the spiders and the flanges 2 of the sections on opposite sides thereof. The cylinder is supported by means of shafts 7, provided with rollers 8, upon which the flanges of the spiders 3 rest and rotate. One or both of the shafts may be driven by power. As shown, one of the shafts is provided with a pulley 9 for this purpose.

Upon the shaft 6 are affixed a series of beaters 10 in some suitable manner. As shown, the beaters are provided with hubs 11, which have internal keys 12, interlocking with a keyway in the shaft. The beaters are not arranged to extend parallel to the axis of the shaft, but at an angle to said shaft, or inclined, as shown in Fig. 1, in such a manner as to propel the material toward one end of the cylinder.

Upon the interior of the cylinder are a series of buckets 13 of suitable shape and designed to lift the fluid or semifluid material and pour it upon the revolving beaters. The cylinder and beaters are preferably rotated in the same direction. The buckets are preferably not connected directly to the cylinder, but are connected to straps or rings 14, as shown in Fig. 5. In some instances for semifluid material simple radial blades upon the interior of the cylinder may be used instead of buckets.

The feeding apparatus shown in Figs. 1 and 2 is designed to convey material, either solid or liquid, to the interior of the cylinder. This apparatus comprises a trough 15, surrounding the end of the cylinder and having an extension or hopper 16, into which the material can be poured. The material is taken from the trough by a series of buckets 17, arranged upon the outside of the cylinder A, and inward extensions or funnels 18 are provided for the double purpose of increasing the capacity of the buckets and preventing the material from running out through the lower bucket-openings back into the trough. With this apparatus material poured into the hopper will be continuously conveyed into the interior of the cylinder and immediately taken

up by the buckets 13 and poured upon the beaters.

The hot air or gases from the furnace C or from any other suitable source are conveyed through a pipe 19 and blown into the cylinder A through a central opening 20. As a safety device to prevent scorching material when the gases are too hot we provide a steam-pipe 21, which discharges into the cylinder along with the hot air. By turning on the steam when the temperature of the gases is too high scorching of the material and burning out of the apparatus can be prevented.

If the material is only to be partially evaporated and is designed to come from the cylinder A in a fluid or semifluid condition, the discharge end of the cylinder is provided with an inwardly-turned flange 22, as shown in Fig. 1. This flange may be provided with a suitable lip 23 to guide the overflow into a trough or discharge-pipe 24.

Instead of the charging devices shown in Figs. 1 and 2 we may in some instances use a hopper 25, the lower end of which enters an annular opening 26 between the hot-air pipe 19 and the flange 27 on the end of the cylinder. The form shown in Fig. 1, however, is preferable, as it permits the use of a hot-air pipe which is much larger in proportion to the diameter of the cylinder.

The operation of our invention is as follows: The cylinder is rotated slowly in the direction of the arrow by means of the pulley 9. The shaft 6, carrying the beaters, is rotated at high speed by means of the pulley 28 in the same direction as the cylinder. The material is fed into the cylinder by means of the devices shown in Figs. 1 and 2 or the hopper shown in Fig. 6. A current of hot gases or air, or gas and air commingled, is forced into and through the cylinder by the blower B. One pipe leads from the blower to the space below the furnace-grate and the branch pipe leads to the space above the grate. Valves 29 and 30 control these pipes respectively, and the temperature of the gases may be regulated by said valves in an obvious manner. Should the gases be too hot in starting the machine before any of the fluid is passed into the cylinder, they may be tempered by turning on steam from the pipe 21. The material is carried up by the bucket 13 and gradually poured out of the buckets upon the rapidly-revolving beaters 10, which break it up into fine spray or particles. The hot gases immediately become ladened with moisture from the material and carry it off, thus rapidly evaporating the liquid ingredients. The solid material is cooked by the heat of the gases and thoroughly comminuted by the beaters. The material is fed from the entrance to the exit end of the cylinder, as shown, by the inclined faces of the beaters; but, if desired, the cylinder can be inclined sufficiently to cause the material to travel lengthwise in it.

Our invention may be employed to partially evaporate fluids or to separate from fluids the materials held in solution or suspension. It is useful in many arts—such, for instance, as the manufacture of fertilizers from fish or meat, in which the cooking, drying, and grinding or comminuting all take place simultaneously.

Having described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In an evaporating apparatus, the combination of a cylinder having internal buckets for raising the material to be evaporated, a shaft supported within the cylinder and provided with beater-arms, which are arranged to feed the material longitudinally of the cylinder, and means for driving a current of heated air or gases through said cylinder, substantially as described.

2. The combination of a cylinder having internal buckets, a shaft within the cylinder provided with beater-arms, adapted to break up the masses of material discharged by the buckets and also to feed such material longitudinally of the cylinder, means for rotating the cylinder slowly and rotating the shaft rapidly, and means for simultaneously directing a current of heated air through said cylinder, substantially as described.

3. In a drying or evaporating apparatus, the combination of a cylinder comprising a series of flanged sections, and a series of spiders held between the flanges of the sections and provided with central bearings, with a shaft mounted in said bearings, beater-arms upon said shaft, elevating devices upon the inner wall of the cylinder, and means for rotating said shaft and cylinder, substantially as described.

4. In an evaporating apparatus, the combination of a cylinder, straps or rings connected to the inner wall of the cylinder, elevating devices connected to said straps, bearings centrally arranged within the cylinder, a shaft running in said bearings, beater-arms upon the shaft, and means for rotating said shaft and cylinder, substantially as described.

5. In an evaporating apparatus, the combination with a rotating cylinder having internal buckets, and a shaft within the cylinder provided with beater-arms, of means for passing a current of heated gas or air through the cylinder, and means for injecting steam into the cylinder to reduce the temperature of the gas or air entering the cylinder and prevent overheating of the material in the cylinder, substantially as described.

6. In an evaporating apparatus, the combination of a cylinder, a rotatable shaft arranged within the cylinder, means for rotating the cylinder and shaft, means on the inner wall of the cylinder for lifting material from said wall and discharging it toward the shaft, a series of radially-projecting arms secured to the shaft and arranged at an angle to the axis thereof, whereby the material is broken into fine particles and moved longitudinally of the cylinder by said arms, and

means for driving a current of heated air through the cylinder in the direction in which the material is moved therein, substantially as described.

7. In an evaporating apparatus, the combination of a cylinder consisting of a series of cylindrical sections provided at their ends with outwardly-extending flanges, and a series of rings arranged between the cylindrical sections aforesaid and secured to the flanges 2 of such sections, said rings being of such diameter as to extend outwardly beyond the flanges 2, and means engaging with said projecting portions of the connecting-rings and supporting the cylinder, substantially as described.

8. In an apparatus of the character described, the combination of a cylinder, means for rotating the cylinder, a series of hangers extending inwardly from the side wall of the cylinder, a shaft supported in said hangers, means for revolving said shaft independently of the cylinder, and a series of radially-projecting beaters secured to the shaft, substantially as set forth.

9. In an apparatus of the character described, the combination of a cylinder, means for rotating the cylinder, a shaft extending longitudinally of the cylinder, supports for said shaft secured to and revolving with the cylinder, and means for revolving said shaft independently of the cylinder, substantially as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

BENJAMIN B. SNYDER.
JONAS J. SELDNER.

Witnesses:
N. F. BURKE,
FRANK R. WESSEL.