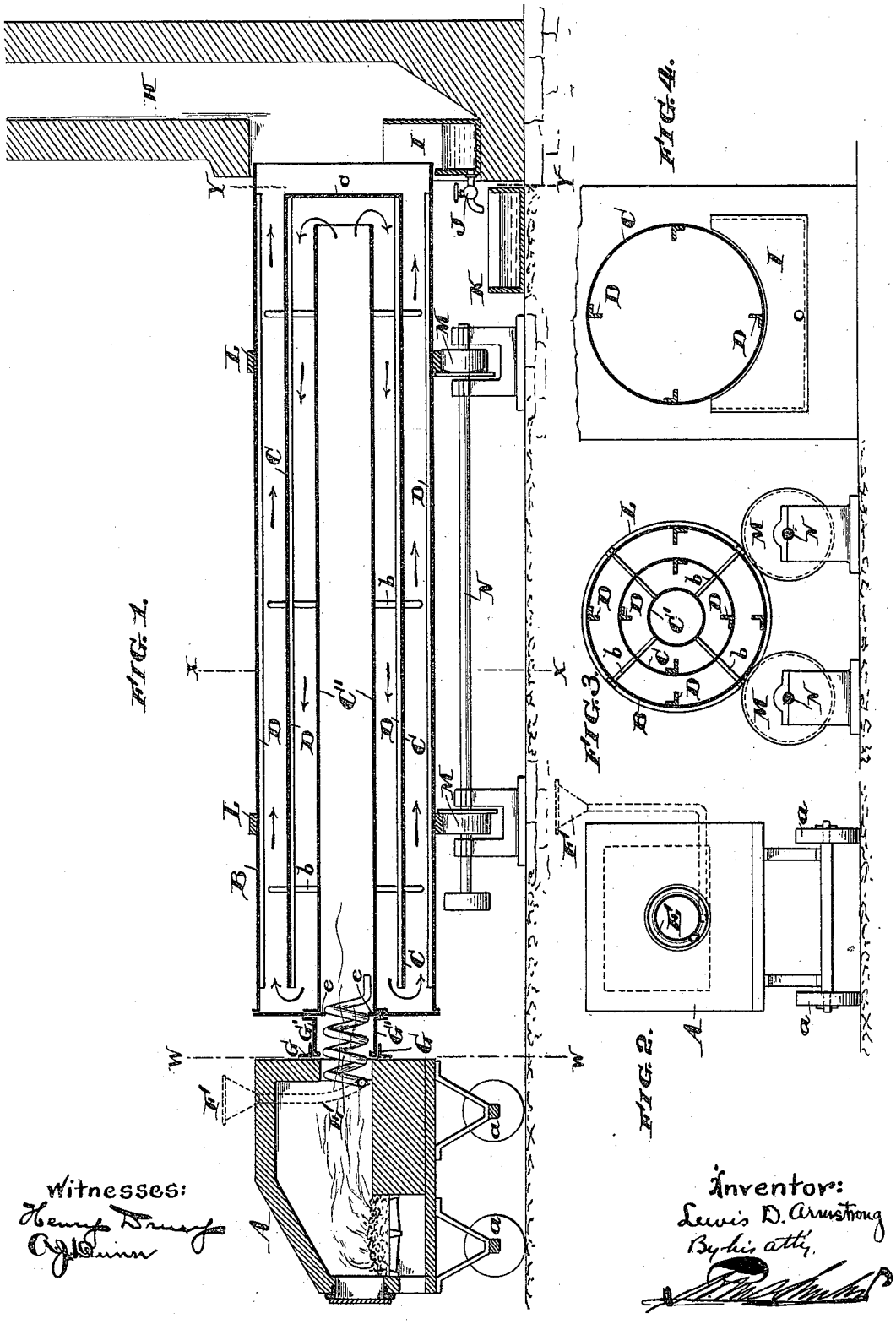
No Model.)

L. D. ARMSTRONG.

APPARATUS FOR RECOVERING SODA.

No. 440,124. Patented Nov. 11, 1890.



Witnesses:
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR RECOVERING SODA.

SPECIFICATION forming part of Letters Patent No. 440,124, dated November 11, 1890.

Application filed March 8, 1890. Serial No. 343,687. (No model.)

To all whom it may concern:

Be it known that I, LEWIS D. ARMSTRONG, of Lock Haven, in the county of Clinton and State of Pennsylvania, have invented an Improvement in Apparatus for Reclaiming Soda-Ash, of which the following is a specification.

My invention relates to apparatus for reclaiming soda-ash; and it consists of certain improvements therein, which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

The object of my invention is to effectively accomplish the evaporation of liquids from liquors for the purpose of recovering chemicals contained therein, with particular reference to the recovery of soda-ash from the spent liquors of pulp-mills, &c.

More particularly my invention relates to the construction of the evaporating apparatus, and contemplates the employment of a rotary cylinder, through which the liquor to be treated is caused to flow and to be subjected to the action of heat.

The object of my improvement is to cause the liquor under treatment, while traversing the rotating cylinder, to be subjected to contact with a large heated area, and with this object I construct my rotary cylinder in such a manner that the liquor is caused to traverse through a series of shells or concentric cylinders to be brought in contact with their internal and external surfaces.

My invention also consists in certain improvements in means for introducing the liquor into the cylinder, and for causing it to flow through the cylinder, and in the devices for withdrawing the concentrated liquor, and in other constructions and combinations of parts hereinafter more fully set forth and claimed.

In the drawings, Figure 1 is a sectional side elevation of my improved apparatus. Fig. 2 is a vertical sectional view of the same on the line *y y* of Fig. 1. Fig. 3 is a similar view on the line *x x*, and Fig. 4 is a similar view on the line *y y*.

A is the fire-box, the particular construction of which is immaterial to my invention. I prefer, however, to have it mounted upon wheels *a*, so that it may be moved to or from the evaporating-cylinder.

B is the evaporating cylinder or drum, within which is arranged a series of concentric cylinders C C′, and while in the drawings I have shown two of these inner cylinders, and prefer that number, it is apparent that the number may be increased or diminished, as desired. These inner cylinders C C′ are supported within the outer drum or cylinder B by means of bolts *b*. The inner cylinders C C′ are so arranged with reference to each other that they project beyond each other at opposite ends—that is to say, at one end the cylinder C′ projects beyond the cylinder C and at the other end the cylinder C projects beyond the cylinder C′—and the same relative arrangement would be made if other cylinders were employed. The ends of the cylinders which project beyond the ends of the cylinder within are closed, as shown at *c*.

I find it advantageous to arrange upon the inner surfaces of the cylinders B, C, and C′ longitudinal ribs or flanges D, the number of which is unimportant.

E is a liquor-supply pipe, preferably constructed in the form of a coil, opening into the end of the internal cylinder C′ and leading from the fire-box A, so that the heat from the fire-box in passing to the cylinder B will pass through and about the coil E and heat the liquor before it is introduced into the rotary cylinder. In practice I find it expedient to have this supply-pipe arranged upon the fire-box, as shown, and provided with a funnel F, through which the liquor may be introduced. The internal cylinder C′ opens to the fire-box A, and to prevent the escape of heat into the atmosphere without passing into the cylinder I prefer to arrange angle-irons G G′ on the end of the fire-box and cylinder, about the opening between them, to prevent the escape of heat.

H is the smoke-stack, through which the smoke and products of combustion from the cylinder B are allowed to pass off, the end of the cylinder B opening into the smoke-stack.

I is a pan or receptacle arranged immediately below the open end of the cylinder B to receive the liquid from the cylinder or drum after it has traversed the same.

J is a valved outlet from the pan or receptacle I to a second receptacle K, into which the liquor from the receptacle I is allowed to

flow, and in which it may be carried to the calcining-furnace.

The drum or cylinder B, provided with a series of internal cylinders C C′, is supported horizontally between the fire-box A and the chimney H, and may be rotated in any convenient manner, though in practice I prefer to employ the apparatus illustrated, consisting of the smooth solid metal rings L L, projecting a slight distance from the outer surface of the drum or cylinder and resting upon flanged wheels M M, carried by shafts N, which may be driven in any convenient manner. By this construction the drum or cylinder is more effectively supported and may be rotated without jarring or lateral displacement.

From the foregoing description of the drawings the operation of my apparatus will be readily understood. Heat is supplied from the fire-box A, and the cylinder or drum B is rotated in the manner described. The liquor to be treated is introduced through the funnel F through the coil-pipe E into the end of the internal cylinder C′. This internal end of the cylinder C′ is provided with a flange *e*, so that the liquor from the supply-pipe E is prevented from flowing back into the fire-box, but is caused to flow forward through the inner cylinder C, and the rotation of the cylinder or drum B causes the liquor to spread out over the entire inner surface of that cylinder. Upon reaching the open end of the internal cylinder the liquor drops upon the inner surface of the next cylinder, the end of which, as heretofore stated, projects slightly beyond the end of the cylinder C′ and has its ends *c* closed. The liquor flows over the inner surface of this cylinder, and, reaching the open end, drops upon the inner surface of the cylinder B, and thence flows to the open end of that cylinder and out into the receptacle I. The longitudinal ribs or flanges D, arranged upon the inner surfaces of the cylinders B and C, cause a portion of the liquor as it comes in contact with them to flow off upon the outer surfaces of the adjacent inner cylinders, and by this means the area of heating-surface over which the liquor passes is greatly increased, the liquor passing in its transit through the evaporating-cylinder over both the inner and the outer surfaces of the cylinder C′ and the inner surface of the outer cylinder B, whence it drops into the receptacle I.

By having the inner cylinder only open to the fire-box and closing the end of the cylinder C adjacent to the open end of the internal cylinder and forming the opposite end of the cylinder B closed, as shown, the heat is caused to traverse successively through the concentric cylinders in the manner indicated by the arrows, being thus brought in contact with both the inner and outer surfaces of the cylinders C′ and C and the inner surface of the outer cylinder or drum B, whereby the liquor traversing these cylinders in the manner heretofore described is subjected to a greater degree of heat and contact with heated surfaces, and is more thoroughly evaporated or freed of its liquid portion.

Any matters which are here shown and described without being claimed are not dedicated to the public, but form subject-matter of my application, No. 301,808, filed on the 2d day of March, 1889.

While I prefer the details of construction which are here shown, I do not limit my invention to them, as it is apparent that they may be modified in many ways without departing from the principles of it.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in an apparatus for reclaiming soda-ash, of a fire-box, a smoke-stack, a horizontal evaporating-chamber having one end opening into the fire-box and the other end opening into the smoke-stack, a supply-pipe to supply the liquor to the evaporating-chamber through the opening between the fire-box and the chamber, whereby the liquor is superheated before it enters the chamber, and a receptacle for the thickened liquor at the opposite end of the chamber.

2. In an apparatus for reclaiming soda-ash, the combination of an evaporating-chamber having an opening for the heat and liquor at one end, a fire-box or equivalent heat-supplying device opening into the evaporating-chamber, and a liquor-supply pipe consisting of a coiled pipe arranged about the opening between the fire-box and evaporating-chamber, whereby the liquor is superheated before it is introduced in the evaporating-chamber.

3. The combination of an evaporating-cylinder having an opening for the heat and liquor at one end, a fire-box or equivalent heat-supplying device, and a liquor-supply pipe carried by said fire-box, consisting of a coil of pipe arranged about the outlet of said fire-box to the evaporating-cylinder, whereby the liquor is superheated before it is introduced into the evaporating-cylinder.

4. In an apparatus for reclaiming soda-ash, the combination of an evaporating-chamber consisting of a series of shells or cylinders arranged one within the other, each shell or cylinder opening into the adjacent shell or cylinder at one end only, the outer shell or cylinder being open at one end to allow the liquor to flow therefrom, a receptacle for the thickened liquor adjacent to the said open end of the outer shell or cylinder, a fire-box opening into the inner shell or cylinder, and means to supply liquor to the inner shell or cylinder.

5. A rotary evaporator consisting of an inner cylinder open at one end to allow the liquor to flow therefrom and having an opening at the other end to admit the liquor, an intermediate cylinder about said inner cylinder, projecting beyond it at one end and having said projecting end closed and the other

end open, an outer cylinder about said intermediate cylinder, projecting beyond the open end thereof and having said projecting end closed adjacent to the open end of the intermediate cylinder, and a source of heat communicating with the interiors of all of the cylinders.

6. In an apparatus for reclaiming soda-ash, the combination of a rotary evaporator consisting of a series of shells or cylinders arranged one within the other, a source of heat communicating with the interiors of all of said shells, whereby the products of combustion from said source of heat may pass through each of said shells, and a supply-pipe for supplying the liquor to be treated into the interior of said evaporator, whereby the products of combustion come directly in contact with the liquor under treatment.

7. In an apparatus for reclaiming soda-ash, the combination of a horizontal rotary evaporator consisting of a number of shells or cylinders arranged one within the other, each shell or cylinder communicating with the adjacent outer shell, whereby the liquor may pass from one to the other, a pipe to supply liquor to the inner shell, and a source of heat communicating with the interiors of all of said shells, whereby the products of combustion from said source of heat may pass into each of the shells and directly in contact with the liquor therein.

8. In an apparatus for reclaiming soda-ash, the combination of a horizontal rotating evaporating-cylinder consisting of a series of concentric cylinders or shells within each other and projecting beyond each other at opposite ends, a supply-pipe to supply liquor to the inner of said shells or cylinders, and a source of heat communicating with the interiors of all of said shells or cylinders, whereby the products of combustion from said source of heat may pass thereinto.

9. In an apparatus for reclaiming soda-ash, the combination of a horizontal rotating evaporating-cylinder consisting of a series of concentric cylinders or shells within each other projecting beyond each other at opposite ends, provided with inwardly-extending flanges about said projecting ends, a supply-pipe to supply liquor to the inner of said cylinders or shells, and a source of heat communicating with the interiors of all of said shells or cylinders, whereby the products of combustion from said source of heat may pass thereinto.

10. In an apparatus for reclaiming soda-ash, the combination of a horizontal rotating evaporating-cylinder consisting of a series of concentric cylinders or shells within each other projecting beyond each other at opposite ends, provided with inwardly-extending flanges about said projecting ends, a number of longitudinally-extending ribs or flanges upon the inner surface of one or more of said cylinders or shells, a supply-pipe to supply liquor to the inner of said shells or cylinders, and means, substantially as described, to heat said shells or cylinders, consisting of a source of heat communicating with the interiors of all of the shells or cylinders.

In testimony of which invention I have hereunto set my hand.

LEWIS D. ARMSTRONG.

Witnesses:
B. F. GEARY,
H. S. MORGAN.