No. 813,078. PATENTED FEB. 20, 1906.

E. F. BERNHARDT.

POTASH LEACHING APPARATUS.

APPLICATION FILED JUNE 4, 1904.

4 SHEETS—SHEET 1.

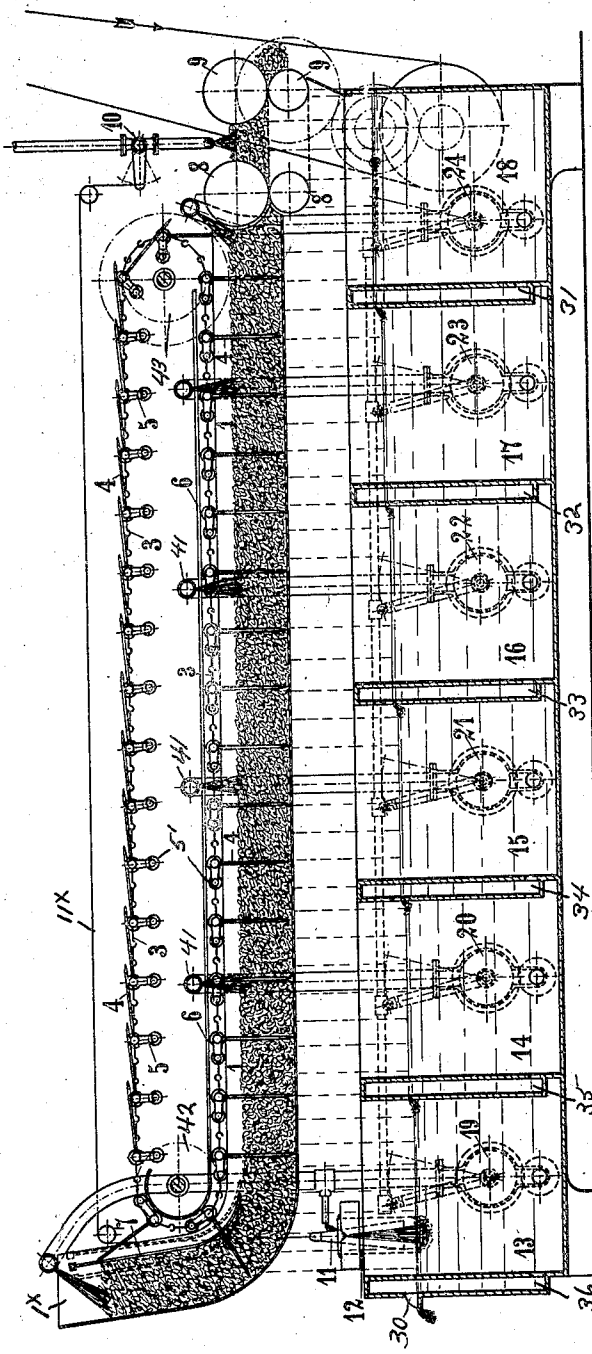


FIG. 1

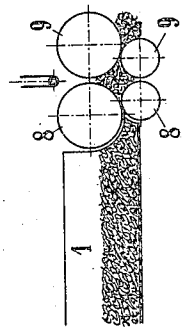


FIG. 2

Witnesses

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FIG. 5.

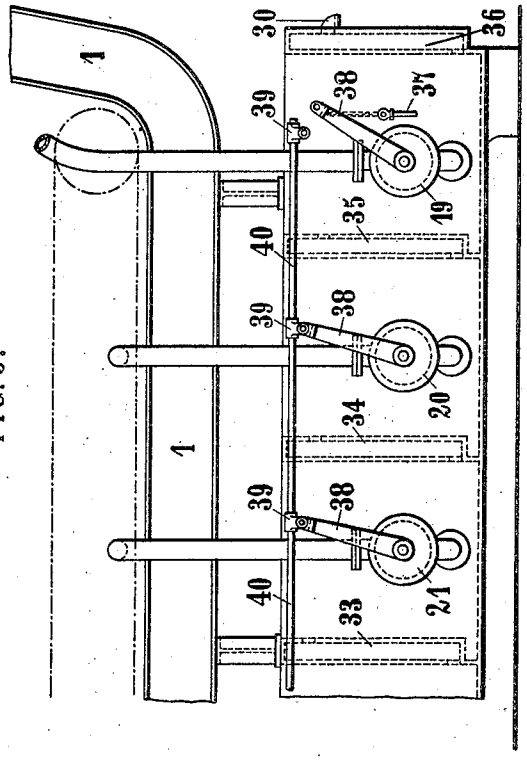


FIG. 7.

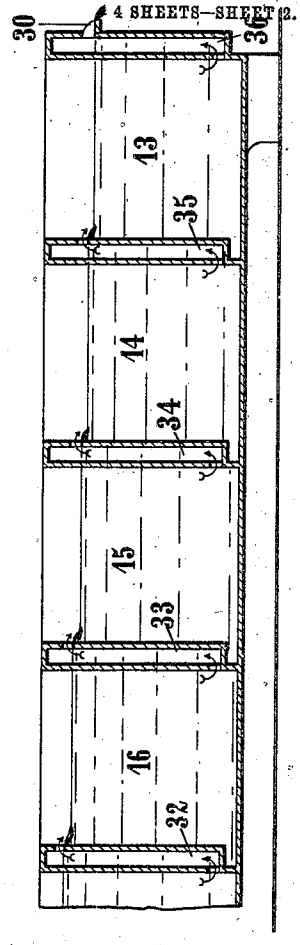


FIG. 3.

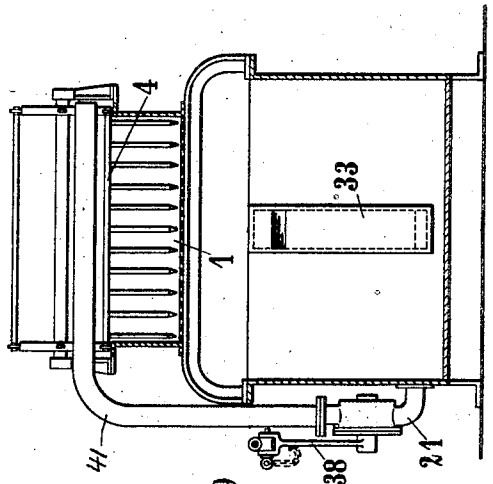


FIG. 6.

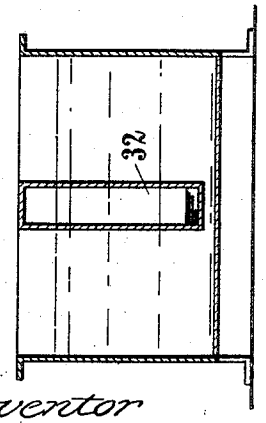
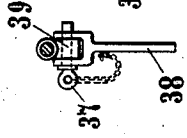


FIG. 4



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4 SHEETS—SHEET 3.

FIG. 10.

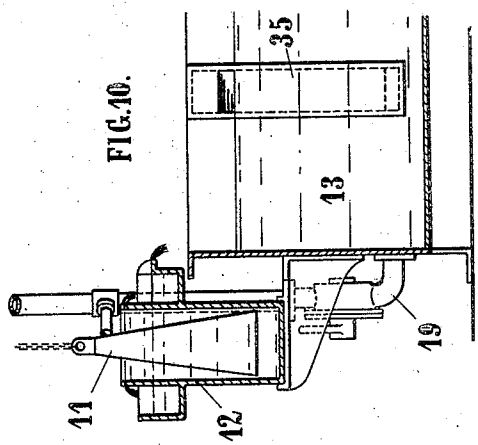


FIG. 11.

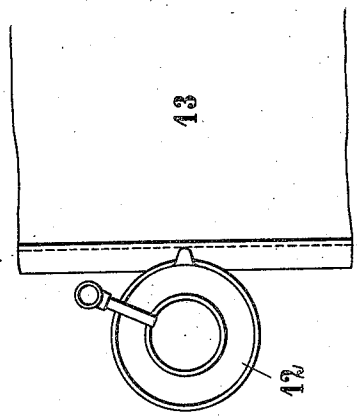


FIG. 9.

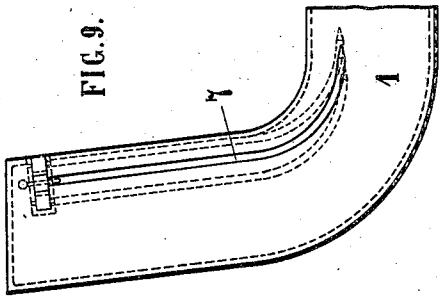


FIG. 13.

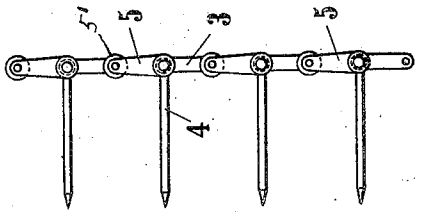


FIG. 8.

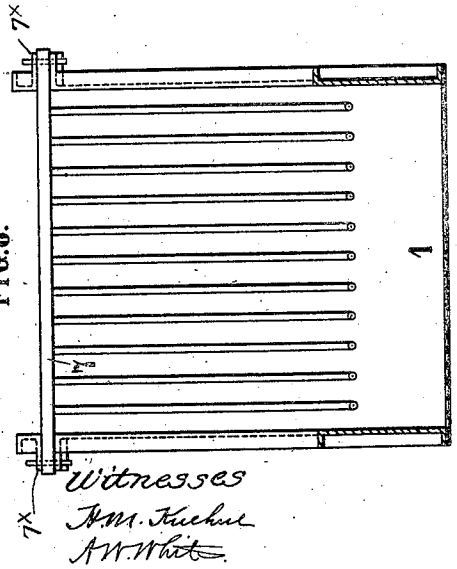
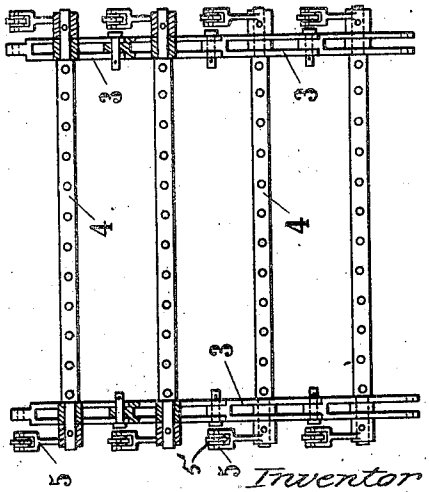


FIG. 12.



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No. 813,078. PATENTED FEB. 20, 1906.

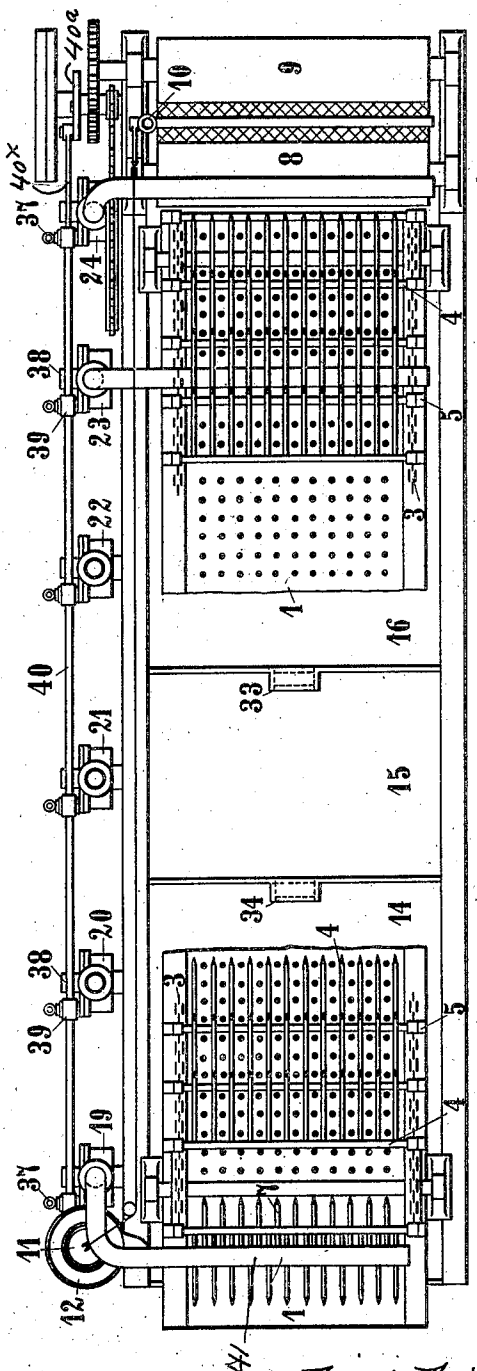
E. F. BERNHARDT.

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APPLICATION FILED JUNE 4, 1904.

4 SHEETS—SHEET 4.

FIG. 14.



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UNITED STATES PATENT OFFICE.

ERNST FRIEDRICH BERNHARDT, OF LEISNIG, GERMANY.

POTASH LEACHING APPARATUS.

No. 813,078. Specification of Letters Patent. Patented Feb. 20, 1906.

Application filed June 4, 1904. Serial No. 211,206.

To all whom it may concern:

Be it known that I, ERNST FRIEDRICH BERNHARDT, of Leisnig, Empire of Germany, have invented certain new and useful Potash Leaching Apparatus for Raw Wool; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form part of this specification.

The leaching of a quantity of raw wool is, as every one knows, effected in the simplest manner by pouring water over a certain portion of the raw wool and by collecting the liquor which has passed through the wool and which contains potash in order to pour it over a fresh quantity of raw wool, which operation is continued until the leaching liquor is so improved that the manufacture of potash from the liquor is profitable. By merely once leaching separate quantities of wool it is impossible to dissolve all the potash contained in it. It is, however, necessary for the economy of the leaching process that all the potash contained in the wool shall be dissolved, and therefore the same quantity of raw wool is repeatedly leached. For this purpose several liquors of different strength contained in special reservoirs are employed. The operation is so conducted that the dry raw wool comes into contact with the most concentrated leaching liquor and the wool which has been leached the most comes into contact with the weakest leaching liquor. The wool is conducted away in a stream of invariable transverse section under the sprinkling-tubes, from which the different leaching liquors are poured out.

It is a principal condition in the construction of the apparatus for producing concentrated solutions of potash from raw wool that it should not only be durable but as simple as possible, inasmuch as all parts of the apparatus coming into contact with the potash are soon deteriorated by the alkaline liquor as well as by the substances, such as sand and earth, that are mixed in it. For this purpose I use a conveying mechanism of which the movable parts do not come into contact with the alkaline liquor, and which therefore cannot be deteriorated by the effect of the latter. The mechanism is constituted of a channel on the perforated bottom of which the wool is passed forward by rakes positively moved. By the motion of the wool over the openings of the perforated bottom the perforations are always kept open, so that thin and short wool also can be leached. A distinguishing feature of the operation is that the alkaline liquor dripping down from the wool passes back directly and continually into the reservoir from which it is taken off. The intensity of the liquor is regulated by the provision of tubes or channels upon the partition-walls of the separate reservoirs through which the liquor passes into the next reservoir after it has reached a certain height therein. This flowing in of the water from one reservoir to the next is caused by the inflow of water in the last reservoir of the apparatus and is controlled by a valve-float which moves up and down in the liquor which is most concentrated, according to the change in its specific gravity, and opens or closes the valve. This valve-float is protected by a covering of enamel or is made of vulcanized india-rubber, so that it cannot be attacked by the alkaline liquor. In this manner the concentration of the separate quantities of liquor in the reservoirs is always the same and the concentrated liquor flowing off will always have the intensity which is desired. The yield of potash from the wool will reach the highest degree without injury to the wool that usually results from the change of strength in the leaching liquor.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a sectional elevation of an apparatus for carrying out the invention. Fig. 2 is a sectional view of the pressing device shown at the end of Fig. 1. Fig. 3 is a cross-section through the apparatus and showing the arrangement of the pumps and spouting-tubes. Fig. 4 is a detail view of the means for connecting the pumps with the draw-bar. Fig. 5 is a side view of part of the apparatus, showing the method of coupling up the pumps with the draw-bar. Figs. 6 and 7 show a cross-section and a longitudinal section, respectively, through the box with the operating parts removed, showing the arrangement of the overflow-channels. Figs. 8 and 9 show a cross-section and a longitudinal section, respectively, of the inlet-channel with the adjustable grating therein. Figs. 10 and 11 show a sectional elevation and a plan view of the method of fitting up the float. Figs. 12 and 13 show a plan and an elevation of the

conveyer-chain. Fig. 14 is a plan of the apparatus.

The movement of the wool in the apparatus shown in the annexed drawings is effected by means of two endless traveling chains 3, between which at regular distances apart are mounted rakes 4, which are protected against the effects of the leaching liquor by a covering of enamel. These rakes push the wool forward by the forward motion of the chains over a fixed channel 1 to two pairs of squeezing-rollers 8 9. Meanwhile the leaching liquor is poured over the wool from the sprinkling-tubes 41, mounted over the channel. The channel is suitably made of vulcanized india-rubber or of enameled iron plates, which are not attacked by the potash or of any other material not capable of being attacked by the leaching liquor, and it has a perforated bottom. On both sides of the rakes links 5 are mounted perpendicular to the forks of the rakes and are provided with guiding-rollers 5′. The rollers run on guiding-rails 6, so that the rakes cannot give to the pressure of the wool. The rails 6 extend above the chain-pulleys 42 43, which effect the return of the chain-links.

The raw wool to be leached enters a square hopper $1^{\times}$, the front wall of which is formed as a grating 7, in which the rakes 4 engage. This grating is movably supported in lug $7^{\times}$ on the hopper $1^{\times}$, so that the height of the layer of wool may be adjusted. The rakes 4 diverge as they enter the hopper $1^{\times}$, owing to their guidance on the curved part of the rail 6, so that the utmost amount of wool may be taken. As soon as the rakes strike the straight part of the rails 6 they change from their divergent position to a parallel position, so that the wool in the channel 1 is pressed between the rakes to a uniform compact mass.

At the end of the channel 1 the wool is squeezed for the first time by a pair of pressing-rollers 8 8, and after leaving the rollers 8 8, as shown in Fig. 1, is conducted by means of an endless bolting-cloth, stretched over the lower rollers 8 9 to a second pair of pressing-rollers 9 9, as shown in Fig. 2, which squeezes the wool a second time. It is highly important that the two pairs of rollers shall have a greater speed of rotation than the speed of the rakes or the wool in the channel and so that the height of the wool in the channel is reduced, and consequently an easier pressing of the wool is effected. In the construction shown in Fig. 1 the lower rollers 8 9 must both have the same speed of rotation, while according to Fig. 2 the pair of pressing-rollers 9 9 can have any greater speed desired.

Beneath the channel 1 are the leaching-reservoirs 13 14 to 18, from which the leaching liquors are drawn by special pumps 19 20 to 24 to the separate sprinkling-tubes 41 in order to pass down into the same reservoir after passing through the wool and being thus enriched with potash. As shown in Figs. 3, 4, and 5, the pumps 19 20 21 are secured to the reservoirs, and they are operated by means of the levers 38, secured to draw-bar 40 by bolts 37. Thus when the bar 40 is reciprocated by any suitable means—such, for instance, as the pitman $40^{\times}$ and the crank 40^{a}—all of the pumps will be put in operation to pump the fluid from the reservoirs to the tubes 41. These reservoirs are disposed beside each other and are provided upon their partition-walls with channels or tubes 31 32 33 34 35 36 of different height, such that the outlet in the channel or tube 33 between the reservoirs 15 and 16 is higher than that in the channel or tube 34 between the reservoirs 14 and 15, and so on. (See Fig. 7.) The pure water for the leaching flows between the two pairs of pressing-rollers 8 8 and 9 9 on the wool to be leached. The water before leaving the apparatus again passes through and reaches the reservoir 18, from which it gradually overflows to reservoir 17. The same applies to the reservoir 17 if the liquor overflows from the reservoir 18 to the reservoir 17, and so on until the liquor reaches the reservoir 13. The leaching liquor is therefore moved automatically from the outlet to the inlet of the apparatus, and the speed of the leaching stream is regulated by the quantity of inflowing water. During the overflow from one reservoir to the other the liquor repeatedly passes through the layer of wool which is slowly moved forward in the channel 1, so that after leaving the reservoir 13 by the escape-pipe 30 it is concentrated sufficiently to be evaporated with advantage.

As the movement of the wool in the channel 1 is effected in direction contrary to that of the leaching stream from one reservoir to the other, the wool which is most leached comes into contact with the pure water and the raw wool comes into contact with the concentrated liquor, while the quantity of inflowing pure water is regulated by a float 11, (see Figs. 10 and 11,) mounted beside the apparatus in a small reservoir 12, which is adapted to overflow into the reservoir 13, containing the enriched leaching liquor. This float rises or falls and automatically opens or closes the valve 10 by means of the connection $11^{\times}$. The concentration of the liquor in the separate reservoirs 14 15 to 18 is thus determinate and the leaching stream from one reservoir to the other is thus used to maintain the concentration constant in the separate reservoirs.

The concentration rises from the outlet to the inlet of the apparatus in each reservoir and is not dependent on the movement of the pumps or other mechanism, but only on a single float-valve, which can be protected against destruction.

Each of the pumps 19 20 to 24 can be put

into or out of operation, according to requirement, by simply removing pin 37 and disconnecting the lever 38.

The method of using the leaching apparatus is, shortly, as follows: The separate reservoirs 13 to 18 are filled with water until it reaches the outlets in the tubes or channels on the partition-walls. The wool is then conducted to the apparatus and the pump 19 and the rakes are thrown into gear. When the wool reaches midway over the reservoir 14, the pump 20 is thrown into gear, and so on until all the pumps are set to work. If the float 11, for example, is adjusted for a leaching intensity of 10° Baumé, it is lifted on the concentration of the leaching in the reservoir 13 until it opens to a certain extent the valve 10 at a leaching intensity of 10° Baumé, and the inflow of water over the wool between both pairs of pressing-rollers then begins.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. A potash leaching apparatus for raw wool consisting of a reservoir, a channel having a perforated bottom located over said reservoir, rakes for feeding the wool in said channel, pressing-rollers placed at the end of the channel and means for sprinkling the wool as it passes along the channel, said means taking its supply from the reservoir.

2. A potash leaching apparatus consisting of a channel having a perforated bottom, reservoirs placed under the channel, sprinkler-pipes arranged over the channel, means for raising the liquid from the reservoirs to said pipes said reservoirs having communicating openings through which the liquid flows from one to the other, said flow being controlled by the inflow of water to the last compartment, and a float regulating the height of liquid in said last compartment.

3. A potash leaching apparatus comprising a series of reservoirs having communicating openings, a perforated channel placed above the same, a series of sprinkler-tubes placed over the channel and pumps for raising the water from the reservoirs to the sprinkler-tubes, said tubes being so placed that the water raised from each reservoir will be returned to the same.

4. A potash leaching apparatus consisting of a series of reservoirs having communicating openings, a perforated channel placed above the reservoirs, rakes for feeding the wool through the channel, sprinkler-tubes placed over the channel, pumps for raising the liquid from the reservoirs to the tubes, said tubes being so placed that the liquid will be returned to the reservoir from which it was raised and pressing-rollers placed at the end of the channel and adapted to receive the wool therefrom.

In witness whereof I have hereunto signed my name, this 24th day of May, 1904, in the presence of two subscribing witnesses.

ERNST FRIEDRICH BERNHARDT.

Witnesses:
BRAINERD H. WARNER, Jr.,
SOUTHARD P. WARNER.