

R. F. FAIRLIE.

Apparatus for Extracting Nitrate of Soda.

No. 140,908.

Patented July 15, 1873.

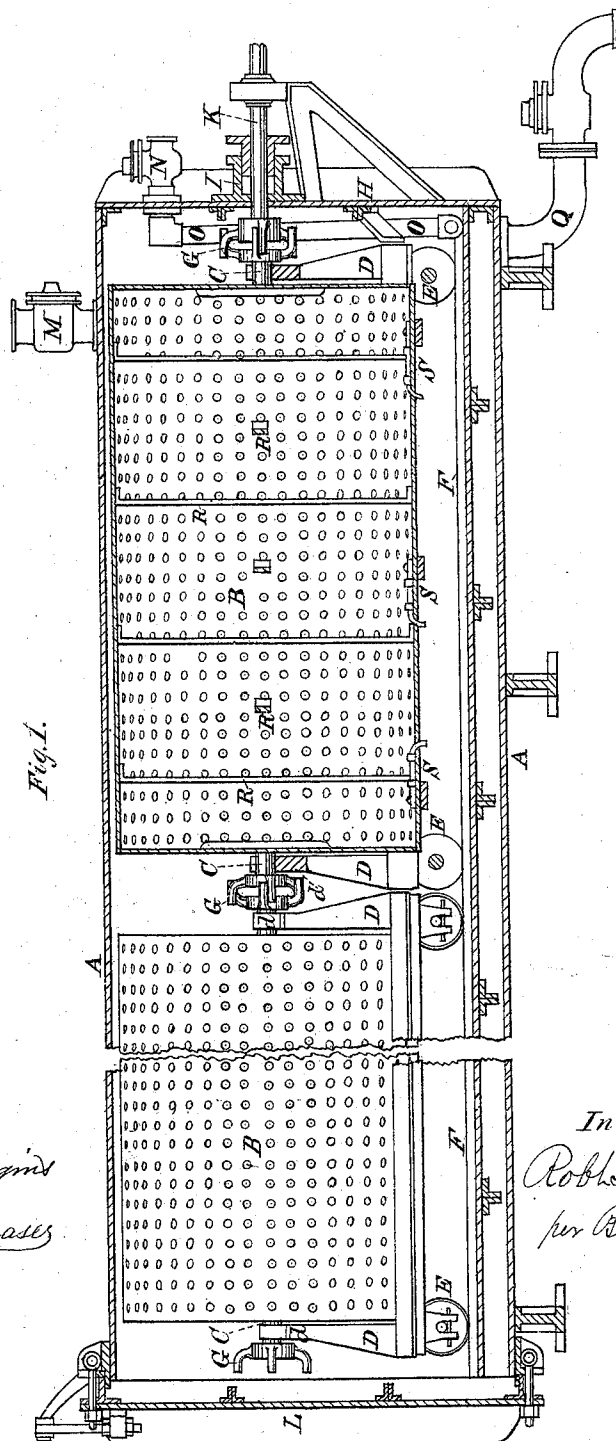


Fig. 1.

Witnesses:

Chas M. Higgins
Arthur C. Fraser

Inventor:

Robt. F. Fairlie,
per Burke & Fraser
Atty.

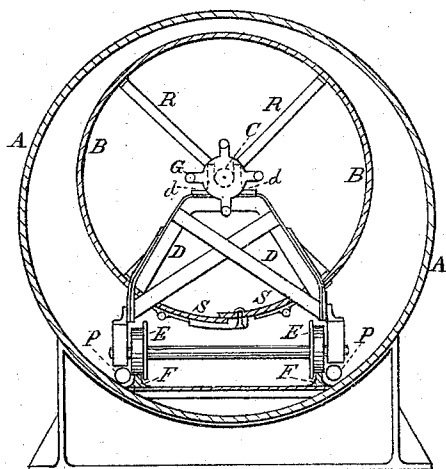
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Fig. 2.



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UNITED STATES PATENT OFFICE.

ROBERT F. FAIRLIE, OF LONDON, ENGLAND.

IMPROVEMENT IN APPARATUS FOR EXTRACTING NITRATE OF SODA.

Specification forming part of Letters Patent No. **140,908**, dated July 15, 1873; application filed April 25, 1873.

To all whom it may concern:

Be it known that I, ROBERT FRANCIS FAIRLIE, of London, England, engineer, have invented or discovered certain new and useful Improvements in Apparatus for the Extraction of Nitrate of Soda from Crude Nitrate Earth-Stone, usually called caleche; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings and to the letters and figures marked thereon—that is to say:

Many methods have been hitherto adopted in the treatment of crude nitrate earth-stone or caleche in order to extract therefrom nitrate of soda. In some of these methods open boilers or caldrons, and in others closed boilers have been employed, such boilers having been varied in their construction to suit the views of those employing them. In every case, however, it has been found that much time and labor have to be spent in order to carry out the process of extraction; and it is well known that even with the best method hitherto adopted a large percentage of nitrate of soda still remains in the caleche after the operation of extraction has been completed, and this percentage is of course lost. In the open boilers or caldrons various arrangements have been adopted for stirring up the caleche in order to effect a better and speedier dissolution of the nitrate of soda from the common earth with which it is mixed, and although this stirring up produces better results than when no movement is given to the caleche during the process of boiling, yet there is no reduction of the large quantity of water usually required in the operation. Moreover, the difficulties attending the cleansing out of the open boilers or caldrons after the dissolution has taken place and the liquor run off are always a source of great expense on account of the great length of time taken up and labor employed. The use of closed boilers is also very expensive, and the percentage of nitrate of soda lost by imperfect dissolution is equally great. The best construction of closed boilers heretofore adopted consists of square and wagon-shaped boilers, usually

termed cachuchos, with one end, and in some cases both ends, made to open and shut with doors, which are made steam-tight. Into these cachuchos, on the bottom of which for their entire length inside rails to a suitable gage are fixed, box-wagons perforated at the sides, ends, tops, and bottoms are run, the wagons having been previously filled to a certain extent with broken nitrate earth-stone or caleche, and the door or doors of the cachucho are made steam-tight. Water is let into the boiler or cachucho through a suitable opening, and when sufficient to cover or nearly cover the wagons containing the caleche the supply of water is shut off, and steam is admitted for the purpose of boiling the water and thus dissolving the caleche. As the dissolution takes place the water absorbs the nitrate of soda, and when the dissolution is supposed complete the liquor, being a more or less saturated solution of nitrate of soda, is run off into settling-tanks, and thence into cooling-pans, where the crystallization takes place; but as the box-wagons may contain from four to six tons of caleche it is found, first, that a very large quantity of water has to be employed, and as water is generally excessively scarce in those districts where caleche is found it is very expensive; secondly, that, though the boiling process may be continued for a considerable period, the water rarely thoroughly permeates or penetrates to the center of the wagons, owing to the great body of caleche in each wagon, and to the wagon being stationary while in the cachuchos; consequently, when the liquor is run off there still remains in each wagon along with the plain earth or refuse a large percentage of nitrate of soda, which is emptied off to spoil and is lost. There are thus in the present operations great loss of time, imperfect dissolution of the caleche, large quantities of water used, which also require a great deal of steam to boil, a large quantity of both water and fuel to provide the steam, and, finally, great delay in the crystallization owing to the large quantity of water which holds the nitrate of soda in solution after the process of boiling, making the liquor poor and thin. The object, therefore, of my

present invention is to overcome these defects and difficulties in the process of manufacturing or extracting nitrate of soda; to greatly reduce the quantity of labor required; to diminish the quantity of water necessary for extracting the nitrate of soda; to greatly quicken the operation; to reduce the quantity of steam necessary for the dissolution of the caleche, thereby saving both water and fuel; to extract a larger percentage of nitrate of soda from the caleche; and, finally, to deliver a strong or rich liquor to the cooling-pans, so that the process of crystallization is much quickened.

My invention consists in constructing and mounting the bodies of the wagons so that they are capable of being rotated when inside the cachucho, and in a mode of imparting rotary motion to the wagon-bodies when inside the cachucho, so that the mass of caleche is not only turned over and over by such rotation, but also worked up or stirred about.

In carrying out my invention I construct the cachucho and the body of each wagon of cylindrical form, thereby greatly lessening the quantity of material required in their construction, and at the same time giving greater strength; and I mount the wagons on their frames in such manner that they are free to revolve thereon on a horizontal axis. The ends of the revolving cylinder or body of the wagons are furnished with clutches or other engaging apparatus, so that when a number of them are run into the cachucho they gear together. One end of the cachucho is provided with a stuffing-box, through which a shaft driven by steam or other power is passed, and this shaft has a corresponding clutch to take into the wagon first run in. The cylinders or bodies of the wagons are perforated with holes, and are furnished internally with bars or arms for working up or stirring the caleche. These bars may be carried radially or otherwise across the wagons, or they may project from the periphery toward the center, or be arranged in any way which may be found best for acting upon the mass of caleche.

Figure 1 of the accompanying drawings is a longitudinal section, and Fig. 2 a transverse section, of apparatus constructed according to my invention, and showing the wagons B D E in the cachucho, one being shown in section, the other in elevation.

A is the cachucho or boiler, which is of cylindrical form. B B are the mounted wagon-bodies, which are also cylindrical. Only two of these are shown in the drawings; but in practice the cachucho would generally be constructed to hold more than two. The wagon bodies B B are provided with journals C C, which rest in bearings on frames D D, one at either end of each wagon-body. The wagon-frames D D are mounted on wheels E E to run on rails F F in the cachucho. The ends of the cylindrical wagon-bodies are furnished

with clutches or drivers G G, and these clutches or drivers gear together when the wagons are run into the cachucho. The end H of the cachucho is a fixture, and is provided with a stuffing-box, I, through which a driving-shaft, K, passes. The inner end of this shaft is also furnished with a clutch or driver, G, into which the clutch or driver on the end of the first wagon gears. The shaft K is driven by any suitable power.

The wagons B D E are run into and out of the cachucho at the end L, which is provided with doors, as shown, which are capable of being closed steam-tight. M is the inlet for water to the cachucho. N is the steam-inlet which communicates by a pipe, O, with longitudinal pipes P P, Fig. 2, perforated to allow the steam to issue all along the bottom of the cachucho. Q is the outlet for drawing off the liquor at the end of the operation into settling and crystallizing tanks. The cylindrical wagon-bodies B B are perforated with holes, as shown in Fig. 1, and are furnished internally with bars or arms R R, (see Fig. 2,) which serve to work or stir up the caleche as the wagon-bodies rotate.

The operation is readily understood. The wagons, filled with broken caleche, having been run into the cachucho, the end door L is closed, the requisite quantity of water, which is considerably less than that required with the old apparatus, is supplied at M, and steam is let in at N, as before explained. During this treatment with steam the wagons are caused to rotate continuously or intermittently by means of the driving-shaft K and clutches G. The whole mass is thus uniformly submitted to the action of the steam and hot water, and the extraction of the nitrate of soda is thereby quickly effected in an efficient and economical manner. The saturated solution of nitrate, commonly called liquor, is drawn off at Q, as hereinbefore stated, into settling and crystallizing-tanks.

The wagons are filled with the caleche through openings in their peripheries, which openings are then closed by suitable covers, shown at S S, Figs. 1 and 2, and when the process is completed and the nitrate has been run off the earth or refuse remaining in the wagons can be readily removed by rotating the wagon-cylinders on their axes so as to bring the said openings to the bottom, the fastenings or covers of the said openings having been previously removed. The refuse thus drops out and the wagon-cylinder is ready for refilling with caleche.

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

1. The wagon-bodies B B mounted on the axis C C, adapted to have a free rotation inside the cachucho A, substantially as and for the purpose specified.

2. The driving-shaft K having a clutch or driver, G, in combination with the wagon-

bodies B B and their respective shafts and clutches, substantially as described, for the purpose specified.

3. The clutches or drivers G G or equivalents in combination with the mounted cylinders B B, substantially as and for the purpose herein set forth.

4. In combination with the rotating wagon-body, the bars or arms R R, substantially as and for the purpose herein set forth.

In witness whereof I, the said ROBERT

FRANCIS FAIRLIE, have hereunto set my hand this fourth day of December, one thousand eight hundred and seventy-two.

ROBT. F. FAIRLIE.

Witnesses:

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