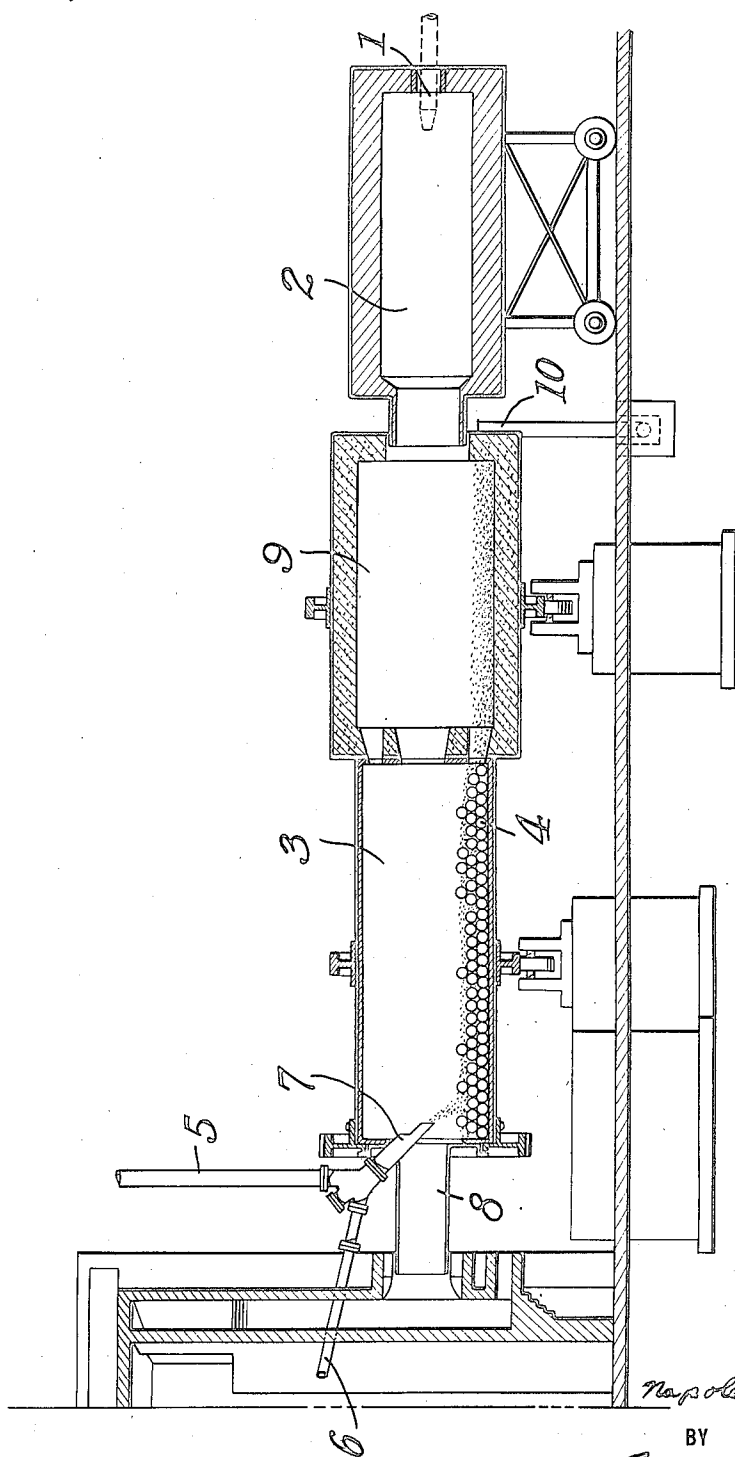


N. A. LAURY.  
 APPARATUS FOR THE PRODUCTION OF SODIUM SULPHATE.  
 APPLICATION FILED SEPT. 29, 1920.

1,435,930.

Patented Nov. 21, 1922.



INVENTOR  
*Napoleon Arthur Laury*  
 BY  
*Murrell C. Clark*  
 ATTORNEY

## UNITED STATES PATENT OFFICE.

NAPOLEON ARTHUR LAURY, OF NEW YORK, N. Y.

APPARATUS FOR THE PRODUCTION OF SODIUM SULPHATE.

Application filed September 29, 1920. Serial No. 413,603.

*To all whom it may concern:*

Be it known that I, NAPOLEON ARTHUR LAURY, a citizen of the United States, and a resident of the city of New York, county and State of New York, have invented certain new and useful Improvements in Apparatus for the Production of Sodium Sulphate, of which the following is a description.

My invention relates to the production of sodium sulphate by the subjection of nitre cake (bisulphate of soda) and salt (sodium chloride) to agitation and heat, and the particular object of my invention is to provide an apparatus for accomplishing this result in an efficient manner and with a minimum of manual labor.

I am aware that sodium sulphate has been produced heretofore in manually stirred furnaces of the brick muffle externally heated type, and in mechanical furnaces provided with pans and plows arranged for relative rotation. These manually stirred furnaces involve excessive labor costs and the mechanical furnaces have a low capacity, require expensive repairs and produce a low quality sodium sulphate. Externally heated rotary furnaces provided on the interior with scrapers have been tried, but without success. One of the main difficulties with all of the furnaces above referred to is that the charge exists largely in lumps, for the complete decomposition of which a high temperature is required with the result that they wear out quickly.

Another method which has been used for making sodium sulphate involves the steps of first finely grinding and intimately mixing the nitre cake and salt, and then subjecting it to heat. The objection to this method is the difficulty and expense of grinding nitre cake to a fine powder.

By the use of my improved apparatus I eliminate the objections to the devices which have been heretofore employed, and obtain a high quality of sodium sulphate at a minimum cost.

In the accompanying drawing I have shown a furnace which embodies my present invention. This furnace is rotary and is heated internally by an oil burner indicated at 1 at the rear end of the combustion chamber 2 of the furnace, or by any other suitable source of heat.

The forward end of this rotary furnace comprises what may be termed a ball mill 3. This ball mill is preferably in the form of a

hollow cylindrical rotary member having a metal lining and is partially filled with metal balls as indicated at 4. The inlet 5 for salt and the inlet 6 for nitre cake preferably unite in a common inlet 7 at the front of the ball mill portion of the furnace. At this end of the furnace is located also an outlet 8 to hydrochloric acid gas absorbers, in order that the hydrochloric acid gas produced as a by-product in the operation of the furnace may be conserved.

At the rear of the ball mill portion of the rotary furnace is the rotary chamber 9, preferably of cylindrical form and provided with a refractory lining. An outlet 10 at the rear of the chamber 9 is provided for the sodium sulphate that has been produced in the furnace.

The method of producing sodium sulphate by the employment of the above type of furnace should be obvious, but it will here be outlined briefly. The salt and nitre cake are introduced in a molten or coarsely ground state in the desired quantities, through the inlets 5, 6, 7, into the front or ball mill portion of the furnace. This portion of the furnace is internally heated, as indicated, but not to the same extent as chamber 9 which is between it and the combustion chamber.

The action of the balls and the heat upon the salt and nitre cake as the furnace revolves brings about the desired reaction and converts the charge from a molten or plastic state into a dry powder. In order to obtain a better product, however, a longer and higher heating is required. This heating takes place in the chamber 9 into which the product of the mill 3 passes. I find that the mere rotation of chamber 9 gives to the powder contained therein sufficient agitation to enable the heat which is present in this chamber to complete the reaction and produce a very high quality sodium sulphate. However, if desired some balls, similar to those indicated at 4 may be placed in chamber 9 to effect a more thorough agitation.

The sodium sulphate produced passes out of the furnace at 10 and the hydrochloric acid passes into suitable absorbers through outlet 7.

As will appear from the foregoing, my improved apparatus is superior in many respects to the devices heretofore employed for the production of sodium sulphate. My apparatus requires practically no manual labor, is substantially continuous in its op-

eration, and produces a very high quality of sodium sulphate. Also, it operates at a comparatively low temperature and is simple in construction so that repairs and replacements are seldom found necessary but when required are easy of accomplishment.

Not only do I obtain efficient production of high grade sodium sulphate, but also, due to the fine grinding of the charge within the furnace, the reaction proceeds so quickly and at such a comparatively low temperature, that the volume of combustion gases is small and the concentration of hydrochloric acid therein is correspondingly large. As a result the hydrochloric acid may be absorbed in water, to a higher strength than has been possible heretofore with internally heated furnaces.

While I have described my improved apparatus as comprising a furnace of a plurality of portions or sections, it should be understood that substantially the same results may be obtained by using a plurality of distinct furnaces. Therefore the terms "furnaces" and furnace "portions" employed in the claims are intended to cover not only a single furnace divided into portions or sections, but also a plurality of furnaces.

The terms and expressions which I have employed are used as terms of description and not of limitation, and I have no intention, in the use of such terms and expres-

sions, of excluding any mechanical equivalents of the features shown and described, or portions thereof, but recognize that various structural modifications are possible within the scope of the invention claimed.

What I claim is:

1. An apparatus for producing sodium sulphate from nitre cake and salt, which consists of a rotary furnace the front portion of which has a metal lining and contains balls and is adapted to operate as a ball mill, and the rear portion of which has a refractory lining, said furnace being adapted to receive the nitre cake and salt in its front portion and to convey it gradually to said rear portion, and means for heating said furnace internally.

2. An apparatus for producing sodium sulphate from nitre cake and salt, which consists of a rotary furnace the front portion of which has a metal lining and contains balls and is adapted to operate as a ball mill, and the rear portion of which has a refractory lining, said furnace being adapted to receive the nitre cake and salt in its front portion and to convey it gradually to said rear portion, and means for heating said furnace internally, said heating means being so arranged as to heat said rear portion to a higher temperature than said front portion.

NAPOLEON ARTHUR LAURY.