

No. 652,761.

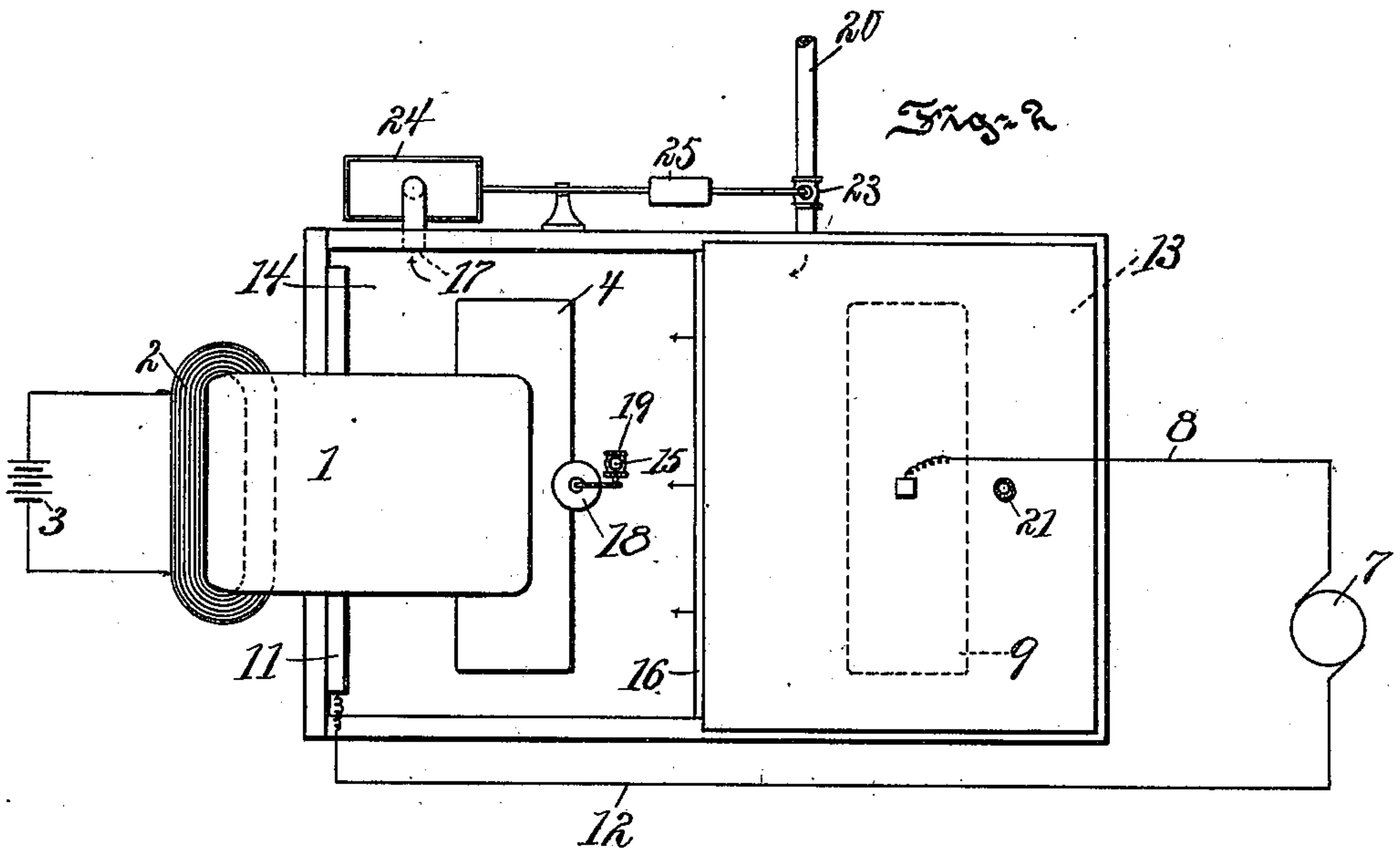
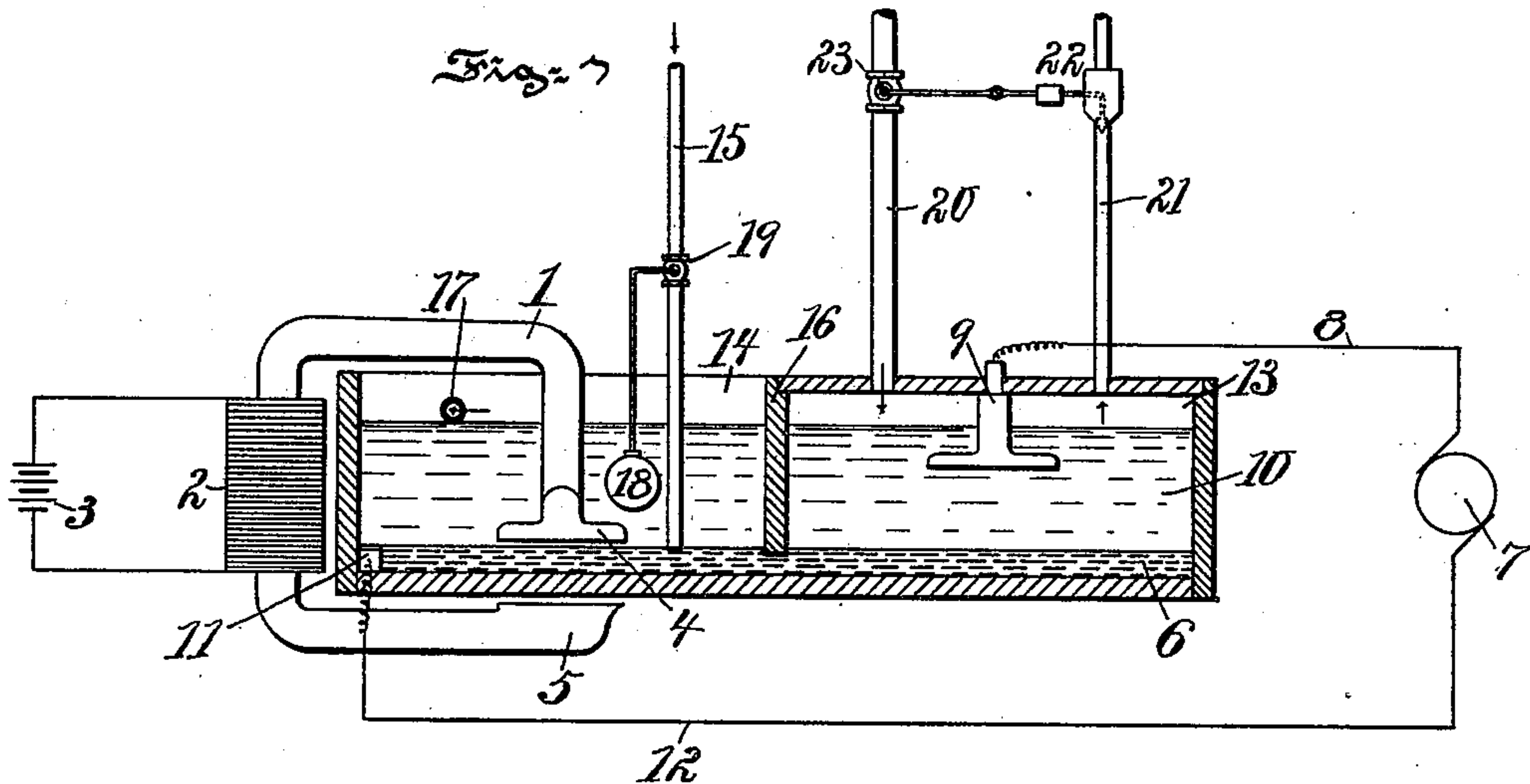
Patented July 3, 1900.

J. B. ENTZ.

ELECTROLYTIC PRODUCTION OF CAUSTIC SODA. &c.

(Application filed May 6, 1899.)

(No Model.)



Witnesses:
W. H. Jackson
K. M. Gilligan

Inventor:
J. B. Entz
By
Augustus B. Stoughton
Attorney

UNITED STATES PATENT OFFICE.

JUSTUS B. ENTZ, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE
AMERICAN ALKALI COMPANY, OF NEW JERSEY.

ELECTROLYTIC PRODUCTION OF CAUSTIC SODA, &c.

SPECIFICATION forming part of Letters Patent No. 652,761, dated July 3, 1900.

Application filed May 6, 1899. Serial No. 715,814. (No specimens.)

To all whom it may concern:

Be it known that I, JUSTUS B. ENTZ, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in the Electrolytic Production of Caustic Soda and the Like, of which the following is a specification.

10 In the electrolytic production of caustic soda and the like there is a deposition influenced by the passage of an electric current which results in the taking up by mercury of certain substances. To recover the sub-
15 stances, it is customary to cause the mercury to circulate in suitable apparatus, as by mechanical agitation or by the action of centrifugal force. Such means for causing a circulation of the mercury in the apparatus involve the movement of the same and also
20 other disadvantages.

One object of the invention is to provide for the circulation of the mercury without the disadvantages heretofore encountered and
25 which have been above referred to.

Other objects of the invention are to automatically control the production, so as to produce a uniform quality of the finished product.

To these and other ends the invention,
30 stated in general terms, comprises effecting the circulation or movement in the apparatus of the mercury through which the current is passing by means of a magnetic field, within which the mercury is included.

35 The invention also comprises the improvements hereinafter described and claimed.

The nature, characteristic features, and scope of the invention will be more fully understood from the following description, taken
40 in connection with the accompanying drawings, forming part hereof, and in which—

Figure 1 is a sectional view illustrating apparatus which is well adapted for the practice of the improvements constituting parts
45 of the present invention; and Fig. 2 is a top or plan view of apparatus substantially like that shown in Fig. 1, but embodying also a modification.

In the drawings, 1 represents means for
50 producing a magnetic field. As shown, these means comprise a core energized by a coil 2,

interposed in circuit with a suitable source of current, as 3. Between the pole-pieces 4 and 5 there exists a magnetic field, which includes the mercury 6, through which current
55 is passing, so that the mercury which carries the current and is thus included in a magnetic field moves and circulates from one compartment to another. As illustrated, the path of the current which traverses the bath
60 6, of mercury, may be traced as follows: from the source of current 7 by the conductor 8 to the electrode 9, from the electrode 9 through the bath 10, through the mercury 6, to the conductor 11, and by the conductor 12
65 back to the source 7. The electrode 9 may be made of carbon.

A description of the invention in connection with the manufacture of caustic soda from salt (sodium chlorid) will now be given,
70 and from it those skilled in the art will be readily able to understand the mode of operation of the invention.

The bath 10 is superposed upon the mercury and consists of and is supplied with
75 common salt or "sodium chlorid," as it is sometimes called, and the latter may be introduced either as brine or as solid salt. The effect of the current passing from the electrode 9 to the mercury-bath 6 is, as is well
80 known, to liberate chlorine and cause the mercury to take up sodium. Since the mercury is circulating under the influence of the magnetic field above described, sodium is transferred by it from the compartment 13 to the
85 compartment 14, which is supplied above the mercury with water, and, as is well known, the water takes up the sodium and produces caustic soda.

The electrochemical reaction above de-
90 scribed, by which salt is decomposed and its sodium transferred from one compartment or receptacle to another by a bath of mercury, is well known; but the employment of the magnetic field for circulating the bath of
95 mercury is the gist of the present invention, and it is important, because it obviates the necessity of mechanically agitating the mercury. The effect of the current passing through the mercury from 9 to 11 is to cause
100 that portion of the mercury in the magnetic field to move at right angles to the direction

of the current in the mercury. The effect of this is to produce continuous circulation in a path including both compartments. The effort exerted upon the mercury is proportional to the product of the current in the mercury and the strength of the magnetic field. The current that would be employed for the electrolysis of the saline solution, which current traverses the mercury, is quite sufficient to cause the circulation even with such strength of field as can be obtained from a permanent magnet or by an electromagnet excited by an amount of electrical energy not exceeding five per cent. of the energy required for the electrolysis. The strength of the magnetic field and the consequent movement of the mercury may be increased or diminished by regulating the source 3 or by the use of a rheostat in the circuit thereof, as will be readily understood by those skilled in the art.

15 is a supply-pipe by means of which water may be introduced into the compartment 14, formed by the partition 16, beneath which the mercury circulates and moves.

17, Fig. 1, is an offtake for the solution of caustic soda. This offtake need not be provided with the apparatus shown in Fig. 2 and to be hereinafter described. If the solution produced in the compartment 14 is of uniform quality, its specific gravity should be the same, and any change in the specific gravity may be taken advantage of and caused to control the ingress of water through the pipe 15, and thereby keep the strength of the solution constant.

18 indicates a submerged float that rises and falls in correspondence with changes in the specific gravity of the fluid in which it is immersed, and this float 18 is connected with and controls the position of a valve 19 on the inlet-pipe 15. If the specific gravity of the fluid produced in the compartment 14 should increase, it would indicate that the strength of the solution had also increased, but the float 18 would rise and thus let in more water, which would reduce the specific gravity and strength to the predetermined condition, and, conversely, if the solution should fall off in strength the float would shut off the supply of water until such tendency to defect is cured.

20 is a pipe or conduit by means of which brine or common salt may be introduced into the compartment 13. By controlling the quantity thus introduced the solution of sodium chlorid in the compartment 13 may be kept of uniform strength. This result may be accomplished automatically—for example, by inclosing the compartment 13 and pro-

viding it with a gas-offtake pipe 21, through which the chlorin evolved escapes and which is provided with a device, as 22, that responds to the pressure of the gas and thus opens and closes a valve 23 in the pipe 20. Under uniform conditions the gas evolved in the compartment 13 is proportional to the quantity of sodium liberated and conveyed to the compartment 14 and there taken up in solution. Thus by regulating the ingress of sodium chlorid and keeping all the other conditions constant it is possible to produce caustic soda of uniform strength. The action of the chlorin gas evolved upon the valve 23, as described, is therefore to automatically increase and decrease the supply of sodium chlorid and thus insure the uniformity of operation.

Another way of automatically introducing the salt or brine required for the production of caustic soda is illustrated in Fig. 2. In that figure, 24 is a receptacle counterbalanced by a weight 25 and adapted to receive the solution as it flows from the receptacle 14. This counterweighted receptacle is in operative connection with the valve 23, that controls the ingress of sodium chlorid, so that this receptacle serves to automatically regulate the admission thereof. When a predetermined quantity of caustic soda has overflowed into the receptacle 24, it overbalances the weight 25, and thus opens the valve 23 and lets in a sufficient quantity of sodium chlorid to replace that previously decomposed. The receptacle 24 in tipping empties itself and then resumes its original position.

It will be obvious to those skilled in the art to which my invention appertains that modifications may be made in detail without departing from the spirit thereof. Hence I do not limit myself to the precise construction and arrangement of parts hereinabove set forth and illustrated in the accompanying drawings; but,

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

The process which consists in passing a current through mercury, electrolyzing a superposed fluid to effect deposition on the mercury, and subjecting the mercury to the influence of a magnetic field to cause it to move and transfer the substance deposited, substantially as described.

In testimony whereof I have hereunto signed my name.

JUSTUS B. ENTZ.

In presence of—

K. M. GILLIGAN,
W. J. JACKSON.