

J. D. SARTAKOFF.
 APPARATUS FOR TREATING CHEMICALS.
 APPLICATION FILED JUNE 5, 1917.

1,284,468.

Patented Nov. 12, 1918.

3 SHEETS—SHEET 1.

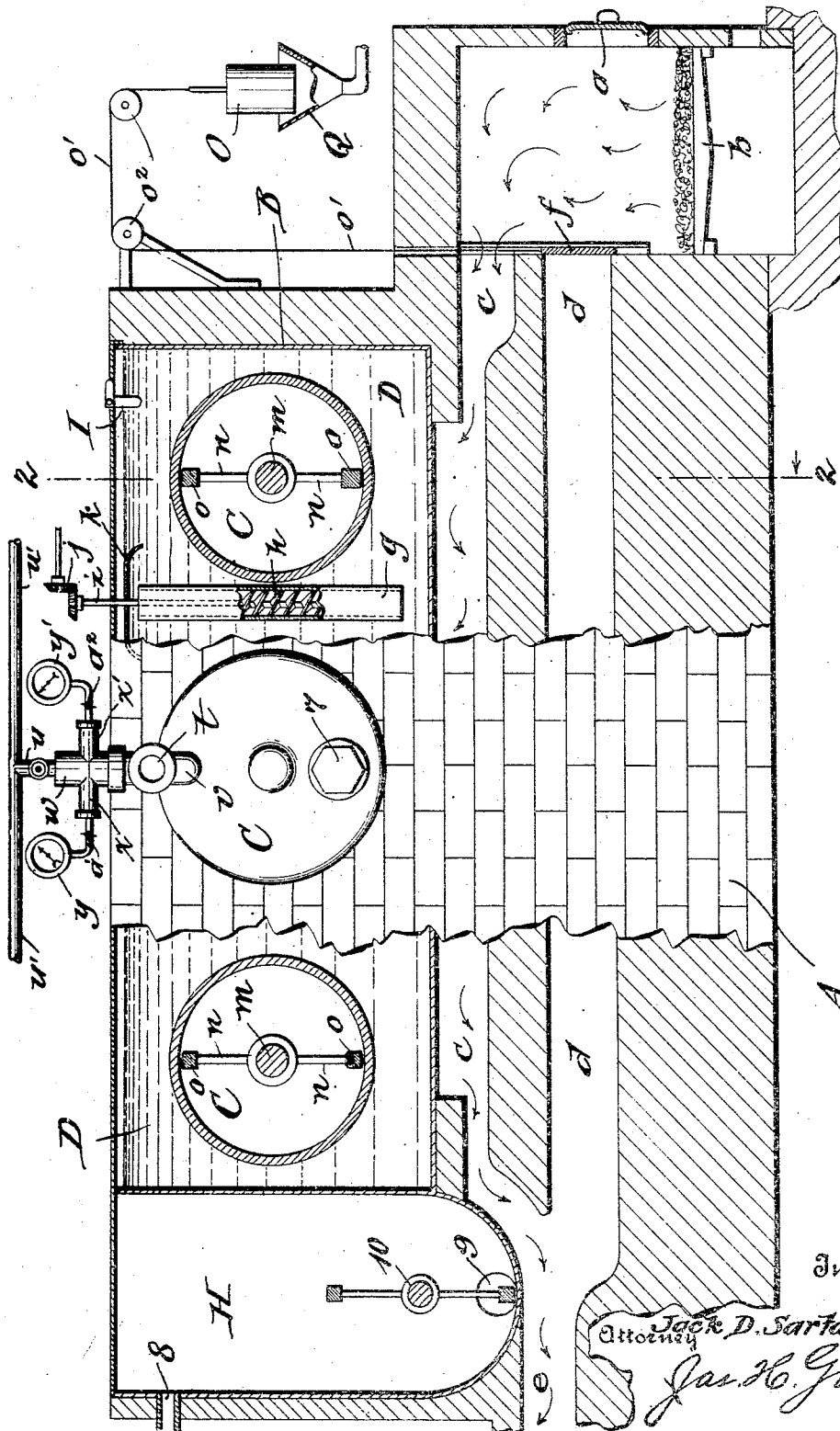


Fig. 1.

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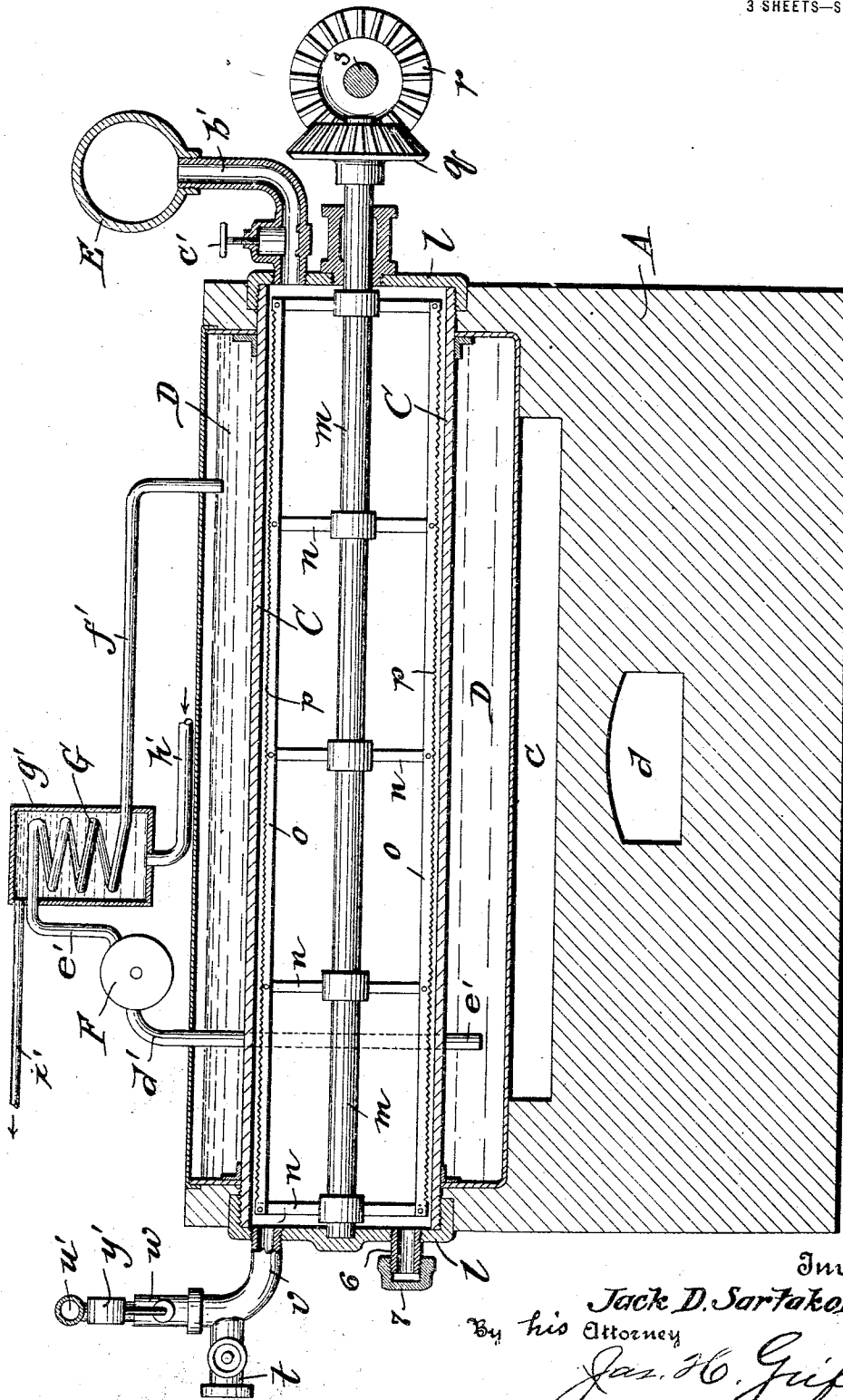
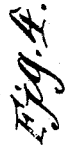


Fig. 2.

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3 SHEETS--SHEET 3.



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UNITED STATES PATENT OFFICE.

JACK D. SARTAKOFF, OF NEW YORK, N. Y.

APPARATUS FOR TREATING CHEMICALS.

1,284,468.

Specification of Letters Patent.

Patented Nov. 12, 1918.

Application filed June 5, 1917. Serial No. 172,351.

To all whom it may concern:

Be it known that I, JACK D. SARTAKOFF, a citizen of Russia, residing in the city of New York, borough of Manhattan, county and State of New York, have invented a certain new and useful Apparatus for Treating Chemicals, of which the following is a specification.

This invention is an apparatus for treating or manufacturing chemicals, and, while it is especially adapted for the manufacture of sodium salicylate, it is equally well adapted in the treatment and manufacture of analogous and different products. Its construction and operation will be described more particularly in connection with the manufacture of sodium salicylate in accordance with the well known "Bayer" process, but, as suggested, the description of its use in this process will suggest its applicability to others.

As is well known, the Bayer process embodies three main operations, viz., first, the production of sodium phenolate; second, the subsequent treatment of the dried phenolate with carbon dioxid under pressure, whereby the sodium phenolate is converted into sodium phenyl carbonate, and, third, the subsequent heating, in the presence of carbon dioxid, of the sodium phenyl carbonate in an autoclave, whereby the sodium phenyl carbonate is converted into sodium salicylate. In carrying out the second operation, the heating is conducted at different temperatures and pressures for certain periods, both the temperature and pressure being increased as the process progresses.

The present apparatus embodies means for automatically controlling said temperatures and pressures, and permits of the manufacture of the product under consideration on an extensive commercial scale, and with great efficiency and economy of operation. In that a superior product is produced, a comparatively small amount of manual labor is required, and a minimum amount of fuel utilized.

In the accompanying drawings I have illustrated the preferred practical embodiment of my invention, but it will be understood that various other forms may be used, provided they embody the distinguishing principles and characteristics of my apparatus, such as appear from the hereinafter detailed description and appended claims.

In the accompanying drawings, Figure 1 is a longitudinal view of the apparatus, partly in elevation and partly in section.

Fig. 2 is a sectional elevation on line 2—2 of Fig. 1.

Fig. 3 is a view, partly in section and partly in elevation, showing, in detail, one form of thermostatic control which may be employed in regulating the operation of the apparatus, and particularly in controlling the temperature thereof, and

Fig. 4 is a cross-section on line 4—4 of Fig. 3.

Referring to the drawings, A is a heating furnace, exposed to the direct heat of which is a metal tank or receptacle B, preferably of steel or iron, in which are located a plurality of metal drums, preferably stationary, C, shown as three in number, although any desired number may be used. Furnace A embodies the customary elements, such as fuel charging door *a*, grate bars *b*, heating flue *c*, by-pass *d*, which have a common exit *e* to the stack, not shown, and damper *f* adapted to cooperate either with the flue *c* or by-pass *d*.

Tank B contains a suitable heat-transferring, liquid medium D, preferably a heavy petroleum, the boiling point of which is upward of 220 degrees centigrade. In order that the oil D in tank B may be kept at a uniform temperature, provision is made for keeping the oil in circulation, and, for this purpose, I employ one or more pumps, preferably of the Archimedean screw type, embodying a casing *g*, and helical screw *h*, fast on a shaft *i*, rotatable by suitable gearing *j*. In order to spread the oil as it emerges from the top casing *g*, I may employ a baffle-plate *k*.

The drums C, which may take the form of large pipes, are screwed at their ends into metal heads *l*, the peripheries of which are secured in the brick-work of the furnace, as clearly appears in Fig. 2. Each of the drums C is provided with a suitable agitator embodying a rotatable shaft *m*, having outstanding, radial arms *n*, to the ends of which are affixed scraping bars *o o*, extending longitudinally of the drum, said scraping bars having their outer edges preferably serrated, as shown at *p p*, the serrations *p* of one bar *o* being staggered with relation to the serrations *p* of the other bar *o*, whereby the entire surface of the drum is thoroughly scraped.

or swept. Shafts *m* are driven by means of beveled gears *g*, each of which has a co-operating driving gear *r* positioned on a main or power shaft *s*.

Each of drums *C* is provided with a valved inlet pipe *t* for liquid, and a valved inlet pipe *u* for a gas, such as carbon dioxide, there being a main carbon dioxide pipe *u'* for supplying the carbon dioxide. Pipes *t* and *u* have a common entrance *v* to the drum, whereby the liquid under treatment may be admitted through pipe *t*, and the dried product obtained therefrom treated with carbon dioxide introduced through pipe *u*. Intermediate pipes *u* and *v* is a double-T-shaped, tubular member *w*, one leg *x* of which connects with a vacuum gage *y*, and the other leg *x'* of which connects with a vacuum gage *y'*, the passage to the vacuum gage *y* being controlled by a valve *a'*, and the passage to the vacuum gage *y'* being controlled by a valve *a''*. Each of the drums *C* is also provided with a draw-off pipe *6*, having a closing cap *7*. A vacuum main *E* is common to all the drums *C*, each of said drums being connected therewith through the medium of a pipe *b'*, in which is positioned a manually operated valve *c'*, whereby the vacuum can be shut off from the drums as desired.

It is frequently desirable to cool the drums and their contents quickly, and, with this object in view, the apparatus preferably embodies means whereby the oil or other heating medium *D* in tank *B* may be readily cooled or chilled. To effect this result, I employ means for circulating said oil through an exterior cooling apparatus, said apparatus embodying a rotary pump *F*, having a hot oil inlet *d'*, extending to the bottom of tank *B*, the oil outlet *e'* from the pump being connected with a cooling coil *G*, having an outlet for cooled oil *f'* leading to the top of tank *B*. Cooling coil *G* is contained in a casing *g'* supplied with cooling liquid, such as water, through pipe *h'* and having an overflow *i'* for the warm water.

In order to fully utilize the heat of the products of combustion, which they may contain upon their escape from flue *c* or by-pass *d*, I position at the end of the apparatus farthest from the source of heat, and in proximity to exit flue *e*, an evaporating or drying receptacle or chamber *H*, preferably extending transversely of the apparatus, said chamber being provided with an inlet *8*, outlet *9*, and agitator or stirrer *10*, as shown. Chamber *H* may, if desired, be connected with vacuum main *E*.

Having described the apparatus generally, as embodied in Figs. 1 and 2, I will now describe a most important feature of the apparatus, viz., the thermostatic means for controlling damper *f*, said means being shown diagrammatically and in detail in

Fig. 3. Said thermostatic apparatus embodies means whereby the temperature of the material in the drums may be kept constant for a predetermined period, and whereupon the temperature may be raised to a further desired point and kept constant for a further predetermined time, etc., the pressure in the drums being also regulable to suit conditions of operation. The main element of the furnace which it is desired to keep under control is the damper *j*, and the thermostatic apparatus embodies means for operating this damper so that it allows of the free passage of the products of combustion either through heating flue *c*, or through by-pass *d*, depending on the temperature which it is desired to maintain in the drums *C*.

The prime mover of the thermostatic means is designated in Fig. 3 by the reference character *I*, and may embody any well known form of thermostat. As here shown, however, it embodies two strips of material *k'* and *k''*, having different coefficients of expansion; in the instance shown, *k'* representing iron, while *k''* represents lead, the lead having the higher coefficient of expansion. These strips are secured together, preferably, by welding and, after being thus secured together, are bent into the general U-shape form, as shown. Thermostat *I* is immersed in the oil *D*, see Fig. 1, with the end of one leg of the U-shaped portion of said thermostat fixedly secured to the top or cover of tank *B*, as at *k''*, while the other leg extends upwardly through a slot in said cover and is pivotally secured to a rack *J*, with which meshes a pinion *j'* fixed on shaft *j''*. Also fixed on shaft *j''* is a gear *K*, which meshes with a second rack *J''*. Mounted on rack *J''* is a contact *l'*, in the form of a pendulum pivoted to a bracket *l''* on said rack and in electrical connection with an electrical circuit *L* fed from battery *l'''*.

With a construction organized as described, it is apparent that, as the temperature of the oil *D* increases, the metals of which the thermostat is composed will expand in accordance with their well defined coefficients of expansion, the lead or outer strip *k''* expanding with greater rapidity than the inner or iron strip *k'*, with the result that the free leg *k'* of the thermostat will approach the other leg thereof, and, in so doing, move rack *J* to the right, as noted by the arrow thereon. By this movement, pinion *j'* is rotated in a counter-clockwise direction, as shown by the arrow, carrying therewith gear *K* in the same direction, as noted by its directional arrow. Moreover, rack *J''*, which is in mesh with gear *K*, will be consequently moved to the left, as noted by its directional arrow, carrying therewith the contact *l'* mounted thereon.

Mounted for sliding movement in parallel relation to rack J^2 is a cooperating rack K^2 , actuated by a pinion M driven at either intermittent or constant speed by any suitable form of time train, not shown, in such direction as to impart sliding movement to rack K^2 in the same direction as that normally imparted by gear K to rack J^2 . Mounted on rack K^2 is a contact l^4 , electrically connected to the source of electrical energy E^3 , as shown, and the circuit L is adapted to be made or broken when relative movement between the racks J^2 and K^2 so position pendulum contact l^1 that it engages contact l^4 .

From the description of the apparatus thus given, it will be apparent that the time train, operating through pinion M , moves rack K^2 to the left, as indicated by the arrow thereon, while rack J^2 is moved in the same direction by pinion K controlled by the heat of the oil bath operating through thermostat I and intermediate mechanism. The parts are so organized, however, that the contact l^4 of rack K^2 is always in advance of pendulum contact l^1 of rack J^2 , so that the circuit L is broken by the bridge between these contacts until pendulum contact l^1 , due to the forward advance of rack J^2 , catches up and engages with contact l^4 .

If it be assumed that the time train is so controlling rack K^2 as to advance it to the left at a constant speed, it appears that the pendulum contact l^1 can only become engaged with contact l^4 on said rack by the raising of the temperature of the oil bath to such extent as to move rack J^2 sufficiently forward to overtake said contact l^4 . Pursuant to one of the objects of the invention, which is to control the raising of the temperature of the oil bath for predetermined periods of time, I utilize the cooperating action between the racks J^2 and K^2 for controlling the heat applied to the oil bath, and, as this may be most readily accomplished through the manipulation of the heat-controlling damper f , provision is made to govern the operation of said damper through the operation of electrical circuit L , controlled by contacts l^1 and l^4 .

In circuit L is included an electro-magnet L' , the armature L^2 of which carries, and is insulated from, a stem L^3 , on the lower end of which is formed a needle valve n' . Stem L^3 projects into a container N , in the bottom of which is a valve seat controlled by needle valve n' of said stem. Fluid, such as water, is fed into container N through an inlet n^2 and may be kept at a constant volume by means of a suitable overflow pipe n^3 . However, if desired, overflow pipe n^3 may be dispensed with and the level of liquid within said container may be controlled by any well known form of float valve.

Communicating with the outlet of con-

tainer N is a pipe n^4 , the opposite end of which is so positioned as to discharge liquid flowing therethrough into a receptacle or bucket O . Bucket O is suspended from a bail, to which is secured one end of a chain or cable o' which passes over suitably disposed direction rollers o^2 and is secured at its opposite end to damper f , which controls the passage of the products of combustion through heating flue c or by-pass d .

The weight of the empty bucket O and its adjuncts hereinafter described, is less than the weight of damper f , so that said damper normally gravitates into a position to leave heating flue c open and to close by-pass d . If, however, the water in container N is allowed to flow through pipe n^4 and into bucket O , it being assumed that the bucket is closed, the weight of said water will be sufficient to over-balance the weight of damper f , thereby causing it to be raised to close flue c and open by-pass d . This operation is carried out through the energization of magnet L' , which attracts its armature L^2 , thereby lifting needle valve n' and allowing of the flow of liquid from container N to bucket O , as described.

Magnet L' has the further function of controlling the retaining of the water within bucket O , since, as clearly shown in Fig. 3, armature L^2 of said magnet, when the magnet is deenergized, rests upon a pair of spaced contacts p' p^2 , which form the terminals of an electric circuit P in which is included an electro-magnet P' . Armature p^3 of said electro-magnet P' is secured to the stem p^4 of a needle valve p^5 for controlling an outlet aperture p^6 in the bottom of the bucket. When armature L^2 is in a position to bridge contacts p' and p^2 , magnet P' is energized and needle valve p^5 moved to a position to open outlet aperture p^6 and allow the water to flow from the bucket into a sink Q positioned immediately therebeneath. However, when magnet L' is energized, its armature L^2 is lifted free from contacts p' p^2 , magnet P' is thereby deenergized, and needle valve p^5 gravitates into a position to seal outlet aperture p^6 . By virtue of the fact that the flow of water into the bucket and the discharge of said water therefrom are controlled through unitary means, viz., armature L^2 , proper coordination between these operations is assured at all times, it being manifest that, when armature L^2 is raised, through the energization of magnet L' , for the purpose of allowing the water to pass from container N into bucket O , this operation automatically brings about the seating of needle valve p^5 in outlet aperture p^6 of bucket O , and conditions said bucket to hold the water. Said water is, however, precluded from overflowing the top of the bucket by the overflow pipe o^3 which maintains the water

at a constant level within the bucket, the superfluous water overflowing into sink Q.

Moreover, magnet L' has the further function of controlling the discharge of water from bucket O, since, as soon as said magnet is deenergized, its armature L² will fall and bridge contacts p' and p², thereby completing the circuit through magnet P' for the purpose of elevating needle valve p⁵ and opening the outlet p⁶, whereupon the water will be drained from bucket O into sink Q. When bucket O is freed from the weight of the water, it will no longer overbalance damper f, which will, because of its greater weight, gravitate to a position to close by-pass d and open flue c. The parts will remain in this position until the circuit L is again closed through the engagement of pendulum contact l' with contact l⁴ on rack K², at which time the hereinbefore described operations will be repeated in the sequence described.

From the foregoing description of the apparatus, coupled with the description of the process, which has been given in part, the mode of operation of the apparatus will be readily understood, but, in the interest of clearness, it may be briefly summarized as follows:

Assuming we are operating upon a solution of sodium phenolate with a view to converting it into sodium salicylate, the liquid sodium phenolate is fed into drums C through their respective inlet pipes t. The furnace having been previously started, and the oil bath heated to the desired initial temperature, with the damper f in lowered position, the vacuum is applied to vacuum main E and the agitators within the drums set in operation. As the result of the heat, partial vacuum and agitation, the liquid is quickly concentrated and eventually evaporated to complete dryness within the drums. Assuming that the temperature at which the material is finally dried is somewhat higher than that at which it is desired to effect the carbonating of the dry sodium phenolate, the temperature of the oil bath may be quickly reduced to the desired degree by means of the oil circulatory apparatus described, embodying pump F, cooling coil G and appurtenances. Assuming the required temperature in the drums C has been obtained, and that it is desired to begin the carbonation treatment, the valve c' having been previously closed to shut off the vacuum, carbon dioxid is admitted to the apparatus by opening valved pipe u, the desired pressure being observed through pressure gage y'. As a general rule, it is not necessary to employ the thermostatic regulating apparatus during the drying operation described, and, in order to render said thermostatic apparatus inoperative, there is included in circuit L a manually operated

electric switch l⁵, which may be left open during the drying operation. The carbonation, however, is effected in successive stages, wherein gradually higher pressures and gradually increased temperatures are employed, and, in order to secure said successive elevations in temperature, the thermostatic apparatus is brought into action by closing switch l⁵.

The preliminary part of the carbonating operation is effected at a temperature, *e. g.*, 90 degrees centigrade, at which the thermostatic apparatus O is not particularly affected. Said apparatus may, however, be employed, if desired, to so control the heat supplied to the bath D during the drying operation that the material within the drums C will not be over-heated or burned. When, however, it is desired to increase the temperature of the oil bath, say to 150 degrees centigrade, such elevation in temperature results in the active operation of rack J² commensurate with the action of thermostat I. During this operation by the thermostat, the time train is operating either at constant or intermittent speed, as the case may be, to advance rack K² at such speed as is calculated to produce a number of degrees rise in temperature through the predetermined period. The operations of rack K² successively carry contact l⁴ in a direction away from pendulum contact l', and, since damper f is in a position to allow of the heating of the oil bath D by the hot products of combustion passing through flue c as long as contacts l' and l⁴ are free from engagement with one another, it will appear that, as contact l⁴ moves away from contact l', the oil bath D will be constantly raising in temperature. When this temperature arrives at such a point that the operation of thermostat I, acting through intermediate connections with rack J², will cause contact l' to overtake and engage with contact l⁴, circuit L will be completed, thereby lifting armature L² of magnet L', breaking circuit P to allow of the seating of needle valve p⁵, and raising needle valve n' to allow the water to run from container N into bucket O. The introduction of this water in bucket O results in the over-balancing of damper f, and causes the same to be elevated to close heating flue c and shunt the hot products of combustion through by-pass d. With this condition of the parts, a further elevation in temperature of the oil bath D will cease.

If the time train is operating intermittently, the engagement of contact l' with contact l⁴ will continue through the period of rest or dwell of rack K², or until said rack again starts to move forward. However, if the time train is operating at constant speed, it will, in a very short time, move contact l⁴ free from contact l', and, by so doing, release armature L², with the

result that needle valve n' will seal container N, the circuit P being simultaneously energized to lift needle valve p^5 and allow of the draining of bucket O. As soon as bucket O is drained, its weight ceases to be sufficient to over-balance damper f , and the latter gravitates to a position to close by-pass d and open heating flue c . This having been accomplished, the hot products of combustion will immediately course through the heating flue and serve to further raise the temperature of the oil bath D, this elevation in temperature resulting in the further operations on the part of the thermostat to advance contact V' sufficiently to catch up and engage with contact V^4 , whereupon circuit L is completed and the operations of closing and subsequently opening the damper, hereinbefore described, are repeated.

In this manner, the heating of the oil bath progresses in successive stages until the temperature has attained a predetermined maximum, at which time contact V' will come into engagement with a fixed contact V^6 in electrical connection with a branch of circuit L. Contact V^6 has no movement, and, since the engagement of contact V' with contact V^6 immediately precludes further heating it is manifest that a further rise in temperature of the heating bath D will be impossible. This is because of the fact that, as soon as contact V' comes into engagement with contact V^6 , the damper will shunt the hot products of combustion through by-pass d . The time train may, of course, continue to operate rack K^2 after contact V^4 has passed the fixed or stationary contact V^6 , but, after this has occurred, said contact V^4 will have passed out of the range of operation of pendulum contact V' and will have no further coöperation therewith.

Contact V^6 has been described as stationary or fixed, but it will be understood that this terminology is to be construed as meaning that it is not moved or mechanically actuated from the operating parts of the thermostat or time train. It may be manually adjusted to different positions with relation to the travel of contact V' in accordance with the predetermined maximum degree of heat desired.

As has hereinbefore been pointed out, time train driven rack K^2 may be actuated continuously or intermittently, as required. If it is desired to heat the material in tank C to a gradually and continuously increasing temperature, the time train will, naturally, be actuated continuously; if, however, it is desired to increase temperatures at successive stages, and to maintain said temperatures for definite periods of time, then the time train will be driven intermittently, *i. e.*, will have times of dwell depending on the length of the periods at which it is desired

to keep the material at a certain temperature for each of the successive periods. Clock-driven mechanism of the two types described, however, is so well known that any further reference thereto is not deemed necessary or advisable.

As heretofore suggested, as the temperature at which the material is treated is increased during the successive stages of treatment, the pressure of carbon dioxide is also increased, and this pressure is, preferably, maintained constant at any of the successive stages of treatment. That is to say, where the temperature is maintained constant for a given period, a certain pressure is employed, whereas at a successive period, where the temperature is increased, the pressure is also increased, but maintained constant for said period of constant temperature. Thus, *e. g.*, the temperature of carbonation may begin at 90 degrees centigrade, whereas the final conversion of the carbonate into salicylate of soda may take place at 200 degrees centigrade, this matter of temperature being continued for quite a prolonged period. The pressure, on the other hand, may begin at 25 pounds and gradually increase, during the several successive changes in temperature, up to 150 pounds.

It will be understood that changes and departures in the apparatus as described, as well as in the specific procedure outlined, may be made without departing from the spirit of the invention, so far as concerns the apparatus, the scope of which is co-extensive with the appended claims.

Having thus fully described the invention, what I claim as new, and desire to secure by Letters Patent, is:

1. In an apparatus for treating chemicals, a plurality of drums, means for heating the drums, and means for automatically regulating the increase in temperature within the drums at predetermined periods.

2. In an apparatus for treating chemicals, a plurality of drums, means for heating the drums, and means for automatically regulating the increase in temperature within the drums at predetermined periods and maintaining the temperatures substantially constant between the successive periods.

3. In an apparatus for treating chemicals, a plurality of drums, means for heating the drums, means for automatically regulating the increase in temperature within the drums at predetermined periods, and means for applying gaseous pressure to the drums.

4. In an apparatus for treating chemicals, a plurality of drums, means for heating the drums, means for automatically regulating the increase in temperature within the drums at predetermined periods and maintaining the temperatures substantially constant between the successive periods, and manually

controllable means for applying increased gaseous pressure to the drums during each successive period.

5 In an apparatus for treating chemicals, a heating drum, means for regulating the supply of heat thereto, and means cooperating with said heat regulating means, for automatically increasing the temperature of the drum at successive predetermined periods.

10 6. In an apparatus for treating chemicals, a heating drum, in combination with means for automatically increasing the temperature thereof at predetermined successive periods and maintaining the temperature constant between each of said periods, and manually controlled means for increasing the pressure in the drum at each of the successive periods.

7. In an apparatus for treating chemicals, a heating drum, an oil bath cooperating with said drum for heating the same, means for heating the oil bath, a thermostat for controlling the heating means, and a moving element controlled by a time train cooperating with the thermostat whereby the temperature of the oil bath may be increased at predetermined periods.

8. In an apparatus for treating chemicals, a heating drum, an oil bath cooperating with said drum for heating the same, means for heating the oil bath, a thermostat for controlling the heating means, and a moving element controlled by a time train cooperating with the thermostat whereby the temperature of the oil bath may be increased for successive periods and kept constant between each of the periods.

9. In an apparatus for treating chemicals, a heating drum, a chamber adapted to contain a heat-transferring medium for heating said drum, means for circulating said heat-transferring medium whereby its temperature is kept uniform, and means for cooling said medium.

10. In an apparatus for treating chemicals, a heating drum, a chamber adapted to contain a heat-transferring medium for heating said drum, means for circulating said heat-transferring medium whereby its temperature is kept uniform, and means for circulating said medium exteriorly of the chamber through a refrigerating means whereby the medium is cooled.

11. In an apparatus for treating chemicals, a heating drum, means for heating the same, means for automatically regulating the temperature of the heating means, and an agitator in said drum adapted to scrape the inner surface thereof, the scraping edge of said agitator being serrated.

12. In an apparatus for treating chemicals, a heating drum, means for heating the same, means for agitating the contents of the drum, vacuum means connected with the drum, an inlet and an outlet to the drum for the mate-

rial being operated upon, and means for introducing carbon dioxide into the drum.

13. In an apparatus for treating chemicals, a heating drum, a liquid bath for heating said drum, means for automatically increasing the temperature thereof at predetermined, successive intervals, means for circulating the liquid bath whereby its temperature is maintained substantially uniform, and means for circulating the liquid bath exterior of the drum through a cooler.

14. In an apparatus for treating chemicals, a heating drum, a liquid bath for heating said drum, means for automatically increasing the temperature thereof at predetermined, successive intervals, means for circulating the liquid bath whereby its temperature is maintained substantially uniform, means for circulating the liquid bath exterior of the drum through a cooler, and an agitator within the drum.

15. In an apparatus for treating chemicals, a heating drum, a liquid bath for heating said drum, means for automatically increasing the temperature thereof at predetermined, successive intervals, means for circulating the liquid bath whereby its temperature is maintained substantially uniform, means for circulating the liquid bath exterior of the drum through a cooler, an agitator within the drum, and means for introducing carbon dioxide within the drum.

16. In an apparatus for treating chemicals, a heating drum, a liquid bath for heating said drum, means for automatically increasing the temperature thereof at predetermined, successive intervals, means for circulating the liquid bath whereby its temperature is maintained substantially uniform, means for circulating the liquid bath exterior of the drum through a cooler, an agitator within the drum, means for introducing carbon dioxide within the drum, and means for creating a partial vacuum within the drum.

17. In an apparatus for treating chemicals, a chamber adapted to contain a liquid heat-transferring medium, a plurality of drums exposed to the heating action of said medium, a furnace for heating the chamber, a heating flue and a by-pass for said furnace, means for directing the passage of the products of combustion either through the flue or the by-pass, and automatic means, cooperating with said directing means for closing off the products of combustion from the flue and directing them through the by-pass when the heat-transferring medium in the chamber attains a predetermined degree.

18. In an apparatus for treating chemicals, a chamber adapted to contain a liquid heat-transferring medium, a plurality of drums exposed to the heating action of said medium, a furnace for heating the chamber,

a heating flue and a by-pass for said furnace, means for directing the passage of the products of combustion either through the flue or the by-pass, automatic means, cooperating with said directing means, for closing off the products of combustion from the flue and directing them through the by-pass when the heat-transferring medium in the chamber attains a predetermined degree, said latter means embodying a bucket cooperating with said controlling means and adapted, when a fluid weight is added thereto, to shut off the products of combustion from the heating flue, and thermostatic means automatically controlling the inflow of water to said bucket.

19. In an apparatus for treating chemicals, a plurality of heating drums, a liquid heat-transferring bath for heating said drums, a furnace for heating said bath, said furnace being provided with a heating flue through which the products of combustion pass to heat the bath, and a by-pass through which the products of combustion pass directly to the stack, and a damper normally closing the by-pass but adapted to open the by-pass and close the heating flue when a suitable, cooperating counter-balance is brought into operation, in combination with thermostatic means and intermediate

mechanism for operating said counter-balance when the temperature of the heat-transferring bath attains a predetermined degree.

20. In an apparatus for treating chemicals, a heating drum, a liquid bath for imparting heat to said drum, means for heating the liquid bath, means for regulating the temperature of said heating means, and thermostatic mechanism, controlled by a time train, cooperating with said temperature regulating means, for automatically and successively raising the liquid bath to predetermined temperatures.

21. In an apparatus for treating chemicals, a heating drum, a liquid bath for imparting heat to said drum, means for heating the liquid bath, means for regulating the temperature of said heating means, and thermostatic mechanism, controlled by a time train, cooperating with said temperature regulating means, for automatically and successively raising the liquid bath to predetermined temperatures, and maintaining the liquid bath at a substantially constant temperature for a succession of predetermined periods.

In testimony whereof I have signed my name to this specification.

JACK D. SARTAKOFF.