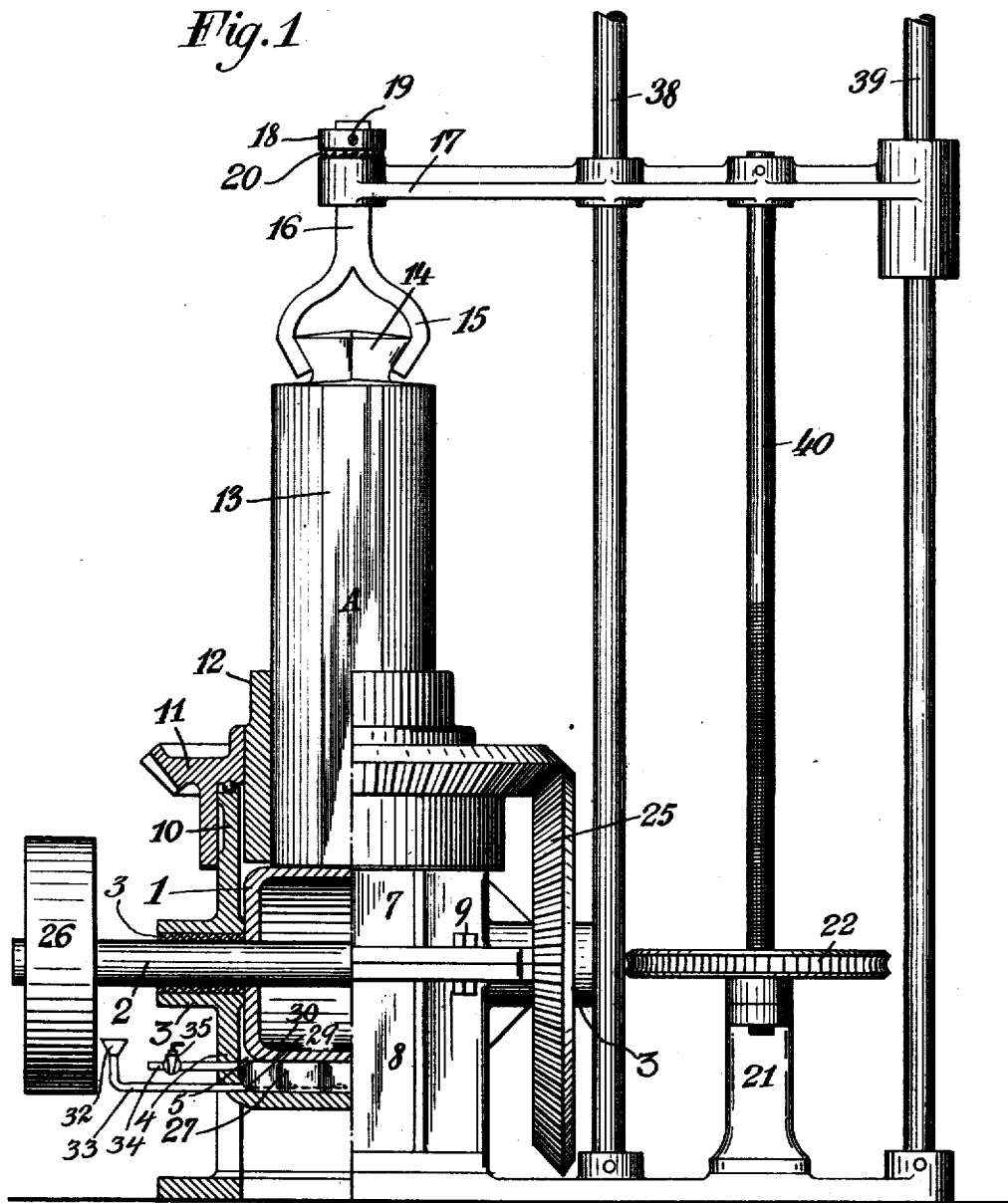


A. L. HALVORSEN.
PROCESS FOR MAKING AMALGAMS.
APPLICATION FILED DEC. 30, 1915.

1,243,062.

Patented Oct. 16, 1917.
2 SHEETS—SHEET 1.



B

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Arthur Ludwick Halvorsen
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Fig. 2

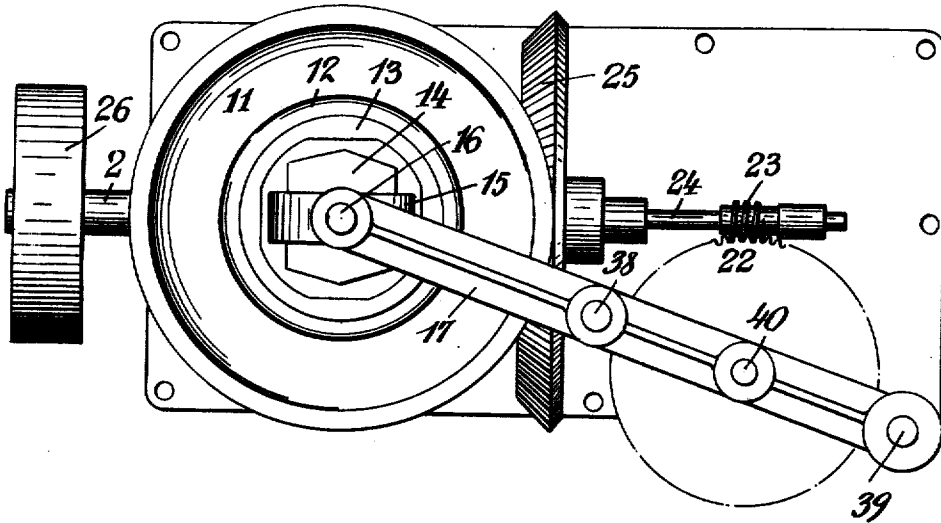
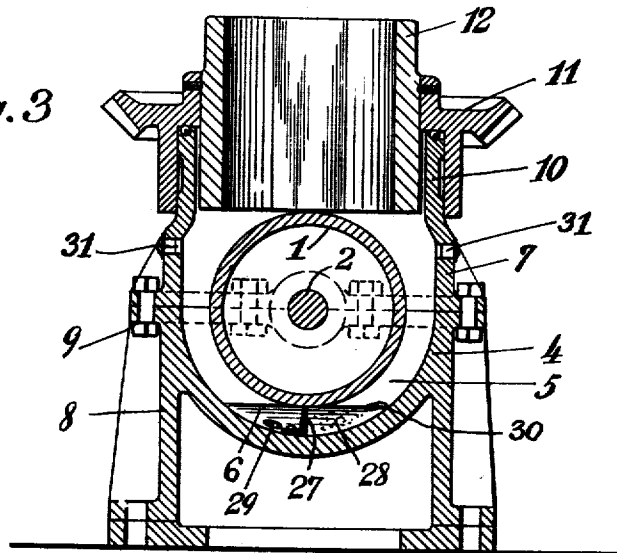


Fig. 3



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UNITED STATES PATENT OFFICE.

ARTHUR LUDWICK HALVORSEN, OF PERTH AMBOY, NEW JERSEY, ASSIGNOR TO THE ROESSLER & HASSLACHER CHEMICAL CO., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

PROCESS FOR MAKING AMALGAMS.

1,243,062.

Specification of Letters Patent.

Patented Oct. 16, 1917.

Application filed December 30, 1915. Serial No. 69,341.

To all whom it may concern:

Be it known that I, ARTHUR LUDWICK HALVORSEN, a subject of the King of Norway, residing at Perth Amboy, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Processes for Making Amalgams, of which the following is a specification.

My invention refers to the manufacture of amalgam for instance sodium amalgam and has for its object to provide means to avoid the vehement reaction taking place when metallic sodium and mercury react together and to thus render this manufacture on a large scale safe both for labor and material.

In accordance with the invention the reaction takes place continuously between small amounts of mercury and metallic sodium; it is caused by bringing a little mercury from a body of mercury into contact with a body of sodium, at the same time continuously disposing of the formed amalgam.

The purpose of the invention is best attained if proportionately small quantities of mercury in the form of a thin layer or film are brought into contact with the metallic sodium, said layer or film of mercury being brought into contact with the body of metallic sodium in such manner that continuously fresh portions of the mercury contact with the sodium; this movement of the mercury may be conveniently achieved in various ways for instance by causing the mercury to adhere to a cylindrical drum rotating in a mercury well.

In the following I shall describe, by way of example, one way of practising my new process, wherein a layer or film of mercury, adhering to a cylindrical drum rotating around its horizontal axis is brought into contact with the body of metallic sodium, describing such apparatus as I prefer to use in carrying out my invention in this particular manner.

Referring to the accompanying drawing, Figure 1 is a front elevation of an apparatus adapted to the carrying out of my invention, parts being shown in vertical section; Fig. 2 is a top view of the apparatus and

Fig. 3 is a cross section on the line A—B of Fig. 1.

Similar numerals of reference indicate similar parts throughout the several views.

The apparatus as shown preferably comprises a cylindrical drum 1 mounted on a horizontal shaft 2 supported by suitable journal bearings 3 in the shell 4 surrounding the drum 1, a space 5 being left between the drum and the shell, the lower portion of said space acting as a mercury well and being filled with mercury 6. Shell 4 is open at the top and preferably comprises an upper part 7 and lower part 8 bolted together by bolts 9. To avoid loss of mercury the level of the same should not extend beyond the rim of the lower part of the shell, although I prefer to have the well but partially filled with mercury, as shown. The upper part of the shell is provided with a vertically extending cylindrical rim 10 adapted to receive a gear wheel 11 in turn adapted to rotate upon and around rim 10. A tube or collar 12 is mounted fast within gear wheel 11 so as to partake in its revolution; tube 12 terminates just adjacent the surface of drum 1 and as it is designed to hold a stick of sodium 13, I prefer to form the inner periphery of tube 12 of an angular cross section so as to hold the sodium stick firmly in the tube and to cause it to follow the rotation of the gear wheel 11. Sodium stick 13 is shown as provided with a head 14 by means of which it is supported in a clip 15, the stem 16 of the clip passing through a hole in arm 17 and being held there by means of a collar 18 and set screw 19, a ball bearing 20 being provided to permit of easy rotation of the stem. Arm 17 is slidably mounted on two fixed guide rods 38 and 39, and controlled to slide in a vertical direction by means of screw threaded rod 40.

Rod 40 is shown as mounted in a base 21 and in screw threaded engagement with a toothed wheel 22 adapted to be driven by a worm 23 on an extension 24 of main shaft 2. 25 is a gear wheel mounted on shaft 2 and meshing with gear wheel 11 so as to drive the latter and 26 is a pulley for driving the

main shaft from any suitable source (not shown). 27 is a brush or scraper for cleaning the surface of the drum 1 and is here shown in the form of a scraper arranged longitudinally of the drum so as to divide the well 5 into two parts, the one part for receiving the comparatively pure mercury 6 and the other for receiving the amalgam 28 scraped from the drum. 29 is an opening for supplying mercury to the well and 30 is an opening for drawing off the amalgam. 31, 31 are openings in shell 4 through which additional mercury may be charged, if desired.

I shall now describe the carrying out of my new method by means of the apparatus above set forth.

The well 5 is first charged with mercury preferably with such a quantity that the drum 1 dips but slightly therein. A stick of sodium 13 is then placed in tube 12 as described, the head 14 of sodium stick 13 being held by clip 15. The lower face of the sodium stick should be adjusted to rest against the periphery of drum 1 with slight pressure. The apparatus is then set in motion. Gear 25 drives gear 11 carrying the sodium stick with it in its rotation so that the entire lower face of sodium stick 13 comes in contact with the periphery of drum 1 while the latter is also rotating. The drum is made of a metal capable of being amalgamated, such as copper and is covered with a thin, endless film of mercury as it passes through the mercury well, bringing such film continuously upward into contact with the sodium and forming strong sodium amalgam which is scraped off in turn by brush or scraper 27. If a brush is used, instead of a scraper dividing the well into two parts, the amalgam will be washed into the mercury well where it may attain any desired strength before removal through pipe 30. In this case the mercury charging pipe 29 may be omitted and the mercury charged through openings 31, 31 instead.

The supply of fresh mercury to and the removal of the sodium amalgam from the device is easily effected, the method depending on whether the apparatus is working as an independent unit or whether it is connected with some other vessel for the operation of processes in which sodium amalgam is consumed. In case the apparatus is working independently the fresh mercury may be supplied through a funnel 32 of sufficient height, discharging into opening 29 through pipe 33 whereas the produced amalgam may be drawn off through opening 30 which may be fitted with a short pipe 34 provided with a suitable cock 35; for greater convenience, the fresh mercury may also be supplied through opening 31 (Fig. 3) as already stated.

In case the apparatus is connected with a vessel where sodium amalgam is consumed in the course of the chemical process operated therein, a suitable pumping arrangement (not shown) may be inserted between the amalgamating apparatus and the vessel so as to forward the amalgam from opening 30 to the vessel, from which vessel the exhausted mercury may overflow to enter the apparatus again through opening 29 as described. It is evident that by this arrangement the sodium amalgam formed by my new method may be drawn off continuously to the place of consumption and after the sodium is removed from the mercury the latter may be continuously returned to the apparatus to be again enriched. As the rotation of the drum is continuous its passage through the mercury well constantly supplies fresh mercury, or mercury containing a little sodium, to the periphery of the drum to come into contact with the sodium stick. The combination of small quantities of sodium with small quantities of mercury is thus continuously going on and requires but little attention and no skilled labor.

As shown in the drawings, it is perfectly within control of the operator to produce a sodium amalgam of any desired strength, as the length of sodium stick consumed per unit of time may readily be calculated and the speed of shaft 2 adjusted to cause the sodium stick to be fed downward to the mercury film more or less quickly through the action of the screw threaded rod 40. When the sodium stick has been practically all consumed the parts are released, the rod 40 returned to its original position by any suitable means (not shown) and the operation repeated.

By my new method of generating sodium amalgam the violent reactions usually accompanying the formation of sodium amalgam are avoided; as the plane of the lower end of the sodium stick never presses hard on the drum, but is only in slight contact with the rotating mercury the rotating motion of the sodium stick around its vertical axis helps to maintain its lower end in a plane. It is obvious that by this mode of operation a line of contact or "tangent" is established which will prevent any but a small quantity of mercury ever coming into contact with the metallic sodium.

The special provision of rotating the sodium stick may be dispensed with by releasing gear wheel 11 from the driving means whereupon in a short time the mercury will eat into the metallic sodium so that ultimately the sodium stick will ride in the form of a saddle on drum 1. If this point is reached the line of contact is naturally extended into a surface of contact. Though such surface of contact is great

enough to cause a vehement reaction if the sodium exposed by it were dipped into a large body of mercury such vehemence is avoided by my invention as in this case also
 5 but a small quantity of mercury comes into contact with the metallic sodium.

The prior art permitted the manufacture of sodium amalgam in various strengths by introducing the mercury into molten sodium, protected against oxidation by a covering layer of paraffin wax, or by feeding the molten sodium onto the surface of the mercury and protecting the surface in this case by an inert layer, or by feeding pieces
 10 of sodium into warm or cold mercury. These methods, however, even on a small scale, have always been accompanied by violent reactions. Furthermore, while in the prior art it has been difficult if not im-
 15 possible to easily or certainly vary the strength of the sodium amalgam produced, by my invention the strength of the sodium amalgam may be varied from very dilute amalgam to such of the highest concentra-
 20 tion. In case a very strong amalgam, or a higher rate of formation of amalgam is wanted, it may easily be provided by means well known to those skilled in the art such as by heating the drum and the mercury inside the shell 4 to accelerate the formation
 25 of the amalgam; the same purpose may also be easily achieved by providing the surface of the drum with scratching devices to separate small particles of sodium from the stick which particles may then be carried
 30 into the mercury to amalgamate with the same; such scratching devices as are suitable for the purposes of my invention are best illustrated by referring to the hard and
 35 sharp elevations of a large rough file, usually called a rasp or a grater.

A considerable advantage of the process consists in its freedom from complication so an ordinary laborer may operate the
 40 same; for general precaution, however, the two openings 31, 31 may be made sufficiently large to provide access from without to the space inside shell 4.

I do not restrict myself to the practice
 50 of my process in connection with any particular apparatus as it is obvious that the process described may be carried out in

many different ways by the use of varying kinds of apparatus.

I claim:

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1. The method of making amalgams consisting in continuously bringing a thin film of mercury into contact with a body of metal.

2. The method of making amalgams consisting in continuously bringing a thin, moving film of mercury into contact with a body of metal.

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3. The method of making amalgams consisting in continuously bringing a thin, moving film of mercury into contact with a moving body of metal.

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4. The method of making amalgams consisting in bringing a continuously horizontally rotating, thin film of mercury into contact with a continuously vertically rotating body of metal.

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5. The method of making sodium amalgam consisting in continuously bringing a thin, moving film of mercury into contact with a body of sodium.

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6. The method of making sodium amalgam consisting in continuously bringing a thin, curved, moving film of mercury into tangential contact with a moving plane surface of sodium.

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7. The method of making sodium amalgam consisting in continuously bringing a thin, cylindrical, moving film of mercury into tangential contact with a rotating plane surface of sodium.

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8. The method of making amalgams consisting in bringing small quantities of mercury into contact with a body of solid metal.

9. The method of making amalgams consisting in bringing small quantities of mercury into contact with a body of solid metal, removing the amalgam, freeing the amalgam from the metal and returning the mercury to again come in contact with the body
 95 of metal, in a continuous cycle.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ARTHUR LUDWICK HALVORSEN.

Witnesses:

MARION SULLIVAN,

OTTO K. ZWINGENBERGER.