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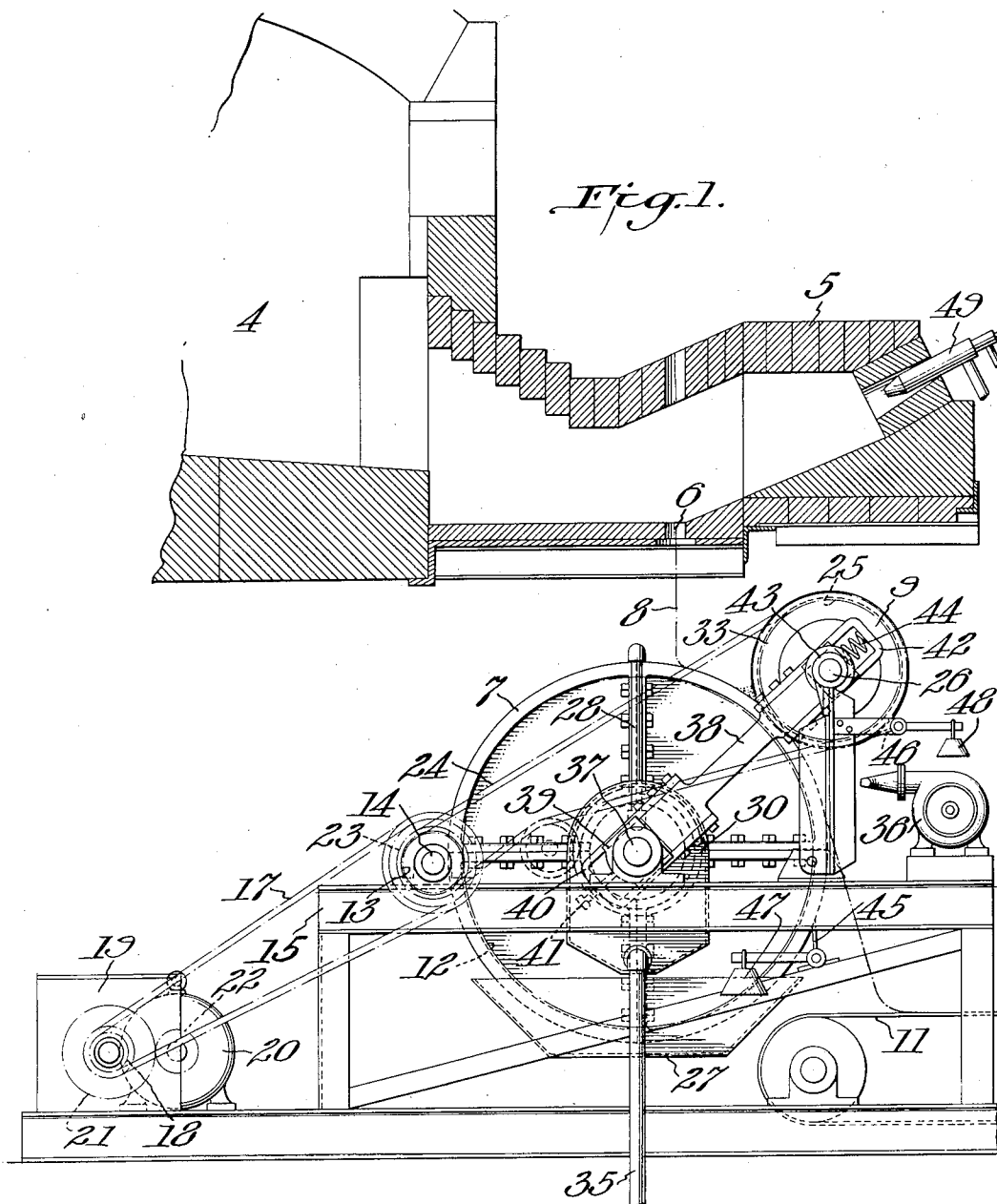
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1,944,848

PROCESS OF SHAPING AND COOLING HOT LIQUID DETERGENTS

Filed March 7, 1930

3 Sheets-Sheet 1



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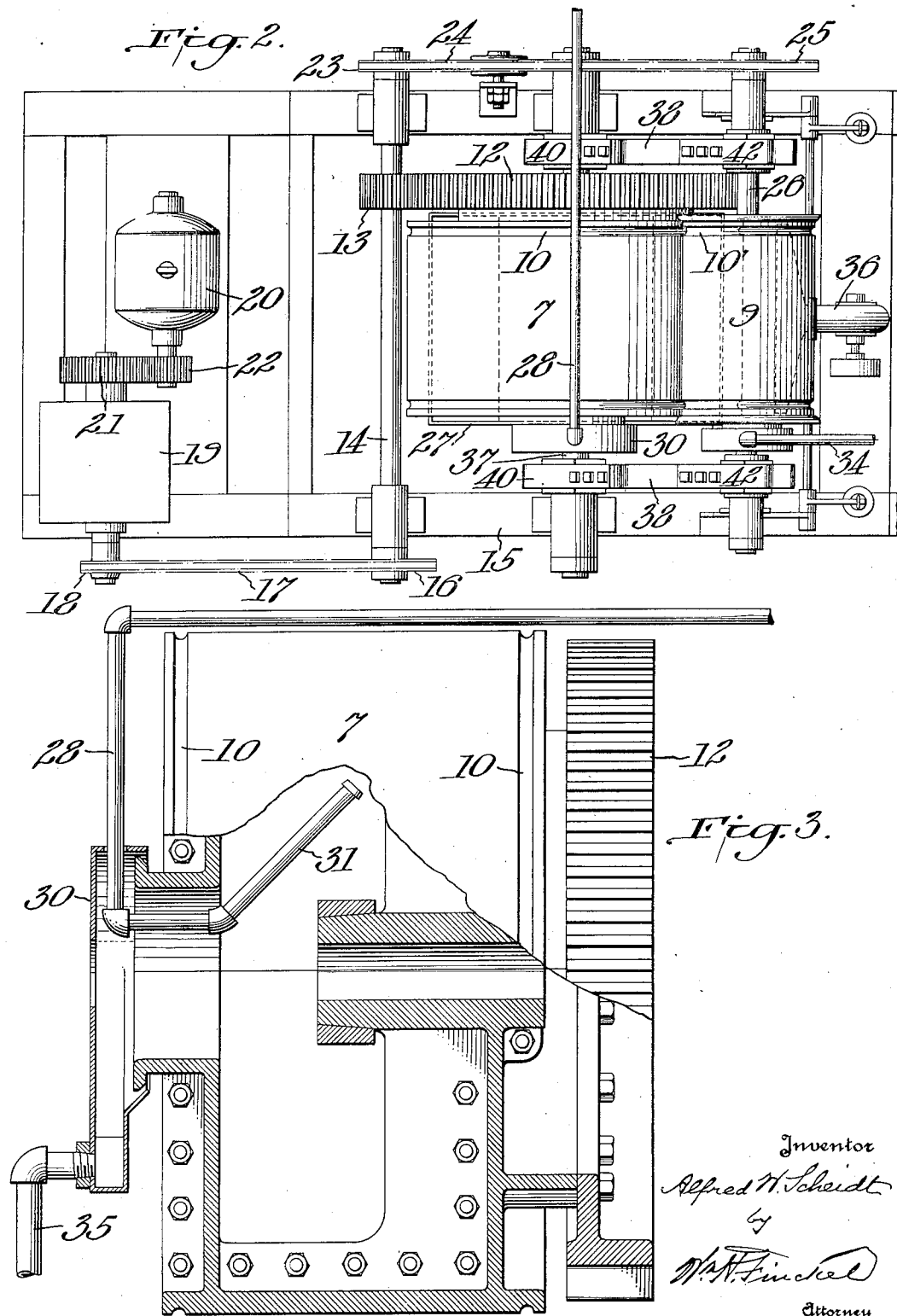
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Fig. 4.

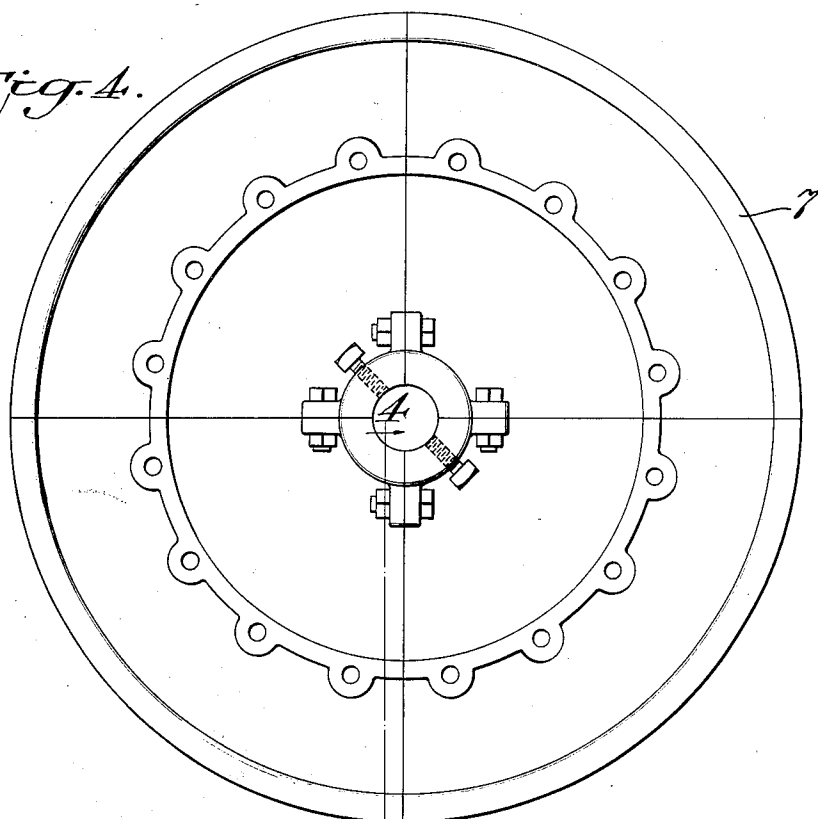


Fig. 5.

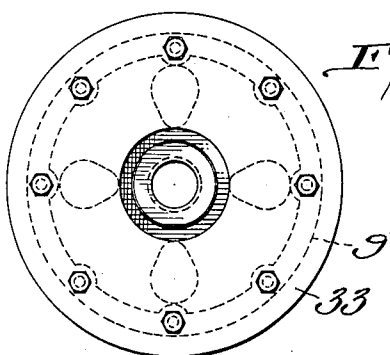


Fig. 7.

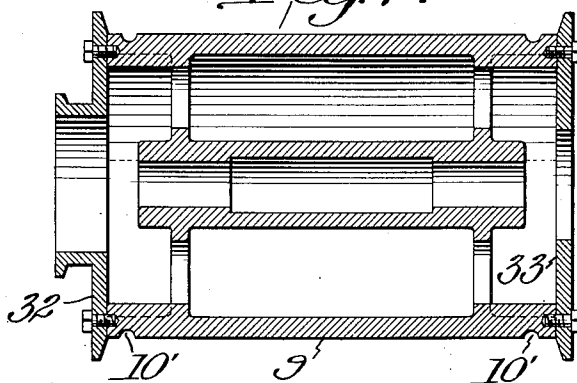
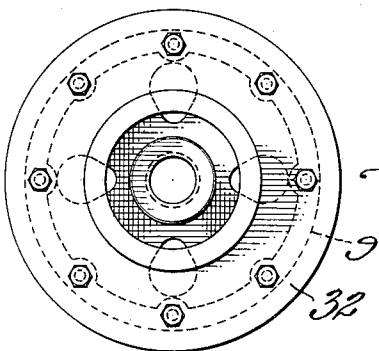


Fig. 6.



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UNITED STATES PATENT OFFICE

1,944,848

PROCESS OF SHAPING & COOLING HOT
LIQUID DETERGENTS

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Application March 7, 1930. Serial No. 434,127

5 Claims. (Cl. 18—10)

My invention relates to a process of cooling and casting hot liquid detergents to a form which may be readily reduced to a merchantable product, and especially the cooling and casting of detergents in a molten or fused state into relatively thin sheets or ribbons.

The process is especially designed for use in the production of the product which forms the subject of the patent to Alfred H. Cowles No. 1,745,844, granted February 4, 1930; but it is equally adapted to the handling of sodium silicates of various compositions.

In the Cowles patent referred to above, a soluble detergent containing an alkali metal oxide is disclosed wherein the caustic effect of the alkali metal oxide may be controlled, and this is also true of the various soluble sodium silicate compositions suitable for detergents. In the detergents disclosed in the Cowles patent the composition may vary in accordance with the desired ratio of the soda and silica content, as indicated by the general formula $Al_2O_3(SiO_2)_x(Na_2O)_{x-1}$, in which x may have any value greater than 7. Thus, the detergent compound may contain various amounts of sodium and silicon compounds and, as explained in the patent, the sodium may be replaced by potassium in whole or in part.

A former method of casting such detergents has been to lead the liquid or molten material onto a chain of molds wherein the molds are filled consecutively, conveyed a distance to allow cooling and then inverted and the relatively thick cake removed from the mold, as by tapping the mold. The thick cake thus produced requires a relatively long time for cooling, is hard to break up in subsequent operations and becomes contaminated with impurities, since the heat of the material raises the temperature of part of the mold high enough to oxidize the metal and the resulting scale adheres to the cake or falls off of the mold with the cake when the cake is removed.

The object of my invention is to provide a method whereby alkali metal silicates of various compositions or a compound formed of a mixture of alumina, silica and an alkali metal oxide in various proportions in a liquid or fused state may be cooled quickly and inexpensively, and solidified and delivered in a convenient form for crushing, grinding, storage or any further treatment or handling.

Another object of my invention is to provide means for carrying out the method.

The invention consists of a process for cooling and casting hot liquid detergent material, such,

for example, as the detergent mixture of alumina, silica and alkali metal oxide or carbonate of the Cowles patent hereinabove referred to; the invention also consists of an apparatus for carrying out the process, as will be hereinafter more fully explained and finally claimed.

The process and apparatus now will be described with particular reference to the handling of the molten material of the Cowles patent, but it will be understood that this is merely illustrative, and that the invention may be practiced in preparing soluble detergents formed of alkali metal silicates of various compositions without departing from its spirit and scope.

In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 is a sectional elevation of part of a reverberatory furnace arranged over the cooling and casting rolls and their adjacent parts. Fig. 2 is a top plan view of the rolls and adjacent parts shown in Fig. 1. Fig. 3 is a partly sectional elevation on line 4—4 of Fig. 4 of the larger roll and its drive gear. Fig. 4 is an end elevation of the larger roll without the drive gear. Fig. 5 is an elevation of one end of the smaller roll, Fig. 6 is a similar view of its opposite end, and Fig. 7 is a longitudinal section thereof.

4 designates part of a reverberatory or other suitable furnace. Preferably the furnace has a tap hole bay 5, shown more in detail in Fig. 1, and in the bottom of this bay is the tap hole 6. Beneath the furnace is arranged the large cooling roll 7 in such relation to the tap hole that the discharge 8 from the tap hole will strike the periphery of the cooling roll to one side (the front side) of its vertical center, so that the molten material may tend to flow off of the cooling roll. Parallel with the cooling roll 7 is the small cooling roll 9 preferably arranged above the axis of rotation of the large roll. These two rolls have matching surfaces, which are smooth in order to flatten the material falling from the furnace on to the larger roll and spread it out within limits over the surface of the larger roll. The surfaces of these two rolls are smooth and polished so as to flatten out the molten material as it progresses towards the smaller roll and help to prevent sticking.

Grooves 10 may be provided in the outside edges of roll 7 to catch material overflowing in the event of the roll being flooded by a sudden large discharge of material from the furnace; but normally the width of the ribbon produced is controlled by varying the speed of the roll and by adjusting

the feed of the roll. The action of the rolls is to spread out the molten material and cool it initially and quickly on both the top and bottom surfaces at once.

5 The sheet or ribbon of chilled material is carried on the larger roll (approximately 90°) when it leaves the surface of the roll and falls on a suitably arranged conveyor 11 or other means for removing it.

10 The sheets or ribbons formed are relatively thin and so may be easily crushed. The thickness may vary from about one-eighth of an inch to one-fourth or one-half an inch, the lesser thicknesses working well.

15 The large roll 7 is provided with a gear wheel 12 which meshes with a gear 13 on a shaft 14 extending across a framework 15 on which the cooling rolls are mounted; and this shaft 14 is provided with a sprocket 16 connected by a drive chain 17 with a sprocket 18 on the shaft of a motor change speed gear 19 which is driven from a motor 20 by the gearing 21 and 22 or any other suitable arrangement of motor and change speed gear.

25 The shaft 14 has on its other end a sprocket 23 which is connected by a drive chain 24 with a sprocket 25 on the shaft 26 of the small roll 9.

In the preferred construction, the two rolls are synchronized in speed so that the surface of each roll is travelling at the same rate and the motion is opposite so that at the point of contact the surfaces of the two rolls are moving in the same direction and at the same speed.

To aid in keeping the cooling rolls cool, the large roll may dip into a bath 27 containing water or brine or other suitable cooling agent. This will tend to keep the outside surface of the roll cool. The cooling of the roll may be further provided for by extending a pipe 28 through a cap 30 at one end of the roll and projecting said pipe, as shown at 31, upwardly into the interior and so that the discharge of the cooling agent from the pipe may strike the inner surface of the roll adjacent to the point where the molten material falls upon its outer surface.

45 The small roll also is made hollow, and its end caps or heads 32 and 33 may be of sufficient depth to retain the cooling agent supplied thereto by pipe 34. This roll also is provided with grooves 10' matching the grooves 10 in the large roll.

50 Any suitable means may be provided for draining the cooling agent from the rolls whenever it becomes heated, such, for example, as the pipe 35, Fig. 3.

55 A further cooling means may be a fan blower 36 located in front of the large roll and below the small roll adjacent to the point of release of the sheeted or ribboned material on its way to the conveyor.

60 The nozzle of the fan blower extends laterally to both sides of the blower as shown in dotted lines, Fig. 2, so as to cover the sheet or ribbon widthwise.

65 The large roll is shown as composed of four sections of peculiar construction, and the small roll also is of special construction, and these structural features form the subject matter of a copending case of even date herewith.

70 On the shaft 37 of the large roll and at opposite ends of said roll, are mounted the links 38 containing bearing blocks 39 in yokes 40 secured to the links, these links being adjustable toward and from the shaft 37 by any suitable means, such as setscrews 41. The other ends of these links have yokes 42 in which are mounted bearing blocks 43

for the shaft 26 of the small roll, and these blocks are held in yielding contact with the shaft 26 in any suitable manner, as by springs 44, so that the small roll may automatically yield under pressure of hardened material and obstructions coming between the two rolls in the mass of liquid material being cast and cooled.

80 The outer surfaces of the rolls may be kept clean by means of scrapers 45 and 46 mounted adjacent thereto. These scrapers are shown as yieldingly kept in contact with the rolls by means of counterweights 47 and 48 respectively.

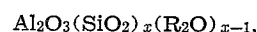
85 The material in the bay 5 may be kept liquid by means of a secondary heater 49, Fig. 1, such as a gas burner.

90 It is noted here that the stream of molten material falling on the top of the large roll as stated, flows by gravity and by the travel of the material between the two rolls, where it is spread out into a relatively thin sheet or ribbon and cooled below a point where it will stick to metals or oxidize them. The thickness of the sheets or ribbons produced, is controlled by the distance apart of the two rolls, the speed of the rolls and the initial temperature of the molten material. The setscrews 41 or any other suitable devices are provided for varying the distance apart of the two rolls; and also the speed may be varied through the speed-changing mechanism previously described.

105 Variations in the procedure and the apparatus illustrated are permissible within the principle of the invention and the scope of the claims following.

What I claim is:—

110 1. The method of preparing a soluble detergent compound having the general formula



115 in which x is greater than 7 and R designates sodium or potassium, in a readily frangible thin sheet or ribbon-like form, which comprises forming such compound in fused condition in a furnace, maintaining the compound sufficiently hot to be molten, withdrawing a continuous stream of the fused compound thus formed, shaping the continuous stream into a sheet or ribbon-like form and simultaneously cooling the same to solidify the material, whereby continuous solidified sheets or ribbons of said compound are formed which may be readily broken up.

120 2. The method of forming a soluble, anhydrous detergent in a readily frangible thin sheet or ribbon-like form, which comprises preparing the detergent in fused condition and passing the detergent while molten between rolls located in such proximity to each other that a thin sheet of the soluble compound will be formed, simultaneously cooling the rolls to partially solidify the material and prevent corrosive action on the rolls, and further cooling the material to complete its solidification.

130 3. The method of forming a soluble, anhydrous detergent in a readily frangible thin sheet or ribbon-like form, which comprises melting an alkali metal compound, silica and alumina together in such proportions that a compound having the general formula $\text{Al}_2\text{O}_3(\text{SiO}_2)_x(\text{R}_2\text{O})_{x-1}$, in which x is greater than 7 and R designates sodium or potassium, is formed, passing the compound in a stream upon a rotating roll, pressing the compound into a sheet or ribbon-like form by a roll cooperating with the first named roll and simultaneously cooling both sides of the detergent by cooling the rolls to partially solidify the sheet, and

forcing a current of air against the sheet after it has passed through the rolls to further solidify the detergent into a sheet or ribbon-like form.

4. The method of forming a soluble, anhydrous detergent material comprising a basic silicate in which the relative proportions of the basic and silicate radicals are such that the material will be highly soluble in water, which comprises preparing the detergent material in fused condition, feeding the detergent while molten between rolls located in such proximity to each other that a thin sheet of the material will be formed, and cooling the material quickly to produce a thin, readily frangible sheet which is highly soluble in water.

5. The method of forming a soluble, anhydrous detergent material comprising a basic silicate in which the basic and silicate radicals are present in the molecular proportion of approximately 1:1, which comprises preparing the detergent material in fused condition, feeding the detergent material while molten between rolls located in such proximity to each other that a thin sheet of the soluble compound will be formed, cooling the rolls to partially solidify the material, to prevent corrosive action of the hot detergent material on the rolls and to prevent contamination of the material, and further cooling the material to complete its solidification.

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