

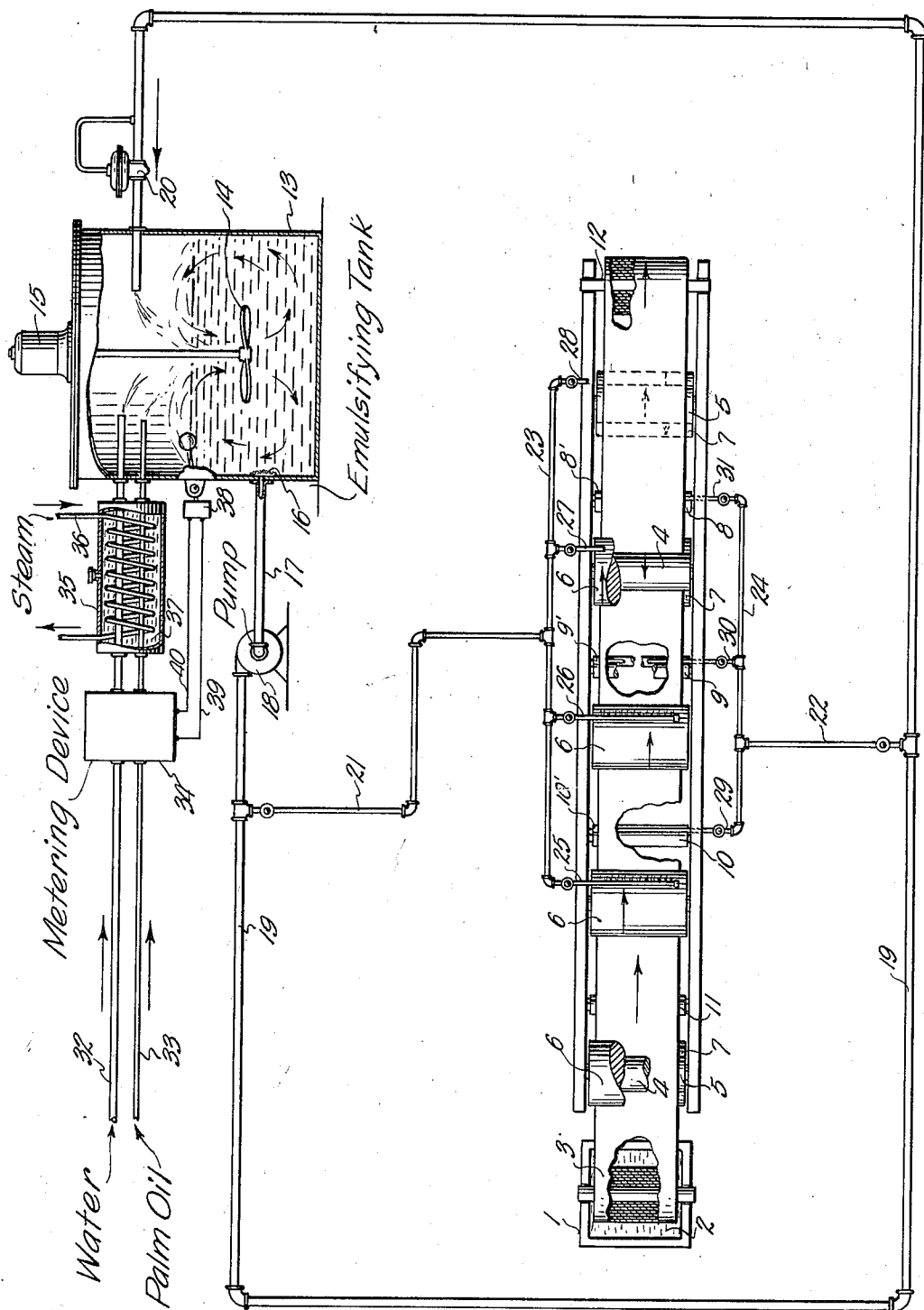
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METHOD OF LUBRICATING COLD REDUCING MILLS

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METHOD OF LUBRICATING COLD REDUCING MILLS

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Our invention relates to a method for lubricating cold reducing mills and more particularly to a method for reducing palm oil consumption in cold reducing mills.

The cold reduction of steel by rolling constitutes a considerable finished product of the steel industry. Palm oil has been used as a roll lubricant because of its high film strength and, too, because it is easily saponified and may be thus cleaned from the rolled sheet after the reducing process has been completed. During the cold reducing process, cold streams of water are applied to the roll surface to prevent the rolls from becoming overheated and to control a roll contour by adjusting the water so that the heat developed during the process will give the proper "crown" to the roll surface.

The problem of the proper distribution of palm oil to either the roll or the sheet surface, or both, is of major importance and, in the prior art, to obtain the proper distribution or "spread" a large quantity of palm oil has been wasted in spite of every effort to conserve oil. The cooling water washes some of the oil from the surface of the strip before it enters the rolls.

Due principally to the high price of palm oil and the apparently inevitable waste of the same, some processes have discontinued the use of palm oil in spite of the lowered quantity of their product.

One object of our invention is to provide a method for lubricating cold reducing mills which will produce a superior product, greatly reduce the cost of the operation and prevent the waste of palm oil.

Other and further objects of our invention will appear from the following description.

The accompanying drawing which forms part of the instant specification and is to be read in conjunction therewith, is a diagrammatic view of apparatus embodying and capable of carrying out the method of our invention.

The coil box 1 is adapted to contain palm oil lubricant 2, in which a coil of sheet metal strip 3 is carried. By way of example and not by way of limitation, the strip in the coil box 1 may be in the order of .076 inch in thickness. This strip is to be reduced by cold rolling to a thickness of .01 inch. The cold reducing mill comprises a series of tandem work rolls 4 and 5 between which the sheet is rolled. Each work roll 4 is provided with a back-up roll 6 and each work roll 5 is provided with a back-up roll 7. Guide rolls 8, 9, 10, and 11 are provided between

the work rolls. The finished rolled strip is wound upon a winding reel 12.

We have discovered that it is possible to lubricate cold reducing mills with an emulsion of palm oil and water and to obtain as good results as the straight palm oil. The emulsion of palm oil and water is one in which the water is slightly in excess of the palm oil. The desired spread may be obtained with the emulsion and produces a considerable saving in palm oil.

Our system comprises an emulsifying tank 13 into which projects an agitating impeller 14, driven by a motor 15. The emulsion is adapted to be pumped from the tank through a suitable strainer 16, through pipe 17, and delivered by pump 18 to a manifold 19. The emulsion is continuously circulated through the manifold 19, which communicates with the emulsifying tank 13 above the level of the emulsion therein, as can readily be seen by reference to the drawing. A back pressure control valve 20 prevents an excessive drop in line pressure and maintains a uniform pressure for the bleeder lines 21 and 22, which go to manifolds 23 and 24, from which the valve controlled delivery lines 25, 26, 27, 28, 29, 30, and 31 are supplied. Water and palm oil are fed through respective pipes 32 and 33 to a metering device 34 which controls the proportion of water to palm oil. The metered amounts of water and palm oil pass to the emulsifying tank through a heat exchanger 35 which is supplied with steam through pipe 36 to heat the fluid bath 37 within the heat exchanger 35. The arrangement is such that the bath is maintained at a temperature of about 180° F. A float control device 38 of an electric type, well known to the art, is adapted to control the metering device 34 through conductors 39 and 40 to maintain a substantially constant level of the emulsion in the emulsifying tank 13. The metering device may be controlled so that ratios of one volume of palm oil to one volume of water to one volume of palm oil to six volumes of water may be supplied to the emulsifying tank.

By way of illustration but not by way of limitation, we will describe one specific example of the operation of our apparatus and method. The emulsifying tank 13 had a capacity of 400 gallons which was sufficient to provide about three hours' supply for the mills in event it became necessary to repair or adjust the metering device and inlet system. The impeller 14 initially emulsified the palm oil and water and maintained the emulsion by agitation. The inlet temperature of the palm oil and water was about 180° F., the ele-

vated temperature aiding in forming the emulsion. The pump 18 delivered 18 gallons per minute of emulsion at pressures between 5 and 18 pounds per square inch. The emulsion was circulated from the tank through the manifold 19 and back to the tank, the back pressure control valve 20 maintaining a pressure in the manifold 19 between 5 and 15 pounds per square inch, depending on the setting of the control device. The purpose of circulating the emulsion around the circuit just described is to prevent segregation or stratification of the palm oil and water in event of short shut-downs for roll changes and the like. The capacity of line 19 is sufficiently great to eliminate large line drops in pressure. Emulsion at the rate of about 2 gallons per minute is bled through each of the lines 21 and 22 for distribution to each of the upper back-up rolls 6 with the exception of the first back-up roll. The strip coming from the coil box is sufficiently lubricated so that the first rolls do not need to be lubricated. Emulsion is also distributed on each of the guide rolls 8, 9 and 10, which are provided with distributing rolls 8', 9' and 10'. The guide rolls thus spread the emulsion along the bottom of the sheet while the emulsion passing to the upper back-up rolls distribute the emulsion along the top of the sheet. In this manner the proper distribution or "spread" is obtained.

In the rolling mill just described, a daily consumption of about 2500 gallons of palm oil was formerly experienced. After the installation of our system whereby the rolls were lubricated by our method, we were able to save 50 percent of the palm oil, while still obtaining improved results flowing from the use of palm oil during the rolling operation. Palm oil cost is now running, using the methods of the prior art, about thirty cents per ton of steel rolled. In a mill rolling over 30,000 tons per month, the saving produced by our method will be about \$4500.00 a month or \$54,000.00 a year. It is understood, of course, that the saving will be a direct function of the cost of palm oil, which varies.

It will be seen that we have accomplished the objects of our invention. We have provided a method of lubricating cold rolling mills which will produce results substantially as good as that produced with straight palm oil, while employing an emulsion of palm oil and water, enabling us to save 50 per cent or more of palm oil costs.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and sub-combinations. This is contemplated by and is within the scope of our claims. It is further obvious that various changes may be made in details within the scope of our claims without departing from the spirit of our invention. It is, therefore, to be understood that our invention is not to be limited to the specific details shown and described.

For example, while we have disclosed palm oil as the preferred lubricant for use in our invention, any other suitable lubricant which may be emulsified may be employed. Fish oil can be successfully emulsified and employed, though we do not believe it is as satisfactory as palm oil. Mineral oil may be employed though its emulsification is more difficult than the vegetable oils generally, such as castor oil and the like. The film strength of castor oil is not as high as palm oil but it is to be understood that the savings

effected in our method and apparatus are applicable to other oils.

Having thus described our invention, we claim:

1. A method of lubricating steel rolling mills in the cold reduction of steel including the steps of forming a body of an emulsion of a lubricant and water, circulating said emulsion from said body around a closed circuit adjacent the mill to be lubricated and back to said body, bleeding a portion of said circulating stream and supplying it to the mill to be lubricated.

2. A method of lubricating steel rolling mills in the cold reduction of steel including the steps of forming a body of an emulsion of a lubricant and water, circulating a stream of said emulsion from said body around a closed circuit adjacent the mill to be lubricated and back to said body, maintaining a predetermined pressure in said stream, bleeding a portion of said circulating stream and supplying it to the mill to be lubricated.

3. A method of lubricating steel rolling mills in the cold reduction of steel including the steps of forming a body of emulsified palm oil and water from streams of palm oil and water, controlling the rate of flow of each of said streams to produce an emulsion having predetermined quantities of palm oil and water, heating the constituents passing to said body, circulating said emulsion from said body and back to said body in an elongated confined stream, maintaining a predetermined pressure within said stream, bleeding emulsion from said stream and passing it to the mill to be lubricated.

4. A method of lubricating cold reducing mills comprising feeding water and a lubricant in predetermined proportions to an emulsifying tank, emulsifying said water and lubricant by agitation, maintaining the emulsion by continued agitation, and passing a steady stream of emulsion through a closed circuit to the mill to be lubricated.

5. A method of lubricating a cold reducing mill comprising forming and maintaining by agitation a body of an emulsion of water and a lubricant, withdrawing a steady stream of emulsion from below the surface thereof, passing said stream through a closed circuit, expending from said stream a pre-determined portion of emulsion to lubricate said mill, and returning the unexpended portion of said stream of emulsion to the aforesaid body.

6. A method of lubricating cold reducing mills comprising forming and maintaining in a tank an emulsion of pre-determined quantities of water and a lubricant, withdrawing from said tank a stream of emulsion, passing said stream through a closed circuit, bleeding portions of emulsion from said stream at points adjacent the mill to be lubricated, and returning the unused portion of emulsion to the tank.

7. In a method of lubricating cold reducing mills with an emulsion of water and a lubricant, the steps comprising passing separate streams of water and lubricant through a metering device to control the volume of each, heating said streams of water and lubricant, feeding said heated streams into a tank, forming an emulsion of said water and lubricant by agitation and maintaining the emulsion by continued agitation, and maintaining the level of said emulsion at a predetermined point by means of a float adapted to control the flow of water and lubricant through said metering device.

8. A method of lubricating cold reducing mills

comprising feeding pre-heated streams of water and a lubricant in pre-determined proportions to a tank, forming and maintaining in said tank an emulsion of said water and lubricant, maintaining the level of said emulsion at a predetermined point in said tank, withdrawing a stream of emulsion from said tank at a point

5 below said pre-determined point, feeding portions of said stream to the mill to be lubricated, and returning the unused portion of said stream to the tank at a point above the level of the emulsion therein.

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