METHOD AND APPARATUS FOR TREATING CONTINUOUSLY MOVING MATERIAL

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Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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WITNESSES:

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This invention relates to a method and apparatus for treating continuously moving material.

The object of the invention is to provide an apparatus and method whereby a continuously moving material has the treating agent used in connection therewith maintained in contact with said material to insure thorough and effective treatment of the material by the agent and to avoid the agent passing out with the material. That is to say, the present invention is adapted for use in connection with the neutralizing waste water from mines, mills, factories, furnaces, tan-yards and the like before it enters streams, lakes or rivers to prevent contamination thereof.

Another object is to provide a simple and effective apparatus for carrying out this method. In that connection the invention resides in the provision of a treating drum or cylinder mounted for rotation and having one end elevated above the plane of the other and equipped on its inner face with means for retaining the active treating agent at or near the entrance of the material to be treated into the drum the turning of the cylinder operating to keep the treating agent in an active state.

In carrying out these objects the invention is susceptible of modification without departing from the spirit or sacrificing any of the advantages of the claimed invention, there being shown in the drawings a preferred and practical form of apparatus for carrying out the method, in which:

Figure 1 represents a side elevation partly in section of the apparatus constituting a part of this invention.

Fig. 2 is a transverse section taken on the line 2–2 of Fig. 1.

Fig. 3 is a similar view taken on the line 3–3 of Fig. 1, and

Fig. 4 is also a transverse section taken on the line 4–4 of Fig. 1.

Similar reference characters designate corresponding parts throughout the several figures of the drawings.

The apparatus constituting a part of the invention comprises a revolubly mounted cylinder 1 open at both ends as shown at 2 and 3 to permit the free passage of air thorough for the purpose of aerating the material and the entrance or front end 2 of the cylinder is located in a plane above that of the lower end 3 and is preferably provided with an inturned flange 4 to prevent the material being treated from splashing out through this end. On the inner face of the cylinder 1 is arranged spiral ribs or flanges 5 which may be either continuous or broken. This rib or flange is preferably made in sections since the upper sections wear out more frequently than the lower and consequently may be replaced more economically. The cylinder is suitably supported in its front end inclined upward as is shown clearly in Fig. 1 and the supports here shown comprise rollers 6 with which is engaged an annular rib or track 7. One set of rollers and track being arranged at each end of the cylinder as is shown clearly in Fig. 1.

To take care of the downward thrust of the cylinder 1 the structure shown at 8 is employed which consists of two frustrums of cones properly tapered to avoid rubbing friction, these cones being numbered 9 and 10.

The means for rotating the cylinder 1 comprise as shown a circular rack 11 which is preferably made in sections and bolted to the outer face of the cylinder. A sprocket chain 12 is engaged with the circular rack 11 and also with a sprocket wheel 13 fixed to a shaft 14 and driven by a worm wheel 15 actuated through a worm 16. This worm is driven by any suitable means, not shown, a connection for which is illustrated at 17.

A flume 20 is arranged at an incline to discharge into the upper end of the cylinder 1 for feeding to said cylinder the material to be treated. The treating agent for use in connection with the material fed through the flume is also discharged into the flume at the point shown at 21 and passes with the material into the cylinder. Any suitable feeding means for the treating agent may be employed and the feed thereof may be controlled by any suitable means.

While this method and apparatus are primarily intended for purifying water which has become contaminated by mines, mills, factories or other industrial enterprises before passing it on into streams or other water-ways, it obviously may be employed for treating other material or it may be used for the preparation of water for industrial purposes, such as softening it for domestic use, the mixing of paints, oils, etc.

The treating agent used in connection
with the water to be purified is supplied from the receptacle 22 and is usually in the form of solid material which is designed to be brought into intimate contact with the water to be purified and held therein so that it will not pass out with the purified water.

The cylindrical drum 1 with the internal spiral ribs is adapted to be turned in such direction as to roll the solids or heavier particles of the treating agent towards the elevated end of the cylinder and retain them until they have been dissolved or worn away to small particles which may then be carried with the liquid passing out through the lower end of the cylinder. The rolling or turning action of the cylinder causes an abrasion between the heavier material and solid particles so as to present a surface to the liquid that is not contaminated by the liquid.

This rolling action also thoroughly mixes the material to be treated passing through the cylinder with the treating agent rolling and splashing it and returning the larger particles of the treating agent to the upper end of the cylinder where they are retained until worn away and acted upon by the liquid.

The cylinder may be made of any suitable material adapted to withstand the abrasive action of the treating agent and also that of the chemical action of the material being treated and the treating agent.

The size of the cylinder, its length, diameter, elevation of intake end, spacing of the spirals, and revolutions of the cylinder will depend on the quantity of liquid to be passed through in a specified time as well as on the kind of liquid and the thoroughness that the liquid is to be mixed or neutralized.

Both ends of the cylinder 1 are made open to provide for a draft of air through the cylinder which will effectively aerate the mixture.

In the operation of the apparatus the driving mechanism above described is set in motion by any suitable means to cause the cylinder to revolve and turn on the rollers 6, it being prevented from slipping or rolling to the lower side by the thrust mechanism shown at 9 and 10. The contaminated water indicated at W is admitted through the flume 20 into the revolving cylinder 1 and in passing through the flume the water receives and carries with it the neutralizing material or agent fed from the receptacle 22. The contaminated water with the neutralizing agent having passed into the cylinder 1 flows over the spiral 5 rolling and tumbling and thoroughly mixing with the agent and then passes out of the lower end of the cylinder to any suitable point which may be a stream, basin or settling chamber.

By methods heretofore in use the neutralizing agent was washed away with the water and great quantities lost which was very objectionable because this agent contributed to the filling up of the settling chambers requiring them to be frequently cleaned out.

The apparatus employed herein is substantially automatic it being of course necessary to set the cylinder rotating mechanism in operation but after this has been accomplished the water flowing in through the flume will carry with it the treating agent and the rotation of the cylinder in the proper direction will while constantly agitating the water passing through it also return the larger particles of the treating agent to the upper end of the cylinder and return it at or near the entrance of the contaminated water until the action of the latter will have completely worn away or dissolved such particles.

It will thus be seen that one of the important features of the invention is to retain the active treating agent at or near the entrance of the water to be treated by means of the spiral and to rotate the cylinder to retain the neutralizing or treating agent in an active state.

Without further description it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will of course be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing from the spirit of the invention and scope of the appended claims.

I claim:
1. An apparatus of the class described comprising a cylindrical casing open at both ends, one end of said casing being elevated in a plane above the other end, the elevated end being adapted to receive the water and a treating agent, said casing having spiral ribs on its inner face, and means for rotating said casing in a direction to cause treating agent to move upward toward said elevated end.

2. An apparatus for treating flowing liquids comprising a tubular casing open at both ends, means for rotatably mounting said casing whereby the receiving end is higher than the discharge end, a spiral rib on the inner face of the casing having its flights pitched opposite to the direction of flow through the casing, and means for rotating the casing whereby the rib will propel solid matter toward the elevated receiving end of the casing.

In testimony whereof I hereunto affix my signature.

CLYDE R. WEIHE.