

The essential feature in starting the agitation is to commence softening the material right at the bottom of the cone by introducing solution, water, or air through a system of jets in sufficient quantity to thoroughly liquefy it, and in this condition it is immediately lifted through the upcast pipe. The portion of the charge around the pipe, being thus undermined, falls down, becomes mixed with solution, and is lifted to the top of the tank. In this manner a channel is worked out around the pipe, leaving a quantity of material lying on the sides of the cone, this quantity depending on the class of material being treated and the diameter of the tank. The solution is now shut off from the bottom jets and turned into a set of jets impinging higher up on the cone, with the result that, in tanks up to 10 ft. in diameter, the remainder of the charge is undermined, settles down, becomes mixed with solution, and is lifted to the top of the tank. With tanks of larger diameter than 10 ft. it is sometimes necessary to use a third set of jets, especially if sandy material is being treated. The second and third sets can be connected to the same supply-pipe and worked simultaneously. Once the agitation has been started, and the sides of the cone cleared, there is no tendency for the material to settle on the cone, provided the velocity of the flow from the upcast pipe is at the speed required for the material under treatment. This speed reaches its maximum when clean coarse sand is being treated (coarse concentrates would require a greater speed, but concentrates are invariably ground very fine for cyanide treatment), and is at its minimum when the charge consists of slimes only.

Air and Power.—The following figures are from actual tests while running under ordinary working-conditions :—

- (1.) A tank 7 ft. 6 in. diameter by 37 ft. high treating slimes requires from 4 to 6 cubic feet of free air per minute, at a pressure of about 22 lb. per square inch. This tank takes a charge of 15 tons of slimes (dry weight). Horse-power = $\frac{1}{3}$ to $\frac{1}{2}$.
- (2.) The same size tank treating finely ground concentrates requires 15 to 20 cubic feet of free air per minute, of a pressure of about 26 lb. per square inch, and this gives a very thorough agitation. This tank takes a charge of about 35 to 40 tons (dry weight) of concentrates. Horse-power = $1\frac{1}{2}$ to 2.
- (3.) An installation of 10 tanks each 10 ft. diameter by 40 ft. high treating slimes requires 88 cubic feet of free air, at a pressure of 22 lb. per square inch. Each tank holds a charge of 35 tons (dry weight). Horse-power = $\frac{3}{4}$ per tank.
- (4.) Two tanks 13 ft. diameter by 55 ft. high treating slimes require 32 cubic feet of free air, at a pressure of 33 lb. per square inch. Each tank holds 110 tons dry slimes. Horse-power = $1\frac{3}{4}$ per tank.
- (5.) Tanks 10 ft. diameter by 40 ft. high treating finely ground sand require 25 cubic feet of free air, at a pressure of 22 lb. The charge for a tank is 50 tons. Horse-power = $2\frac{1}{4}$.

From these figures it is a simple matter to approximately estimate the power required for any material ranging from clean sand to slimes.

In starting the agitation it is advisable to use about two to three times the above quantities of air for a short time until the charge in the tank has become thoroughly softened. This can easily be done where several tanks are in use, as the air can be reduced on some so as to provide for the extra quantity required for the one being started up.

Description of a Tank for treating 50-ton Charges of Finely Crushed Ore (Dry Weight).—Fig. 1 shows a sectional elevation of the tank, which is 10 ft. in diameter, and of a total height of 39 ft. 6 in., being 32 ft. above the cone.

A is a central pipe 10 in. in diameter, open at both ends, and supported by hangers and stay-rods as shown. Compressed air is admitted at the bottom of pipe A through pipe B, which is connected with the main supply of air. The delivery of the air is through valve C, this valve being shown in detail in Fig. 4. It is similar to those used on the air-tubes of bicycles, and consists of a slotted pipe covered by a tight-fitting rubber sleeve, which prevents any danger of sand getting into the pipe. In the valve C the rubber sleeve is clamped below the slots, and this allows the escape of air to be upwards into pipe A. This is a convenient method of introducing the air, as it is simple, and allows the operator to regulate the quantity of air by the valve D, and at the same time observe the flow from the top of pipe A.

E is a circular hollow casting, connected by pipe F with the main water-supply or solution-pump. E', E', E', E' are four pipes 1 in. in diameter, through which the solution or water from E is discharged. These pipes, E', E', are curved as shown in Fig. 3, and furnished with rubber valves similar to valve C, and are arranged to deliver the solution or water in a circular and downward direction against the sides of the cone near the bottom of the tank.

G is a casting similar to E, and is also connected by pipe H to the main water-supply or solution-pump. G', G', &c., are eight straight pipes, $\frac{3}{4}$ in. diameter, fitted at their discharge-ends with rubber valves similar to valve C. These pipes discharge in a downward direction against the sides of the cone.

Besides these two means of supplying solution, it is advisable, when treating heavy-sand material, to be able to introduce solution through the same pipe that supplies the air, and this is provided for by the connection shown at I.

J is the discharge-opening of the tank.

K is a pipe for decanting off water or solution. This pipe is made from four pieces connected by loose joints, so that it can be lowered and raised in the tank by means of the wire line L.

M is a circular sheet-iron deflector on top of pipe A, and its object is to prevent splash, and to direct the flow towards the outside of the tank. It can be adjusted as to distance above the top of pipe A according to requirements.

O is an overflow pipe.