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THE TOLGUS TIN STAMPING CO. LTD. REDRUTH CORNWALL

by

W.J. Houston

This firm is an old established tin dressing firm which has been in the hands of the Stewart family for the last hundred years and uses more or less the same equipment that their forerunners used decades ago, that is except for a few modern innovations which have inevitably been incorporated from time to time.

The basic material for these operations is derived from old mine heaps and from the streams issuing from the mills of Cornwall's two remaining tin mines, namely South Crofty at Camborne and Geevor at Pendeen. The stream tin is in the form of a fine suspension which is carried along by the streams and deposited in long pits about four feet deep with small weirs at the end of the pits to permit the water to overflow and leave behind the red stanniferous slimes. Unfortunately the water takes some tin with it and this necessitates the construction of more pits further down the stream.

These red slimes are concentrated on the well-known Cornish Frames (Plate C, fig.l) which are approximately fifteen feet in diameter and rotate at approximately one revolution per four minutes. The slimes are introduced by way of a launder fed from the pits by a dipper wheel and flow round one half of the outer circle of the frame, this flow being aided by the addition of water introduced into the launder. The rotating part of the frame is thus slowly covered in slimes and water which drips continuously from the one half of the outside and some of the gangue is washed off over the edge of the frame, leaving tin ore and some of the heavier gangue. The cassiterite tends to stick on the wooden surface due to the holding effect of roughened wood. The slimes then come within the area of the other half of the outside structure, from which a flow of clean water discharges over them and thus more gangue is washed over the edge, which process continues until a brush, worked off an eccentric motion, pushes the now partially-concentrated slime over the edge of the frame and into a concentrate launder whence it is conveyed to another frame, together with the heads (as this product is known) from an accompanying frame, and reconcentrated to produce a better concentrate. This is once again re-concentrated and finally runs into a concrete-lined pit known as a cover, which works on the same principle as the first pits, the two being generally built together so that one can be emptied whilst the other is filling up. In this primary concentration, the slime is collected directly below South Crofty mill at Tuckingmill on two separate mills, one to collect the first slime and the other to recover the slime which the first mill cannot collect. There are fifty frames in this section of the works and the majority of them are worked by small water-wheels or electric motors suitably geared down. The concentrate is handled many times on different frames before it reaches the cover and the tailings are also retreated to collect as much tin slime as possible. The final product is a reddish-brown, dry mud containing about 2.5% SnO_2 which is taken by truck

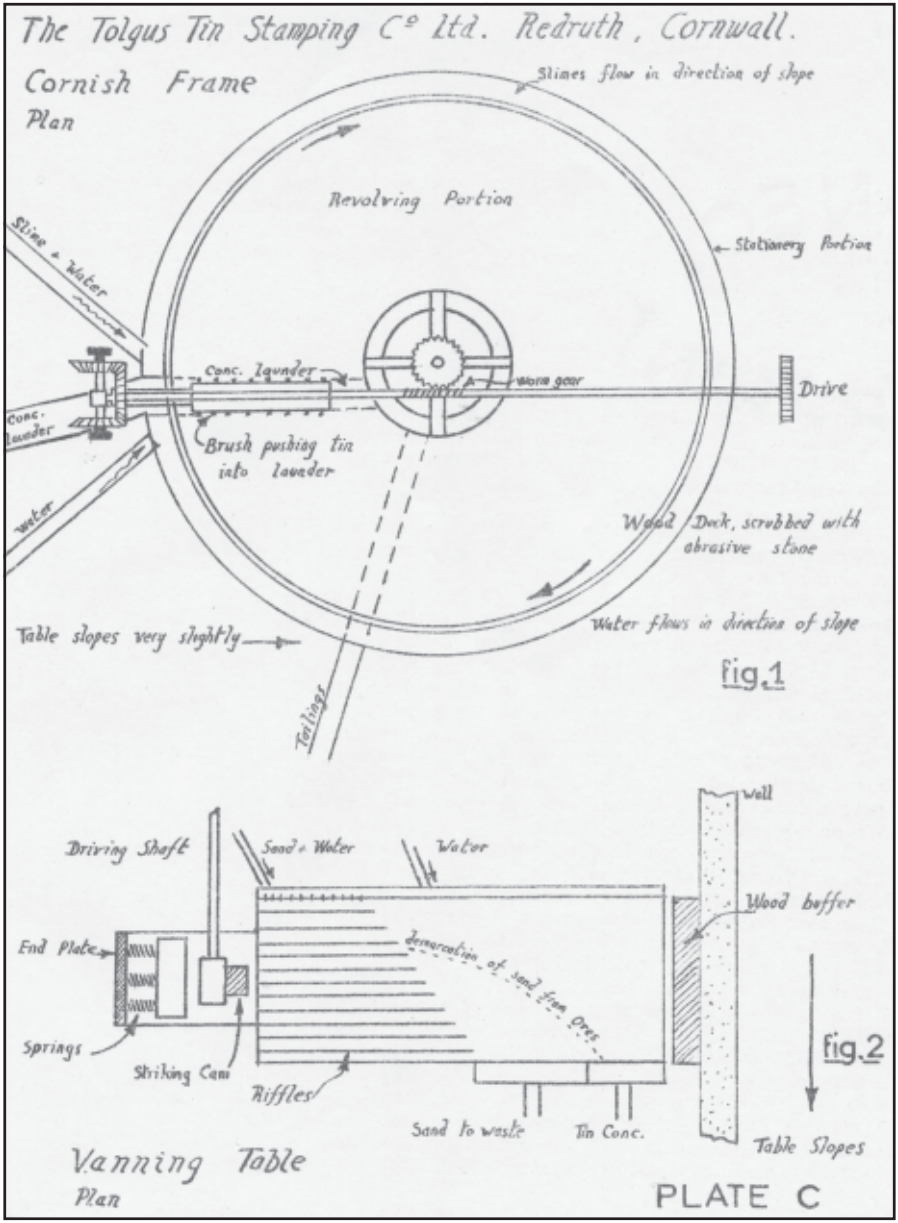
The Tolgus Tin Stamping Co Ltd. Redruth, Cornwall.
Cornish Frame
Plan
Slimes flow in direction of slope
Revolving Portion
Stationery Portion
Slime + Water
Conc. launder
Worm gear
Drive
Conc. launder
Brush pushing tin into launder
Water
Wood Deck, scrubbed with abrasive stone
Table slopes very slightly
Water flows in direction of slope
Tailings
fig.1
Wall
Driving Shaft
Sand + Water
Water
Wood buffer
End Plate
Demarcation of sand from grits
Springs
Striking Cam
Riffles
Sand to waste
Tin Conc.
Table Slopes
fig.2
Vanning Table
Plan

PLATE C

to the Tolgus concentrating works where it is elevated to a launder by a nine-bucket dipper and to two more frames, the product of which is put in a storage yard for further treatment. The tails flow to some covers, then on to two slime frames for further concentration and then on to a tin frame, which is the same as a slime frame. It is then taken to join the other concentrated slime which is fed on to a Holman James slime table to provide a tin/arsenic concentrate. It is interesting to note that the cassiterite is in fact a light grey-brown colour at this stage, but as the smelting works penalise very heavily for arsenic present in the final concentrate, this has to be removed.

Several years ago, the arsenical pyrites used to be burnt out of the tin slimes and the old flues used for this purpose can still be seen on the hillside nearby, but today the arsenic is removed by flotation in a small home-made cell built of wood. This cell also acts as a conditioner and the slimes are first conditioned with acid to break up the sulphides present. Then frother and pine oil are added to the mix which is left whilst the arsenical froth which rises to the top is scraped off by a paddle into more covers where it is settled and refloated later on to retrieve all tin possible. After a period of time the overflow is sampled regularly with a vanning shovel to ascertain the amount of tin coming up to the surface and as soon as this becomes larger than usual, the cell is stopped and emptied of water. Then the tin is collected from the bottom and put aside on to another yard, when the cell is ready for another “charge”.

The tinstuff from the cell is then treated on round buddles to provide a higher concentrate; the round buddle is a small cone of about 7' diameter, the sides sloping at an angle of 450 and wet sacking trailing round suspended
from rods turning at about four revolutions per minute. The water added with the slime helps to carry off gangue and a thick layer of tin concentrate remains at the top. This builds up layer by layer aided by an operator raising the sacking every few minutes. There is a lip half way down the cone and another concentrate forms below this - this is only low grade and is recirculated through the plant. There are about half a dozen of these buddles in the tinyard, but unfortunately some or all of them are due to be replaced with Holman James tables from a discontinued mineral operation near Plymouth.

Finally, after the rich tinstuff has been scraped from the buddles it is brought up to 50% SnO_2 by an old method known as keiving. This entails the use of kiers which are metal or iron tubs with flared sides capable of holding three or four cwts. of slime which is agitated or “tossed” with a stick or similar implement. Behind the kiers are spring-fed metal strikers actuated by a cam on a mainshaft hitting the kiers at regular intervals to provide a concentrating effect, this process continuing for about two hours, when the water is drained off and the tin concentrate shovelled out from the bottom - all the gangue having been previously removed. The concentrate is stored in a special room with a concrete floor and well locked doors until sufficient of it has been collected to send off to be smelted. The average production is somewhere in the region of ten tons of 50% SnO_2 concentrate per month and this resembles. a light grey dried mud in appearance.

Further down from the first works are two other dressing stations, one of which processes the Geevor Mine slimes, which are extracted from the beach at Pendeen, while the other treats dump material from the old Dolcoath Mine nearby. The Geevor slimes are treated by the same methods as South Crofty slimes, but the dump material is treated somewhat differently.

As this dump ore has large lumps of stone in it crushing is necessary in order to break up the tin-stones. This is done by a set of old Cornish stamps which are more likely than not the only ones still in working order in the world, and, as these are really on their last legs, some effort at preservation ought to be made when they are finally retired. The general principle of these stamps is very simple. There are twelve striking heads of six hundredweight apiece, which are lifted at regular intervals by cams on a cylindrical shaft engaging on rims half way up the heads, and these pound the ore by dropping violently in rhythmic succession when the cams leave the rims. The operator shovels material into the stamps at such times as the outlet from the stamps is running clear, the outlet being simply a weir at one side of the stamps to allow sand and slimes to be washed over, leaving unstamped material behind. Due to the weight of the stamps and their rather ancient origin there are only two sections actually in operation i.e. eight heads now working. The mill used to be driven by a large overshot waterwheel, but due to water difficulties this has now been superseded by electric power, even though the water wheel is still in place and appears to be driving the stamps.

The stamp product is a mixture of sand and slimes and these are separated on two very original classifiers made of small pyramid-shaped boxes. Sand and slime enter through a spigot at the bottom with a slight head of water which causes the slimes to overflow to some covers; whilst the sand does not rise with this water but flows out through a pipe into some more covers. The slimes are subjected to the usual framing over about six slime frames and one. tin frame after. Which they settle in covers and are taken by dumper up to the flotation cell for arsenic removal.

The classified sand is dug out of the covers and piled nearby to await the vanning treatment, which is done on three vanning tables of doubtful origin. Only one of them is in operation at present and soon they will be replaced by two James sand-tables. The vanning table (Plate C, fig.2) is a simple form of concentrating table being about 5' x 3' and vibration is imparted by a arm striking a spring-loaded plate and causing the whole table to knock on a piece of hard wood-faced concrete at the opposite end and return for another cycle. There are approximately 80 ½" strokes per minute. Sand and water is metered over the riffles and water is metered over the blank area; tin and its associated ores tend to stay at the top of the riffles whilst the sand finds its way further down. As the table is vibrating towards the delivery end all the minerals are slowly travelling in that direction and when they leave the riffles they enter the clean water area which further concentrates them and also helps them to move downwards. The sand reaches the bottom of the table first and is discharged down a spigot; the stanniferous sands reach the furthest end of

the table and discharge into a cover and thence to a couple of small ball mills up at the tinyard, after which they go through the flotation cycle and are subject to the rest of the tinning operations.

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