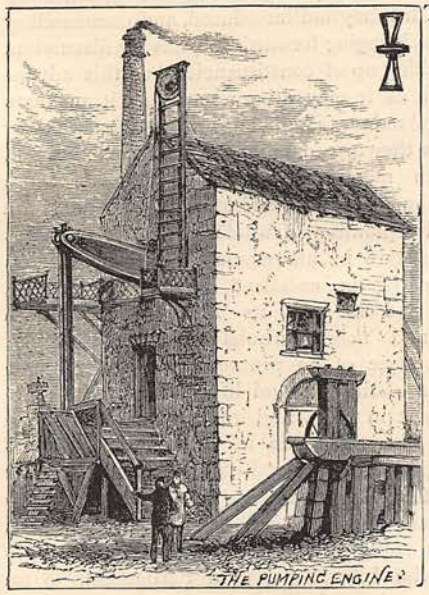
AN OLD TIN KETTLE.



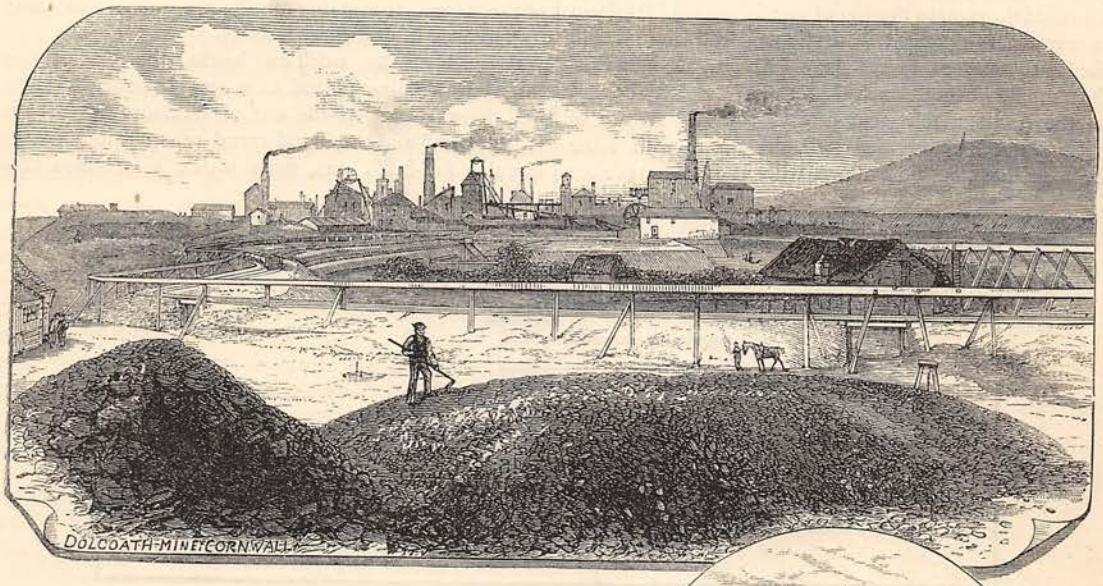
IT comes as natural to the generality of our servants to throw away anything at all damaged, or for which an immediate use is not apparent, as it does to their employers to mend and utilise all to the utmost. The dustpan, loose at the handle, is triumphantly displayed to her mistress by Mary the housemaid, as a plausible excuse for a new one; the tin which Mrs. Soufflé the cook has just opened to extract the potted meat, or other contents, is straightway consigned to the ash-heap. Yet each of these very common articles has in its manufacture gone through many a process that, if they could but peep at them, would make the said domestics certainly open their eyes in astonishment, and possibly treat their household utensils with more care and consideration in future.

Let us look back at the early career of, say, a tin kettle, and briefly glance at a few of the multitudinous operations carried out to give it its present form and appearance. *Scene*—one of the principal mines of Cornwall: *time*—any hour, any day of the week. The first thing attracting attention is the vast iron beam protruding from the engine-house, solemnly rising, pausing, and slowly descending, without jerk, without vibration, with but the smallest noise. The cylinder is over eighty inches in diameter, and all the other parts are on a scale of similar magnitude. No wonder there is an air of dignity and irresistible power about the movements of this mighty engine, for it happens to belong to the oldest mine in the world, and is engaged in pumping from the bottom to the adit, the water constantly trickling through the shaft's walls, thereby allowing the men underground to work in comparative dryness: to effect which, at every stroke the beam is lifting a perpendicular wooden pump-rod (reaching from it to the bottom) more than 2,300 feet in length. And this is far from being the largest of Cornish pumping-engines, cylinders of ninety and a hundred inches being met with in other mines; while an engine constructed in Cornwall a few years ago, for drainage purposes in Holland, had a cylinder twelve feet in diameter, thirteen feet high—the size of a moderately large room. The work of this engine, however, does not immediately concern us, so we pass on.

The blocks of stone containing ore, being raised to the surface by another engine, are wheeled away to groups of women and girls, each armed with her hammer, who break them into smaller pieces, discriminating with a practised eye the good portions from the worthless. The good part is then taken to the stamps to be crushed. Imagine fifty or sixty tall upright iron bars, with square "heads" fixed at the lower end, each about six hundredweight, standing in a row like soldiers on parade, alternately being raised and dropped with a clanking, deafening din, by a revolving barrel with catches in it, that lifts and lets them loose, in the same manner as the metallic tongues of a musical box are caught by the drum. At the back of the stamps are compartments, narrowing towards the bottom, into which the ore is tumbled, a fair share being thus crushed by each of the heads. A stream of water carries the pulverised stone, as a thick reddish fluid, away in a wooden launder.

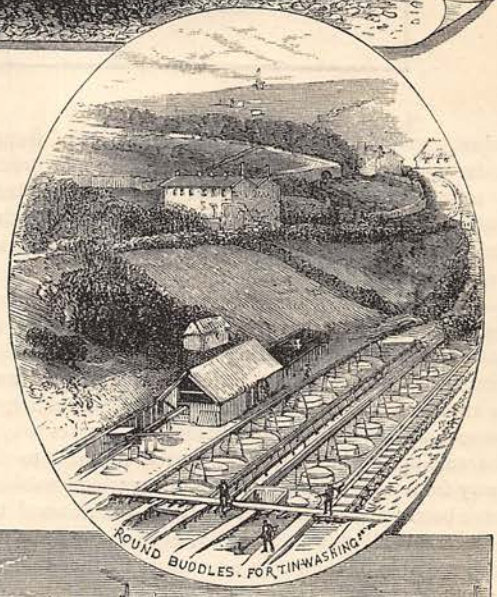
The next matter required is to separate the particles of tin from the earthy matter of the powdered rock. For this purpose the fluid is carried along to a series of round "buddles"—large flattened cones, about nine feet in radius. A glance at the diagram on page 274 will illustrate the use of these buddles. The tin ore in solution is carried in the shoot B (fixed by supports not shown) through an iron funnel, C, on to the apex of the buddle. This funnel is slowly revolved by wheels, D, E, carrying round with it two sweeps, F. The liquid trickles in a gentle stream over the metal surface N, and slides over the edge on to the larger wooden surface, depositing in its passage, first the heaviest and best grains of tin, I; next the smaller particles mixed with more impurities, J; then the larger, lighter bits of grit, K; which latter, meeting the still water in the trench L, are deposited near the circumference of the buddle. Two brushes, G, lightly graze the descending watery film, evenly distributing the liquid and keeping the refuse matter in agitation. The smallest and lightest particles of tin, carried with the waste over the buddle, settle at the bottom of the trench L, and are known as "slimes." The water flowing away from M, almost clean, is allowed to escape. When a stratum of the thickness shown has settled upon the buddle, the supply is cut off and the machinery stopped.

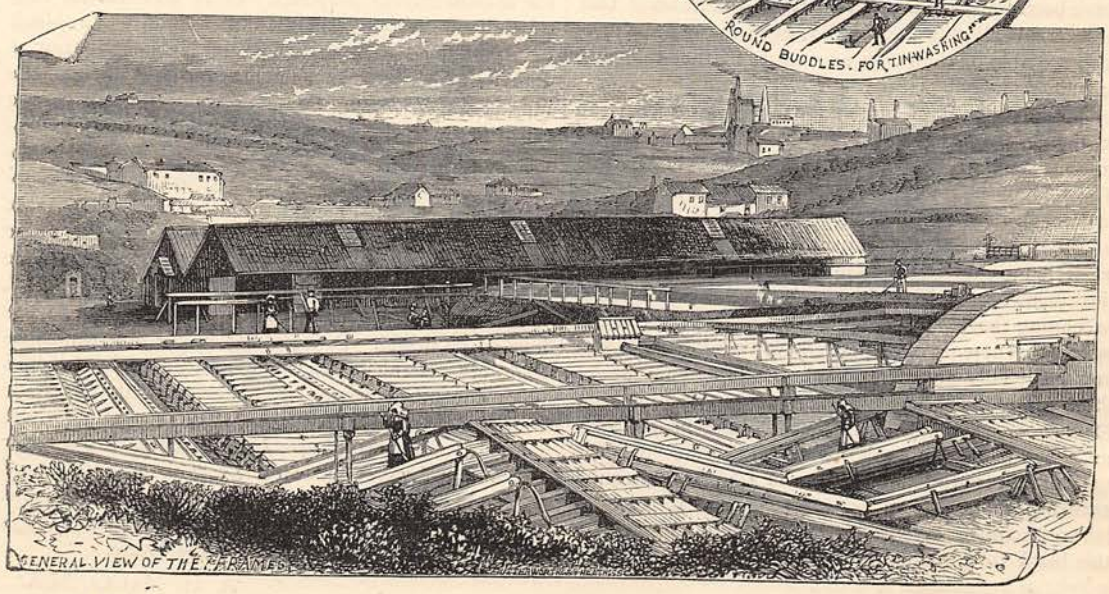
The ore has now been divided into three parts, I, J, K, graduating into each other like the colours of a rainbow, by a scarcely discernible partition: also, with the addition of the sediment in the trench, into three qualities, I, J, L. Of these, the best, I, already fairly clean, is carried to another buddle; the best from that taken to be calcined. The



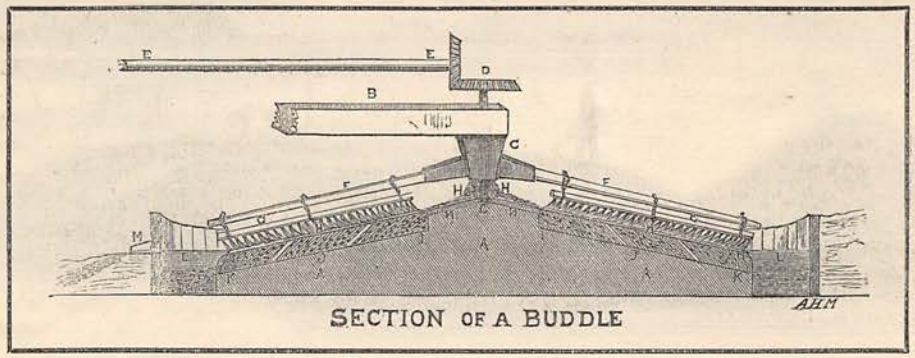
next, J, containing smaller particles and more impurities, is passed over two or three other buddles successively, then emptied with water into wooden tubs, against the sides of which hammers worked by machinery keep tapping, precipitating the heaviest portion to the bottom. Of the contents of these tubs, the upper part is re-buddled, the lower goes to be calcined. The portion K, if containing a little metal in the bits of grit, is re-stamped and cleaned afresh, if worthless is thrown away.

The third quality, L—in the trench—contains a good deal of tin, but in minute grains. This slime is taken away, again in water, to a series of "frames"—inclined wooden legless tables arranged in tiers—the working of which is effected by ingenious contrivances





of water-power, too intricate to be here described. The fluid flows on to the top of one frame, trickles down its surface, is received in a shoot at the bottom and thence transferred to the next. At regular intervals, the supply being cut off, there is left behind on the frame a thin coat of tin-dust. A stream of *clean* water now emptied over the frame with some force washes the dust down with it into a receiver below, conveying it thence to another series of frames, under cover of a long shed. Here the former process is repeated, except that instead of the frames being worked by water-power, between every two stands a girl, cleaning the tin from one while the fluid is trickling over the other.



SECTION OF A BUDDLE

Surely, the reader may say, by this time every single grain of tin must have been cleaned out. So far, however, is this from being the case, that the slime after passing over the two series of frames, goes away to another series of buddles, and after that undergoes some additional operations before finding its way to the calciner; while the fluid that is allowed to flow away from the mines after all the various washings have been finished, is still so rich in the mineral that at intervals all down the valley, even to the sea-shore, men are able on their own account to extract sufficient to gain their living.

The ore, now freed by the agency of water from the earthy matter at first mixed with it, still contains sulphur and arsenic, which must be removed by fire. For this purpose it is taken to the burning-house (calciner), dried, and then passed through a funnel into the interior of a reverberatory furnace, where it is subjected to sufficient heat to vapourise the two impurities mentioned. The flames from the oven, before ascending the chimney-stack, pass away into flues, in which the arsenic is deposited as a white crystalline coating. This arsenic is sold to the arsenic works, there refined, and becomes the poison of commerce. Removed from the oven, the ore is again passed over more buddles, and in other ways still further purified, until at last it is piled on a floor, as a heap of brownish earthy powder, known as *black-tin*, and is ready to leave the mine. According to the degree of its purity, this black-tin contains from twelve to fifteen hundredweight of metallic tin in a ton.

The mineral now passes away from the adventurers of the mine. It remains for the tin-smelters to assay it, purchase it, and carry it away.

Arrived at the smelting works, the black-tin is mixed with culm, placed in a reverberatory furnace, and there fused. At the end of six hours the furnace is "tapped," and the liquid metal runs out into a large circular fire-brick pan, from which it is ladled into cast-iron moulds, and allowed to cool. In spite of the six hours' fusion, however, it still contains a little of a good many substances besides tin, and needs refining. To effect this refining, the metal is placed in another furnace at a lower temperature, re-melted, and run as before into a basin, beneath which is a fire sufficiently fierce to keep it (the tin) in a liquid state. A block of green wood is now lowered into the pan, which keeps the molten mass in a hissing, bubbling condition. Gases are evolved, and much of the remaining dross settles on the surface round the edge of the pan. When this block of wood has become charred, its place is taken by others in succession, until the tin has become sufficiently refined for manufacturing purposes. It is now ladled into moulds of convenient size and weight, each block being stamped (like the bricks of Nebuchadnezzar at Babylon) with the owner's name, and sent away to the market as *block-tin*. Some of these tin blocks are taken to Swansea, there to be manufactured into tin-plates — that is, thin iron-plates are dipped into melted tin, which not only coats, but actually penetrates the iron. These tin-plates are then sent away to London, Birmingham, or elsewhere, to be tinkered into kettles, cans, and the thousand and one other articles of household use.

A portion of this tin-ware finds its way back to the land of its origin. Perhaps the bright new tin kettle that Mrs. Penhalurick, the miner's wife, brought home the other evening from her marketing, is made from metal that originally came from the mine where her husband is working. In due course it will grow old and leaky, get thrown out into the roadside, and there kicked about by thoughtless rosy-cheeked urchins, who will one day hence be busy enough raising material for the kettles of the future.

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