A certain proportion of "fines" is inevitably produced in raking the briquette seconds from the pots into the caves beneath the furnace house. These are separated, damped with water, and rebriquetted for lead-smelting purposes from time to time at a cost of about 2s. per ton of fines.

We append a schedule of cost incurred during the late treatment of a parcel of Broken Hill slimes, averaging 25 p.c. of zinc, 24 p.c. of lead and 26 oz. of silver per ton.

Calcining.—Hand roasting of such material to 3 p.c. of total sulphur or slightly under in South Wales costs about 9s. per ton, whilst mechanical roasting in the Godfrey furnace amounts to about 6s. 6d. Other forms of mechanical calciners, such as the Brown Straight Line, will roast complex sulphide ores to this limit at even lower cost; but at present the hand-calciner and the Godfrey appear to yield the denser product and also to be preferable in other respects. The question of the best form of calciner is not fully settled, but we select the Godfrey costs as those most lately obtained.

COSTS PER TON OF ORE TREATED.

	s. d.	s. d.	s. d.
Ore drying.—Screening and crushing of lumps, and wheeling....			2 6
Calcining.—Fuel, labour, maintenance..			7 0
Briquetting.—(30 tons of roasted ore per day)—			
Labour.—1 pressman at.....	5 0		
3 belt men "	5 0		
2 labourers "	3 9		
Boilerman "	4 9		
		32 3	
Coal.—			
1 ton for boiler.....		8 6	
6 tons for mixing, at 8s. 6d...		51 0	
Pitch.—1½ tons at 45s.....		72 6	
Stores.—Oil, etc.....		1 3	
Cost of briquetting 30 tons =		165 6	
= per ton ore			5 6¼
Retorting.—(Costs per furnace per 24 hours).			
Labour.—2 foremen at 6s. 8d. =	13 4		
2 second hands at 5s. 6d..... =	11 0		
2 helpers at 4s. 3d... =	8 6		
4 cave men at 4s. 3d. =	17 0		
1 pipe chipper (boy)....	1 4		
General labour	5 9		
		56 11	
Pottery.—3.7 pots at 6s. ..... =		22 3	
9 pipes at 2d..... =		1 6	
Coal, for firing 3¼ tons at 9s.6d. =		30 10	
Stores, luting clay and repairs....		4 6	
		116 0	
Contingencies, unoccupied pots, dead-fires, etc., add 5 p.c... =		5 9½	
		121 9½	
For charge of 7 ton briquettes = 5·6 tons of ore = per ton..			21 9
Yard and general labour			1 6
Re-briquetting of "fines," at 2s. per ton— Seconds contain 30 p.c. fines; on 80 p.c. of seconds..... =			5¼
Smelting costs on seconds (see p. 12).— (Seconds amount to about 80 p.c. on the original ore.)			
Smelting per ton seconds.....	12 6		
Refining, sales, brokerage, insurance, etc., at £2 per ton of Bullion produced, at 26 p.c. bullion	10 5		
Per ton of seconds		22 11	
= per ton ore.....			18 4
Lead smelting losses—			
2.8 units of lead (= 10 p.c. on residues) at 2s. 3d.....			6 4
5 p.c. silver = 1¼ oz. at 2s. 1d.			2 8
Office management and assays—dependent on size of installation, say			5 0
Total cost of treating 1 ton of ore.....			71 1
Recoveries—			
Zinc, 70 p.c. (of 25 p.c.) = 17·5 units at 3·65s. =			63 10½
Lead, 90 p.c. (of 24 p.c.) = 21.6 " 2s. 3d. =			48 7¾
Silver, 95 p.c (of 26 oz.) = 24·7 oz. at 2s. 1d. =			51 5½
			163 11¼
Less costs			71 1
Realisations...			£4 12 10¼

From which must be deducted cost of transport of slimes or cost per ton of ore.

In regard to the first four items the above costs are certainly capable of reduction.

In South Wales we have at present no lead-smelting plant for spot recovery of the seconds values, but dispose of these to local reduction works according to their assay values upon the usual scale of returning charges. The erection of lead-smelting plant at our own works is under consideration, in order to save these extraneous profits and to obviate freight to the smelters. In Australia, the smelting plant is that in ordinary use for reduction of the lead concentrates, etc.

The work outlined has occupied our attention for some years past, during which we have carried through a large number of experiments in the laboratory, in small works specially erected in Surrey, and finally at the Emu Works in South Wales, where large scale furnaces have been running for the past year as a commercial undertaking. We have there treated over four thousand tons of Broken Hill slimes besides many other parcels of complex sulphide ores. The recoveries of lead and silver have been practically complete in all cases, whilst the spelter yields have varied from 60 p c. to 80 p.c., according to the original zinc contents.

Complex ores containing copper present no further difficulties as to retort treatment: the copper, of course, remains with the lead and silver in the seconds, and is thence obtainable by modern copper-lead smelting methods.

Summarising our process, it may be said to consist in the holding up of the minute particles and prills of reduced silver-lead in a coherent but still highly porous coke or carbonaceous sponge during zinc distillation; thus preserving the retorts from contact with lead or other slag material, and ensuring the all but complete non-volatility of the lead and silver in the liberated vapours of metallic zinc.

In spite of its apparent simplicity, our process has been found capable of complete patent protection in the principal countries and colonies of the world; whilst the grant to the United States, German and Scandinavian patents, may be taken as evidence of novelty.

Gold Dredges—Their Construction and Manipulation.*

By DAVID K. BLAIR, Consulting Dredging Engineer.

In this paper it is not the intention to traverse gold dredging from its elementary stages, or to deal to any extent with its aspects historically—this has already been done by various authors—but simply to give as concisely as possible, in the limited time at our disposal, a description of the "Bucket Gold Dredge" as we find her at the present moment, and the general principles of her construction and manipulation, the accidents to which the various parts are liable, with their cause, effect, and remedy; avoiding, as much as possible, technicalities of a bewildering nature.

To many the idea of dredging suggests the necessity of a river, lake, or harbour, or some place where it is possible to float a fair sized ship—in fact some navigable place; but if you told a large percentage of the well-informed of the day that it was possible to dredge an ordinary city street without any serious difficulty, with a modern "Gold Dredge," your assertion would be considered impracticable and ridiculous in the extreme. However, at the present moment in Australia dredges are working quite as dry places with comparative ease, and plants exist that work without water at all; but it is not intended to deal with them in this paper, but to confine ourselves to the floating "Bucket Dredge," and more especially to the "paddock" type of this class.

*Paper read before the New South Wales Chamber of Mines.