SOME CORNISH MINES AND TREATMENT WORKS.

By Lionel C. Ball, B.E., Assistant Government Geologist.

The Botallack Mine.

The Botallack Mine, which is on the sea coast a few miles north of St. Just, is the second in point of output of the Land's End tin-copper mines, the total for the period 1815 to 1905 being: 14,549 tons of black tin; 23,739 tons of copper ore carrying nearly 12% of copper; and 1,525 tons of arsenic and arsenical pyrites.* After lying idle for a generation the mine was opened again about a year ago, owing to the rise in the price of tin; and though the work now being done is in the nature of prospecting, extensive operations are expected to be carried out here in the future, under the management of Mr. W. Thomas, assisted by Captains Prinn and Stratton. Even now about 110 miners are employed, all on day work, because of the worked-out ground; and the rate of pay for the best men is 4s. per day.

The main shafts are the Nineveh, 240 fathoms deep; the Wheal Cock, 210 fathoms deep; and Carnyorth, 130 fathoms deep. The Carnyorth and Nineveh are 300 fathoms apart, and between them the ground has been stoped out from the surface down to the 100-fathom level. A new shaft is being sunk to connect all the workings; and the Wheal Hazard adit, which opens on the sea cliffs just above high-water mark, will be taken advantage of as a drain.

Allen's new shaft, which is 19 ft. 6 in. by 6 ft. within the timbers, is now 300 ft. deep. It has been lined with concrete for 40 ft. from the surface, and is divided into five compartments, with dividers 6 in. by 9 in., wall- and end-plates 9 in. by 9 in., and studdles 6 in. by 12 in., the timber used being American pitch-pine. At present work is being carried on by means of a kibble, steadied by a cross-head, sliding on wire ropes.

The old Crown Mine, on the cliffs in the neighbourhood, was worked in the early part of the century for copper, and is to be opened up and worked for tin, in connection with the general development of the Botallack lodes. (See Fig. 1.) The lode is said to vary between 2 ft. and 12 ft. in width, and has been worked to a depth

[*L.C.B., photo.*

FIG. 1.—THE CROWN MINE, ST. JUST, CORNWALL.

of more than 235 fathoms, at the same time extending out beneath the sea a distance of between 500 and 600 yd.

The Nineveh old workings extend down to the 240-fathom level in part. This work was done by tributers, and the characteristically erratic workings have been filled in with mullock, which sometimes, when struck by the modern miners, necessitates putting in "spilings"—6 in. by 2 in. boards driven overhead on frames—as often has to be done in auriferous gravels in Australia. Some of these old stopes were worked from the Carnyorth shaft, which is over 1,500 ft. distant, when the rate of wages was no more than £3 10s. per month. The old workings contain a great amount of filling, which it is proposed to crush, provided the average content is 10 or 12 lb. of tinstone per ton, for it simply has to be run down the chutes and trucked along the level to the shafts.

The use, on the chutes, of loose boards sliding within iron staples is found to give greater satisfaction here than the iron doors worked by levers elsewhere preferred. This is presumably owing to the generally fine character of the filling. (See Fig. 2.)

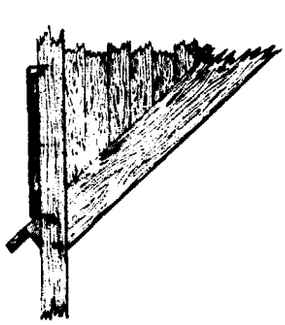

Fig. 2.—Staple and Loose Board Chute Door.
Scale: 2 ft. to an inch.

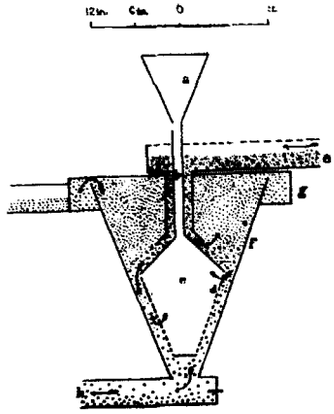

Fig. 4.—Diagrammatic Sketch of Upward Current Separator.
(a) Water-supply funnel. (b) Water pipe. (c) Water reservoir. (d) Perforated cone. (e) Launder with pulp from battery. (f) Separating cone. (g) Annular launder to catch slimes. (h) Launder for sands.

Composite candles running eight to the pound, for which the miners pay 6d., are in favour in the working places here, on an average two and a-half candles lasting one shift of eight hours. These are a vast improvement on the tallow dips still held to in some other English mines.

The telephone installed throughout the mine has been found a great convenience, and has, in saving the officials' time, materially reduced expenses.

All the water for the dressing mill is derived from the Nineveh shaft, 300 gallons per minute being raised by a Westinghouse electrical centrifugal sinking pump from 340 ft. depth. The pump and motor weigh over 3 tons, and are attached to a trolly suspended by a 1-in. steel wire rope.

Ore-bodies.

The lodes of this district are characterised by their thinness but general great richness, and appear to be, as a rule, occupying the sites of joints rather than of extensive dislocations. The larger lodes (including the Botallack) exhibit comby structures, and have yielded a great variety of iron, copper, tin, lead, silver, zinc, cobalt, bismuth, antimony, and arsenic minerals. It is stated that the most productive parts of the lodes were near the junction of the granite with the overlying killas and greenstone.

The average dip of the Nineveh lode is 65 deg. At the 30-fathom level there is 15 in. of slightly stanniferous dog-tooth quartz on the footwall, and then 18 in. of ore (*i.e.*, granite silicified and darkened, but still showing felspar crystals), but in other places there is 2 ft. of quartz and only 3 in. of ore, and occasionally the lode has a total width of 3 ft. 6 in. and a content of 35 lb. of tinstone per ton. In places the lode is made up of a great number of anastamosing and lenticular veinlets of quartz enclosing blackened silicified granite, and when the quartz is creamy the ground is said to be generally payable. On the 40-fathom level arsenical pyrites appears in the quartz, here only 18 in. thick and ill-defined. The ore and quartz vary greatly in thickness within a few yards, but the average total width may be taken as 2 ft. 6 in., carrying about 28 lb. tinstone per ton, which may be otherwise stated as 1¼% tinstone. The stone is generally richest when the quartz is on one or other of the walls, not when it is in the centre of the lode. There are no defined walls, the footwall country being generally a little crushed or else kaolinised, while the hanging-wall country is slickensided, and shows a gradual change into unaltered rock.

* Geology of the Lands End District." By Clement Reid, J. S. Flett, D. A. MacAlister, etc., pp. 124 and 134.

On the 40-fathom level there is a western lode, about a foot in thickness, wherein pyrite and grey-ore are visible as well as tinstone, but as the country is very hard machine drills will be necessary here.

A vein was struck in the crosscut, 46 ft. east from the bottom of Allen's shaft, on the contact of granite and slate, striking north by east and south by west, and dipping about 50 deg. westwards. There is no gangue filling to speak of, but the slate is crushed and slickensided for 18 in. or so from the granite. It has been found that when there are copper stains, as is common in the slate, there is little tinstone, the average content being 12 or 15 lb. per ton, which is too poor to pay. Nevertheless, as this is supposed to be the Botallack lode, further prospecting will be carried out. A branch of the lode (here granite, stained along cracks) running into the granite is considered promising for tin.

A new lode had, at the time of my visit, just been discovered to the west of the Nineveh shaft. It was 18 in. wide at the surface, and consisted of greenish, siliceous granite, fairly rich in tin. That this was not located many years ago in one of the inexplicable surprises incidental to mining.

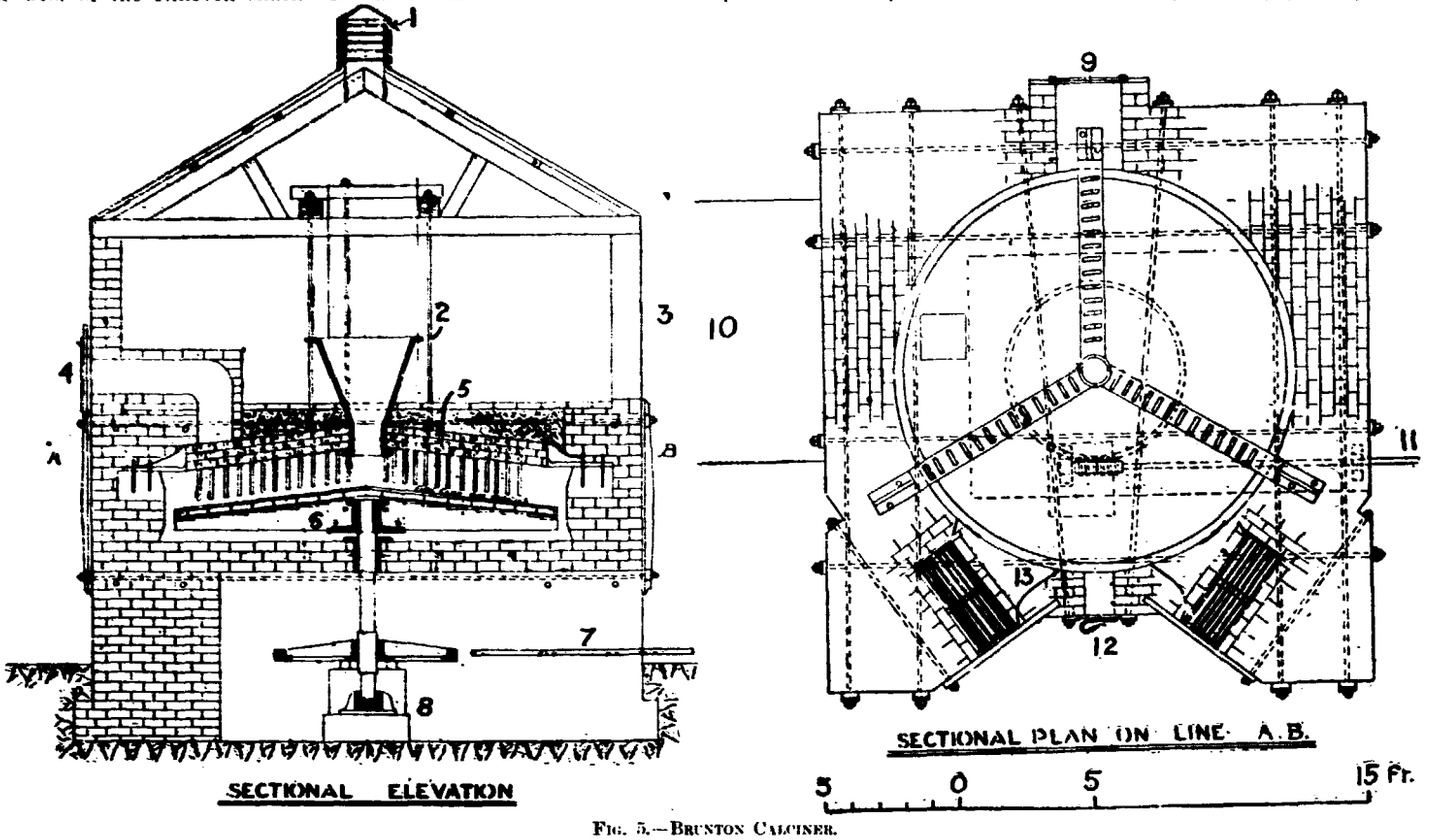

Fig. 5.—Brunton Calciner.

1. *Ventilator.*
2. *Bolts for supporting knee-piece.*
3. *Doorway.*
4. *Damper.*
5. *Knee-piece.*
6. *Revolving bed.*
7. *Worm shaft.*
8. *Stone for carrying worm shaft bearing.*
9. *Outlet.*
10. *Stack.*
11. *Driving pulley.*
12. *Peephole.*
13. *Bridge.*

The Botallack Mill.

This mill is only now in course of erection, and one should expect to find in it all the highest developments of Cornish milling and concentrating practice. (See Fig. 3, next page.)

POWER HOUSE.

The present capacity of the generating station is 650-h.p., but space has been allowed for an additional 350-h.p. plant. The whole of the power is to be derived from three anthracite-consuming gas producers, which had been installed only three months when seen in the summer of 1908, two Dowson suction gas producers (made by the Economic Gas and Power Company, of London), and one Mersey pressure plant. Of these only one of the Dowsons is as yet in use. This has been fitted with a hand-rocking grate, and burns half a ton of anthracite per shift of ten hours. The complete producer comprises:—The furnace, which has to be cleaned out once a week, and is then idle for a couple of hours; a coke waterfall scrubber; a sawdust or fibre scrubber; and both hand and electric fans which are provided for starting combustion.

The engine-room is 35 ft. by 70 ft. in area, and is fitted with a travelling overhead crane. In it there are three British Westinghouse gas engines; two of 150-b.h.p., each having three cylinders direct coupled and driving a 150 k.w., 440 volt, 136 amperes, three-phase dynamo; and one of 315-b.h.p., making 270 r.p.m., and driving a 210 k.w., 440 volt, 275 ampere dynamo.

MILL AND CONCENTRATING PLANT.

In the design of the mill (see Fig. 3) a great point has been made of cleanliness, all the floors and walls being cemented, and, with a view to reducing loss of tinstone, all unnecessary handling has been done away with. Sufficient room has been left in all the buildings for duplication of the plant, should developments in the mine warrant it.

The mill now contains 20 head of Californian stamps (Brenner's patent), the duty of which is 4 to 5 tons per stamp per day. The hoppers above the stamps are 12 ft. high and 10 ft. in width; they are fitted with rack doors, and discharge into Challenge feeders. The pulp from the stamps is led into a series of upward-current separators (see Fig. 4). The overflow (that is, the slimes) is conducted to a set of five Frue vanners, and the coarser sands are led on to a series of Buss tables (made by the Luhrig Appliance Company), the tailings from which are raised by a bucket-wheel elevator and put over a second set of three Buss tables. The concentrates from both the tables and the vanners are trucked out to a Brunton calciner. The roasted coarser ore is then run on to a Wilfley table, raised by an elevating wheel, crushed in two pulverisers, and passed over three Frue vanners. The roasted fines go into two Cornish buddles, and the firsts produced are freed from silica in ordinary kieves.

The working of the Buss table is rather interesting; they make a sharp separation of a red slimy material from the white quartz, black tourmaline, and grey tinstone; then there is a fairly sharp separation of quartz and tourmaline, and a less definite separation of the tourmaline from the tinstone.

Very little power is required for the elevators, which are dipper wheels 12 ft. in diameter.

The Brunton calciner (the form of roaster used throughout Cornwall) is 20 ft. in diameter, makes three revolutions an hour, and is driven by an electrical motor of 2-h.p.. It has a conical feed hopper and

its essential parts are a flat revolving cone and fixed scrapers. (See Fig. 5, which has been reproduced from Messrs. Holman Bros.' catalogue.) The calcined ore from these furnaces contains 4 to 5 cwt. of tinstone per ton. As a rule, the concentrates are roasted to drive off the arsenic, but the ore from this mine is free from arsenic, and is roasted simply to render it suitable for disintegration.

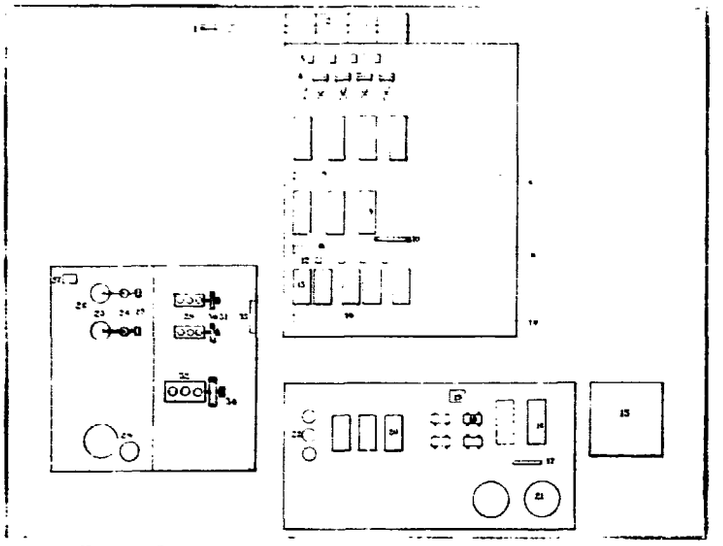

Fig. 3.—Diagrammatic Sketch Plan of the Botallack Mill.

DESCRIPTION

1. *Tramway for ore from the mine.*
2. *Hoppers.*
3. *Motors.*
4. *Stampers.*
5. *Apron.*
6. *Upward current separators.*
7. *Lukrig tables for coarse material from* (6)
8. *Tramway for concentrates from* (7) *to* (15)
9. *Lukrig table for seconds from* (7)
10. *Bucket wheel elevator for seconds from* (7) *to* (9)
11. *Tramway for concentrates from* (7) *and* (9) *to* (15).
12. *Pointed box separators (out of use).*
13. *Frue vanners for overflow from* (6)
14. *Tramway for slimes concs. from* (13) *to* (15)
15. *Brunton calciner.*
16. *Wilfley tables for calcd. concs. from* (7) *via* (15)
17. *Elevating wheel for tails from* (16) *to* (18)
18. *Pulverisers.*
19. *Motor for pulverisers.*
20. *Frue vanners for tails from* (16).
21. *Cornish buddles for calcd. slimes from* (13) *via* (15)
22. *Kieves.*
23. *Dowson gas-producer furnaces*
24. *Coke scrubbers.*
25. *Sawdust scrubbers.*
26. *Hand fan.*
27. *Electric fan.*
28. *Mersey gas producer.*
29. *British Westinghouse gas engine.*
30. *Dynamos.*
31. *Motor.*
32. *British Westinghouse gas engine.*
33. *Dynamo.*
34. *Motor.*
35. *Switchboard.*

The pulverisers are solid cast-iron cylinders, requiring 4 to 5 h.p. for driving purposes. Such have been in use in Cornwall for 20 years, and appear to be the prototype of the tube mills now giving such satisfaction in South Africa.

The kieves are iron-hooped barrels, 3 ft. in diameter and 2 ft. 6 in. high. They are mechanically tapped on the sides, to bring about the separation of free silica from the tinstone, while at the same time a man stirs up the contents and scoops off the uppermost layer of impurity.

No rack frames are to be erected here, as there are no mines in the valley above whose tailings could profitably be treated.

The Wheal Bassett.

The ores first raised here were those of copper, but even in the earliest years a little tinstone was produced. The total amount of

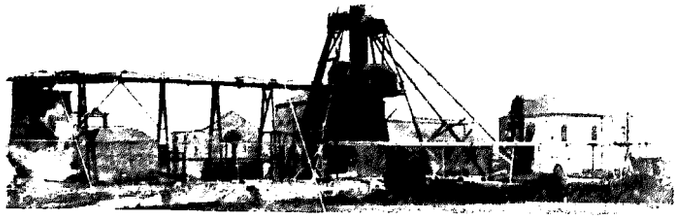

FIG. 6.—SOUTH SHAFT, WHEAL BASSETT. [*L.C.B. photo.*

copper ore raised between 1851 and 1880, in decreasing quantities each year, was 85,076½ tons, containing 6,566½ tons of metallic copper (*i.e.*, 7·7%), while the black tin produced between 1852 and 1905, in annually increasing totals, was 15,014½ tons (21 tons in the first year, and 768 tons in the last).*

Captain James placed me in the hands of one of his "agents," who took me down "after hours," so necessarily rendering my visit a hurried one.

On this mine there are employed 500 men in two shifts, and the output from the South shaft is 175 tons per day, of an average tinstone content of 1·6%. One thousand gallons of water are pumped per minute from the same shaft.

The Mill.

A Blake stone-breaker is working adjacent to the South shaft. From this crusher the broken ore is fed into 16-cwt. double side-tip trucks, ten of which are made into a rake and drawn by horses a distance of half a mile to the mill at the East Bassett shaft.

This mill comprises 33 head of Cornish stamps. Each stamp, weighing 5½ cwt., is square in section, stem and head being roughly cast in one piece. The whole of the stamps, which are in sets of four,

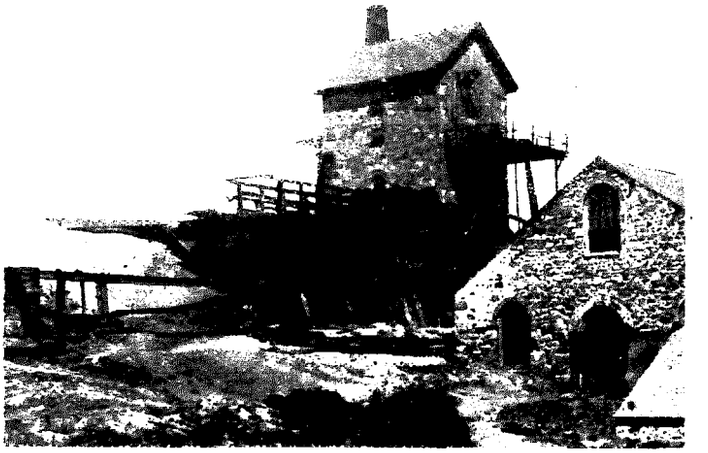

FIG. 7.—WHEAL BASSETT MILL. [*L.C.B., photo.*

are lifted by pins projecting from one huge timber shaft, and an accident to one necessarily causes the stoppage of the whole plant.

Workings.

A descent was made in the South shaft to a depth of 290 fathoms on the underlie. This shaft is 16 ft. in diameter. It is divided into two compartments, in which work the cages, each holding 20 men, and wound at the rate of 260 fathoms per minute.

Winze-sinking is done by contract, by parties of eight men, using double-handed drills. As a matter of fact, everything (stoping, driving, sinking, rising, and tramming) is done by contract. Seven Holman rock-drills are used here in driving the levels.

A feature of the mine is the small amount of timber used; very few props were noticed, and that only in the old stopes.

Geology.

Mr. MacAlister† mentions twelve distinct lodes occurring on this property. The Great Flat lode now worked was discovered in 1876. This is on the edge of a trough of altered Devonian slates, lying between two granite intrusions. It dips at an angle of 32 deg. As a rule, slate forms the hanging-wall and granite the footwall, but the latter rock sometimes also forms the hanging-wall. Crosscourses are frequent, and generally cause enrichment, though they seldom carry tinstone themselves. The enriched areas are known as carbonas, and are simply altered granite that has been rendered stanniferous.

The lode is 3 ft. to 15 ft. wide, the mean being quite 6 ft.‡ In a total length of 700 fathoms the agent informed me twelve shoots have been proved, and these average 80 ft. in length

The milling stuff from the South Mine is a very siliceous chloritic material, with quartz veins, in which are traces of chalcopyrite, but all mud from the mine is of a light chocolate colour.

* The quantities have been computed from statistics given in "The Geology of Falmouth and Camborne." By J. B. Hill and D. A. MacAlister, p. 261.

† *Op. cit.*, p. 207.

‡ At points of intersection of the Great Flat lode with other lodes the total width of ore is said to be sometimes 150 ft.

South Crofty Mill.

No opportunity offered for me to make a personal examination of the South Crofty Mine, but Mr. F. Thomas, the late manager, gave me to understand that north-dipping lodes, such as the South Crofty, are more complex, as a rule, and are older than the south-dipping lodes, by which they are faulted and in which very little wolfram is found.

The monthly output of this mine is 3,300 tons, carrying between 28 and 40 lb. of tinstone per ton. This ore contains, besides the

[*L.C.B., photo.*

FIG. 8.—OLD WINDING-ENGINE HOUSE, WHEAL BASSETT.

gangue minerals (felspar, quartz, tourmaline, fluorspar, chlorite, mica, and zircon), cassiterite, copper pyrites, mispickel, wolfram, hæmatite, ilmenite, and chalybite*

Milling and Concentration.

The treatment is under the general management of Captain James, who allowed me to see the works, in which the whole of the machinery is driven by electricity.

The battery comprises 40 head of Californian stampers, each weighing 1,050 lb., and making 100 drops per minute. They are arranged in double sets of five, and though really only 23-h.p. is required for each ten head, they are driven by four 30-h.p. Brush motors, supplied with a current of 340 amperes at 460 volts. Each set of five head of stamps is provided with a Challenge ore-feeder below a 10-ton hopper.

When Mr. MacAlister, of the Geological Survey of England and Wales, reported† on this mill in 1905, the following was the method of treatment:—The pulp from the stamps (containing 1½% tinstone) was led directly on to Frue vanners, and the concentrates (containing 21% tinstone), after calcination, were treated in buddles, yielding "heads" (containing 48½% tinstone), and "tails" (containing 11% tinstone), the former of which were treated in kieves to obtain a final product, known as "crop tin" (containing 62% tinstone), and "skimmings" (containing 8% tinstone). The tailings from the Frue vanners went into upward current separators, which removed "rough waste" (containing 0·2% tinstone). The "slimes" from the separator (carrying 0·8% tinstone) were calcined and then sent over ragging frames and revolving tables, which yielded concentrates known as "slime tin" (containing 9% tinstone) and waste (carrying 0·5% tinstone). Mr. MacAlister remarks "In the examination of this series of products, the most striking point is the general great variety in sizes of the grains in each sample of the material, and it is probable that if the materials were sized before treatment losses would be considerably reduced." Apparently, as a result of his experiments, hydraulic classifiers were installed, and the whole plant was remodelled.

Below the battery are three conical classifiers; the first takes out the rough concentrates, which go to six Buss tables; the second takes out the middles, which are sent to a row of seven vanners; and the finest from the third classifier pass to a third row of seven vanners, in place of a set of spitzkasten formerly in use.

The headings from the Buss tables (containing 44% of tinstone and 9% of wolfram) are trucked to five calciners of the Brunton type, which produce each day 1 ton of crude arsenic (oxide), worth about £10 per ton.* The headings when calcined are ground in pulverisers (revolving cast-iron tubes, containing scrap-iron, each 6 ft. long and

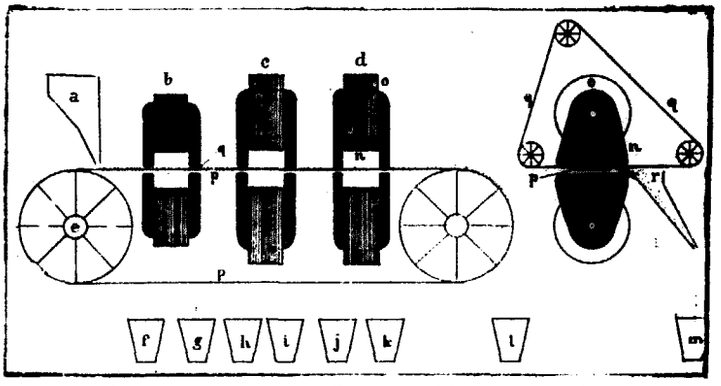

Fig. 9.—Humboldt Magnetic Separator (Diagrammatic Sketch).

DESCRIPTION:

a Hopper.
b Iron magnet.
c Wolfram magnet.
d Wolfram tin magnet.
(e) Belt pulley.
(f) and (g) Iron oxide.
(h) and (i) Wolfram.
(j) and (k) Wolfram and tinstone.
(l) Tinstone and silica.
(m) Bucket.
(n) Magnet.
o Armature.
p Longitudinal belt receiving ore from (a) and discharging non-magnetic mineral into (l)
q Cross-belt carrying magnetic mineral and travelling to the right.
r Chute for magnetic mineral.

2 ft. 6 in. in diameter, and each requiring 8-h.p.), and the discharged pulp, after being dried, is conveyed direct to the magnetic separator.

The concentrates from the fines and middlings vanners are cleaned in the twelve convex buddles, half of which are reserved for calcined material and half for the unroasted. These products are also sent to the separator.

Magnetic Separation.

Wolfram and cassiterite, being of nearly the same specific gravity, cannot be separated by the ordinary mill appliances, depending on that property, and, as the concentrates here are rich in wolfram, two electro-magnetic separators have had to be procured, one for roasted and one for unroasted concentrates. The Humboldt machines in service for the last two years are similar in principle to the Conkling and Wetherill—that is to say, there is a main belt carrying the ore beneath fixed electro-magnets, to which the more magnetic minerals are attracted, but are carried out of the field of force by transverse belting, and dropped into convenient buckets. For driving 7½-h.p. is required, and in addition 9-h.p. has to be provided for the electro-magnets of each machine. Current at 480 volts is supplied by the Works, and is transformed down to 110 volts for the separators. The iron magnets are given current of 7 amperes, while the two wolfram magnets receive 11 and 12½ amperes respectively.

Of the unwashed but roasted ore 12 tons are put through the first magnetic separator (see Fig. 9) each day. The following is the composition of the washed ore as fed to the second machine:—Tinstone, 50%, wolfram 40%, and iron 10%; and of this 3 tons is put through per day of 24 hours.

The first magnets separate iron containing from ¾ to 1% of tinstone. The first wolfram magnet produces a mixture containing 5%

* *Op. cit.* D. A. MacAlister, p. 270.
† *Op. cit.*, p. 270.

* This product is conveyed in open carts (loosely—not even bagged) to one or other of the three refining works within 10 miles of the mine.

of tinstone, 3 or 4% of iron, a little silica, and the remainder wolfram. The fourth and fifth buckets contain no tinstone at all, and the sixth bucket contains 10% of tinstone in a very fine state of division, the cross-belt being almost on the main belt, in order that no wolfram should go over with the tin. The wolfram concentrates from the last magnet contain 12 to 15% of tinstone, and these, after being washed with sulphuric acid, are again put through the separator.

The tinstone, after magnetic separation, contains no iron and wolfram, but includes 5% of silica, which is washed out into the kieves, leaving a product containing 68% of metallic tin. The finest tinstone concentrates are the most impure, containing as they do only 65% of tin.

The wolfram for the market contains 2% of tinstone, and possibly 1% of iron, and averages 63% or 64% of tungstic acid. The whole of the wolfram product is shipped to Hamburg, *viâ* Plymouth.

Porth Ledden Mill.

This is a small water-driven battery and concentrating plant, employing five men and three boys, and is located on the coast between St. Just and Land's End.

During the winter months, the 20 head of Californian stamps are driven by two Pelton wheels, with water under pressure of 100 ft. This water is brought in a 2-ft. square sluice-box, discharging into a pent-stock, 2 ft. in diameter at the top, but branching into two 9-in. pipes above the wheels.

In summer, however, there is water sufficient for only two head, and an auxiliary producer gas plant has then to be depended on. This plant was made by Davey, Paxton, and Co., and consumes 3 or

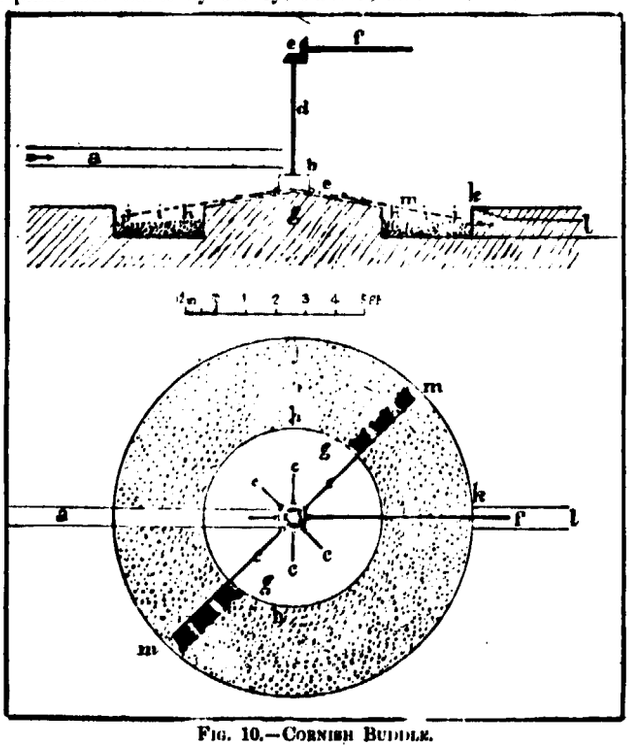

Fig. 10.—Cornish Buddle.

a Concentrate or pulp launder from mill.
b Reservoir.
c Distributing arms.
d 1 in. shaft driving distributing arms.
e Mitre wheels.
f Driving shaft.
g Distributing cone.
h Tinstone first (s).
i Seconds (s.o.)
j Tails (o)
k Discharging gate.
l Discharging launder.
m Wooden arms with rag sweeps connected to the pulp reservoir.

4 cwt. of anthracite every 24 hours, or, say, one bucketful per hour. The furnace is only 3 ft. in diameter, and 5 ft. high, and with the scrubbers occupies a space of only 6 ft. by 3 ft. Some little trouble has been experienced here in the cleaning of the gas, the valves, electric ignition, rings, &c., being much dirtied. The producer also is stated to require much attention, and has to be cleaned out every 24 hours.

The concentrating appliances comprise three fixed Cornish buddles (*see* Fig. 10); two of them for the pulp from the stampers, and one for dressing the concentrates, to which a final dressing is given in kieves.

Herberton and Chillagoe Districts.

NEWLY CONSTITUTED GOLD AND MINERAL FIELDS.

Proclamations have been issued abolishing the Walsh and Tinaroo Mineral Field, the Hodgkinson Gold and Mineral Field, the Mareeba Gold and Mineral Field, and the Tate Gold and Mineral Field; and constituting in their place the Herberton Gold and Mineral Field and the Chillagoe Gold and Mineral Field. The map on the next page shows these two last-named fields, their boundaries being indicated by dotted lines. Another proclamation assigns to the Warden's Court at Herberton the Mulgrave Goldfield, hitherto under the jurisdiction of the Warden at Cairns.

Th following are the official descriptions of the boundaries of the two newly-arranged fields:—

HERBERTON GOLD AND MINERAL FIELD.

Counties of Cardwell, Hodgkinson, Dagmar, and Nares.

Area, 1,718,080 acres.

Commencing at the crossing of the Chillagoe Railway Line over the Main Coast Range about nine miles south-west of Mareeba, by that railway line south-westerly to Lappa Lappa Junction, by the Mount Garnet Line upwards southerly about seventeen miles to the range at Munderra, by that range southerly for about sixty miles; thence south to the north-west corner of Wyandotte, by the west boundaries of Wyandotte, the north-west and south-west boundaries of Ringwood Park No. 2, the north-west, the north-east, and south-east boundaries of Balcooma Goldfield, the south-west boundary of Lucky Downs; thence by the north-west boundaries of Gray and Gray No. 3 Occupation Licenses, by the north-west boundaries of Maal Maal Downs, by the west and north boundaries of St. Martin's, by the east boundary of St. John's road, by the south-west, south-east, and north-east boundaries of Arthur's Plains No. 3, by the north-west and north-east boundaries of Hopewell Creek, by the south-west, south-east, and north-east boundaries of Lake Lucy No. 1, No. 2, and No. 3, the south boundaries of Wairuna, part of the west, the south, and east boundaries of Cromwell, the west and part of the north boundary of Forest Park to Herke's Creek, by that creek downwards to the Herbert River; thence by a line north-east to the Coast Range at the head of Dallachy Creek; thence by that range northerly to the north-east corner of the parish of Ramleh, by the north boundary of that parish westerly about ten miles to Blunder Creek, by that creek downwards to the north boundary of Blunder No. 1, by that boundary west for half a mile; thence by the east boundary of Woodleigh and Millstream north to Millstream Creek, by that creek downwards to the Wild River, by that river upwards to the confluence of Dry River with the Wild River; thence by a line north-east about thirteen miles to the Coast Range, by that range northerly about seven miles to the south-west corner of portion 67v, parish of Barron, by the west boundaries of portions 67v, 66v, 63v, 62v, 59v, a line, and 130v, the west, north, and west boundaries of portion 16, the west boundaries of portions 26, 24, 44, 10, 25, 123, 34, the Atherton Sections, the south boundaries of portions 9, 3A, and 57v, and by part of the west boundary of the last to Middle Creek, by that creek upwards to its head in the range, by that range northerly about two and a-quarter miles to the head of a creek forming the north boundary of portion 179, by that creek easterly to the north-west corner of portion 72v, by the north boundary of portion 72v, by the east boundaries of portions 72v and 71v, by the north and part of the east boundary of portion 13, the north-west boundaries of portions 51v and 52v, the west and north boundaries of portion 176 to the west side of the Atherton-Mareeba road, by that road northerly to the south boundary of a Camping and Water Reserve, proclaimed in *Government Gazette* 1882, volume 2, page 487, by the south and west boundaries of that reserve to the west side of the Atherton road, by that road north-westerly to the north-east corner of portion 185; thence easterly by the south boundaries of portions 141, 38v, 39v, 58, 42v, 43v, and a line east to the southern watershed of Tinaroo Creek and Emerald Creek, by that watershed north-easterly to the range forming the eastern watershed of the Barron River; thence by that range to the extreme head of Clohesy River, by the left bank of the Clohesy River downwards to the confluence of the Clohesy and the Barron Rivers; thence by a line northerly to Harris Peak; thence by the range north-westerly along the Heights of Victory (taking in Mount Demi Peak and Mount Spurgeon), and westerly by the south-east watershed of St. George River to the north-east corner of Talgijah Run, by the east boundaries of that run southerly to McLeod's River, by that river downwards to the Mitchell River, by that river upwards to the north-east corner of Cudgee Cudgee No. 1 Run; thence by the eastern boundary of that run southerly to its south-east corner; thence by a line south to the watershed between the Mitchell and the Hodgkinson Rivers; thence by that watershed south-easterly to the Coast Range, and by that range southerly to the point of commencement.

CHILLAGOE GOLD AND MINERAL FIELD.

Counties of Wrotham, Bolwarra, and Lynd.

Area, 6,928,000 acres.

Commencing at the confluence of the Walsh and Mitchell Rivers; thence by a line south about seventy-eight miles to the north boundary of Eveleigh Run, by that boundary east to Eveleigh No. 5, by the north and east boundaries of Eveleigh No. 5, the north and east boundaries of Eveleigh No. 4; thence east by the north boundaries of Brooklands No. 1, Fixby, Fixby No. 2, Springfield, Fossilbrook, St. Roman's, the east boundary of St. George, and a line south to the range, by that range north-easterly to Munderra on the Mount Garnet Railway, by that railway northerly to the Chillagoe Railway, by the Chillagoe Railway north-easterly to the Main Coast Range, by that range northerly to the watershed between the Mitchell and the Hodgkinson Rivers; thence by a line and the eastern boundary of Cudgee Cudgee No. 1 Run northerly to the Mitchell River, by that river downwards to McLeod's River, by McLeod's River upwards to the south-east corner of Talgijah Run, by the east boundary of that run north to the south-east watershed of the St. George River, by that watershed westerly to the Mitchell River, and by that river downwards to the point of commencement.