free hydrochloric acid is present, but that the amount of free acid up to 4 per cent. does not appreciably influence the amount of heat evolved. The heat of solution of steel in slightly acid copper ammonium chloride is not changed more than 2 per cent. by variation in the heat or mechanical treatment of the sample.

Notes on Selenium and Tellurium. By EDWARD KELLER. *J. Am. Chem. Soc.*, **22**, 241–245.—In a previous paper (*this Rev.*, **4**, 4) the author pointed out the difference of behavior of selenium and tellurium in the dioxide state, towards sulphur dioxide and ferrous sulphate in solutions of hydrochloric acid. These reactions have now been studied with the idea of using them for the quantitative separation of the two elements. It has been found that selenium is most readily precipitated by sulphur dioxide in strong hydrochloric acid solution while tellurium is not precipitated until the acidity of the solution is lowered to 80 per cent. Details are given for the application of this method to the quantitative determination of selenium and tellurium in copper. The author has found that in commercial work the criticism against determining tellurium in the metallic state on account of oxidation is unjustified.

Upon Bismuth Cobalticyanide. By J. A. MATHEWS. *J. Am. Chem. Soc.*, **22**, 274–277.—The quantitative precipitation of bismuth cobalticyanide was studied. The precipitate is crystalline, settles and filters well, and retains water below 165°. The author remarks that it has not been found useful in the analysis of pig-lead, as anticipated, "but it may still be found useful in the analysis of lead-bismuth alloys, 'fusible metals' such as Wood's alloy, etc." His results do not, however, in the least indicate its usefulness. Below a concentration of 0.0079 gram of bismuth per cubic centimeter the precipitation was under no conditions complete, and at ten times that dilution no precipitate was produced even on long standing.

METALLURGICAL CHEMISTRY.

H. O. HOFMAN, REVIEWER.

The Zellweger Roasting Kiln. By J. ZELLWEGER. *Eng. Min. J.*, **69**, 260–262.—This is a straight-line, single-hearth, mechanical reverberatory roasting furnace, 15 × 135 feet, with external fire places. The new feature is the rolling stirrer which turns over the ore and moves it slowly from feed to discharge. It consists of a heavy shaft carried by wheels, 6 feet in diameter, rolling on tracks in the depressed wheel-pits on either side of the hearth. The shaft carries a number of collars on which are mounted projecting V-shaped blades. While travelling from feed to dis-

charge, the collars are locked to the shaft, and the blades scoop up the ore during one-half of a revolution and discharge it during the other half, thus stirring, mixing, and moving it. During the return trip, the collars are unlocked, and revolving around the shaft cause the blades to displace the ore only about in the same way that a plow or rake would. The furnace is in use at the works of the Cherokee Lanyon Spelter Co., Gas City (Iola), Kans., and treats in twenty-four hours 15 tons of blende reducing the sulphur to 1 per cent., 12½ tons if the sulphur is reduced to ½ and 16½ tons if 1½ per cent. sulphur are allowed to remain in the roasted ore.

Utilizing the Heat of Molten Slag. By H. Lang. *Eng. Min. J.*, **69**, 493–494. By Bretherton, *Eng. Min. J.*, **69**, 614.—The author criticizes the claims made by Bretherton (*this Rev.*, **6**, 45) that by means of his apparatus he is able to raise the temperature of the blast to 500°–600° F. The second reference is to Bretherton's reply.

Notes on Lead Smelting and Gold and Silver Refining; V, Cost of Smelting Silver-Lead Ores. By M. W. Iles. *Eng. Min. J.*, **69**, 258–259.—After a few general remarks on the relations that should exist among the officers in charge of a smelting plant, the author shows that between 1887 and 1898 the cost of smelting at the works of the Globe Smelting and Refining Co., Denver, Colo., was reduced from $4.644 to $2.260 per net ton of ore. In 1886, the blast-furnaces were 36 × 100 in. at the tuyeres, 11 ft. from tuyeres to throat, the blast pressure was 1 lb. per sq. in., the matte settlers had a capacity of 6 cu. ft. and slag was collected in pots holding 250 lbs. which were pulled by men. In 1899, the blast-furnaces were 42 × 120 in. at tuyeres, 16 ft. from tuyeres to throat, the blast pressure was 3–4 lbs. per sq. in., the matte boxes (at the Globe works) had a capacity of 128 cu. ft., and small switch-engines handled per trip 3000–6000 lbs. slag. The results were obtained with slags containing 31–34 per cent. SiO_2. When a slag ran high in lead, this could be reduced by adding lime to the charge or in some cases by increasing the percentage of fuel. While iron flux was more expensive than limestone, it was often advantageous to make slags running high in iron on account of the larger amount of charge that could be put through with them. The author is confident that the cost of $2.26 for smelting a net ton of ore can be further reduced by using coke made from washed coal (the present Colorado coke containing 16½–22 per cent. ash), and by improving the system of handling.

Notes on Lead Smelting and Gold and Silver Refining,—Apparatus for Collecting Solids from Smoke. By M. W. Iles. *Eng. Min. J.*, 69, 647.—The paper is an illustrated description of a No. 2 Pelton wheel driving a Monogram Sturtevant blower which aspirates the smoke and delivers it into a tin box, 3 ft. square and 5 ft. high, with a discharging door at the side and thimble, 18 in. in diameter and 12 in. long, at the top. Over the thimble is placed a sack, 60 in. in circumference and 20 ft. long, made of plain woven cotton cloth having, per square inch of surface, 44–50 threads in the warp and in the woof. By running the apparatus for 10–14 days and gathering the filtered solids, a correct idea of the metal lost is easily obtained.

A Portable Stamp-Mill. By Taylor. *Eng. Min. J.*, 69, 263.—The apparatus which serves to make working tests on small batches of gold ore, consists of two parts. The lower one is a cast-iron mortar (8 in. in diameter) with a square discharge (6 × 6 in.); the upper one, fastened to the mortar with a hinge-pin and hinge-bolt, is a cast-iron conical cover carrying two columns for the cam-shaft. The single stamp, weighing 45 lbs., is operated by hand and drops 6½–7 in. with a force of 750 lbs.; the ore is fed through an opening in the cover.

Water and Fuel Economy in Stamp Milling. By A. W. Warwick. *Eng. Min. J.*, 69, 529–530.—Engineers frequently assume that a ten-stamp gold mill requires about 800 gals. water per hour when the water is allowed to run off with the tailings. As to fuel and water consumption, using a locomotive boiler and an engine with a throttle governor, a fair figure is 8⅛ lbs. coal and 7½ gals. water per horse-power hour. The following data obtained by the author at the mill of the Matterhorn mine, in the southeast corner of the Mojave desert, show that an effective system of water saving will reduce the 800 gals., usually required per hour by a ten stamp mill, to 200 gals., or 75 per cent.

Week.	Water supplied in gals.	Hours run.	Water per stamp per hour. Using once.	Actually used.	Per cent. recovered.
1	13154	82	80	16.0	80.0
2	16760	80	95	22.2	76.8
3	15487	81	93	19.1	79.4
4	14850	80	92	18.5	79.8

On account of the large amount of water required for making steam, the author advocates the use of an oil-engine. At the Matterhorn mill a Fairbanks-Morse engine of 34 brake horse-power, with cooling water used continuously, required in twelve hours only 55 gals. water to make up the loss by evaporation.