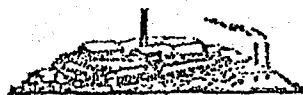


# INDUSTRIAL PROGRESS



## Precipitation and Cyanide Recovery Process

Developed by General Engineering Company

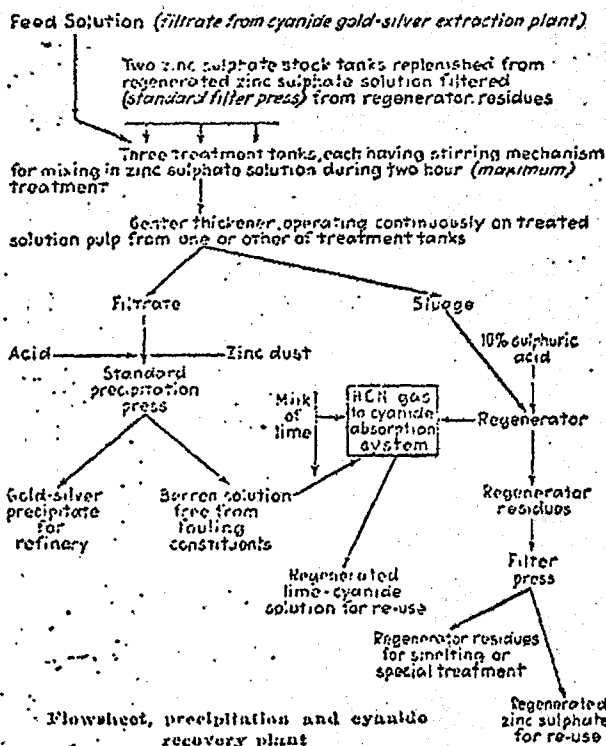
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**AN EFFICIENT METHOD** of recovering inexpensively the cyanide and precious metal (if any) in the barren solution fouled by contact with cyanide-consuming ores has been developed by the patentees of the Geco process. Local conditions, of course, would govern the detailed application, but reference may be had to the accompanying flowsheet for a general case.

Pregnant or barren solution is run into one of three receiving tanks having a storage capacity equivalent to two hours' flow of solution, or it can be treated continuously. If the cycle method is employed, the first tank will be allowed to fill, then the second, and later the third. When the first receiver is filled, titrations will be made to determine cyanide and lime content per ton of solution. Reference to a table such as is shown herewith indicates an equivalent quantity of zinc sulphate added in the form of a 10 per cent solution, or other convenient

strength. After about an hour of contact, the resultant precipitate will have settled in white, easily filtered floccules in the lower half of the tank. The pulp is then run through a standard Genter (filtering) thickener, which operates continuously from the discharge of one or other of the three receiving tanks. The Genter delivers a clear filtrate and a sludge product, the latter amounting to 2 or 3 per cent of the original solution. The sludge is stored in a small receiving tank for subsequent regeneration of cyanide, the

whatever quantity of gold and silver is present. The solution is then contacted with zinc, without evacuating or de-oxygenating, and the precious metals are recovered in the form of a clean, high-grade precipitate. Zinc dust may be used with a standard type of filter



plant to accomplish which is operated on day shift only.

The Genter filtrate, in a decyanided condition, is neutral, free from fouling constituents, and contains only the cyanide combined with the gold or silver not previously precipitated. If sulphocyanides occur, they can be precipitated by copper sulphate, sulphur dioxide, or other cheap reagent. To recover the precious metals, it is necessary to add to the decyanided solution enough acid to dissolve the weight of zinc chemically required to precipitate

press, or zinc shavings, according to local conditions. After contacting with zinc, these solutions may be regarded as "water," re-used in the mill, or run to waste if water is plentiful.

The Genter sludge goes to the regenerator—a lead-lined chamber having natural or forced draft connections to the absorber for hydrocyanic acid. This is a contact chamber for fixing the regenerated gases in lime water, for re-use in the mill.

When the regenerator is from one-third to one-half full of Genter sludge, sulphuric acid is added in proportion to the amount of cyanide and lime (or zinc sulphate) indicated by titrating the feed solutions, and by reference to the table shown herewith. Regeneration is aided by agitation for a period up to two hours. Samples of the regenerator solution will then be slightly acid to methyl orange. The cyanide, originally titrated in the feed solution and precipitated by zinc sulphate, will have been driven off from the regenerator charge as hydrocyanic acid gas and "fixed" as calcium cyanide ( $\text{Ca}(\text{CN})_2$ ).

### Precipitation and Cyanide Recovery Process Chemical Equivalents

	2KCN	2NaCN	$\text{Ca}(\text{CN})_2$	$\text{Zn}(\text{CN})_2$	2KCN	CaO	$\text{H}_2\text{SO}_4$	$\text{Ca}(\text{OH})_2$	$\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$
KCN*	1.	0.753	0.706	0.903	0.416	0.43	0.753	0.57	2.21
CaO*	2.32	1.75	1.64	2.1	0.965	1.00	1.75	1.32	5.14
NaCN	1.328	1.00	0.94	1.2	0.552	0.571	1.0	0.756	2.94
2NaOH	1.62	1.222	1.15	1.47	0.675	0.7	1.222	0.925	3.6
$\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$	0.453	0.342	0.32	0.408	0.188	0.195	0.342	0.2575	1.0
Zn	1.990	1.50	1.4	1.8	0.830	0.857	1.5	1.13	4.4
$\text{Ca}(\text{CN})_2$	1.416	1.066	1.0	....	....	....	1.066	....	3.129

\* KCN and CaO in solution are precipitated by their respective equivalent quantities of  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ .  
CaCN<sub>2</sub> precipitation:  $249.7 \text{ CuSO}_4 \cdot 5\text{H}_2\text{O} + 248.2 \text{ Na}_2\text{S}_2\text{O}_8 \cdot 5\text{H}_2\text{O}$  (mixed) in equal proportions precipitate NaCN, Cu, etc.  
Solubility of CaO in water is 0.14 per cent at 0 deg. C. and 0.07 per cent at 80 deg. C.  
Solubility of  $\text{CaSO}_4$  in water is about 1 part in 400, by weight.

by the lime water in the absorber. The zinc sulphate originally consumed in precipitating the cyanide and the fouling constituents in the feed will have been regenerated by the action of the sulphuric acid, so the residual sludge is filtered to recover the regenerated zinc sulphate solution. The resultant filter cake, containing base-metal constituents such as copper and iron, may be handled according to commercial valuation.

The process is cyclical, its net chemical requirement being the sulphuric acid needed to regenerate the hydrocyanic acid from the zinc cyanide precipitate, plus the small amount necessary for gold and silver precipitation with zinc, and the lime required to "fix" the regenerated hydrocyanic acid in lime water. No white precipitate can be formed to block solution flow; only the actual regeneration requires special attention, and this operation is carried out on day shift. Vacuum precipitation is unnecessary, and the precious-metal precipitate is clean and high grade. Over 95 per cent of the solutions going to the recovery plant may be re-used as fresh water in the mill circuits, which are thus kept active without the wastefulness of careful and troublesome handling of bulky solutions, which cannot otherwise be avoided except by sending fouled solutions to waste.

### Protecting Steel Tanks With Lead

A satisfactory method of protecting its many steel water tanks against corrosion has been developed by the Union Pacific Railroad System, according to the Lead Industries Association. The tanks are given a shop coat of ready-mixed red lead paint inside and out. After erection the exterior is given a brown and a black coat, both being mixtures of red lead and lampblack, with lampblack increased in the black coat.

Interiors receive three coats in addition to the shop coat. The first field coat is brown and is made by adding 10 oz. of lampblack paste, 6 fluid oz. of japan dryer, and 2 lb. of finely powdered litharge to 1 gal. of ready-mixed red lead paint. A second field coat, light brown, has the same composition as the first with the exception of the lampblack paste, 5 oz. of which is used instead of 10 oz. The third field coat, red, is the same, with all lampblack omitted.

The paint must be thoroughly mixed at the start and frequently stirred. A rather high proportion of pigment is desirable, especially on interior surfaces. Each coat must be brushed out to a thin film. Proper intervals of time must be allowed for the drying of each coat.

The litharge passes a No. 325 sieve with total residue on the sieve not exceeding 1 per cent by weight. The ready-mixed red lead-paint pigment contains 88 per cent of red lead by weight,

which must run not less than 94 per cent true red lead. The lampblack paste is 25 per cent pure lampblack by weight, balance pure linseed oil. Addition of litharge gives an extraordinarily hard paint film that does not become unduly soft by continued soaking. The ready-mixed red lead paint contains 76 per cent by weight of pigment.

Tanks are inspected annually and painted at intervals of from four to ten years, depending upon local conditions. The tank is drained and the steel cleaned, sometimes by sandblasting, but more generally by scraping and wire brushes. Brush painting is usually used. The paints described cover about 400 sq. ft. per gal. with the brush method.

## Aluminum Booms for Draglines

### Other Interesting Developments in Equipment

A major development of the year 1931 in the power shovel field was the new 18-yd. stripping shovel built by the Bucyrus Erie Company, South Milwaukee, Wis. This machine weighs over 1,000 tons and has thus far found its most extensive use in the strip mining of coal. Another development of unusual interest was the adoption of aluminum booms for dragline excavators.

#### Air Compressor of Mine Car Type

Having an over-all height above the rails of only 31 in., a new type of horizontal mine-car air compressor has been developed by the Worthington Pump & Machinery Corporation, Harrison, N. J. These compressor-cars are built with displacements of from 110 to 200 cu. ft., and will run one to three rock drills, depending on their size. The frame is made of heavy structural-steel channels and beams, electrically lock-welded. Front and rear bumpers are rounded to permit the car, when coupled, to negotiate curves without difficulty. The 110-cu. ft. car, fitted with a single, double-acting Feather Valve air compressor, weighs 6,250 lb. and has an over-all length of 115 inches. A 20-hp. motor (230-550-volt d.c. or 220-440-550-volt a.c. 60-25 cycles) drives the compressor through a V-belt drive.

#### New Electric Cap Lamps

Two companion lamps to the Edison Model H electric safety cap lamp have been introduced by Mine Safety Appliance Company, Pittsburgh, Pa. The new models are the Model J and Model K, both being officially approved by the U. S. Bureau of Mines and the Mines Department Testing Station of Great Britain. Model J weighs only 63 oz. and furnishes 26 candle power illumination. Its battery dimensions are 7½x3½x1½ in. and it is the lightest-weight mine-lamp battery of its kind available today. Model K develops a maximum of 55 candle power and is said to surpass by far, in volume of illumination, any portable safety lamp ever offered to the mining industry. The latter lamp introduces a novelty in the design of electric cap lamps in that the battery employs three cells instead of the usual two. Both models have light-weight

bakelite headpieces and double-filament highly efficient gas-filled bulbs. Both employ the Edison nickel-iron alkaline batteries, which are magnetically locked to prevent tampering.

#### A New Combination of Motor and Speed Reducer

A simple arrangement for powering various motor-driven equipment which operates at reduced motor speeds is afforded by new unit drives now available from the Westinghouse company's Nuttall Works, Pittsburgh, Pa. These drives, known as Gearmotors, consist of speed reducers combined with motors forming self-contained units only a few inches longer over all than motors alone. Advantages include economy in space requirements, easy and simplified installation, reduced number of drive parts, high efficiency of operation, and assured low maintenance requirements. Each unit includes a Westinghouse Type CS general-purpose induction motor and a double-reduction, non-planetary-type helical-gear speed reducer built onto the one-piece motor frame, forming a sturdy and rigid assembly which is supported entirely by the motor feet.

#### New Separator Works Successfully in Non-Metallics

A new magnetic separator of extra high intensity that makes separations heretofore practically impossible has been developed by the Dings Magnetic Separator Company, Milwaukee, Wis. With it weakly magnetic materials, such as slate, may be separated satisfactorily from gypsum or coal. It has worked successfully also on silica sand, feldspar, coal, gypsum, and other materials where they have become mixed with supposedly non-magnetic steel or abrasion. It removes biotite, muscovite, and pure oxide of iron from feldspar and silica and has demonstrated its value on many other combinations of materials that have always been stumbling blocks, where the alternative to leaving the objectionable ingredients un-separated has been to employ expensive acid treatment. The new machine operates on the induction principle, requires little horsepower, and has low current consumption.