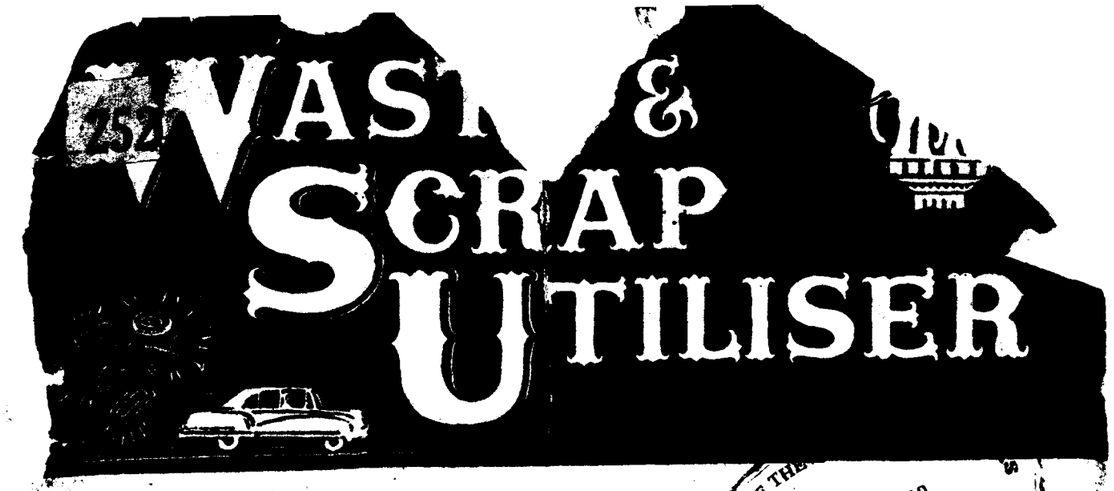

PUBLISHED MONTHLY
DEVOTED TO SECONDARY RAW MATERIALS

Vol. I MADRAS—DECEMBER 1958 No. 5

WE WISH YOU A HAPPY NEW YEAR

In this year let us pledge that we will not throw any material as waste and that we will find a use for it in one form or other. As far as possible let us not try to start an industry which requires imported raw materials. In this year at least, we must try to fabricate machineries and equipments in India instead of going for imported ones and thus save our valuable foreign currency. Let us make wealth out of waste.

THE WEALTH OF INDIA

The term "Wealth" has been defined by various authorities, both in Economics and in Sociology, in diverse ways. But when one analyses these definitions critically and strip them of all their trimmings, pomposity and jargon, it becomes clear that the term, "Wealth" connote the nation's purchasing power in comparison with the accepted international standard set by the progressive and far-advanced few. The Wealth of India, therefore, by this process of reasoning, is indexed by the purchasing power of the rupee.

It is significant that the purchasing power of the rupee is inextricably linked with the sterling, as India happens to be a memberof the Commonwealth, and so considerations of the price structure of materials shifted from England to India naturally loom large in one's mental vista. Comparative statistics bear out that the price of English imported goods in India rate as much as two to three times more than the same sent to Australia or any other country of the Commonwealth.

A small illustration may well serve to indicate the colossal drainage of Indian currency arising from this economic dependency of India on foreign suppliers 7 million tons of petroleum are being imported annually into India which statement tantamount to an expenditure of Rs. 100 crores of the Indian rupee.

What is the remedy? The only step that can save our country is either to develop cheap available motive power like coal, steam or electricity to our system of transportation or invest in the Gyromomentum system. We sincerely hope that the New Year will rectify these thoughts and contribute to the onward march of India.

Official Organ :

THE WASTE & SCRAP UTILISERS COTTAGE INDUSTRIES ASSOCIATIO

1-A, Edward Elliots Road, Mylapore, Madras-4 (India)

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(*continued on page 22*)

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WASTE & SCRAP UTILISER

VOL. 1 **DECEMBER** **No. 5**

THE LAW AND THE MAN

The evolution of the modern codified law in its relations to man presents itself for our consideration in this issue. In its oldest and crudest manifestation, it existed in the form of the law of the jungle, in which might was right, and the will of the strong man counted as the prevailing code of conduct and action. With the lapse of time, however, this rule by force, began to assume expressions and outlooks tinctured by logic and intelligence. By a process of slow but steady progress, the man of intellect and reason forged to the front ousting his uncouth rival of strength and sinew, and took over, as it were the portfolio of the codification and interpretation of the law.

The pendulum now began to swing in the opposite direction. Hitherto, the man of might weilded his muscles over his weaker fellows exacting obedience and servility from them, and obtained unsatisfactory results from hands that were often too weak and incompetent to do justice to the tasks set for them. Now the man of intellect exercised his powers of thought, reasoning and reckoning over the physically fit and yoked strength to tasks in constructive proportions and achieved results that held the world, spellbound, for a while.

Then crept in the economic factor on law-making and law-breaking: Great care became necessary in law-making and legislation became more and more involved in the thinking man's assays to compass both problems of law and problems of economics within his purview. The legislator's dilemma became more acute, as foreign greed, capital and commercial competition began to assume threatening proportion. Opposition to the foreigner was too weak, loyalties within the country were too nebulous and small wonder, that the foreigner captured markets and men alight within a fine web of economic dependence. The power and the right of legislation shifted from the native to the foreign Despot, Dictator or Democrat as the changing politics fashioned the Governmental machinery of the exploiter.

But as the old order changeth yielding place to the new victimised nations threw away the foreign yoke. Within the nation, victimised labour, aware of their rights, conscious of their importance in the economic structure and development of the nation and roused by their erstwhile oppression, rose up in arms against the capitalist and the rich

man. Labour Unions, Labour Boards, Labour Laws and various other hypocrisies came into being, calculated mainly to appease the labour under some form of specious humanity and civil chicanery. Most of these labour organisations found a ready leader in some rich man, who is nothing but the wolf in the proverbial sheep's coat. He makes speeches, sheds sympathetic tears, gesticulates wildly and spouts a lot of hot air relating to equity of distribution. He puts on this cloak of the champion of the oppressed and eggs the labourers to a state of seething discontent, so that during the ensuing pandemonuim he can press his own personal gains to advantage by using the trusting labourers as his catspaws to blackmarket his hoarded goods and or to run his other clandestine or nefarious trade. He reminds one of the overtly sympathetic Londoner fifty years ago, who made touching speeches in England concerning the need for granting independence to India. He did not believe in it though he bleated about it. Likewise the rich man, ostensibly interests himself in the poor man's affairs and exploits him to further his ulterior motives. The laws, as they exist today, gravitate towards making the rich man richer and the poor man poorer, and therefore, leave much to be desired. If this state of affairs continues, then the law of Physics. "Anything in excess will neutralise itself" asserts and the excesses of the current legal lawlessness will be neutralised. A familiar illustration may perhaps help to clarify the point. A projectile urged into space causes a dislocation of electrons contrary to the natural order and this evil finds a reaction in the form of an electronic bombardment at the location where the projectile started, and gets itself termed as some cosmic ray disease, as every living being is an electron-proton concentration of different frequencies. The laws enacted become a mockery and the courts too busy with the law become likely to side-step justice, and defeat their purpose.

A NEW PASTIME OF THE INDUSTRIALISTS

Under Section 56 of the Madras Port Trust Act 11 of 1905 goods lying unclaimed at Madras Port Trust premises are auctioned and frequent references to such auctions can be seen in the *Fort St. George Gazette*. A natural question that seems to arise spontaneously is "What are these unclaimed goods and why are they at the Port Trust premises?" These are articles imported by the Industrialists of the modern days, who, in his anxiety to save his foreign outlays and investments and Letters of credit, orders these goods at fancy prices and then leaves them as unclaimed. These industrialists are really clever and bubbling over with the grey matter. Hats off to these wizards, who can so easily beard the lions of the Ruling Party in their own den!

—An Onlooker of an Auction

A Request to the Government

No scrap should be allowed to be exported from India. Any type of scrap can be reclaimed. Rich men are plundering the wealth of the nation by way of export, with ulterior personal motives. It is estimated that several thousand tons are exported as iron scrap carrying coatings of monel, inconel and beryllium.

Do you know that you are one of the biggest foreign currency consumers. You can spend less by running your vehicle carefully, reconditioning your equipment in time, and maintaining it properly. If you have any surplus equipment which is not useful to you and used equipments which you cannot recover, please offer to us. We are willing to pay you a nominal price and one of our members can recondition the same and save a large portion of your expenses in foreign currency.

DICTIONARY OF TRADE TERMS

WOOL WASTE AND WOOLLEN RAGS

ART SERGE	... A thick furnishing fabric made from thick cross-bred woollen yarns, sometimes contains a percentage of cotton.
ANGOLAS	... Angola flannels, Union flannels. A cloth mixture of cotton and wool varying from 15—18% wool, 20—85% cotton. A twilled woollen or cotton cloth with napped surface. Also used in Rag Trade for knitted rags of wool and cotton mixture. (Sometimes Angola Stockings).
ALPACA	... A cloth made from cotton yarns and alpaca, mohair or ordinary lustre worsted yarns. Has a bright lustrous surface, used for dresses, overalls, linings, etc.
ARTIFICIAL SILK	... Fine filaments of cellulose, has a very lustrous appearance.
AXMINSTER WASTE	... Made in the manufacture of Axminster carpets.
BROKES	... Broken wool; short staples of wool from the neck and belly parts of fleece.
BURRS	... Vegetable matter in raw wool.
BRUSH WASTE	... Short wool swept up from the floor under spinning frame or machine.
BAG WASTE	... Worsted threads, usually single yarn
BAIZE	... Made from coarse qualities of wool, dyed red or green, used for screens, table covers and cheap curtains.
BILLIARD BAIZE	... Strong woollen fabric with a fibrous surface, usually dyed green and used for billiard tables.
BRILLIANTINES	... A fine class of lustre cloth, similar to alpaca.
BURR WASTE	... Waste from which burrs and seeds have been removed by carbonisation.
BERLINS	... Old fine quality knitted rags.
CHEVIOTS	... Any kind of coarse wool cloth (rags)
COMFORTERS	... Large knitted woollen garments, such as scarves, comforters, pullovers, cardigans, jerseys, etc.
CROSSBREDS	... Wool between 60's—40's qualities. (Fine crossbreds 50's—58's, medium crossbreds 40's—50's).
CIDO	... Woollen fabric in imitation of hair cloth.
CARD WASTE	... Waste rejected beneath the revolving cylinders of a carding machine, short and fluffy waste used for blending in low wool and flock wall paper.

COATING WASTE ... Worsted thread "Waste" made in weaving pure wool cloth or worsted coatings, usually two-fold.

CARBONISED RAGS ... Rags treated with sulphuric acid, hydrochloric acid or other chemicals in such a way as to destroy any vegetable matter.

CASHMERE ... Cloth made from wool of Tibetan goat. (Cloth made from fine merino wool is sometimes known as Cashmere).

COUNT ... For woollen yarns the number of skeins to the pound is the "count" (256 yards to the skein). For worsted yarns the number of hanks to the pound (560 yards to the hank).

CLOTTED WOOL ... Clotty wool, wool matted through being badly grown.

COP WASTE ... Unused or unwindable cop ends.

CADDIS ... A Scotch term for sweeping waste.

DAGGINS OR DAGS ... Clothed wool locks, matted together on the sheep by dung, etc.

DRUGGET ... A coarse woollen felt or woven cloth, generally used as a lining or protective covering for carpets and furniture.

DAGS ... *See* DAGGINS.

DEFECTIVE WOOL ... Wool containing burrs, etc., or kemps, hairs or stains, or tender wool.

DAGLOCKS ... Unclean, low quality wool locks.

DROPPINGS ... Card waste.

EXTRACT ... A fibrous woollen material obtained from wool and cotton goods from which the cotton has been extracted by carbonising.

ENDS ... Odd lengths of cloth, shorter than whole pieces but longer than "Fents".

FUDD ... Droppings from carding and condensing machines.

FLOCK ... Produced in the milling, raising and cropping of woollen fabrics, short fibres used as a mixture in spinning low weft or filling yarns or for felted woollen goods.

FENTS ... Short damaged lengths of cloth, odd lengths cut from the piece.

FLY WASTE ... Waste from spinning roller, a low quality fluffy waste extracted in carding.

FANCY CLOTH ... Cloth with either coloured threads or patterns.

FANCY WOOLLENS ... Tweed cloths, various bright colours.

FAN FLY ... Very short dusty waste collected in the fan chamber in a spinning mill.

GARNETTED WASTE ... Threads which have been disintegrated by passing through a Garnett pulling machine.

HALLINAS ... Coarse woollen covers.

HEALDS ... Are used upon a loom to lift the warp threads so that the shuttle can pass between.

HARD WASTE ... A double yarn which is more difficult to Garnett up than single yarn. (Hard spun thread waste as opposed to loose fibrous waste).

HOSIERY WASTE ... Wool threads made in the process of knitting.

KNITTS ... Knitted goods.

KEMPS ... Inperfectly developed fibres of wool, thick, brittle. Large quantity considerably lessens quality of wool.

LAPS ... Waste pieces from the ball of tops, broken lengths of silver.

LINSEY ... A cloth mixture of linen and wool.

LUSTRES ... Alpacas, Brilliantines, Sicilians, Glaces and Lustre cloth in general, a union cloth of cotton yarns and alpaca, or mohair or lustre worsted yarns (mercerised cotton cloth is sometimes known as Lustres).

LUMP (COLLOQUIAL) ... Rag sorter's working place, comprising riddle, baskets for various sorts and working space between.

MILLING PROPERTIES ... (Of woollen rags) responsiveness to thickening process (called milling or fulling) after re-manufacture. N. B.— Rags which have been repeatedly washed and subjected to heavy use lose their milling properties.

MOREENS ... A northern term for serges. Although Moreen cloth is a cotton Moire yarn, "Coarse Moreens" are known as Scotch cloth in Scotland.

MUNGO ... A short fibrous woollen material produced by grinding (or pulling) all qualities of wool suitings and other milled or felted woollen cloths.

MERINOS ... English term. Wools above 60's quality. Botany yarns are made from this.
American term. Merino yarn is made on the woollen principle from a mixture of cotton and wool. Knitted goods of cotton and wool. Woollens made from shoddy.

MUNGO RAGS ... Worsteds, serges, fine cloth, coarse cloth, linsey cloth.

NOILS ... Combers' waste, consisting of short fibres of wool.

OVERLOCKS ... Cotton seams and selvedges on knitted fabrics.

PATTERNS ... Samples of cloths.

PLAIN WOOLLENS ... Smooth-faced cloths, *i. e.*, Beaver, Melton Box and Livery cloth.

RE-WORKED WOOL ... Shoddy.

RAG WOOL ... Shoddy and Mungo.

RIDDLE (COLLOQUIAL) ... Sorting bench (with wire netting riddle inset to allow dust to fall through).

ROVING WASTE ... A soft waste left on speed—frame bobbins.

RING WASTE ... Made in ring spinning.

RIPPERS ... Those who rip. *See* RIPPING.

RIPPING ... Cutting of cloth and worsted garments to make rags free from linings and seams, ready for re-manufacture.

RAG FLOCK ... Produced by grinding or pullings rags to fibre, used for stuffing mattresses, bedding etc.

SEAMING ... Removing light and small seams and mendings from cloths and worsteds, and not only the heavier seams removed in normal process to produce rags with absolute minimum cotton content.

SEAMS ... Pieces of rag containing the sewing of cotton and wool cloth cut off by shears or other means during the process of ripping.

SHIV ... Vegetable matter in raw wool.

SHODDY ... A long, fibrous woollen material produced by grinding (or pulling) soft rags *i.e.*, knitted rags, flannels, worsted cloth, merinos, lightweight serges, cheviots.

SOFT RAGS ... Knitted rags, stockings, flannels, merinos, lightweight serges.

SLUBBING WASTE ... Short lengths of wool tops made in dyeing.

SELVEDGES ... List, selvedge, piece ends, edging of cloth.

SCOTCH CLOTH ... A Scottish term for coarse Moreens.

SWEEPING WASTE ... Sweepings from the floors of the various rooms in the mill. A short fibre flubby waste, used for blending within low woollens and flock wall-paper.

SLIPE ... Wool, recovered by lime, from the skin.

SILK WASTE ... The outer covering or cocoon which contains unreelable silk, and waste from silk reeling and silk-throwing processes.

SKELETONS ... Cloth garments from which the large 'Fleshy' pieces of cloth have been cut away, leaving only seems and linings.

STOCKINGS ... Any knitted rags.

STRIPPING ... Alternative form of "ripping", but this use is deprecated as the term is used by dyers of woollen rags to mean removing by chemicals, Processes Colour already in materials, preparatory to applying new dyes.

STEAM WASTE ... Lustrous silk waste. Waste with a sheen.

TOPS ... Long fibres of wool in silver form after combing and prior to drawing and spinning by worsted process.

THIBETS ... Merinos.

THREAD WASTE ... The thready waste from any spinning or weaving process.

THRUMS ... Weaving waste, short length produced when starting the loom.

TABS ... Narrow pieces of cloth, cut from the end of the piece of any class of woven material.

TWISTS ... Cloth made from coloured yarns twisted together.

THRUM WASTE ... The threads of woven-out warps cut from warp beams etc., often tight twist, and therefore is garnetted before re-use.

VELOUR ... Cloth made of fine wool with milled face in which texture is entirely hidden as in velours used for hats.

WATERFLOCK ... Unripped cloth, garments complete with linings, just as produced from collections of domestic rags, mostly to denote unripped cloth without worsteds.

WAREHOUSE LOCKS ... Inferior pieces of wool clipped from the wool fleece.

WOOLLEN YARNS ... Made from short fibre wool spun so that the fibres lying in all directions.

WORSTED YARNS ... Made from long fibre wool spun so that the fibres are parallel.

WORSTEDS ... Wool fabrics made from worsted yarns such as serges, gabardines, repps, charmalaines, worsted taffetas and cashmeres.

WOOLLENS ... Wool fabrics made from woollen yarns such as flannels, velours, molletons, meltons.

WOOL PACK ... Bales, bags, sacks, in which wool is packed.

YARN WASTE ... Any kind of thread waste.

CONGRATULATIONS

It is a matter of genuine pleasure for us to extend our hearty congratulations to Sri V. Emberumanar Chetty, our member, in his assumption of office as the SHERIFF of Madras.

RUBBER RECLAMATION

'SCRAP—MASTER'

Old rubber were reclaimed from automotive tyres by very many processes.

Most of them involve the use of chemicals which destroys a soluble by-product namely reinforcing fibres. A newer method mechanically separates rubber and fibre, resulting in added income for reclaimer.

Further this mechanical separation has no air, water and chemical pollution problems. Also here the residual sludge that remained after digestion of fibres no longer exists as a waste, and fibres that were digested now are available for sale to drilling contractors, the packing industry, athletic equipment manufacturers and others.

This process involves the use of sturtevant air separate. Rubber to be reclaimed such as automobile tough and burst tyres are fed into cracker rolls that tear and cut the scrap to about fraction of an inch.

After tearing and crushing action the material is carried by belt conveyor vibrating screens. During the conveyor steps the bead wires which have been stripped of rubber are removed.

At the vibrated screen the smaller size scrap is air blown to storage bins to await them move, to air separated. Over-size material is recycled through the cracker rolls for further cutting and crushing.

At regular interval by using magnetic pulleys any metal that may remain in this mutilated scrap are removed.

After passing through the second vibrating screen the sizes are further crushed by a disintegrator and then all blowned in air separator.

In the air separator, the material is carried to the centre of a revolving distribution plate which shoots the material of its outer edge in a thin, even, horizontal circular spray. A fan sucks the finer material upwards through a large opening. At the same time, a secondary lower fan wheels the upcoming materials forcing the coarser sizes away from the opening.

By regulating and controlling the centrifugal force and air currents, one counteracts and overbalances the other, expelling coarse and fine particles by different cones. This means that fibrous material is diverted to beaters and rubber particles are carried to a classification table.

In the beaters, entrapped fine rubber is removed, and the fibre is ready for garnetting and baling.

Rubber with a minimum of fibre is further defibred on the classification table which has a slightly inclined reciprocating porous deck. Controlled air is delivered through the pores, and heavy rubber particles, which remain in contact with the vibrating deck, are carried to the higher edge. The light fibre particles suspended by the air stream, flow to the lower edge of the table. Intermediate weight rubber particles, which contain some fibrous material, are discharged for reprocessing through the disintegrator and separator.

Usable rubber then is fineground and mixed with chemicals and oils for depolymerzation in horizontal autoclaves. The regulating rubber is milled on smooth face rolls into very thin sheet and then is built up into one-inch-thick slabs.

This mechanical separation method is said to produce a reclaimed rubber that retains more of the original quality of rubber than the old process of cooking the scrap material in large vats, adding chemicals and oils to devulcanize the rubber and removing the waste. Sturtevant units come in sizes from 3 to 18 feet in diameter. Larger unit has a capacity of up to 100 tons of rubber scrap an hour.

Although the idea behind reclaiming rubber is to salvage rejects and scrap from the scarce natural material, reclaim has emerged as a raw material in its own right.

In adhesives, for example, it claims advantages over new rubber. It is extremely uniform; allows faster and easier mastication and mixing than new rubber; permits quicker extrusion and calendering than both synthetic and natural rubber: and is less thermoplastic than new rubber.

INVITE CONTRIBUTIONS

Readers are requested to contribute articles and essays regarding the recovery of Chemical, Industrial, Electrical and other wastes and their utilisation as secondary raw material. They will be paid appropriately.

Editor.

PROSPECTS OF REDUCING THE COST OF PRODUCTION OF HEAVY CHEMICALS

BY

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An addition of one or two steps involving simple precipitation, heating and filtration reactions to the existing or proposed heavy chemical industries will introduce overall economies in the production of many vital inorganic chemicals. This contribution gives an outline of such possibilities.

LOWERING THE COST OF PRODUCTION OF AMMONIUM NITRATE

It is stated that the annual capacity of Nangal Fertilizer Factory will be Ammonia 90,000 tons; Nitric acid 1,63,000 tons and ammonium nitrate 2,00,000 tons or a total equivalent to 70,000 tons as fixed nitrogen per year. At Rourkela ammonium nitrate equivalent to 80,000 tons of fixed nitrogen will be produced. At Neyveli 2,00,000 tons of ammonium sulphate-nitrate and at Sindri 1,48,000 tons of sulphate-nitrate are expected to be produced annually. Instead of directly neutralizing ammonia with nitric acid to get ammonium nitrate, the nitric acid may be initially employed to produce soluble metal nitrates from minerals like rock phosphate, clay, low grade reduced manganese ore etc. and subsequently ammonium nitrate be obtained by reacting nitrate solutions with ammonia or with a mixture of ammonia and carbon-dioxide by the following procedure.

Clay, low grade bauxite or high level laterite or mixtures of these containing varying amounts of iron, silica, titania etc. are heated with nitric acid in suitable amounts and concentration, in autoclaves to dissolve out only aluminium as aluminium nitrate. The resulting aluminium nitrate solution containing only alkali or alkaline earth nitrates as impurities is treated with ammonia gas to precipitate out pure aluminium hydroxide suited for use in the production of all aluminium salts, abrasives, refractories etc., and also as a source for aluminium metal production. Ammonium nitrate is obtained in solution.

Finely ground rock phosphate is reacted with 30—40 percent nitric acid. The resulting calcium nitrate-phosphoric acid is filtered off. Potassium nitrate in calculated amounts is added to precipitate out the entire fluorine in solution as potassium fluosilicate which is recovered by filtration. The filtrate from this operation is reacted with ammonium sulphate to precipitate out calcium sulphate leaving behind a mixture of ammonium nitrate and phosphate. Calcium sulphate can again be used in the production of ammonium sulphate by the conventional procedure.

Low grade iron-manganese ores are first reduced to get a mixture of magnetic oxide of iron and manganous oxide. The mixed oxide is treated with nitric acid to dissolve out manganese as manganese nitrate. Manganese nitrate solution is separated out and then treated with a mixture of ammonia and carbon dioxide when manganese carbonate is precipitated out leaving behind ammonium nitrate in solution. Manganese carbonate can be thermally decomposed to get manganese sesquioxide which can be used as feed for ferro-manganese plants. The sesquioxide can also be leached with 5—10% mineral acids to get pure manganese salts leaving behind very pure manganese dioxide as residue for use as a depolariser in dry Leclanche cells, in the production of potassium permanganate etc.

Another equally important method for the production of manganese carbonate and ammonium nitrate solution consists in reacting the nitrogen dioxide (obtained by the oxidation of ammonia gas) with finely powdered low grade, high iron manganese ores under proper conditions to get manganese nitrate in solution, leaving a residue of iron oxide etc. The manganese nitrate solution is freed from iron etc. by adding proper amounts of manganese carbonate from the later stage of the process. The pure manganese nitrate solution is then treated with ammonia and carbon dioxide to get a

precipitate of manganese carbonate leaving ammonium nitrate in solution.

At Rourkela and Sindri all the raw materials are available and the finished products like manganese concentrate, aluminium oxide etc., can also find use as cell feeds to the closely existing or proposed ferromanganese and aluminium plants. At Neyveli and Travancore, suitable varieties of clay or clay mixtures are available for processing. Rock phosphate in Tiruchirappalli and also bone ash collected at various centres in South India can be sent to these places for processing. Low grade iron manganese ores of Sandur and Mysore can be treated. Thus the production of heavy chemicals can be combined with the utilisation of low grade minerals to reduce the overall costs of producing fertilisers, simultaneously eliminating the use of sulphuric acid in the production of fertilisers.

ECONOMIES IN THE PRODUCTION OF AMMONIUM CHLORIDE

At F.A.C.T., Travancore, 8,000 tons of ammonium chloride will be produced annually by direct neutralisation of ammonia with hydrochloric acid. It is also proposed to produce there ammonium sulphate and phosphate as fertilisers. Greater economies can be introduced by producing the mixed fertiliser containing ammonium chloride and ammonium phosphate by the following procedure.

Rock phosphate is treated with hydrochloric acid and filtered. The filtrate is treated with potassium chloride to precipitate out any fluorine as potassium fluosilicate. The filtrate from this operation is treated with ammonium sulphate to precipitate out gypsum leaving behind a mixture of ammonium chloride and phosphate. From gypsum, ammonium sulphate for use again in the process can be had by the conventional procedure. Thus, the use of sulphuric acid in the production of ammonium sulphate and ammonium phosphate can be eliminated.

In addition to the above procedure, greater economies in the production of ammonium sulphate can be had at Travancore by initially using sulphuric acid for decomposing the minerals like ilmenite and clay. The ferrous sulphate formed as byprduct in the production of titanium dioxide from ilmenite can be reacted with ammonia under proper conditions, to precipitate out iron oxide leaving behind ammonium sulphate in solution. Aluminium sulphate, obtained by decomposing clay low in iron with sulphuric acid can be converted into ammonium alum to eliminate impurities like iron etc,, and finally decomposed by ammonia to get high grade aluminium oxide which can be advantageously employed as cell feed for the existing aluminium plant at Travancore.

Wherever ammonium chloride or mixtures of ammonium chloride, low grade mineral gypsum and or inorganic manure can be successfully substituted as fertiliser for ammonium sulphate, the demand for ammonium chloride can be met economically by double decomposing ammonium sulphate with sodium or potassium chloride (recovered from bitterns) in some favourable central localities. This procedure will not only serve to produce ammonium chloride at a cost comparable to the byproduct ammonium chloride in the modified ammonia-soda process but also serve to fix sulphur as valuable sodium or potassium sulphate. The cost of production of sodium and potassium sulphates by this procedure will be practically the same as the cost of their production by heating mixtures of potash or soda felspars with byproduct calcium carbonate and mineral gypsum and subsequently leaching out the alkali metal sulphates.

FURTHER ECONOMIES IN THE USE OF SULPHURIC ACID

Wherever waste sulphate pickle liquor from iron and steel industry, low grade manganese ores and coke oven plants exist in close proximity to each other such as in Orissa, Madhya Pradesh, Durgapur etc. the pickle liquor can be made use of to leach out manganese from low grade manganese ores in the form of a mixture of manganese and ferric sulphates and this mixture can be employed to fix ammonia from coke oven plants as a mixture of manganese and ammonium sulphates with the simultaneous elimination of iron as insoluble ferric hydroxide. The clear manganese ammonium sulphate solution is treated with ammonia in the presence of carbon dioxide to precipitate out manganese as manganese carbonate leaving ammonium sulphate in solution. The manganese carbonate can be used as a suitable source for the

production of ferro-manganese, electrolytic manganese, manganese dioxide, manganese salts etc., or for preparing pure manganese sulphate from a mixture of manganese and ferric sulphate. Thus, ultimately the sulphuric acid employed for pickling can be used in the production of ammonium sulphate, manganese sulphate etc.

The process can be made still more economical by conducting electrolysis of sodium sulphate solutions (either the naturally occurring sodium sulphate after purification can be employed as a cheap source, or sodium sulphate obtained by double decomposing ammonium sulphate with sodium chloride) in the latest filter press type of vertical mercury cathode cell, cooling the anolyte liquor to—10°C to recover Glauber's salt and employing the solution containing 21% sulphuric acid and 3% sodium sulphate for use in pickling. The waste pickle liquors can then be employed for the production of manganese concentrates and ammonium sulphate or manganese sulphate as indicated. This procedure can not only bring down the cost of production of sodium hydroxide by electrolysis of sodium sulphate but also eliminate the installation of separate sulphuric acid plant to meet the requirements of sulphuric acid in pickling operations and also for fixing ammonia from coke oven plants etc. Moreover caustic soda is produced without the simultaneous production of chlorine. The electrolysis of sodium sulphate solutions in the latest filter press type of vertical mercury cathode cells at the rayon factories will make the rayon factory independent of two major heavy chemicals namely high grade caustic soda and pure sulphuric acid and also help to utilise the by-product sodium sulphate on the spot.

Any expansion programme for the production of heavy chemicals at Mysore can include similar procedures to introduce overall economies. It is favourably placed not only with respect to the raw materials but also for utilising the mineral concentrates.

ECONOMIES IN THE PRODUCTION OF HEAVY CHEMICALS WITH BITTERNS AS THE MAIN RAW MATERIAL.

Bitterns discharged from salt pans after the deposition of common salt contain a mixture of magnesium sulphate, sodium chloride, potassium chloride, and magnesium chloride. Conditions are very favourable in India to treat bitterns at the ammonia soda factories for the economical recovery of sulphur and other salts. Bitterns, after the removal of bromine, can be treated with calculated amounts of calcium chloride obtained as waste byproduct in the ammonia soda process. The precipitated calcium sulphate is reduced to calcium sulphide and is then decomposed by carbon dioxide in the presence of water to get calcium carbonate for use in ammonia soda process with the simultaneous expulsion of hydrogen sulphide. The hydrogen sulphide can be oxidised to sulphur or sulphur dioxide.

The solution left after the removal of sulphate from bitterns contains a mixture of sodium chloride, potassium chloride and magnesium chloride from which the individual components can be separated by the well known processes. A portion of the magnesium chloride can be thermally decomposed to meet the demand for dry Sorel cement with the expulsion of hydrochloric acid. Magnesium metal and chlorine can also be produced from magnesium chloride by the well-established fused salt electrolytic process.

The treatment of bitterns at ammonia soda works has the following additional advantages.

1. The sodium carbonate produced in the works can be treated with sulphur dioxide gas (obtained by the oxidation of hydrogen sulphide) to get sodium sulphite and bi-sulphite.

2. Any requirements of sodium sulphate can also be met by double decomposing calcium sulphate (obtained from the bitterns by utilising calcium chloride waste) with sodium carbonate. The precipatated calcium carbonate is used again in the ammonia soda process.

3. The requirements of sodium sulphide can be met either by reducing the sodium sulphate obtained as described in (2) or by double decomposing the calcium sulphide with sodium carbonate. The precipitated calcium carbonate is used again in the ammonia soda process.

Thus not only sulphur can be recovered economically from the sea but also valuable chemicals by the procedure outlined above.

ECONOMIES IN THE REDUCTION OF OTHER METAL SULPHATES:

Calcined dolomite or magnesite can be reacted with gypsum and carbon-dioxide in the presence of water to get pure magnesium sulphate in solution. Manganese sulphate can be obtained from low grade ores by reacting the mixture of manganous oxide and magnetic oxide of iron obtained in the conventional roast reduction procedure with ammonium sulphate solutions. The ammonia expelled in this reaction is employed together with carbon dioxide for obtaining more ammonium sulphate from gypsum for use in the cyclic process. Clay very low in iron can be decomposed with solid ammonium sulphate to get aluminium sulphate with the simultaneous expulsion of ammonia. Aluminium sulphate is leached out from the residue, purified from traces of iron if necessary and crystallized. The ammonia is employed together with carbon dioxide for producing ammonium sulphate from gypsum for use again in the cyclic process.

Aluminium sulphate obtained as indicated above can find use as such and also be employed to produce alkali metal sulphates economically. The aluminium sulphate solution is double decomposed with sodium or potassium chloride to precipitate out the alkali metal sulphate. The filtrate from this operation is evaporated and heated in a current of hydrochloric acid to get anhydrous aluminium chloride or thermally decomposed as such when alumina is left behind and hydrochloric acid is expelled.

WANTED

Non-ferrous Scrap and Residues.
High Prices Paid for uniform parcel components, Armatures, etc. Striping.
Immediate Cash Settlement.
B. No. 1001.
C/o. Waste & Scrap Utilisers
C. I. Association
MADRAS-4.

All Nickel Content Materials,
Pure nickel, Anodes, Cutting, etc., Stainless Steel, Scrap, Offcuts, Bars, Special Prices for Tungsten and Cobalt-Bearing Materials.
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Of
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Bagging, Plastic Scrap, etc.
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C/o. W. & S. U. C. I. Association,
MADRAS-4.

All Types of Ball and Roller Bearings and Steel Balls,
B. No. 1006.
C/o. Waste & Scrap Utiliser,
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PURCHASED REGULARLY
Upholstery and Motor Hide Off-cut large or small quantities.
B. No. 1009
Waste & Scrap Utiliser,
MADRAS-4.

Because:—
We are buyers for our own manufacture. We pay top prices promptly, and collect from your works. Let us quote you.
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ZINC BASE ALLOY SCRAP,
IRON, COPPER &
ALUMINIUM SCRAP.
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With or without paper.
Also Aluminium Scrap of all grades.
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Only serious prices acceptable.
One year's contract.
Waste & Scrap Utiliser,
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About 40 tons
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20 tons gaints, and passenger (20 tons)
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C/o. Waste & Scrap Utiliser.
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S/Hand Steel Shelving.
Useful condition.
B. No. 1103.
WASTE & SCRAP UTILISER, MADRAS-4.

WANTED

PURE NICKEL ANODES,
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"NIMONIC", "INCONEL",
"MONEL", Etc.,
B. No. 1022.
Waste & Scrap Utiliser,
MADRAS-4.

Job Toned of c/sk Brass woodscrews, c/sk Galvd. woodscrews, Rensable Bronze propellers. All Marine equipment.
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C/o. Waste & Scrap Utiliser
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KRAFT PAPER TOWELLING.
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MULTI-PLAY KRAFT SCRAP and CEMENT BAGS.
Free of Contraries.
B. No. 1017.
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Light Toned Shavings White and coloured Shavings, White Heavy Letters, Coloured Heavy Letters. Tabulating Cards
Prices and Tonnage to:—
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C/o. Waste & Scrap Utiliser,
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B. No. 1047.
C/o. Waste & Scrap Utiliser
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EX. A. M. Stocks.
Radio and Electrical Equipment, Instruments, particularly Rotax, Smiths and Plessey equipment.
B. No. 1019.
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All sorts of
FEATHER, FEATHER BEDS,
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Keenest prices.
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Used CINEMA FILMS
Highest Price Paid
Weather Exposed or Cleaned.
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Stainless Steel
High Grade 1000 tanks
URGENTLY.
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C/o. Waste & Scrap Utiliser
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WAY BRIDGES in condition or broken
B. No. 1074.
C/o. Waste & Scrap Utiliser,
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ACID JARS. Any number.
B. No. 1081.
C/o. Waste & Scrap Utiliser,
MADRAS-4.

Auction Sale held by Messrs. Murray & Co., Auctioneers, at the General Stores, Madras Port Trust, on Wednesday, 31st December, 1958.

Lot No.	*Description*	*Qty.*	*Price*	*Bidders.*
1.	as per Catalogue		155-00	B. Md. Kassim
3.	,,		69-00	Muniswamy Chetty
5.	,,		255-00	G. M. Lall
6.	,,		550-00	,,
7.	,,		84-00	Kader Moideen
10.	,,		265-00	,,
11.	,,		230-00	Radhakrishna
12.	,,		216-00	Muniswamy Mudr.
12A.	,,		54-00	G. M. Lall
13.	,,		355-00	P. K. Swamy
13A.	,,		605-00	R. V. Iyengar
14.	,,		879-00	Jaimulla Dean
15.	,,		725-00	Satyanarayana Chetty
15A.	,,		155-00	Champa Lall
16.	,,		115-00	Jaimulla Dean
17.	,,		580-00	Kader Moideen
18.	Compressor air complete with air receiver No. 1.		9350-00	G. Rangaswamy
19.	Machine Radial Drilling M. E. 30 No. 1.		3000-00	,,
21.	as per Catalogue		275-00	Kader Moideen
22.	Mechanic Boring, M.E. 6	No. 1	5500-00	G. Rangawamy
24.	as per Catalogue		4410-00	M. Nohov
26.	,,		725-00	Kader Moideen
28.	,,		560-00	G. M. Lall
29.	,,		999-00	Allaudin
30.	,,		4900-00	Kamalanathan
31.	,,			
34.	,,		600-00	M. K. Naina Mohd.

CONDOLENCE

We are deeply touched by the sudden demise of Dr. V. K. John, Bar-at-law, M. L. C., President of the Bharatheeya Jana Sangha. Dr. John was an outstanding son of India who worked for the interests of the nation until his last breath. He was a sympathiser of the Association and the members of the Association extend their hearty condolences to his bereaved family.

Electrolytic Recovery of Lead and Antimony from Lead Acid Battery Wastes

B. B. DEY, V. ARAVAMUTHAN and P. R. RAJAGOPALAN,

Electro-Chemical Research Institute, Karaikudi

(Continued from page 6 of the November issue, 1958)

PART II. ELECTROWINNING OF LEAD FROM LEAD SULPHATE WASTES

The electrowinning of lead from lead sulphate wastes has been investigated by several workers in the past. Possible raw materials include electrolytic zinc plant tailings, lead sulphate in the flue dust, lead sulphate from sulphuric acid plants, lead sulphate from a storage battery scrap and also primary sources like galena concentrates. In the manufacture of lead-acid batteries, considerable quantities of lead sulphate and oxide of lead known as 'battery dust' get accumulated. This constitutes another important raw material for the electrowinning of lead.

Ralston, Flynn, Tainton and Van Arsdale employed, as leaching agent, brine containing ferrous chloride, which is reported to prevent the liberation of chlorine by the formation of ferric chloride. Difficulties in the handling of hot brine, containing lead in solution, corrosion problems in large scale working, disintegration of the anodes, and above all, the contamination of the final product with impurities, all stood in the way of commercial success of the process. The practical difficulties in the hydrometallurgy of lead, based on leaching with brine, have been emphasized by Arend. He has also drawn attention to the possibility of explosions on account of the combination of chlorine and hydrogen produced during electrolysis.

Realising the insurmountable difficulties in brine leaching, Fink investigated the alkaline leaching of lead sulphate. According to him, caustic soda seemed to be the most suitable solvent for lead sulphate from a chemical engineering point of view. Fink employed 20-24% caustic soda solution for leaching lead sulphate. He has not described the purification of the lead sulphate prior to leaching. The resulting sodium plumbite solution containing also sodium sulphate, was electrolysed in an alundum-diaphragm-cell, employing lead-silver anode and lead cathode. The application of alundum-diaphragm to large scale work has limitations, since it is not resistant to the prolonged action of alkali at 60-70°C. According to Fink, the optimum conditions of electrolysis were: Temperature—55°C. Current density—15 amps./sq. ft. He did not examine any addition agent other than glue, which began to flocculate with efflux of time. He pointed out, however, that adherent deposits might be obtainable with other addition agents. Under the conditions employed in his experiments, nearly 0.8 lb. of oxides of lead of indeterminate composition was formed for every pound of lead deposited. There was thus considerable wastage of the lead value in formation of the oxide.

When a plumbite solution is electrolysed, even though a divided cell is used, lead in the anion migrates to the anode and gets oxidised at the anode surface. The advantage of the present process lies in the elimination of the formation of oxides of lead, besides getting lead in a coherent and peelable form at the cathode. On the basis of several experiments using different types of cells a new cell has been designed in which the formation of oxide is eliminated. A suitable addition agent has also been found to get efficient recovery of lead.

MATERIALS AND METHODS

The raw material employed by us for the electrowinning of lead was essentially discarded lead-acid batteries. The anode mud from the electrolytic separation of lead from high antimony lead alloy, the "battery dust" obtained from battery manufacturers, and the sulphate waste of discarded batteries have all been found to be suitable sources of lead sulphate.

In the case of battery dust and sulphate wastes from discarded batteries, the material was first ground to—200 mesh and the powder was then treated with the minimum quantity of concentrated sulphuric acid at 100-120°C.

By this process, lead was converted into lead sulphate and antimony into basic antimony sulphate. Washing the product free from acid resulted in a mixture of insoluble lead sulphate and basic antimony sulphate, free from all metals forming soluble sulphates like Zn, Fe, Cu, Ag, etc. At this stage, when scrap from lead-acid batteries containing lead silver alloy grids are employed, silver recovery is also possible. The residual mixture of pure lead sulphate and basic sulphate of antimony is leached with the spent electrolyte (from the electrowinning cells for antimony) containing hydrofluoric acid and sulphuric acid. Antimony goes in solution, leaving behind the insoluble lead sulphate which is washed and sent to leaching.

Leaching of lead sulphate.—Leaching experiments were conducted using caustic soda solution varying in concentration from 5% to 20%. Even though 5% caustic soda holds a sufficiently high concentration of lead in solution (26 gpl), it was not found suitable for electrolysis as the voltage was high. Hence in all experiments, 20% caustic soda was employed for leaching. The caustic soda solution was raised to the boiling point and a known excess of lead sulphate wastes was added (60-65 gms./litre) and the solution kept boiling for an hour and allowed to settle. The clear solution was filtered and made up to the required volume and analysed. A 20% caustic leach usually contained about 55-60 gpl. of lead-sulphate.

Recently, Anderson, Halpern and Samis have successfully investigated the dissolution of galena in caustic solution in presence of air, under pressure, with the production of pure plumbite solutions. It is also known that galena can be converted into lead sulphate by controlled oxidation in air, and then pure plumbite solution can be obtained by reaction with caustic soda. Hence, the electrowinning process can advantageously be adopted for application to primary ores also.

The cell-assembly and other details.—The electrolytic cell was a rectangular stainless steel vessel (9" × 6" × 6" on the inside). Two graphite anodes (10" × 3" × ¼") wrapped sufficiently with blue asbestos rope were kept in position by means of a grooved perspex sheet kept at the bottom of the vessel. The stainless steel cathode (9" × 3" × 1/16") had a perspex frame surrounding it on three of its edges to an extent of 1/16", in order to eliminate "treeing" at the edges. The bottom edge of the stainless steel cathode rested on the groove of the perspex sheet at the bottom. The two anodes and the cathode were kept rigid by means of two perspex strips, fixed to the top of the vessel. A glass stirrer with a span of 1¼" was used to agitate to electrolyte turbulently, and is worked by means of a F. H. P. motor.

Concentration of leaching solution Vs. voltage.—To start with, liquor obtained using 5% sodium hydroxide solution was electrolysed in the set-up. At 12 amp/sq. ft. current density, the voltage at 85-90°C was 2.9. Since lead was rapidly depleted in the electrolyte, the voltage started rising. Hence in subsequent experiments 20% caustic soda was employed for preparing the electrolyte. Glue was employed as the addition agent. When the addition agent was used in the concentration of 0.2 gpl, there was considerable "treeing". The "treeing", though decreased, was still considerable when the concentration was increased to 1 gpl.

Rosin as addition agent.—Since glue got floculated and "treeing" could not be eliminated, the use of rosin as addition agent was examined. Concentrations ranging from 0.25% to 1% were tested and 0.25% was found to be of optimum value. With lower amount the deposit was not adherent.

Current density.—The effect of current densities varying from 5 amps/sq. ft. to 12 amps/sq. ft. was studied. At 5 amps/sq. ft. the deposit got actually plated and was quite smooth. At 12 amps./sq. ft. there was slight treeing at the edges, in spite of the addition of rosin. A current density of 8-10 amps./sq. ft. was found to be optimum.

Temperature.— Fink *et al* carried out the electrolysis at 50-60°C. It was, however, found advantageous to maintain the temperature at 85-90°C, since this led to a lowering of the cell voltage, without affecting the current efficiency.

Duration of electorlysis.—Experiments were conducted varying the duration of electrolysis from two hours to eight hours. The voltage and current efficiency did not show appreciable variation unless the lead concentration fell below 10 gpl. Subsequent experiments were done for eight hours continuously, maintaining the lead concentration in the electrolyte above 10 gpl.

"Strip" of the solution.—These experiments were conducted for eight hours under the optimum conditions. The lead concentration in the feed varied from 40 to 45 gpl. and the concentration in the spent electrolyte was about 10 gpl. A strip of 30 gpl. was obtained in all these experiments.

The optimum conditions for the electrowinning of lead are:

1.	Electrolyte :	20% caustic soda leach-liquor containing 45 gpl. of lead.
2.	Anode :	Acheson Graphite.
3.	Cathode :	Stainless Steel.
4.	Cathode current density :	8-10 amps/sq. ft.
5.	Temperature :	85-90°C.
6.	Addition agent :	0.25% of Rosin in solution.

The optimum current density of 8-10 amps/sq. ft. could be maintained at a cell voltage of 1.3-1-6. The current efficiency obtained under these conditions was 95-100% with a D. C. power consumption of 0.17 KWH per pound of lead deposited.

The laboratory scale work on electrowinning of lead from lead sulphate wastes has been completed. Several firms manufacturing lead-acid batteries like Messrs. Bharat Batteries & Company, Calcutta, Messrs. Oldhams & Sons, Madras and Messrs. Amco Batteries Ltd., Bangalore, have evinced interest in the process This process, in conjunction with the process for the electrowinning of antimony is proposed to be studied on a semi-pilot-plant scale in order to adapt the same for commercial operation.

A patents application covering our rights of these processes, has been filed.

Re-printed from 'I. M. J.'

Auction by Messrs. Murray & Co., at the Medical Stores Depot, Naval Hospital Road, on Wednesday, 17-12-58.

Lot.	*No.* *Items.*	*Qty.*		*Price*	*Name of Purchaser*
1.	Undah (Tank, Aluminium)	6	Nos.	155-00	Varadhan, Kandaswamy Koil St.,
2.	Still Stokes for Distilled Water	1	No.	260-00	R. V. Iyengar
3.	Roller Mill	1	No.	105-00	,,
4.	Edge Runner	2	,,	1450-00	,,
5.	Gun Metal Bearing Weighing 165 lbs.	23	prs.	260-00	,,
6.	Barrows Hand (Broken)	1	No.	6-50	Kuppuswamy
17.	Broken glass	1	lot.	230-00	Muniswamy Chetty of Choolai.
20.	Tins square 1 gallon	850	Nos.	180-00	Thangavelu Mudaliar, Drum Merchant.
21.	Drums G. I. (1 Cwt/cap)	120	Nos.	320-00	Muniswamy Chetty of Choolai.
22.	Glass Carboys of sorts	218	,,	330-00	Annamalai
23.	Drums Iron 56 lbs.	56	,,	155-00	Lakshmana, Wall Tax Rd.
24.	Drums 5 gallons (Turpentine)	323	,,	655-00	R. V. Iyengar
25.	Drums (Creosote) 5 gall.	40	,,	75-00	Guruswamy Chetty
26.	Drums Iron 56 lbs	47	,,	31-00	Muniswamy Chetty, Choolai.
27.	Drums Iron Narrow mouth 45 galls. ( )	189	,,	1910-00	R. V. Iyengar
30.	Drums Iron.	85	,,	160-00	Lakshmanan, Wall tax Road.
38.	Iron Scraps	2	Tons.	375-00	M. Muniswamy Chetty, Choolai.
39.	Gunnies Empty	3500	Nos.	1255-00	G. M. Lal, Tondiarpet.
40.	Gunny Scrap	1/2	Ton.	155-00	,, ,,

NEWS CORNER:

SUPPLIES OF NICKEL

World output of nickel has now overtaken its demand. Industry can therefore plan ahead, safe in the knowledge that nickel is available and

will continue to be available.

An important contribution to this improved situation will be made by the new nickel deposits now being developed in Manitoba by the International Nickel Company of Canada Limited.

EFFECT OF CHEMICAL CLEANING ON STAINLESS STEEL CONDENSOR TUBES

J. P. Engle, C. F. Reich and A. C. Shoults: 'Effect of Velocity of Acid Water on Condensor Tube Corrosion'.

Proc. Engineering Soc., West Pennsylvania, 18th Annual Water Conference, Pittsburgh, Oct. 1957; 8 pp.

Impurities frequently present in water used as a coolant for heat exchangers cause formation of deposits on the surface of the tubes. The resultant loss of efficiency, the degree of which depends upon the thickness and type of the deposit, necessitates periodic cleaning, which may be effected by mechanical or by chemical means. The investigation reported in this paper was carried out to determine whether chemical cleaning would have a deleterious effect on the corrosion-resistance of the tubes; this effect was assessed by measurement of loss in weight caused by circulating an acidic cleaning solution through tubes made from typical materials of construction. Circulation was controlled in such a manner as to minimize extraneous effects which could be caused by cavitation, aeration, etc.

The solvent (a 5 wt. per cent. Solution of inhibited hydrochloric acid in water) was circulated for 6 hours, at velocities of 2, 4, 6, 8 and 10 ft./sec. (0·6, 1·2, 1·1 and 2·4 m/sec) through 12-in. (30-cm.) long tubes of six tyres of heat-exchanger tubing: copper, Admiralty brass, Muntz metal; 0·13 per cent. Carbon steel; molybenum-containing and titanium-stabilized 18-8-types of chromium-nickel stainless steels (XXX A. I. S. I. Types 316 and 321). The experiments were carried out at 150.F. (66 C), and, for comparison, tubular specimens were exposed also under static conditions for the same time and at the same temperature.

Corrosion rates under turbulent-flow conditions were found to be higher than under static conditions. Rates for the copper-alloy specimens were not significantly greater at the higher velocities used than at 2 ft./sec. At 2 ft/sec. the carbon and stainless steels exhibited approximately the same increase (*vis-a-vis* static corrosion) in corrosion as the copper alloys, but at higher velocities rate of attack of the steels slightly increased: the extent appeared to be a liner function of velocity.

The maximum corrosion rate for any of the materials tested (that recorded for the carbon steel) was equivalent to penetration of 0·000035 in./hr. (0·0009 mm./hr.), which is considered negligible. The authors therefore conclude that heat-exchange equipment constructed in the materials studied may safely be cleaned by circulating hot inhibited-hydrocloric-acid solutions the resulting metal loss will be less than might be expected to occur during operational periods.

REGENERATION OF POISONED NICKEL CATALYSTS

Nickel, copper, cobalt or iron catalysts which during catalytic hydrogenation or dehydrogenation, have been poisoned by metallic sulphides, are restored to the active condition by treatment with liquid formic acid. The formic acid is passed over or through the catalyst in a current of an inert carrier gas (or in a static atmosphere of similar type). The flow of formic acid is then discontinued, and excess acid, together with the hydrogen sulphide formed by decomposition of the metallic sulphide, is driven off by the passage of an inert gas or hydrogen. It is emphasized that the formic acid must be maintained in the liquid state: treatment by the acid in the vapour phase is less effective.

PROTECTION OF MOLYBDENUM FROM OXIDATION

An adherent oxidation-resisting coating, claimed to posses high resistance to impact, abrasion and thermal shock, is produced on molybdenum (or alloys containing molybdenum) by flame-spraying the basis metal with a powdered nickel-silicon-boron alloy of the following percentage composition: carbon 0·05-0·10, silicon 2·5-4·0, boron 1·5-2·2, remainder nickel. The sprayed component is

heated to the fusing temperature of the coating (about 2100·F. : 1150:C), causing the powdered alloy to melt and form a metallurgical bond with the basis metal. Prior to spraying, the surface should be electropolished and finally roughened (by gritblasting). Both flame-spraying and heat-treatment should be carried out in a reducing atmosphere, and where the component is of irregular shape it must be rotated during the fusing operation, to ensure an even coating. The particle size of the nickel-silicon boron alloy should not exceed 200 mesh, and the final hardness of the coating should not be greater than 40 Rockwell C. A particular application of the process is the coating of gas-turbine blades.

From NICKAL—BULLETIN.

ASSOCIATION CORNER :—Continued

A NOTABLE EVENT

In the auction held at Port Trust, Madras on 31-12-58 Lot Nos 18, 19 and 22 Compressor Air complete with Air Receiver, Machines Radial Drilling M.E. 30 Machines Boring M. E. 6 were bid in the name of Sri G. Rangaswamy by Sri Lakshmipathy. Though the machines were old they were certainly unworthy of being 'auctioned' and they deserve to be renovated to working order. Interested parties **please contact Lakshmipathy, Basin Bridge, Madras.**

The modern times seem to be full of surprising events. Among them, perhaps, one of the most notable features is that big businessmen are purchasing through auction under fictitious names or by means of stooges, presumably because they are afraid of an imaginary tax evil. Government will be well advised to introduce Auction licences to *bone-fide* bidders at auctions and to insist through legislation that biddings should be done in the name of the licence Number. The 1600 scrap merchants in the city at the rate of Rs. 100 each for annually renewable licence will get the Government Rs. 160,000 from a clean and evasion-proof source.

Regd. No. M. 7048

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1959

JANUARY

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FEBRUARY

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MARCH

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APRIL

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MAY

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JULY

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AUGUST

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SEPTEMBER

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OCTOBER

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NOVEMBER

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DECEMBER

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