

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included \$3 20
One copy, six months, postage included 1 60
Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at \$3.20 each; additional copies at same proportionate rate. Postage prepaid.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly; every number contains 16 octavo pages, with handsome cover, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, postage paid, to subscribers. Single copies 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of seven dollars. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter. Address MUNN & CO., 37 Park Row, N. Y.

Subscriptions received and single copies of either paper sold by all the news agents.

The Postal Union.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European states; to Japan, Brazil, Mexico, and all States of Central and South America. Terms when sent to foreign countries, Canada excepted, \$4 gold, for SCIENTIFIC AMERICAN 1 year; for both SCIENTIFIC AMERICAN and SUPPLEMENT, \$9 gold for 1 year. This includes postage, which we pay. Remit by postal order or draft to order of Munn & Co., 37 Park Row, New York.

VOL. XXXVIII, No. 12. [NEW SERIES.] Thirty-third Year.

NEW YORK, SATURDAY, MARCH 23, 1878.

Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as Alcohol, reagent for; Astor library; Astronomical observations; Bath, Bozerian's shower; Belt lubricator; Belt explosion commission; Bellows, evaporative power of; Book notices; Business and personal; Car lighting; Cast iron, mending; Cementing metal to wood; Chestnuts as food; Chloroform; Clothes mangle; Communications received; Dandruff; Decorating ease; Deepening without digging; Desert, utilizing; Ditching machine; Divining rods; Electroscopes; Exposition at Sydney; Eyes of reptiles and fishes; Floor wax; Gearing, new; Gilbert elevated railroad; Helioscope, improved; Herald weather bureau; Hose coupling; Hydrocarbons in lava; Inspectors of steam vessels; Inventions, agricultural; Inventions, mechanical; Inventions, new; Inventors, work for; Isinglass; Lenses; Liquefaction of gases; Liquid calorimeter; Lithographic crayons; Locomotive works; Lower levels; Machinery, coating for; Melting and casting; Microscopic slides; Milk, setting; Moon rising in West; Muscular power; Notes and queries; Nuts and screws; Oil hunting; Ores, working; Paris Academy prizes; Paris green; Patent law, proposed changes; Patent office models; Patents, official list; Poison, neutralizing; Poisonous candy and beer; Polar expedition, Bennett's; Polar expedition, Howgate's; Propeller and dock attachment; Pump, Worthington's duplex; Saccharometer; Solar parallax; Spontaneous generation; Steam engines and boilers; Stamping machines; Stupor, repeated; Survey of N. Y. boundary; Temperature, measuring; Temperatures at 831; Tide of Lake Superior; Tool, new; Tunnel, Sutro; Vinegar, clarifying; Waterproof cloth; Weaving machines; Wolf, red; Wood, polishing.

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 116,

For the Week ending March 23, 1878.

Price 10 cents. To be had at this office and of all newsdealers.

I. ENGINEERING AND MECHANICS.—Steel Torpedo Boats. Messrs. Wigzell, Halsey & Co.'s Boats. Action of Salt Water on Steel. Miners' lamps and particulars. Engines, Boilers, and Screws. Apparatus for Discharging Greek Fire. The Torpedoes. Ventilating Apparatus. Illustrations. Progress of Flying Machinery.—Messenger & Churchward's Steam Engine. 1 illustration.—Vertical Engine with Reversing Gear. Constructed by F. W. TURNER. 10 illustrations. Improvement of the Mississippi. By J. B. EADS, C.E. An address before the New Orleans Cotton Exchange. The River Slopes at New Orleans. Red River, Cairo, and St. Louis. Causes of Retardation of the Current. Regulation of Current and Prevention of Floods. How to Dispose with Levees. An explanation of the laws governing the river's flow, and the proper method of curbing it. Progress of Lumber Flumes. Their Construction, Cost, and Utility. The Magnitude of the Lumber Industry of the West. Chimney Construction. A paper read before the Society of Civil and Mechanical Engineers by J. M. BANCROFT. Temperature of Escaping Gases. Size of Chimney Foundations. Townsend Chimney, Port Dundas. St. Rollax Chemical Works Chimney, Glasgow. Dobson and Barlow's Chimney, Lancashire. Edinburgh Gas Works Chimney, West-merfield & Co. Glasgow. Factory Chimney, Preston. Mitchell Bros. Chimney, Manchester Road. Capertown Linen Works Chimney, Dundee, with construction, dimensions, and cost of each. Protection from Lightning. Methods of Straightening, etc. Preventing Honeycombs in Castings. Explosions in Coal Mines. How blasting drives the lamp flame through the gauze.—The inventor of the Irish Car. Biographical Sketch of Charles Blancani. A remarkable career. II. TECHNOLOGY.—The Technology of the Paper Trade. By WILLIAM ARNOT, F.C.S. Lecture III. Washing, Bleaching, Beating, Loading, Sizing, Coloring. The Hollander or Beating Engine described at length. The Bleaching Powder. Bleaching with Chlorine. The "Antichlore." Kaolin. Resinate of Alumina. Resin Soap. A clear practical description of all the processes and apparatus. Ceiling of a Bouloir of a Villa in Wiesbaden. 1 engraving with description of colors.—Soap and Soap Plants.—Natural Amber. By M. REBOUX.—On a new Thickener. By M. G. VANCHER.—Blue Black on Garments with Cotton Warps.—Loupes.—Cocoa-nut Fiber as a Paper Material. By M. PRUD'HOMME.—On Electricity in Dyeing. By M. L'ABBE VASSART.—Glycerine in the Fixation of Indigo. By M. PRUD'HOMME.—Appearances vs. Realities.—Improvements in Photographic Lenses. By FREDERICK VON VORGLANDE. 1 illustration.—Rapid Emulsions.—Suspensions. Solution, and Chemical Combination. By WILLIAM DURHAM, F.R.S.E.—Manufacture of Iodine, Bromine, Nitrate of Potash, and Soda. By THORWALD SCHMIDT.—Coal and its Components. By Professor BARRE.—Copper with the aid of Waste Products. By HUGH M. WILSON.—The Liquefaction of the Gases.—Soda-ash Potash from Chlorides. By M. J. BOHLIG.—Glass-melting Ovens.—To keep Size and Glue from Putrefaction. III. MISCELLANEOUS.—The Mosque of St. Sophia. A description of one of the most magnificent structures of the world. Ice-house and Refrigerator. Directions and dimensions for a well built structure, with illustration of cold-house intended to preserve fruit from season to season, with a filling of ice once a year.—House Grapes. Varieties for Early, Second, and Late Vineries.—The Chinese Yam.—Stately Seed Plants. Mr Stanley. A concise sketch of his great African expedition, and the valuable discoveries made. IV. CHESS RECORD.—Biographical Sketch and Portrait of Charles H. Wheeler, of Ill., with one of his enigmas.—Sans Voir.—Two Problems by Samuel Loyd.—Game between Blackburne and Ford.—Game between Zukertort and Minchin.—Solutions to Problems. Remit by postal order. Address MUNN & CO., 37 Park Row, New York.

IMPROVEMENTS WANTED IN WORKING GOLD AND SILVER ORES.

But few of the writers who treat of the working of gold and silver ores do more than describe the practiced methods, without attempting to criticise them or to suggest possible improvements; and especially is but little stress laid by any of them upon a point which seems to us to constitute one of the most necessary factors to successful working. We allude to fine comminution or pulverization of the ores.

The discovery and consequent working of our gold and silver mines introduced to us the prevailing methods and machinery of countries where cheap labor and lack of competition have always restrained inventive talent and conserved traditional ideas. In our ignorance and inexperience we were forced to accept and adopt these unsuitable guides, and, the choice being apparently justified by some isolated successes, the so-called "practical miners" seemed for years to be committed to a system of defence which gave no quarter to new ideas and improvements.

In evidence, however, that education, observation, and experience are gradually becoming substituted for the old order of things, we now find among mine managers a hopeful and growing belief that the science of metallurgy has not reached its limits; and, not seldom, a modesty of opinion which is most promising of progress and success.

It may not then be premature to inquire whether the stamps and pans of the present epoch satisfy the conditions for which they were intended. Because they are of simple construction and require but little intelligence or care on the part of superintendent or workmen, they have, naturally, maintained a preference over all other machines designed for the same work, a preference which has been strengthened by their successful use in mines of exceptional richness and celebrity.

And yet it may be fairly questioned whether experience has not demonstrated that a very frequent if not a principal cause of non-success has not been because these machines have failed to comminute the ore to the fineness requisite for an economical separation of the precious metals.

It is stated that some coarse gold ores have yielded nearly their assay value when reduced only fine enough to pass through a 10 mesh sieve, or 100 holes to the square inch.

A few years since preference was given to the 40 mesh sieve or screen for stamps, =1,600 holes per square inch, in successful mines. Now the 60 mesh is generally advocated, an evidence of progression which is very encouraging. From the stamps the ore, gold or silver, goes to the amalgamating pan or to the chlorinator. In the pans it is still further comminuted while being ground or rubbed into the mercury. This further comminution, slight as it is, as is apparent on an examination of the "tailings," is effected, however, at a most disproportionate expense; the cost of the wear on the pans being three or four times greater than on the stamps, for in grinding or rubbing the hard quartz or other stone has the advantage of iron. But the "tailings" still are sand, not powder, and these particles of sand may, and in many instances do, hold enveloped smaller particles of the precious metals which further comminution would have exposed to the action of the quicksilver.

The most approved writers on the subject agree that when the ores are in the most finely divided state the most satisfactory results are obtained in chlorination. But this assertion is not made when amalgamating in pans is treated of, because the pan process is a very imperfect one, and is not adapted to finely powdered ores.

Phillips says that in amalgamating the pan process gives better results than any other (naturally enough where stamps are used), and yet that the yield of the metal rarely amounts to 75 per cent, and that the average scarcely exceeds 65 per cent, and that the "tailings" from the pan process, after being exposed to the atmosphere for a few months (becoming further disintegrated), may sometimes be again advantageously worked over, thus increasing the total product to 85 per cent.

Küstel says that "not more than 50 to 60 per cent of the silver is ever obtained by this process; if it is higher it is owing to the presence of gold or silver glance." "The result of the operations depends considerably upon effecting a more or less perfect grinding in the pans."

The size of the apertures in the stamp grating or sieves, says Phillips, varies to a certain extent in conformity with the particular views of the superintendent of the mill on that subject.

It seems evident, then, that much finer comminution—say through a 90 or 100 mesh—would, in many instances, add 20 to 30 per cent to the product of mines now profitably worked, and would assure profits to many others which have been worked at a loss. But as the combination of stamps and pans cannot effect this, and as, even if the stamps were effective, the pans could not work such fine powder successfully, other machines must, in time, supplant them.

Stamps and pans are indispensable to each other, but stamps cannot economically make a fine powder of the ore so that all the metal shall be liberated from the matrix, nor can the pans successfully manipulate anything finer than sand. Both a new comminutor and a new amalgamator are needed.

It seems to us that the first principle of successful working is a thorough separation of the metal from its envelope, and, next, a presentation of the metal to the quicksilver without the rubbing and grinding which create "flouring" and "slimes."

WILL OUR MOON EVER RISE IN THE WEST?

When the periods of Encke's comet were found to be shortening it was suggested, by way of explanation, that the cause might be some appreciable resistance to the comet's motion by the luminiferous ether, it being one of the paradoxes of astronomy that resistance must cause a planet's motion to be accelerated. But this explanation was open to two serious objections: there was no other occasion for suspecting such action on the part of the luminiferous ether, and subsequent observations and computations showed that the quickening of the comet's motion was not uniform. In some of its periodic revolutions the velocity of the comet was accelerated, in others no acceleration appeared. Obviously some cause acting irregularly is at the bottom of the puzzle.

When it was discovered that the inner moon of Mars had an anomalously rapid motion, revolving around its primary three times while the planet revolved on its axis once, the puzzle rose to a problem of the most serious magnitude. Such a flat contradiction of what should have been expected, according to the nebular hypothesis, would be little less than fatal to that hypothesis unless it should appear that some cause had been acting with special force to shorten the radius of the moon's orbit and so accelerate its motion.

The most reasonable explanation of the anomaly yet offered is that of Professor Doolittle, of the United States Coast Survey; and his suggestion answers equally well for Encke's comet. Professor Doolittle rejects the hypothesis of resistance on the part of the luminiferous ether, since that substance, whatever it may be, is so different from ordinary matter that it is scarcely proper to say what is credible or incredible in regard to it. There is, however, in the interplanetary spaces a well known form of matter, in quantity presumably sufficient to produce the effects observed, namely, the matter of aerolites or shooting stars. It is well known that a larger number of these bodies strike the earth in front than in the rear, and it is quite possible that the impact of these bodies may cause resistance to planetary bodies sufficient to shorten their radii and accelerate their velocities. This action would tend to increase the relative velocity of satellites in three ways: (1) by striking the satellite and increasing its velocity by making it revolve in a smaller orbit; (2) by striking the primary, and thus increasing its mass and its attraction of the satellite; (3) by increasing the mass of the primary, and thereby consuming its original velocity of rotation through the taking up of this addition to its mass. However slight may be the average annual effect thus produced, any assignable diminution of radius and increase of velocity is thus attainable in a sufficient number of years.

By reason of its going faster than the surface of its primary the inner moon of Mars must, to an inhabitant of that planet, rise in the west and set in the east. And to this condition all the planets and satellites are destined to come if the causes now in operation continue to operate as in the past. Some curious changes may fall to the lot of our earth if the meteoric rain is not abated. The time will surely come when our moon, too, will rise in the west and set in the east. But before that there must be a period, perhaps very long, when the moon will revolve around the earth just once a day, and consequently hold an unvarying position in the sky, visible to half the world, invisible to the rest. Possibly during this period it may happen to fall in the shadow of the earth, and so suffer eclipses of long duration. Or it may chance to fall between the earth and the sun and be invisible save in slow eclipses of the earth's chief source of light and heat.

All this assuming that the meteoric storm goes on as heretofore. But Professor Doolittle suggests that after all the minor moon of Mars may continue as now an exception. It is known that aerolites belong largely, perhaps wholly, to the solar system. If so, their number must be finite and exhaustible—may be they are already nearly all picked up. Such being the case the acceleration of planetary motions through their action must gradually come to an end. This danger to the stability of the solar system will cease; and though our remote descendants will miss the sight of a moon rising in the west, their lot will not be without its compensations.

WORK AHEAD FOR INVENTORS.

It has been a favorite dogma with speculative philosophers that the surest road to human improvement and happiness lies through a limiting of man's wants. All our troubles and most of our crimes, they tell us, arise from the multiplicity of our artificial needs and desires—from our complicating life with innumerable inventions.

A practical philosopher, though a transcendentalist, has a truer conception of the order of human progress and the conditions of human happiness. The hope of the future rests not on Arcadian simplicity—an impossible civilization of bare-backed and empty handed philosophers—but on the continued conquest of the materials and forces of nature, and the widening of all men's wants, until every possibility of art and nature shall be made tributary to everyday life.

Emerson, in his latest utterance, "The Future of our Republic," takes this standpoint, and hints of the predominant part to be played by inventors in the great drama of the future. In the effort to meet one want a thousand others may be created and satisfied; and any one of these may mark an enormous advance in the progress of civilization and the elevation of human existence.

"Our modern needs," says Emerson, "stand on a few