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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 aërolites 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 aërolites 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 every-day 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

staples. In our war one of these was exaggerated in importance—cotton. And what is cotton? One plant out of some two hundred thousand known to botanists, vastly the largest part of which are reckoned weeds. And what is a weed? A plant whose virtues have not yet been discovered. Yet every one of the two hundred thousand plants probably is yet to be of utility in the arts, as Bacchus of the vine, Ceres of the wheat. As Arkwright and Whitney were the demigods of cotton, so in time there will yet be an invention to every plant. There is not a property in nature but a mind is born to seek and find it. There is not a plant in the whole magazine of material nature that cannot be made a power in the hands of thinking men; and every new application is equivalent to a new material."

There is no danger that the inventor will ever lack material or opportunity, or that the profession will ever be overcrowded. And we believe that, in the long run, the common wisdom of civilized men will never suffer these, the highest benefactors of their kind, to be robbed of the fruits of their labors, or unfairly weighted in their struggle for material recompense.

THE NEW YORK HERALD'S BEST WORK.

If asked to name the most notable illustration of modern newspaper enterprise we should mention—not the achievements of Abyssinian or Bulgarian war correspondents, not the relief of Livingstone, not the survey of the Equatorial Lakes of Africa, not Stanley's conquest of the Congo; no, nor even the *Herald's* latest project to attack the north pole. We should name a service to humanity greater than any of these, and one less liable to suspicion as to its motives; that is, the work of the *Herald's* Weather Bureau. In this we find not only the noblest exhibition yet made of newspaper enterprise, but one of the most significant achievements in modern practical science.

A few days ago the *Herald* gave a review of the first year's work of its weather service, with a complete list of the warnings and predictions transmitted by cable to Europe, with the manner of their fulfillment.

The first warning issued was dated February 14, 1877, predicting the arrival of a storm on the European coast five days later. The prediction was fulfilled to the letter. During the ensuing three months eleven more warnings were cabled, and each was justified by the event. During May, June, and July, sixteen warnings were sent, and but one proved out of time. From August, 1877, to January, 1878, out of nineteen predictions cabled, seventeen were completely fulfilled, one was generally fulfilled, and one failed, the failure being due to a miscalculation of the progress of a slow cyclonic storm from the southwest. Thus out of forty-six warnings only two wholly failed of complete or partial fulfillment. Of the forty-four successes thirty-one were correct in every particular, eight were correct in general, and five were partly fulfilled by the arrival of storms on sections of the European coasts, but not affecting other sections to which their influence was believed likely to extend. It certainly speaks well for the truth both of the observations and the theory on which these predictions were made that over ninety-five per cent of them were fulfilled, and as nothing succeeds like success, it is not surprising that the warnings, which were received at first with derision, are now published regularly in the leading commercial and agricultural papers of England and France, and also find a place in the official International Bulletins of the Observatories of Paris and Brussels.

The storm movements on which the warnings are based are few and simple. Except in the Mediterranean regions the weather of the countries to the east of us is chiefly determined by the weather of the American continent, and as the telegraph outspeeds the wind the storms approaching the European coast can usually be foretold days in advance of their arrival. Nearly every storm that strikes the Norwegian, British, French, and Spanish coasts has affected in its course the weather of some portion of the United States or Canada. These storms generally strike the coasts northward of the Bay of Biscay, traveling in a northeasterly, easterly, or southeasterly direction. Those which come from the southwestward are usually, but not exclusively, of equatorial origin, or pass over the American continent by the southward route of the gulf from the Pacific Ocean. Cyclonic storms, such as the one which devastated southern Texas in 1875, take very direct courses toward Europe from the southwest. But instances are by no means rare of storms that have passed over the lake region from the northwestern territory and the Pacific, being carried southeastward to comparatively low latitudes, and then northeastward so as to reach Europe from the southwest.

After storms reach the European coast they pass either over Norway toward Northern and Central Russia, or eastward over Denmark and the Baltic to Northern Germany or Southern Russia, or else southeastward over the English Channel, the Netherlands, and France to Central Europe and the regions of the Danube Valley and Asia Minor. Nearly all the storms that affected the belligerents in Bulgaria during the recent campaign in Turkey were of the latter class.

After a protracted comparison of weather reports on both sides of the Atlantic, supplemented by observations of ship captains on the Atlantic and the Gulf, the *Herald* Bureau was able to deduce the laws of Atlantic storm movements on which its weather predictions and European warnings are based. From their scientific, not less than their commercial and agricultural value, these warnings are among the most notable achievements of the age.

THE HARVEST OF THE SEA.

At the meeting of the American Fish Culturists' Association, Professor G. B. Good gave statistics showing that the fisheries of this country yielded in 1876 a grand total of nearly thirteen hundred million pounds, valued at over $75,000,000. First in prominence were the oyster fisheries, the products of which were valued at $50,000,000. When it is remembered that to a large extent the oyster crop depends on artificial planting and systematic cultivation, the suggestion that the government ought to take proper steps to secure to the owners of oyster grounds a defensible right to the products thereof seems no more than just and reasonable. It is something new, to be sure, to grant individual title to land below low water mark; but since industry has given to such land, over large areas, a value equal to that of any dry land, and since the cultivation of such reclaimed sea-bed adds enormously to the common food supply, it would be but simple justice to put the sea farmer on the same footing before the law as the upland farmer. The legal right of an oyster planter to the ground he cultivates and the crop he produces should be put beyond dispute; and its wholesale invasion, now so common wherever oyster cultivation has been attempted, should be made impossible. It is no less than a national disgrace that an industry so honorable and useful should be practically outlawed.

Compared with the oyster crop other fisheries are of small value. The cod fisheries yielded in 1876, according to Professor Good's figures, $4,825,540; the whale, $2,841,000; the mackerel, $2,375,262; the menhaden, $1,657,790. The yield of the Great Lakes is valued at $1,600,000. Of river fisheries (shad, salmon, etc.) no estimate is given. The lobster catch is valued at $1,000,000. Of the various other shell fish (clams, scallops, etc.) no mention is made. The number of vessels employed in our fisheries is set down as 2,188, with a tonnage of 80,000, clearly an underestimate.

PATENT OFFICE MODELS.

The matter of providing accommodations for models in reconstructing the burned portions of the Patent Office will shortly come before Congress. Suitable apartments for the storage of those already on hand will have to be arranged, and some provision should also be made for the large annual increase in their numbers, which before many years will cause the room now capable of being rendered available to be insufficient. The new quarters will, of course, have to be constructed with especial view to their purpose, and so built as to protect their contents from the recurrence of such disasters as the recent fire. This will involve expenses and require consideration, which will be unnecessary if the obligatory furnishing of models in all cases is to be done away with, and therefore the present is a fitting time for the careful review of the arguments advanced in favor of this proceeding.

We recently gave a brief summary of Mr. H. Howson's very able pamphlet on the subject, and we now recur to the same in order to examine more fully some of the principal considerations which he suggests. Referring to the anomalous state of affairs now existing under the present system, he says: "An examiner, in acting on an application for a patent, has before him a specification and drawing, which he interprets by the light of a model; the application is allowed, and the patent goes out to be interpreted by the public without the aid of the model, the latter constituting no part of the patent." Hence it is argued that a specification and drawing are all that is necessary to afford an examiner a clear idea of the subject matter, and when these means fail to do so, it is certain that they are not in a proper condition to go before the public in the shape of a patent. Again, it is believed that the knowledge on the part of inventors, that if an invention is not set forth with proper clearness and exactness a model will be called for, will tend to render the specifications and drawings more accurate and comprehensible.

Whether the furnishing of a model be regarded in the light of a penalty or otherwise, it is certain that the removal of the obligation as it now stands will be a great relief to inventors. Mr. Howson states that the yearly tax from this cause cannot be less than $250,000, and he points out, as we have frequently already done, how onerous an imposition this becomes when the circumstances of the inventor, as often is the case, are straitened. Where a tax is oppressive and at the same time unnecessary it can have but one effect, and that is repression, and it is a legitimate conclusion consequently that many valuable inventions are "thus smothered in their infancy."

The same point which Mr. Howson makes as regards inventors preparing their papers in better manner because of the absence of models, he adduces with greater emphasis with reference to patent solicitors, and he asserts with much truth that these practitioners should not need models to obtain a clear comprehension of inventions committed to them, but that they should be able to take their clients' rough sketches and ideas and put them in proper and complete form. "A patent," he says, "should be simply a lesson, by which any member of the community familiar with the art to which it relates may acquire a positive knowledge of the thing patented, with the least possible trouble." Elaborate working drawings, therefore, should not find place in the patent; but a similar course should be adopted to that taken by scientific and technical journals in rendering their readers conversant with new and improved devices. Perspective drawings might, it is true, cost more, but their expense would be less than that of models, while the fact that inventors are constantly availing themselves of the former means of elucidation in presenting their devices in a business way to the public, plainly indicates their efficiency.

A large portion of Mr. Howson's argument is devoted to the elaboration of these views, and we commend it to the attentive perusal of inventors. He suggests as a corollary to his demonstration the opinion that the presence of a model must in some measure react unfavorably upon the preparation of drawings and specifications, owing to the fact that these are apt to be slighted and dependence placed upon the model to supply deficiencies. It would hardly be justifiable to postulate this as a rule, although it is an open possibility. Still, the argument may be conceded in so far as it reaches the conclusion that the abolition of the model will compel the writer of specifications "to exercise patience and forbearance in discovering the main points of the invention, and the consequence is that more brains will be put into the specification than if he had a model."

Mr. Howson's other points are, that the constant increase in the number of models will in course of time necessitate the provision of very extensive accommodations for them; that, as a rule, models fail to represent accurately the machines, etc., to which they relate; and that when collected, as at present, they do not furnish the "great museum of national industry" which some suppose. He further points out the dangers of fraud entering into attempts at reissues of patents on the models, and offers some good suggestions as to how a really valuable national industrial museum might be founded upon properly made models contributed voluntarily by patentees. To some of these topics we shall recur in another article.

CLOTHES MOTHS.

BY PROFESSOR C. V. RILEY.

This name includes several distinct but similar species of minute moths belonging to the family *Tineidæ*, which, in their larval state, are very destructive to woolen goods, fur, hair, and similar substances. Among them may be mentioned the clothes moth (*Tinea vestianella*), the carpet moth (*Tinea tapetzella*), the fur moth (*T. pellionella*), and the hair moth (*Tinea crinella*). These tineans have slender bodies and lanceolate, deeply fringed wings that expand $\frac{6}{10}$ or $\frac{8}{10}$ of an inch. The antennæ and palpi are short and thread-like, and there is a thick orange or brown tuft on the forehead. The colors range from buff to drab and dark gray. The eggs are laid in May and June (the moth dying immediately afterward), and hatch out in fifteen days. The young worms at once proceed to work, gnawing the substances within their reach and covering themselves with the fragments, which they shape into hollow rolls and line with silk. These rolls are by some carried on their backs as they move along, and by others fastened to the substance they are feeding upon; and they are enlarged from time to time by additions to the open extremities and by portions let into the sides, which are split open for this purpose. In such ambush the worms carry on their work of destruction through the summer; rest, in seeming torpor, during the winter; and change to chrysalids early in the spring. They transform again in twenty days, and issue from their shelter as winged moths, to fly about in the evening till they have paired and are ready to lay eggs. Then follows an invasion of dark closets, chests, and drawers, edges of carpets, folds of curtains, and hanging garments, and the foundation of a new colony is swiftly laid.

The early days of June should herald vigorous and exterminating warfare against these subtle pests. Closets, wardrobes, all receptacles for clothing, should be emptied and laid open, their contents thoroughly exposed to light and air, and well brushed and shaken before being replaced. In old houses much infested with moths, all cracks in floors, wainscots, shelves, or furniture should be brushed over with spirits of turpentine. Camphor or tobacco should be placed among all garments, furs, plumes, etc., when laid aside for the summer. To secure cloth linings of carriages from the attacks of moths, sponge them on both sides with a solution of corrosive sublimate of mercury in alcohol, made just strong enough not to leave a white mark on a black feather. Moths may be killed by fumigating the article containing them with tobacco or sulphur, or by putting it, if practicable, into an oven heated to about 150° Fah.

American Isinglass.

The best quality of American isinglass is made from the sounds of the hake. The crude material is collected during the summer and autumn, coming from Maine, New Brunswick, Nova Scotia, and Prince Edward's Island. The conversion of the crude material into the mercantile article takes place in winter. A low temperature is necessary, in order to turn out by machinery the fine ribbons of isinglass, and ice-water passes through the rolls. The total product is about 250,000 pounds. Besides the use of isinglass for fining beer, etc., it is employed as a dressing or glaze for straw goods in the United States.

A BETTER plan for improving the aroma of butter, in use in many parts of Switzerland noted for good milk and fine butter, is as follows: The milk, as soon as it is drawn, and while yet warm, is filtered through a sprig of washed fir tips, the stem of which is inserted loosely and upright in the hole of the funnel. The milk deposits hairs, skins, clots, or gelatinous sliminess on the leaves. It has imparted to it a most agreeable odor, and does not readily turn sour. A fresh sprig should be used each time.