IMPROVEMENT IN PREPARING CITRIC ACID.

Citric acid, of which the consumption in this country is now very large, is imported chiefly from Sicily, and usually reaches this country as a black fluid, in appearance closely resembling a thin treacle. This black fluid is obtained by inspissating the juice procured by subjecting lemons to pressure, after the rinds of the lemons have been removed, for the sake of their essential oil. The first process to which this black juice is subjected, by the manufacturers here, is that of treatment with chalk, whereby an insoluble citrate of lime is obtained. This citrate of lime, after having been well washed with cold water, is decomposed by sulphuric acid, insoluble sulphate of lime being thus formed and citric acid passing into solution. At this stage the citric acid is still associated with a considerable quantity of coloring matter, of which citric acid is perhaps more tenacious than any other vegetable acid, and accordingly the next step is to remove as much of this as possible by means of animal charcoal. The solution is then evaporated, until, on cooling, it will crystallize. The crystals it then yields are by no means free from coloring matter, but are of a decided brown color, and are therefore re-dissolved, and their solution treated again with animal charcoal, evaporation and crystallization being then repeated as before. Such is the process by which citric acid is usually manufactured; but M. Perret, as has already been announced in these columns, is trying to introduce a process, the first stage of which would be the combination of the citric acid in the lemon juice with magnesia, instead of with lime. The *Bulletin de la Societe Chimique*, of Paris, has just given a detailed account of M. Perret's proposals, the main object of which is to avoid the great loss which so frequently occurs by reason of the inspissated lemon juice becoming so alterated, during its transit from Sicily to England, as to be completely spoilt. This liability of the inspissated juice to spontaneous alteration is shared by citrate of lime, and hence no advantage has been found to attend the plan, which has been many times tried, of treating the lemon juice with lime in Sicily, and so bringing the citric acid to this country, not as inspissated lemon juice, but as the compound which is first formed in the usual process for converting the crude into the commercial acid. M. Perret finds, however, that, by treating lemon juice with magnesia, compounds are obtained which are almost absolutely unalterable, resisting heat and moisture for a very long time without suffering the least injury. He therefore proposes that the lemon juice, immediately on its having been expressed, shall be treated on the spot, with an excess of magnesia—which earth, in the form of carbonate, quite pure enough for use for this purpose, is very abundant in Italy. There is thus formed a perfectly insoluble tri-basic citrate of magnesia, in the form of a very dense granular powder, and if this compound be added to a fresh quantity of lemon juice, heated nearly to the boiling point, there is obtained a solution of bi-basic citrate of magnesia, which, on cooling, yields crystals almost absolutely pure. This bi-basic citrate is of course the most suitable for transport, and will probably before very long be the only form in which we shall import citric acid.

CURIOSITIES OF SOAP BUBBLES.

Mr. J. Broughton, B. Sc., chemical assistant at the Royal Institution, has contributed to the March number of the *Philosophical Magazine*, an account of some very curious optical appearances observed by him in the remarkably permanent soap bubbles which M. Plateau some time ago taught us how to produce by means of a solution of one part of pure oleate of soda in fifty parts of distilled water, mixed with two-thirds of its bulk of pure glycerine. Mr. Broughton states that a bubble blown with this solution and placed on a wire ring under a glass case will frequently, after standing for an hour, exhibit at its upper pole a circular black spot, one-third of an inch in diameter. The black is intense, but it always possesses the property of reflecting a small amount of light. In this position it can easily be examined by means of a lens, which renders visible optical effects of great splendor and interest, and reveals that the film is incessantly in motion. This discovery led Mr. Broughton to devise a simple arrangement for examining a small bubble by means of a powerful compound microscope, the bubble being strongly illuminated by a good condenser, so that the light, after a reflection, might pass through the microscope. With this arrangement he found the film of the bubble to exhibit optical phenomena of the utmost magnificence. The appearances observed in and near the black spot above described were, he says, "of especial splendor. On the black ground moved specks of brilliant yellow and orange, which again contain smaller spots of blue and black, of almost every geometrical form, but always in rapid motion. Many other appearances were observed; among the most common being spots of such regularity that at first sight they produce the effect of structure. Under a high power, these latter were resolved into series of Newton's rings of excessive minuteness. The variety of the phenomena was quite remarkable; but the most commonly occurring effects were those in which the colors red and green prevailed. The motion appeared to be invariable and incessant." Mr. Broughton calculated that the thickness of the film, in the part at which the appearance of a black spot was presented, amounted to about three eight-millionths of an inch.—*Mechanics' Magazine*..

Cast Steel—Magnesian Crucibles.

SIR:—Last month M. Boussingault presented a note of M. H. Caron to the Academy of Sciences on the air bubbles and blisters in steel, and in which he stated that cast steels in general, and particularly those which are termed in commerce soft, because the tempering modifies very little their hardness, are subject to contain bubbles. In order to avoid these, or at least to lessen the number and dimensions, the general practice is, as soon as the jet is run, to weigh the ingot with a piece of cast iron, fitting exactly into the ingot mold. The effect of this piece is to cool the surface in fusion which it touches, and thereby prevent the gases from escaping, and producing numerous cavities, which would deteriorate the value of the steel cast without this precaution.

These blisters are of two kinds. One sort, with metallic and iron-colored luster inside, seem to have been produced by a gas incapable of oxydizing the metal; this is the most numerous. The other presenting to the eye the varied colors of iron or of steel heated in the presence of an oxydizing gas, is much more seldom met with than the first, and is only met with at the surface of the ingots. It is certain that hydrogen, carbonic oxide gas, nitrogen, or a mixture of these gases, are the only possible causes of these blisters. Have these gases originated from the atmosphere of the furnace? or have they been absorbed in nature by the metal in fusion? If they do not proceed directly, and without transformation, from the ambient gases, how and why does it happen that they are developed just at the moment of the solidification of the metal? Lastly, how are these bubbles to be avoided? Such are the questions which M. Caron proposed to himself, the answers to which he has endeavored to furnish by direct experiment.

Steel, cast in a crucible of refractory earthenware, and left to cool slowly, is always full of cavities lined with crystals; often, even, when the gases of the furnace have penetrated in sufficient quantity into the crucible, the ingot is found to be surmounted by a metallic and cavernous efflorescence, occupying a considerable volume. This is never seen in the case of iron.

These two fusions of steel and of iron having been made under the same circumstances, the two metals have had to be exposed to the influence of the same gases composing the atmosphere of the furnace. There are, therefore, only two hypotheses now possible:—1. That the direct absorption of the hydrogen and carbonic oxide gas of the furnace by the metal in fusion may lead us to suppose that steel possesses the property of absorbing these gases, and that iron does not. 2. That, not admitting this direct absorption as demonstrated satisfactorily, we may be of opinion that the bubbles proceed from a disengagement of gases, caused by the action of the carbon (which distinguishes iron from steel) upon some substance mingled with, or dissolved in, the steel.

In order to determine which of these two hypotheses is the right one, M. Caron considered that it would be sufficient to melt steel in a porcelain tube, traversed by a current of hydrogen or carbonic oxide gas, and to ascertain the presence or absence of bubbles. When the cup in which the steel is placed is of porcelain, no efflorescence is perceived after the cooling of the molten metal; but the surface of the ingot which touches the porcelain is covered with cavities similar to those remarked in steel melted in a crucible. This being the case, M. Caron tried to know whether the nature of the vessel in which the fusion took place did not exert some influence on the result obtained, so he substituted for the porcelain cup a vessel of magnesia, and afterwards one of quicklime (both these cups being separated from the porcelain tube by a layer of platinum); he then obtained ingots perfectly free from cavities, efflorescence, or blisters.

These experiments demonstrate that it is not the hydrogen nor the carbonic oxide gas, absorbed by the iron or steel in fusion, which produces the blisters; they show, moreover, that the bubbles proceed from two causes, which contribute equally to the formation of carbonic acid gas. These two causes are, first and foremost, the oxide of iron produced by the oxidizing atmosphere of the furnace; next the decomposition, by the carbon, of the steel, of the silicate of iron formed at the contact with the silica of the crucibles. M. Caron states that it is very easy to obtain, by compression, crucibles of magneisa very resisting and inflexible. They have the advantage over chalk crucibles of being able to be preserved for a very long time without alteration. M. Regnault states that Tillover has operated successfully at the Sevres manufactory in fabricating magnesia crucibles. He compresses the magnesia by means of a lever-beam, and so infusible are they that platinum may be readily melted in them.—*London Mining Journal.*

C. H. D.

NEW PUBLICATIONS.

TEXT BOOK OF CHEMISTRY—For the Use of Schools and Colleges. By H. Draper, M. D., Professor Adjunct of Chemistry in the New York University. Harper & Bros., Publishers, New York.

This book contains over 500 pages and is embellished with more than 300 engravings, and embodies the valuable parts published on the same subject in 1846, by Dr. Draper's father. This volume is brought up to the present time, and a free use has been made of all the most recent authorities, both in the English and other languages. The subjects are all presented in plain language; and as a text book for schools or for those who desire to obtain a knowledge of the elemental principles of chemistry, we do not think it has a superior. The author appears to be a thorough master of the subject.

PATENT-OFFICE DECISIONS.

Application for a patent for improvements in Cartridge Cases.

The Board, by Elisha Foote—These cartridges are provided with a nipple in the base, adapted to the use of ordinary percussion caps, and to prevent accidental explosions, it is inserted entirely within the cylinder in what is termed the safety chamber. In this, however, the applicant was found to have been anticipated by several previous devices, and thereupon, by amendents, he has limited his claims to the peculiarities of his construction.

In the previous devices the nipple was placed at the center of the base, so that the cap would be struck by the hammer in every position of the cartridge in the barrel. In the applicant's it is placed at one side, and can be struck by the hammer only in one position, to insure which projections are made on each side of the cartridge to fit corresponding slots in the barrel. For these variations the patent is claimed.

We are unable to perceive any advantages from this arrangement. It seems to be going from simplicity to complication—to increase rather than diminish expenses, and to require care and precision in use beyond what was necessary in previous devices. Patents are intended to be a reward for improvements—something must be given to the public in return for the privileges bestowed. It is a great mistake to suppose that every different arrangement of devices is patentable. Changes of form merely, without new results, do not come within the object and provisions of the patent laws. Inventions, even, are made patentable (Act of 1836, Sec. 7), only when deemed "sufficiently useful and important."

The decision of the Examiner in charge is affirmed.

A DR. SACE has proposed a plan of utilizing the marshes of France, which at present produce nothing but fever and ague. M. Sace proposes sowing them with Canada rice, and turning down a lot of beavers; both the plant and the animal can live in any climate—both would be equally useful, and one would support the other. At present large sums are annually sent from France to America to purchase beaver skins, which might thus become articles of home production.