enabled to devise a means for the extermination of the destructive pest. The loss of fruit was reduced in the current year to a maximum of one and one-half per cent.

RECOVERY OF WASTE IN USING WHITE METALS.

A very valuable paper by Joseph Richards, ex-president of the Franklin Institute, upon utilizing the waste entailed in working silver, tin, zinc, antimony, bismuth, lead, mercury, and their alloys is here reduced to its lowest terms for the benefit of manufacturers employing such metals in their goods. The author says that it is more than forty years since he began his investigations in the direction indicated, and his experience is therefore of practical value.

I found, says the author, that tin and galvanized iron scrap could be utilized by removing the coatings, the average tin amounting to 3 per cent; the resulting iron plate could be re-puddled, and the scheme was so promising that I resolved to erect a plant upon a commercial scale. Six lager beer casks, about 6 feet by 6 feet, were set in the ground in a semicircle and a crane rigged that commanded all of them. In the first tank hydrochloric acid was placed, in the second water, and water with a little lime in the third. In the fourth cask was water again, and in the fifth a solution of copper sulphate. A wooden cage containing about 200 pounds of clippings put in loosely was turned into No. 1 tank, and raised after ten minutes' immersion to observe the result. If the tin had been dissolved the cleaned scrap was put in the tank containing water alone, and agitated thoroughly and then put into lime tank No. 3, which neutralized all the acid remaining in the pores of the iron; afterward washed again in tank No. 4, and finally plunged into the copper sulphate for a moment to prevent the scrap from rusting when exposed to the air, which would almost instantly attack it. The iron scrap was then worked into balls under a press and was worth from $10 to $12 per ton. After the process described had been continued for some time the acid would be neutralized in No. 1 tank and would contain tin chloride in solution. The tin-scrap cleaning was here discontinued for a time, for another stage of the recovery. Galvanized iron scrap was put into the cage and immersed in tank No. 1; when it came in contact with the tin solution the metallic zinc took the place of the tin, forming zinc chloride, all the tin being precipitated as metallic tin, in a finely divided state. From about 10 tons of scrap I got about 600 pounds of tin; the zinc chloride sold for $20 per barrel for disinfecting purposes, and for treating wood to make it fireproof. Although commercially successful, the process had to be discontinued, on account of the objectionable vapors created which annoyed the public.

The galvanizing bath is of various sizes, according to the work to be done, and divided on the surface by a partition into two parts. On one side a flux is placed which will dissolve the oxide of zinc on the surface or prevent its formation.

The flux used is ammonium chloride (salammoniac), and the other side of the bath is kept clean by constantly skimming the oxide of zinc as fast as it forms. Just here is where loss occurs, for considerable shot-zinc is formed and removed with the oxide. Also, the salammoniac side soon becomes covered with a thick black crust, or scum, consisting of the dissolved oxide which has partly decomposed the ammonium chloride and formed a double chloride of zinc and ammonium. Salammoniac must be fed constantly to the top of the pot so as to keep the surface of the molten zinc clean and free from oxide, or else the oxide will adhere to the iron surface and seriously injure the finished product by leaving spots on it not coated with zinc. After a time the crust gets so thick on the top that the plates cannot be pushed through it, and a portion must be removed. This causes waste on one side of salammoniac and on the other of zinc.

Another by-product made is zinc-slab dross, formed by washing away a portion of the iron being galvanized, for molten zinc alloys with iron, and as soon as it becomes hot as the bath, begins to dissolve in the zinc. This addition of iron to the bath forms an alloy of iron-zinc which is heavier than the zinc and falls to the bottom; a bath of the usual size for sheets will collect a ton in one week. It is removed by a perforated spoon to allow the zinc to run out and the dross is pasted into molds and forms the slab-dross of commerce. There are then, in galvanizing, three by-products, salammoniac skimmings, slab-dross, and zinc oxide. The skimmings can be recovered by leaching the skimmings in hot water and steam, which gives all the zinc chloride and ammonium chloride in solution, which last can be evaporated down and recrystallized for use in the bath again. The residue contains zinc oxide, dirt, and shot-zinc; this last on being put into a tumbling barrel ground out all the oxide and cleaned the zinc finely, so that it was worth $30 per ton to makers of zinc paint.

The average yield was: zinc 20 per cent, zinc oxide 35 per cent, ammonium and zinc chloride 30 per cent, iron scale and dirt 15 per cent. I then visited galvanizing works and bought all the waste skimmings, etc., I could get and it realized about $300 a carload. The largest lot I ever treated realized when melted and refined 25,000 pounds of good spelter. The oxide process is now generally used in the trade, having been purchased from my workmen by other parties. Galvanizers now separate their skimmings, and it is worth about $40 per ton, according to quality.

The most valuable by-product in galvanizing is the zinc-dross, and I made numerous costly experiments before I had any success at all. Cyanides answered the purpose of recovery well, but were too costly. I finally patented a process which dispensed with the direct use of cyanide and solved the problem of recovering the zinc from the dross, so that it is almost equal to virgin spelter by analysis.

The sensitiveness, so to call it, of zinc to any addition of aluminium is well shown by the fact that 1-1000th part of the latter is immediately detected, and the quantity, although so small, is taken up at once and distributed. It is of no advantage to exceed the quantity mentioned. If a quantity of pure zinc be poured into a mold it will not run half way down, but if a portion only of aluminium alloy be put into the ladle, the effect is to make it as fluid as water. For practical purposes I use 2 per cent aluminium and 98 per cent of zinc, and over 100,000,000 pounds of zinc dross have been treated by this process. Scrap zinc is melted in pots and treated in the same way as the zinc dross for impurities, and battery zincs which contain mercury are treated in a special way which recovers all the mercury. Britannia metal, pewter and scrap pewter are often plated with silver, which must be stripped off before treating them. This is done by the usual processes well known to the trade, and not calling for special mention. The metal is then made into ingots and sold for typefounding, stereotyping, and Babbitt metal. The composition being changed, according to the metal to be made at any time by adding tin or copper, etc.

BAROMETER READINGS.

BY ROBERT GRIMSHAW.

We often hear: "It is going to rain soon; the barometer stands at 'stormy.'" It is high time that barometer-makers stopped putting their instruments on the same level as the frog-in-a-bottle affairs, by marking them "Clear," "Very dry" and so on. Properly understood and used, the barometer is a reliable instrument, not only for measuring the weight or pressure of the air, but also in connection with the weather-cock and the thermometer, for prophesying weather conditions in the near future.

What a good barometer does tell is the weight of a column of air of definite cross section, reaching upward from the level of the instrument to the surface of the aerial ocean which surrounds our earth. But no matter what the condition of the weather, this weight varies with the depth from the surface of the aforesaid ocean, so that if the column stands at 762 millimeters at the level of the water-ocean which lies at the bottom of the aerial one, the same instrument would stand at a height of 1,178 meters above the sea level at only 663 millimeters. This being the fact, a barometer that at the sea-level stood at "Very dry," would, under the same conditions of temperature of the air and of the instrument itself, indicate "Stormy" when carried to a height of 1,178 meters above the sea.

The "prophecies" of the mercury barometer are different for various temperatures and degrees of moisture of the air in any one country, and for different countries. Further, the "weather indications" of an aneroid and of a mercurial barometer for the same readings are different; because a good aneroid is not influenced by the air-temperature.

Those who use the mercury barometer scientifically and for scientific purposes, use tables giving the following data:

(1) Height of the column of mercury for each distance above sea-level; (2) "corrections" for the height, for different latitudes; (3) logarithmic corrections for temperature and latitude; (4) the height of a column of air corresponding to each difference of one millimeter or of one special fraction of an inch, in the height of the mercury column; (5) "corrections" for the height of the mercury for different barometer temperatures, at different heights above the sea, and which latter corrections must be applied, before the height of the mercury column can be used with the other tables; (6) the average temperature of the air at the sea level for each month for the district where the observation is made.

It may be noted here (a) that the differences of temperature during the day vary with the latitude; (b) the higher the latitude, the greater this variation; (c) the average temperature for the twenty-four consecutive hours in the day is that of 9 A.M., and (d) the average daily temperature between 9 A.M. and 5 P.M. occurs at noon.

SCIENCE NOTES.

For the last three years it has been planned to study the sea and the fisheries of northwest Europe. Two international conferences have been held, and a third convention is now meeting at Copenhagen, where delegates from the governments of the United Kingdom, Germany, Holland, Denmark, Norway, Sweden, Russia and Finland are discussing the problem. It has been decided that simultaneous observations are to be made four times a year. The British government has assigned two ships to the task of making periodical trips in the Faroe-Shetland channel and across the northern end of the North Sea. Trips will also be made in the western part of the British channel. Dutch ships will scour the southern half of the North Sea, while the northern half will be covered by the Germans. Denmark will investigate the region between Faroe and Iceland. Norway will explore the North Atlantic along the extensive western seaboard of Scandinavia. Work has been assigned to Russia along the Murman coast and across Barents Sea to Novaya Zemlya. The Baltic will be studied in detail by Danish, Swedish, Finnish, Russian and German ships. Much scientific, as well as practical, information will be gathered.

Prof. Baccelli's method for the treatment of tetanus has been used during the last few years in a considerable number of cases, especially in Italy. This method consists essentially in administering a series of hypodermic injections of phenol in dilute solution. The phenol is rapidly absorbed, and its action is that of fixing the state of the malady; in the favorable cases no new symptoms appear after the first injections of phenol have been regularly made. As to the symptoms which already exist, these are not at once attenuated, but at the end of several days they diminish gradually. Dr. Croffi has been engaged in formulating the results of the cases treated by the Baccelli method, of which 80 have already been published, and shows that it has given more satisfactory results than the other methods. The figures show a mortality of 12 to 13 per cent, while in the case of anti-tetanic serum as used by Holesti, Haberlinge and others the mortality reaches 30 per cent, which is a considerable difference. Even considering the grave cases, the method is still superior, and shows a mortality of 30 per cent, but this is not excessive, as in the treatment of grave cases of diphtheria by the anti-diphtheritic serum the mortality reaches 37 per cent. The advantages of the Baccelli method are best seen when it is applied from the commencement of the disease, in this case, if the patients arrive at the seventh or eighth day, the issue is almost sure to be favorable. It is a striking fact that while the method is successful in the case of the human system, it seems to have no marked effect upon the animals which have been used in the experiments, but this may be explained by the fact that in the latter case the tetanus shows itself in the acute form which causes a rapid mortality, and here the remedy is of no avail.

An extended series of observations upon the hygiene of acetylene lighting has been recently carried out by M. Masi, a prominent Italian scientist, who made a number of experiments at Rome. The number of appliances for producing acetylene is considerable, but in many cases their imperfections and defective construction have rendered the use of acetylene less extensive than might be, seeing that it has many advantages and is a more healthful method of lighting. According to the experiments of Grehant, Weyl and Frank, the gas has a harmful influence only upon the air when it reaches the proportion of 46 per cent and it is only at 79 per cent that it causes death. When absorbed by the blood in quantities not exceeding 10 per cent it seems to combine easily with the albuminoid elements. The burner, to give a good light, should work under a pressure equal to 3 or 4 inches of water at least, and be mixed, before burning, with oxygen or an inert gas which permits it to come in contact with a great quantity of air. Messrs. Lewes and Hempel have shown that its lighting power is 15 or 20 times that of illuminating gas used in an ordinary burner and from 3 to 5 times when in a Welsbach burner. M. Masi carried out some experiments in a chamber fitted up in the cellars of the Institute of Hygiene at Rome, under the most unfavorable conditions as to ventilation, so as to bring out as much as possible the effect on the respiratory organs. He observed also the intensity and steadiness of the flame, the quality of light produced, the heat and the change brought about in the surrounding air. Repeated experiments on these different points showed that acetylene gave superior results. The gas in burning consumes less oxygen and gives off less carbonic acid gas and water vapor than is the case with other methods of lighting, excluding, of course, the electric light. In a confined locality it produces less heat than either gas, candles or petroleum, and it does not give rise to ammonia, nitrous acid or carbon monoxide. He considers that it does not present any more danger from explosion than gas or petroleum, and that it is cheaper for a given candle power than all other methods of lighting.