A SIMPLE BALANCE.

The want of an inexpensive balance, sensitive enough to weigh very small quantities of matter accurately, frequently makes it impossible for those of slender means to engage in assaying or any quantitative chemical work. The simple and easily constructed contrivance described below will supply this want. With a little practice and care weighings can be made on it that will compare favorably in point of accuracy with the more elaborate and costly analytical or assay balance.

The hollow pillar, A (Fig. 1), is made of strips of perfectly dry, light wood, three-eighths of an inch thick, two inches in width, and twenty-eight inches in length, smooth finished inside and out, and joined at the edges and secured with screws. It is firmly fixed in a perpendicular position on the heavy wooden base, B, by mortising. The square wooden rod, C, thirty inches long, is planed and smoothly finished so as to snugly fit and slide easily in the hollow pillar, the screw, D, serving to hold it securely in any position.

A strip of good plate glass mirror, two inches wide and twenty-eight inches long, is secured in position against the face, F, of the pillar, A, by small brass bands at top and bottom. The slide, *b*, of thin, hard brass, one inch wide and three and a half inches long, is bent so as to slightly pinch the sides of the pillar and be moved easily up and down before the mirror. A spring, *a*, of fine hard brass wire is suspended before the mirror from a brass pin or screw, E. From the bottom of this spring is suspended a slender wire three inches in length, in the middle of which is fastened a small white bead, *c*. A scale pan, one and a half inches diameter, preferably of nickel-plated brass, is attached to the end of the wire. The base, *b*, may be secured by screws to a table. The mirror surface should be as nearly perpendicular as possible.

The method of using the balance is as follows: The substance to be weighed is placed in the scale pan, and the rod, C, is drawn up until the tension of the spring is sufficient to suspend the pan with its load before the mirror. As soon as the vibrations cease the eye is brought on a line with the top of the white bead, *c*, and its reflection in the mirror, as in Fig. 2. The slide, *b*, is then moved up until its upper edge just touches the line of vision between the bead and its reflection without disturbing the slide, *b*, the substance is then transferred from the scale pan, and small standardized weights put into its place until sufficient weight has been introduced to bring the bead again fairly on a line with the edge of slide and reflected bead. The weights in the pan correspond to the weight of the substance.

Fig 1

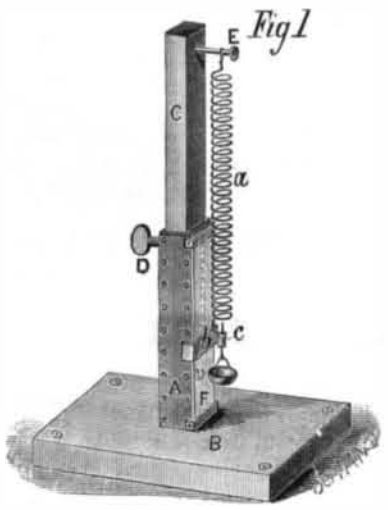
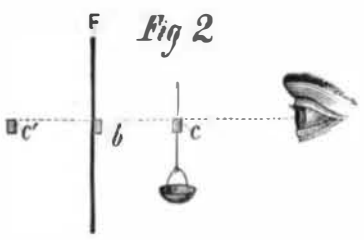


Fig 2



If the spring is gently handled in changing the substance for the weights no appreciable change takes place in its tension, but to avoid any chance error it is best to return the substance to the pan after the weights have been removed, and note if the bead returns to the first position marked by the slide.

In making these weighings the weights should be put into the pan as soon as the substance is removed, and *vice versa*, no interval being allowed.

This balance is not intended to weigh a greater quantity of any substance than thirty grains, though with stronger wire spring it can be made to weigh ounces nearly if not quite as accurately as an ordinary balance. The rod, C, can be made to move smoothly if it sticks by rubbing it with a little powdered talc or soapstone.

CRYSTALLINE ALBUMEN IN PUMPKIN SEEDS.—Pumpkin seeds contain an albumen which may be easily obtained in well developed octahedral crystals. The proteine contained in the seeds consists chiefly of such crystals. Crystalline albumen is distinguished from the amorphous variety by a far smaller proportion of ash and of phosphoric acid, and by higher proportion of carbon, nitrogen, and sulphur.

VENTILATED BATH BOX FOR CHEMICAL AND PHOTOGRAPHIC PURPOSES.

Every photographer knows or ought to know the exceedingly poisonous character of the fumes rising from the cyanide of potassium bath used in fixing photographic negatives and ferrotypes. These fumes are nothing more nor less than prussic acid, the most subtle and deadly poison known. Usually the poison is so diluted with air as to be very slow in its operation. Nevertheless it acts continually

MACURDY'S VENTILATED BATH BOX.

on the operator, gradually undermining his health, producing premature decline. The engraving shows a compact and efficient device for avoiding all this by inclosing the cyanide bath in a small box provided with a ventilating tube communicating with the external atmosphere.

The box is provided with glass sides, one of them forming a door which can be opened or closed at pleasure. When open it forms a hood, which prevents the fumes from escaping into the room, while it admits of viewing the plate as it lies in the bath.

The invention will be readily understood by reference to the engraving, and it will be appreciated by all photographers. It is a thing that has been needed, and should meet the approval of every operator.

Further information may be obtained by addressing the inventor, Mr. J. C. Macurdy, P. O. box 426, Boonville, Mo.

CONDENSED MILK.

In answer to a number of correspondents who have asked how condensed milk is prepared we give the following:

When the milk is brought into the factory it is carefully strained, placed in cans or pails, which are put into a tank of water kept hot by steam coils. When hot it is transferred to larger steam heated open vessels and quickly brought to a boil. This preliminary heating and boiling has for its object the expulsion of the gases of the milk, which would cause it to foam in the vacuum pan and, also to add to the keeping quality of the milk by destroying the mould germs. A second straining follows, after which the milk is transferred to a vacuum pan, where, at a temperature below 160° Fah., it boils and is rapidly concentrated to any degree desired. The vacuum pan employed is a close vessel of copper, egg-shaped, about six feet high and four and one-half feet in diameter. It is heated by steam coils within, and by a steam jacket without—inclosing the lower portion. In one side of the dome is a small window through which gas illuminates the interior, while on the opposite side is an eye-glass through which the condition of the contents may be observed. The pan is also provided with a vacuum gauge and test sticks. Much of the milk used in cities is simply concentrated without any addition of sugar. The process of concentration is continued in the vacuum pan until one gallon of the milk has been reduced to a little less than a quart—one volume of condensed milk corresponding to about four and three-tenths volumes of milk. The following table of analyses by Dr. Waller shows the composition of several brands of this condensed milk sold in New York city:

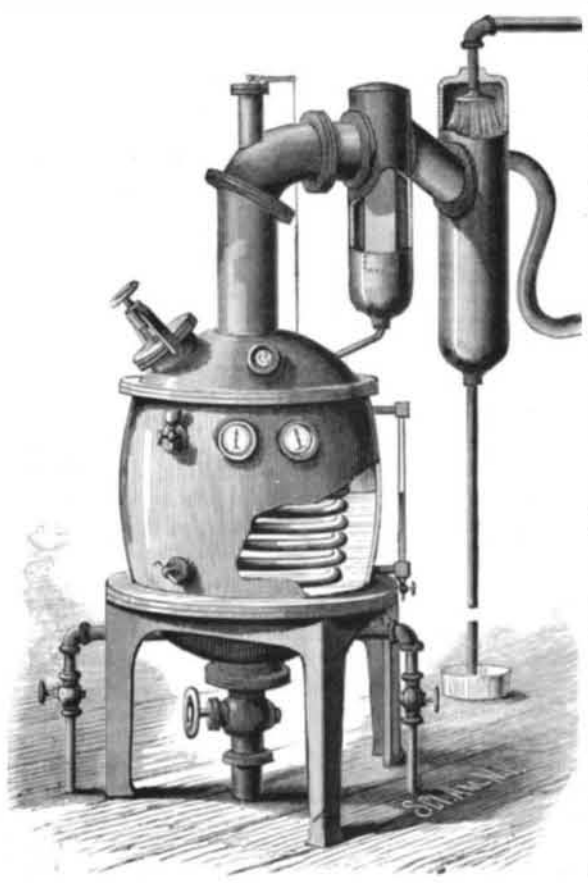
	American.	Eagle.	New York.	National.
Fat	16·29	14·36	14·28	13·97
Casein	17·26	15·07	13·96	14·02
Sugar	10·64	11·64	13·90	10·44
Salts	2·77	2·10	2·00	2·33
Water	53·04	56·83	55·86	59·24
	100·00	100·00	100·00	100·00

The average composition of fresh cow's milk is as follows:

Fat	3·799
Casein (and albumen)	4·369
Sugar	4·543
Salts	0·635
Water	86·660

Condensed milk intended to be preserved for any length of time has an addition of pure cane sugar made to it during the boiling, and is usually put up in sealed cans. This sugared or "preserved" milk, when properly prepared, will keep for many years. The following analysis of this "preserved" milk will serve to indicate its composition:

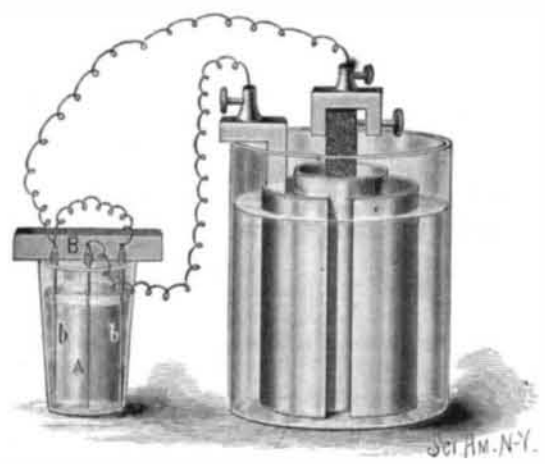
Fat	9·55
Casein (and albumen)	10·26
Milk sugar and cane sugar	53·34
Salts	1·91
Water	25·94



VACUUM PAN FOR CONDENSING MILK.

ELECTRO-ASSAY OF COPPER ORES.

The average copper ore is difficult to assay by fire. The results, even where great care is exercised in the various manipulations, are rarely exact or trustworthy. The ordinary wet methods of analysis are rather complicated, slow, and expensive, good work requiring the facilities of a chemical laboratory.



ELECTRO-ASSAY OF COPPER ORES.

Correspondents who have asked how to test copper ores will find the following method simple, expeditious, and sufficiently accurate for all practical purposes.

The operations are, reduction of the ore to a uniform powder, sampling, decomposition and solution in acids, separation of the soluble and insoluble portions, decomposition of the dissolved copper salts, and separation of the copper by means of electricity.

A representative sample of the ore is reduced, by pounding and grinding it in an iron mortar, to a powder, the whole of which will pass through a wire gauze sieve of 100 to 120 meshes to the square inch. This powder is well mixed together, and a sample of one third ounce is taken for assay. The sample is put into a porcelain dish or cup, and enough hot water is stirred in (with a glass rod or clean slate pencil) to form a thin paste. About two ounces of strong nitric acid is then gradually added, and as soon as the first strong reaction has quieted somewhat the dish or cup is set in a pan and surrounded with hot water. The treatment with acid is best conducted out of doors, so that the abundant fumes may escape without injuring anything or poisoning the air. If too much acid is added at first the action is apt to be violent and some of the contents will be lost through spattering. The water in the pan, as it cools, should be replaced by hot water if it is not convenient to keep fire under the pan. When the disengagement of red fumes ceases, usually in the course of half an hour, the liquid portion (or as much of it as can be without disturbing the sediment) is decanted into another porcelain dish, which is placed in the water bath. More acid—an ounce or more, if required—is poured over the undissolved residue, and the dish containing it allowed to remain on the water bath another half hour. The partly evaporated acid solution, first decanted, is then carefully washed back into the dish containing the sediment with a little hot water, and the liquids allowed to evaporate to complete dryness over the hot water bath. Over the dry residue half an ounce of strong sulphuric acid is poured, cautiously, and the mixture is stirred until fumes are no longer given off. Then one ounce of cold water is stirred in, and after a few minutes' standing two ounces of

hot water are added, the mixture stirred, and the suspended matter allowed to settle.

The liquid is next filtered through a small piece of good filter paper adjusted in a glass funnel, the filtrate being collected in a small clean vessel of porcelain or glass. The residues are shaken up repeatedly with small quantities of clean water, the washings being thrown on the filter, and the filtered liquid allowed to mix with the clear acid copper filtrate. The dish containing the residues, as well as the filter, must also be rinsed with a little water, so that none of the copper liquid may be lost by adhering to them. If these operations have been properly conducted all the copper will be contained in the filtered liquid. The decomposing cell into which this liquid is next placed is shown in the illustration.

The cell is an ordinary flat-bottomed drinking glass. The strips, A, *b*, and *b*, are of thin platinum foil, three inches in length and two in width. Over the upper end of each piece a strip of lead foil is doubled, with the battery wires inserted and pinched between the lead and platinum.

The lead-bound edges are forced into slits in the strip of wood, B, which suffice to hold them firmly enough in position. The outer strips, *b* and *b*, are joined by wires and connected with the positive pole of the battery, the middle plate, A, being connected with the zinc pole. Two cells of any of the common gravity form of battery used on telegraph lines may be used, but a single element of the bichromate (carbon) type is preferable and more convenient.

In using the decomposing cell the plate, A (minus the lead binding), is first heated to redness for a few moments to cleanse it, then weighed and slipped into position, with as little handling as possible. The battery being set up and connected properly, the acid solution of copper is poured into the glass, the plates immersed in it, and the decomposition allowed to proceed undisturbed until the liquid has lost its color, and a drop of it, when brought into contact with a drop of strong ammonia water on a white porcelain surface, no longer develops a perceptible blue color. The plates are then lifted out, with care if the deposited copper does not adhere firmly, and the liquid in the glass is decanted and replaced by boiling water. This cleanses the plates, and the heat imparted by it causes them, when taken out, to dry quickly. The plate, A, is at once detached, with any filaments of copper which may have separated in the cell, and weighed. This weight, minus weight of platinum, corresponds to the weight of metallic copper in the sample of ore taken. If the sample weighed one-third of an ounce avoirdupois, multiply the weight in grains of copper found by 13·714, to convert it into terms of pounds per ton.

Iron, zinc, nickel, cadmium, and other minor impurities, may be present in the copper solution, but so long as there is any copper present no considerable quantity of any of these is likely to be thrown down with the copper from the acid solution with one cell of battery.

Large Schools of Sperm Whales.

Several incoming shipmasters have reported seeing schools of sperm whales working southward along the New Jersey coast, of late. Captain Sawyer, of the bark Ibis, just arrived from Pensacola, reports "two miles of blackbacks and water spouts" off the Carolina coast, July 16. He said to a *Sun* reporter: "It was on Saturday and Sunday when we encountered these sperm whales going south or southwest, as if to round Hatteras. They were going very slowly, backs above the water, and were spouting all of the time. They were strolling along in groups, sunning themselves half an hour at a time, and then taking a header, and coming up to spout.

"First we met two schools of about 100 each, I should say. Occasionally they frolicked and flopped about heavily in a sort of dignified and elephantine sport. More followed, and the next morning, Sunday, we saw more. Altogether there were over 700 on the picnic. We passed within 500 feet of two big fellows, but they seemed preoccupied and didn't notice the ship. I don't think they knew we were there."

"Had you any means of capturing them?"

"No; and it did seem a pity to have so much valuable sperm oil indolently swimming away from us. There were some big whales there too. I said to Limerick, one of my men here, 'Now, there's a fellow that's worth $2,000,' and he must have been, and there were bigger ones in the school. It would have been a harvest for a whaling ship. A million dollars in sperm whales is too good a haul to let go by, but we couldn't do anything. Occasionally I've seen a sperm whale cruising along as far south as Savannah, and once in a while I've heard of whale ships off about there. But I never saw so many whales at one time before anywhere."

It will be remembered that the Bermudas used to be the center of the sperm whale fisheries of the North Atlantic. Of late years the pursuit of whales has been almost abandoned, and they seem to have multiplied rapidly.

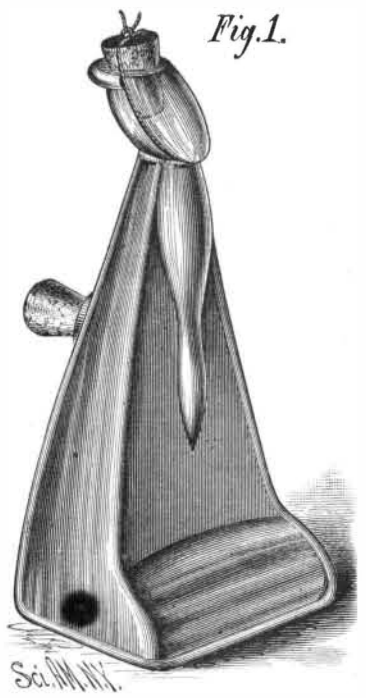
Birch Bark Rubber.

It is said that a dense black gum may be obtained from the outer layers of the birch tree bark by distillation, which possesses all the ordinary properties of gutta percha, and has the additional merit of resisting the deteriorating influence of air and the corrosive action of acids. This advantage makes it useful as an ingredient of India-rubber and gutta percha, which it renders far more durable. Whether these statements are true remains to be proved.

A NOVEL BOTTLE.

Dr. J. B. Moore, of Philadelphia, in *Druggists Circular*, has said that "it often happens, in dropping a medicine from a bottle a little too full or with a badly formed lip, the most steady and practiced hand can with difficulty drop a dose even with a near approach to accuracy." . . . "To the nervous and careworn attendants who are so frequently found in the sick chamber the task of dropping medicines becomes doubly irksome and annoying, and especially when it has to be done, as in cases of lingering illnesses, day and night, sometimes for weeks at a time. Besides, it is sometimes impossible, no matter with how much care and judgment the dropping is performed, to prevent the number of the prescription and the directions on the label from being defaced, if not entirely obliterated, as is often the case, and the outside of the bottle becoming stained and bedaubed with liquid, and especially if it be any of the stronger acids or iron preparation; and the trouble does not stop here, for the hands are liable to be stained, and the clothing, the furniture, or any damageable article that the medicine may come in contact with may be ruined or soiled."

Fig. 1.



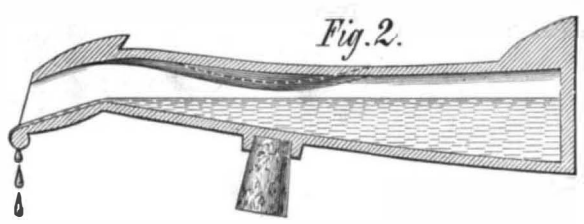
GOLDSMITH'S IMPROVED BOTTLE.

In the ordinary prescription bottle, during the act of dropping or pouring, the liquid is often two-thirds above the lower lip, and hence the air cannot find ready entrance, and either dropping or pouring becomes difficult and vexatious. In the improved bottle the liquid level (even when full) is always on a level with the lower part of the neck. Its inclined side and crooked neck form double inclined planes, which, with its shape and the airway, make it a complete dropper, obviating all the objections to the ordinary bottle. The liquid will not, during the act of pouring, "run back" outside to deface the label, the hands, or furniture. The shape secures steadiness; but should the bottle topple over a cork inserted in the recess on the inclined side will prevent breaking or spilling of the liquid, and the cork thus used will afford support and aid as a rest on dispensing medicines.

This bottle may also be used for table sauces, for perfumery, for patent medicines—for any purpose for which the ordinary bottle is employed

It does away with the necessity of purchasing a dropper, which takes time and trouble to adjust in the ordinary bottle, and which, besides the expense of first cost, is liable to be out of place or lost. In the new bottle the dropping feature is a part of the bottle and goes with each one, while the bottle can be made at a cost (not above that) of those imperfect and annoying ones, now in daily use by millions of people. It will become a necessity in every household.

Fig. 2.



The bottle has a conical or pyramidal shape, so that the greater part of the weight of the liquid in the vial will be concentrated at the base of the same, thus giving the bottle or vial a much better bearing and protecting it from being thrown over as easily as the bottles in use at present. This bottle has an inclined neck, with a lip or a bead at the lowest point of the edge to facilitate pouring the liquid from the vial in single drops. If the neck of the vial is inclined the flow of the liquid can be controlled much better than if the neck is straight. As is shown in Fig. 2, the liquid rests mainly on the inclined side of the bottle, and as it cannot flow up this inclined surface very small quantities of the liquid can be drawn by slightly lowering the neck of the vial. The vial is provided with an air channel for conveying air into the interior of the vial to prevent bubbling of the liquid. The air can pass through this channel from the neck to the extreme rear end of the vial. The cork is secured in the neck of the vial by means of a cord or wire, catching on a projection of the neck of the vial. For further information address the inventor, Mr. W. T. Goldsmith, 64 Corn street, Atlanta, Ga.

Correspondence.

A Remedy for Sea Sickness.

To the Editor of the Scientific American:

Having noticed from time to time the different remedies suggested for sea sickness, I concluded to give you my experience through two voyages of several days' duration, one during particularly rough weather. My first sensation on reaching the ocean was that of being in a very high swing. The same sensation of nausea immediately exhibited itself. It struck me at once that probably the same means adopted to overcome the sickness in the swing would prove effective on the sea, that was, to force the swinging. I therefore watched the motion of the steamer, and as she was about to descend I made an effort as though to force her down. Continuing this for a short time the feeling of nausea disappeared, and I had no recurrence of it during either voyage, separated by several months' duration. I have no idea that every one could be so successful, but I fully believe that nearly any one with a little determination and strength of stomach can easily overcome sea sickness by this means.

W. E. F.

Helena, Montana, August, 1881.

How to Prevent Car-Safe Robberies.

To the Editor of the Scientific American:

The late robbery of the safe of the express company on the Rock Island road leads me to offer the following plan to prevent such cases: The safe to be provided with combination locks; the safe to be locked by the express company's agent at New York city on leaving that place; the numbers of the combination to be telegraphed to agents of the express company at Chicago, San Francisco, and any intermediate places; the safe to be opened by them on its reaching their places. The messenger in charge of the car, not knowing the combination, could not, even by compulsion, open the safe, nor could it be opened by any practicable means except at the proper places.

WALTER L. SMITH.

Weston, Mass.

MISCELLANEOUS INVENTIONS.

An improved device for thawing out sink spouts has been patented by Mr. Amos Stevens, of Fairfield, Me. A pipe of considerable less diameter than the sink spout is passed through this spout and is as nearly in the middle of the spout as possible. The upper end of the inner pipe is slightly tapered outward, and passes through and is fastened to a slotted plate forming a strainer. This plate supports a cup fitting into the upper beveled end of the inner tube. If the water in the sink spout freezes, hot water is poured into the cup, from where it flows through the inner pipe and thaws out the sink spout in a short time.

Mr. George O. Denison, of Waterloo, Ind., has patented an improved bag holder made low in front and high in rear to expedite the filling of the sack and prevent the grain from running out at the rear of the bag holder. It is provided with suitable hooks adapted to be inserted into the upper end of the sack to secure it to the bag holder. The holder is partly supported by a coil spring.

An improvement in horseshoes, patented by Mr. Sebastian K. Minton, of Des Moines, Iowa, consists in the combination with halves hinged together at the toe and having their upper faces beveled inward of the toe calk, having a hole and slot, and heel calks having right and left screw threaded holes, by which the heel of the shoe may be expanded.

Mr. William T. McLean, of Sidney, Ohio, has patented an improvement in that class of earth scrapers the body of which is made of thin sheet steel with wooden backboard, the lower edge of which has always heretofore been secured to the scraper by means of rivets passing through the bottom of the scraper in such a manner that the rivet heads soon wear off by abrasion and let the backboard loose, which wholly disables the scraper for further use until repaired. The improvement consists in the construction and arrangement of the devices for more perfectly securing the wooden back to the steel body without the use of rivets.

An improved drag saw has been patented by Mr. Samuel Clemens, of Rockport, Ill. The invention consists in having the saw blade pivoted at one end of a lazy-tongs connected with the framework of the apparatus, and in having a hand lever pivoted to the said framework and connected with the lazy-tongs by means of a pitman to operate the lazy-tongs.

An improved sand guard for car axle boxes has been patented by Mr. Henry Roth, of New York city. The object of this invention is to improve the construction of the sand guards for which Letters Patent No. 235,298 were issued December 7, 1880, to the same inventor, in such a manner as to make them more effective.

An improved wagon step, patented by Mr. Henry F. W. Koehler, of St. Joseph, Mo., consists in a novel arrangement of a cam lever, a slotted crossbar, two connecting bars, and a step or steps, all arranged in a frame attached to the wagon body. By this means provision is made for lowering the steps for use or turning it up out of the way by moving the lever in one direction or the other.