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THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 185,
For the Week ending July 19, 1879.

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ALUM IN BAKING POWDERS.

In the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT will be found a communication from G. E. Patrick, Professor of Chemistry in the University of Kansas, giving details of a series of practical tests to determine whether the hydrate of alumina is dissolved by the gastric juice. The question has a vital bearing on the discussion as to the safety of using alum in baking powders. Professor Patrick attacks it without prejudice, by strictly scientific methods, and arrives at results which are certainly gratifying in view of the wide use of alum powders in our kitchens.

Professor Patrick takes his text from the published opinion of a prominent physician, who says, after stating the difficulties attending a thorough mixture of the ingredients of alum baking powders:

"But even if the exact proportions were maintained, the salts formed would retain their injurious properties, as they would dissolve in the gastric juice. The gastric juice contains not only lactic acid, but a large amount of hydrochloric acid, and both the sulphate and hydrate of alumina would be dissolved."

After testing by reference to authorities the statement that the gastric juice contains a large amount of hydrochloric acid, and finding the weight of evidence to be that the quantity is in reality extremely minute, and that little not free, Professor Patrick proceeds to describe his examination of the practical question whether the hydrate of alumina as it exists in bread after baking, when made with alum powders, will be dissolved in the fluids of the alimentary canal.

This question could be determined only by careful tests with living animals. Professor Patrick found cats to be most available. Having made biscuits with an acknowledged alum baking powder, using twelve times the proportion of powder directed on the labels, and employing for each experiment a distinct sample of powder, he fed the biscuits to cats that had fasted from one to two days. The amount eaten in each case was enough to give at least half a teaspoonful of powder to each experiment. After allowing for digestion 20 minutes, 45 minutes, 1½ hours, 2 hours, and 2½ hours, respectively, the cats were killed, and the contents of the stomach and small intestines were carefully examined for dissolved alumina. In each case undissolved hydrate of alumina was found, but of dissolved alumina there was never a trace.

Surprised at the uniformity of these results, and thinking that the organic matter of the flour might have interfered with the solution of the alumina or his detection of it, Professor Patrick made two crucial experiments. In each, two teaspoonfuls of the powder were mixed with water and baked at the ordinary temperature of the oven. The mass was then fed to a cat (under compulsion) and after a specified time the stomach and intestines were examined as before. In neither case was a trace of dissolved alumina discovered.

Similar experiments were then tried with unbaked (gelatinous) hydrate of alumina, and in both cases a trace of dissolved alumina was found; the inference being that it is not safe to eat dough made with alum powder—it should always be baked. Another important practical point was also suggested—namely, that if bread is carelessly mixed or with insufficient water, some of the powder may remain dry and the alum not changed to the hydrate; in which case the effect would probably be injurious.

In order to test this question, and also to furnish a check on the other experiments with biscuits, Professor Patrick had a batch made in which the mixing was less thorough than usual and with less water. These were fed to cats, and subsequent tests developed in every case a trace of dissolved alumina. These experiments, while proving the reliability of those first described, go to show, Professor Patrick thinks, that to insure the entire absence of alum in the bread, the mixing must be done with plenty of water. As a simple precaution it might be well to mix the batter too thin at first, and stiffen it by the addition of pure flour.

Tests of this nature are obviously worth any amount of theory; and if there is no radical difference between the gastric juices of cats and men, it seems to be conclusively established that alum baking powders may be used without injury to health.

THE CAPTIVE BALLOON AT CONEY ISLAND.

Not the least of the many attractions of Coney Island this summer is Mr. King's captive balloon, "Pioneer," the first ascension of which was made on the afternoon of July 1. This balloon is not as large as the Giffard captive balloon at Paris, but is said to be much more perfectly constructed. It is sixty-five feet in diameter, and has a capacity of 150,000 cubic feet. The material is Irish linen in two thicknesses. The basket or car of wicker work weighs 476 lb. Above the balloon is white, to reflect the sun's rays; below it is ornamented with dark red and green, to make it a conspicuous object against the sky. It is inflated with hydrogen, and in calm air shows on the dynamometer a lifting strain of 1,400 lb. The gas is made on the spot by Mr. A. O. Granger, by passing steam over hot iron. Wound about the drum of a very large windlass is 1,215 feet of 1½ inch rope, through the center of which runs a telephone wire. An end of this rope is carried through a trench to the center of the inclosure, where, after passing around a pulley, it is fastened to the balloon. The pulley is attached to the foundation by a universal joint of iron, so that, in whatever direction the balloon may pull, there will be no side strain on the pulley. A good hold on the sand is secured by the use of four sticks of yellow pine, each 12 feet long and 12 inches square. These are planted horizontally nine feet below the surface, and above them is a well, made of concrete. Across the top of the well lie two other similar timbers, which are strongly fastened to their fellows below by long and thick iron bolts. Mr. King says this foundation will resist a strain of 100,000 lb., while the utmost strain that wind and gas united can exert on the connecting rope of the balloon will not exceed 22,000 lb.

On its trial trip the balloon ascended three or four hundred feet, and shortly afterwards a second trip of seven hundred feet was made. At this height the view was pronounced magnificent by the small party making the first venture. All the ocean approaches of New York harbor were at their feet for a radius of thirty miles; and inland they could see the numerous towns and cities about the bay of New York. Along the Sound to Flushing, up the Hudson River as far as Tarrytown, and the Orange Valley, and other parts of New Jersey as far as Paterson, Perth Amboy, and Long Branch.

THE TELEPHONE AS A LIGHTNING INDICATOR.

Mr. George M. Hopkins, of Brooklyn, N. Y., during a recent thunder storm connected the gas and water pipes of his dwelling with an ordinary Bell telephone, and discovered that the electrical discharges were plainly indicated, either by a sharp crack or by a succession of taps. This occurred when the discharge was so distant that the thunder was inaudible. The sound also seemed to be perceived by the ear before the lightning could be seen. There was a marked difference in the character of the discharges, some that appeared single to the eye were really multiple. Often the discharges would consist of a series, beginning and ending with discharges larger than the rest, thus: ▬ - - - - - - ▬, sometimes it would be thus: ▬ - - - - - -, sometimes the reverse, and often a single crack.

The gas and water pipes were used, being the most convenient and at the same time the safest conductors for the purpose. Special apparatus might be devised, having a good ground, and a series of points for gathering the electricity from the air, but in using apparatus of this kind there is always more or less danger.

New Steel Railway Bridge.

A new and splendid railway bridge over the Missouri River, built wholly of steel, has lately been completed and opened for traffic by the Chicago and Alton Railway Co. The bridge is located at Glasgow, Mo. The constructing engineer was Gen. Wm. Sooy Smith. The material was furnished by the Hay Steel Co., of Chicago, and while the structure is stronger than an iron bridge its weight is thirty-three per cent less than it would have been had iron been employed. The time of construction was only one year. The cost, $450,000. The following are the principal dimensions:

Five spans, 314⅔ feet each, from center to center of piers, three above and two below grade; all steel; depth of truss, 36 feet center to center of pins. Height of through spans above high water, 50 feet. East approach, iron trestle, 210 feet; two deck spans of iron, 140 feet each, 280 feet; west approach, iron deck span, 140 feet; west approach, iron trestle, 510 feet; west approach, wooden trestle, 864 feet total length of the bridge proper (steel) 1,573⅓ feet; total length of bridge and approaches, 3,577⅓ feet.

The Silver Deposits of Leadville, Colorado.

Says a correspondent of the Boston *Advertiser:* The ore beds vary from one to forty feet in thickness. They are generally undulating like the waves of the ocean, so that the distance from the surface varies with the undulations. The size of a mining claim is in most cases 300 feet inside by 1,500 feet long, being about ten acres in area. The ore known as "hard carbonates" consists of silver mixed with iron or lead. The soft or sand carbonates resemble common road gravel, yellow and red ocher and gray sand. Chlorides of silver are frequently visible in the hard carbonates. The usual size of a shaft is 3½ feet by 7 feet, and is substantially timbered. After the ore deposit has been penetrated, the "main entry," "parallels," and "cross cuts" are excavated, leaving the remaining ore in blocks while the work of exploration is going on. In sinking a shaft we usually penetrate, first, a deposit of gravel or "wash" from 20 to 100 feet in thickness, frequently containing bowlders which have been subjected to abrasion. Not unfrequently a stratum of "cement" a few inches in thickness is encountered, resembling Roxbury pudding stone or an old cemented cellar floor. Next we come to calcite, or porphyry—sometimes soft like "fire clay," either pure white, gray, or red—the latter showing an iron stain. The soft porphyry runs from one inch to several feet in thickness. The hard porphyry is often "picking ground" (*i. e.*, porphyry rock, which can be excavated by means of a pick), but frequently it is blasting or "shooting rock." Following the porphyry is iron ore, varying in thickness and sometimes containing a few ounces of silver. Following the iron we find the "pay ore," more or less rich in silver.

The generally accepted theory is, that this region was once covered with a lake, the waters of which held in solution silver, lead, and iron, which were in time precipitated on the bottom of the lake. The porphyry, gravel, etc., were subsequently deposited. After the precipitation came the age