SCIENCE

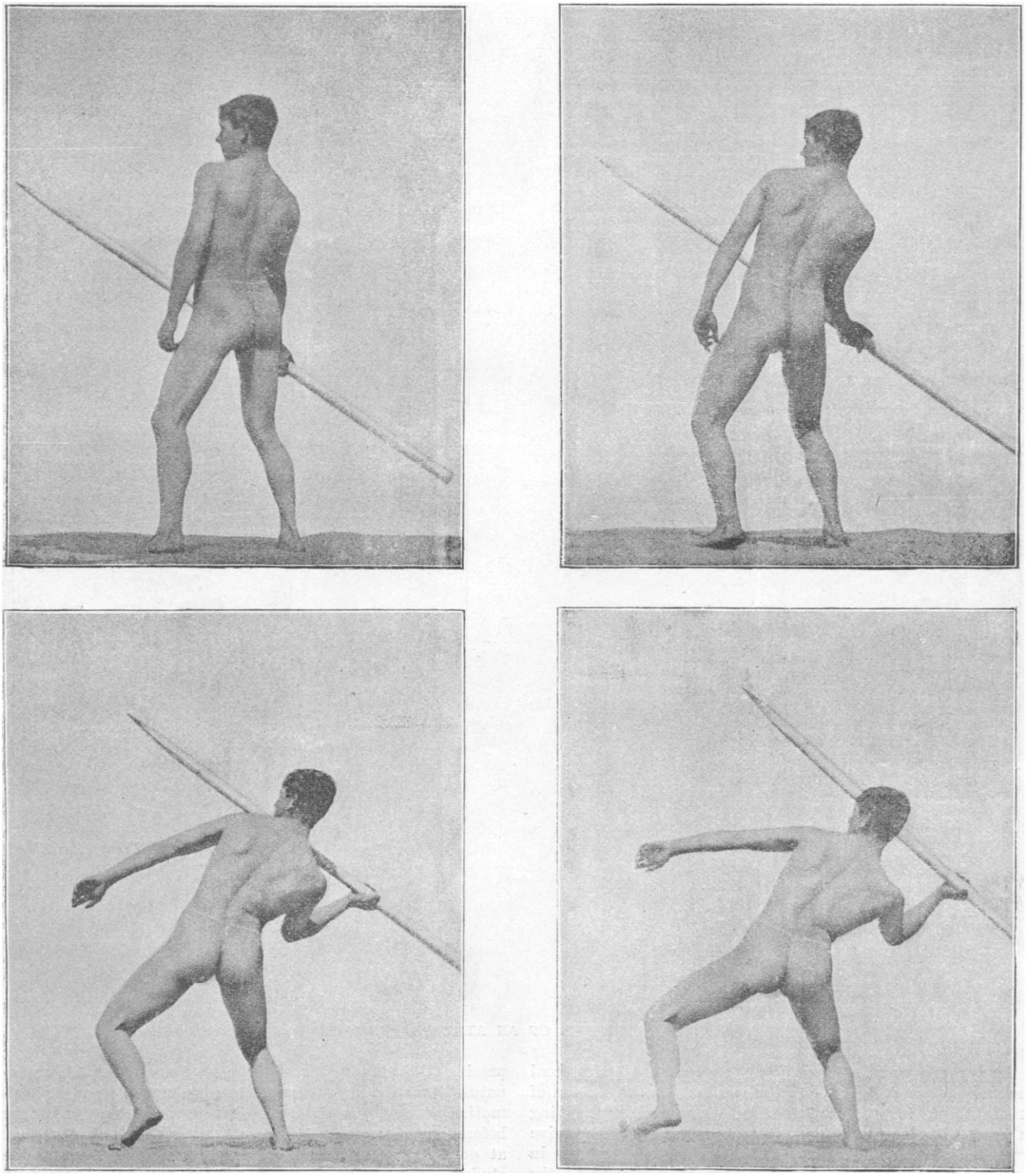
[Entered at the Post-Office of New York, N.Y., as Second-Class Matter.]

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

EIGHTH YEAR.
VOL. XV. No. 366.

NEW YORK, FEBRUARY 7, 1890.

SINGLE COPIES, TEN CENTS.
$3.50 PER YEAR, IN ADVANCE.

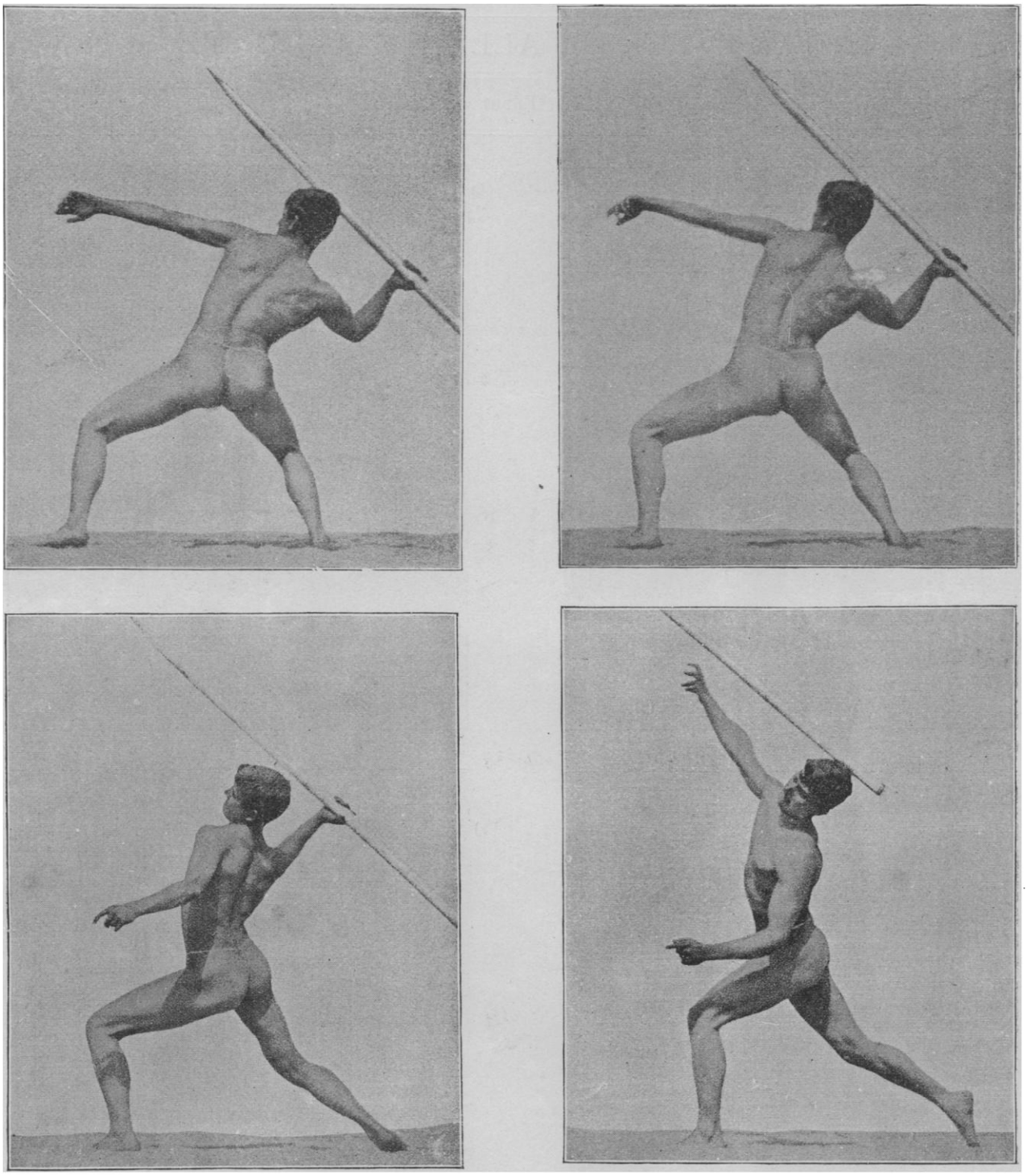


INSTANTANEOUS PHOTOGRAPHS OF AN ATHLETE THROWING A JAVELIN (see next page).

INSTANTANEOUS PHOTOGRAPHY.

IT is a psychological peculiarity of our eye to retain an impression for some time after its source has ceased to exist: thus, if a piece of glowing coal is quickly swung around in a dark room, the eye perceives a circle of light. This is a proof that the eye at a given moment does not see the glowing coal at the place where it happens to be, but that the impression of light of the previous position continues to prevail, thus giving us a composite picture consisting of separate and successive impressions. The same occurs in observing an animal in motion, when the impression we receive is composed of the momentary as well as the immediately preceding positions. It is only by means of photographic apparatus that any single and separate phase of motion can be seized and rendered visible to the eye. Thus it becomes apparent that photography enlarges the power of vision to an extent which is truly wonderful.

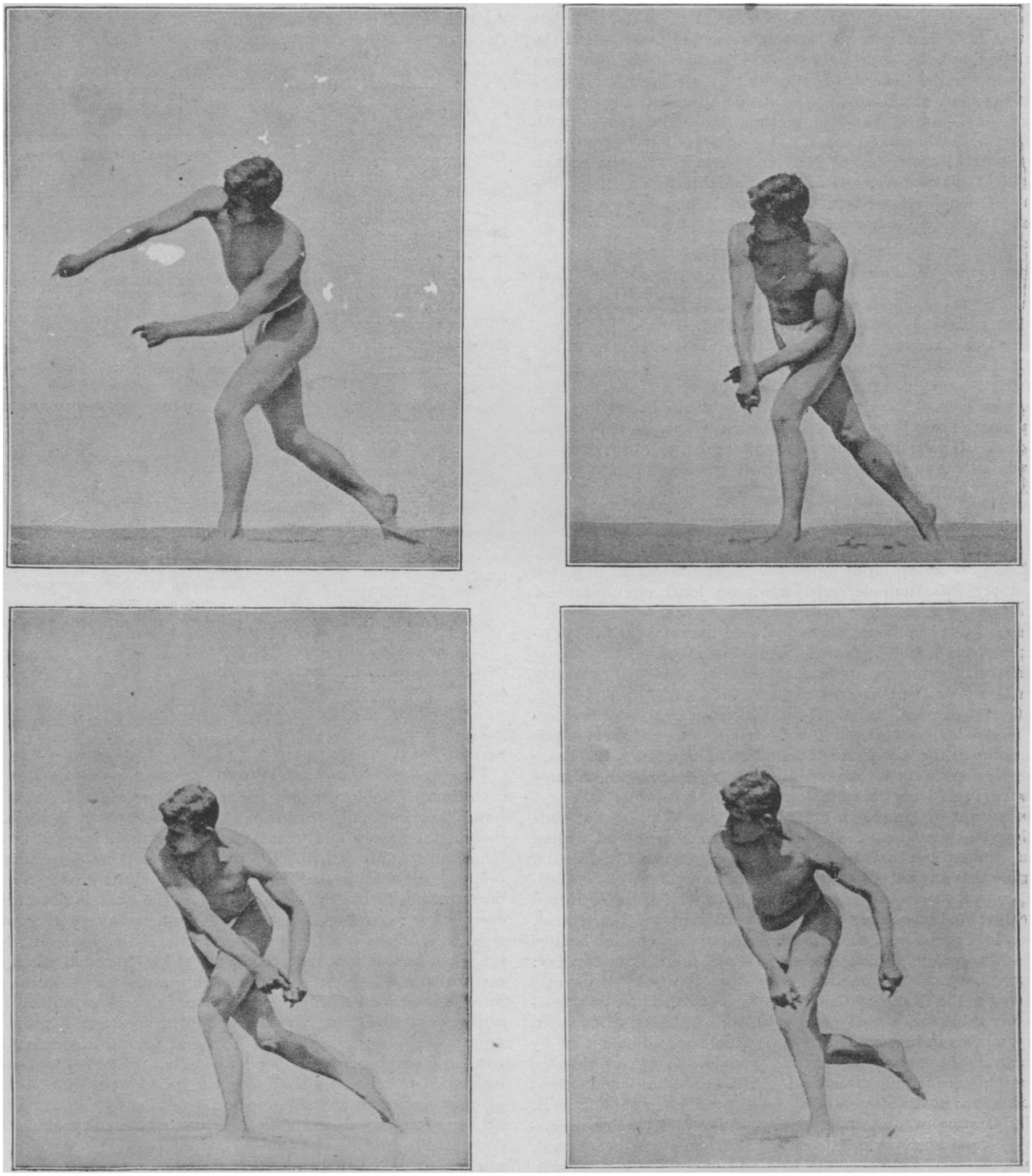
Of course, the sensitiveness of the photographic plate surpassing that of the human eye so many times, it was quite natural that the very first pictures made of men or animals in motion showed many new positions which the eye had never before been able to perceive, and artists as well as scientists at once began to make use of photography for the purpose of studying the phases of rapid animal motion. Prominent in this field of investigation is Mr. Ottomar Anschuetz of Lissa,



INSTANTANEOUS PHOTOGRAPHS OF AN ATHLETE THROWING A JAVELIN.

Prussia, who has taken thousands of pictures of flying birds, running horses, jumping men, etc., all admirable for their perfect "technique," and for the great artistic tact and scientific skill with which the moments of exposure had been chosen. In these pictures the characteristic positions peculiar to different motions are well presented. Many of them at first appear absolutely unnatural, because the eye has never been able to observe them.

These pictures produced rich and important material for the study of motion, but Mr. Anschuetz succeeded in making his experiments more valuable by obtaining whole series of pictures giving the different phases of motion. He made it his object to get of one period of motion, for instance, of the step of a walking man, as many views as possible in equal intervals of time, and he succeeded admirably in his undertaking. He was able to observe in this manner even the fastest motion, for instance, the hurdle-jump of a racing horse, which occupies only seventy-two one-hundredths of a second, and in this short time made twenty-four pictures of the different positions in equal intervals. A dozen pictures showing the different phases of position assumed by an athlete in throwing a javelin, reproduced from instantaneous photographs taken by Mr. Anschuetz, are given on this and the preceding pages.



INSTANTANEOUS PHOTOGRAPHS OF AN ATHLETE THROWING A JAVELIN.

Mr. Anschuetz next constructed an apparatus which he called the electric tachyscope, in which he was financially assisted by the German Government. In this instrument the series o-

pictures is put on a circular glass plate, which is rapidly turned round its axis; and, whenever a picture appears before the eye of the observer, it is lit up by an electric spark. By this means the natural motion of the object is reproduced with a degree of truth and accuracy that is absolutely bewildering. Looking thus at the representation of a man on a galloping horse, every single movement of horse and rider can be followed. Not only do the legs of the horse move according to the gait, but one sees the dust rise, the horse's mane and tail fly, and the nostrils extend. The rider is jerked in his saddle, he urges his horse, pulls the curb-chain, and moves back his leg to apply the spur, etc. Each series in this apparatus represents a bit of life — not a life-like picture, but life itself — with amazing naturalness and truth. One of these tachyscopes, and many notable examples of Mr. Anschuetz's work, have been brought to this country, and are now on exhibition at the show-rooms of the United States Photographic Supply Company on Fourteenth Street, this city.

SOME FOOD SUBSTITUTES AND ADULTERANTS.[1]

MR. PRESIDENT, LADIES AND GENTLEMEN,—In his address before this society last year, our late president, Dr. J. H. Kidder, presented the subject of air as one of the "two necessities of life which," he said, "are absolute," and "which we cannot live without;" namely, "food (including water) and air." It is more especially to a certain class of foods, whose increasing consumption and sale have of late years attracted public notice, that I wish to call your attention this evening; namely, that of cheap and wholesome food substitutes, which are also frequently used as food adulterants.

Our bodies are like a furnace, and require fuel and air to sustain the heat of combustion by the constant renewal of fresh material and the elimination of the waste products. The form, whether solid or liquid, of animal or vegetable origin, in which we supply this fuel, depends largely on local circumstances, climate, education, etc.; and, as long as the food employed goes to furnish the proper amount of fuel material for the maintenance of the body temperature, life is sustained.

The extent of the consumption of any new food will evidently depend on how it fulfils this requirement as a fuel, and by its pleasing appearance, its palatability, its capacity to appease hunger, its wholesomeness, and its relative cheapness, attracts public attention. If the new food is a manufactured product, its cheapness will depend upon the possibility of its production on a large scale from relatively cheap materials.

From want of reliable information in regard to the materials employed in most new food products, there is a general feeling of uncertainty and insecurity on the subject. People, as a rule, imagine that any substance used as an adulterant of, or a substitute for, a food product is to be avoided as itself being injurious to health; and when they hear that a certain food is adulterated, or is a food substitute, there is immediately a prejudice excited against the article, which it takes time and familiarity to allay. A moment's reflection ought to show that it would be directly contrary to the food manufacturer's interest to add to, or substitute any thing for, a food product which would cause injurious symptoms, as in that case his means of gain would be cut off by the refusal of consumers to buy his product. It is true that the unscrupulous manufacturer or dealer does not hesitate to cheat his customer in the interest of his own pecuniary profit and gain, but he does not want to poison him. Where, through carelessness or ignorance, injurious substances, such as the arsenic, copper, aniline, and other metallic and organic poisonous salts sometimes used for artificial colors, are added to foods, their presence is promptly revealed by the dangerous symptoms which they call forth in the consumer. About a year ago the case of the Philadelphia bakers, who added chromate of lead to color some of their cakes, and thus caused the death of several persons, and serious illness in nearly every one who ate any of these products, will be recalled by many present.

[1] Annual address of the retiring president, Mr. Edgar Richards, delivered Jan. 23, 1890, before the Chemical Society of Washington.

The great majority of substances used for food adulterants or substitutes consist of cheap and harmless substances, which are not injurious to health, as the following list of those most commonly met with in the principal food products will show. This list has been compiled from the reports of the State boards of health, the returns of the British Inland Revenue Department, the reports of the British Local Government Board, and those of the Paris Municipal Laboratory.

TABLE I.

Food Products and their Chief Adulterants.

FOOD PRODUCT.	ADULTERANTS.
Milk	Water, removal of cream, addition of oleo-oil or lard to skimmed milk.
Butter	Water, salt, foreign fats, artificial coloring-matter.
Cheese	Lard, oleo-oil, cottonseed-oil.
Olive-oil[1]	Cottonseed and other vegetable oils.
Beer	Artificial glucose, malt and hop substitutes, sodium bicarbonate, salt, antiseptics.
Sirup	Artificial glucose.
Honey	Artificial glucose, cane-sugar.
Confectionery	Artificial glucose, starch, artificial essences, poisonous pigments, terra alba, gypsum.
Wines, liquors	Water, spirits, artificial coloring-matter, fictitious imitations, aromatic ethers, burnt sugar, antiseptics.
Vinegar	Water, other mineral or organic acid.
Flour, bread	Other meals, alum.
Baker's chemicals[1]	Starch, alum.
Spices[1]	Flour, starches of various kinds, turmeric.
Cocoa and chocolate	Sugar, starch, flour.
Coffee[1]	Chiccory, peas, beans, rye, corn, wheat, coloring-matter.
Tea	Exhausted tea-leaves, foreign leaves, tannin, indigo, Prussian blue, turmeric, gypsum, soapstone, sand.
Canned goods[1]	Metallic poisons.
Pickles	Salts of copper.

[1] For list of adulterated brands see Report of the Commissioner of Internal Revenue, 1889, pp. 181–184.

Water.

Ordinary potable water is not generally considered either externally or internally "injurious to health," yet it is probably the most common adulterant used. We find, indeed, in the Canadian "Adulteration Act," that "if water has been added" to milk, "it shall be deemed to have been adulterated in a manner injurious to health" (Section 15). The watering of milk is everywhere recognized as not only a fraud, but also a grave misdemeanor, if not actually a crime. This is the food on which the whole population under one year old is fed; and, where the mother cannot supply the proper nourishment for the child, she must depend for its bringing-up on cow's or other milk. It is self-evident that a pint of watered milk does not contain the same amount of nourishment as the same volume of whole milk, so that a child or invalid might be actually starved to death if compelled to rely on the former for its sole sustenance. The placing of watered and skimmed milk on the market should, in all large cities, call forth the active exertions of their health departments to supervise and as far as possible suppress their sale.

The skill of the milk adulterator has kept pace with the march of improvement, and to-day we find centrifugal machines costing over two hundred dollars placed on the market, designed solely to manufacture, from skimmed milk and oleo-oil and lard, an artificial cream or milk, depending on the amount of animal fat added, which, it is stated, can be used for all purposes in which the genuine article is employed. A description of such machines will be found in *Engineering* (vol. xliv. 1887, p. 478) and in the catalogues of the dealers.