to the elevated stations). These stairways also serve as exits for arriving passengers. The loops in the endless train of cars are arranged so as to encircle about three-fourths of the platforms, the cars locking with the platform edge, and rotating the platforms at the same speed as the moving train. People will then be able to step from one to the other with as much ease and safety as they now step from the parlor-car to the dining-car of a moving express train. The stairways, which are attached to the platforms near the center and extend downward to near the ground, rotate with the platforms, but the motion is so slight as to be scarcely noticeable. If the platforms are made 400 feet in diameter, at twenty-miles-an-hour speed of the cars, the stairways would have a rotary speed of one mile an hour. Beneath each stairway, and leading to it, would be an intermediate circular platform, twenty feet in diameter, on a level with the ground. It would rotate in the same direction, with a speed one-half that of the stairways, or one-half mile an hour. An automatic fence prevents a person falling off the platform.

Each platform would have four stairways, twenty feet in breadth, which would accommodate more than 100,000 persons an hour. Congestion on the platforms would be impossible, for if persons packed the stairways as closely as they could, each occupying two feet of breadth, forty persons would fill the eighty feet of stairways; but when they arrived at the edge of platform, beside the cars, they would be more than thirty-one feet apart, the edge being 1,250 feet long, and 940 feet of cars being always in contact with the platform. If a person failed to step off the car, moving at ten miles an hour, he would be carried over the bridge again, and back, and would lose twelve minutes; but if he did not step on the car during the first revolution of platform, he would lose but fourteen seconds, when he would begin his second revolution. He would have sixty-four seconds to step on or off the car as against twenty-eight at present. The proposed plan would reduce the load on the bridge and distribute the load more uniformly.

Results Compared.	Present System.	Proposed System.
Load on span (cars and passengers)	868 tons	716 tons.
Length of loading platforms	440 feet	940 feet.
Number of cars at platforms	10 cars	24 cars.
Number of cars per hour	440 cars	1320 cars.
Number of persons in each car	150 persons	75 persons.
Speed of cars per hour	10 miles	10 miles.
Time for loading	28 seconds	64 seconds.
Number carried per hour at 10 miles	50,000 persons	100,000 persons.
Number carried per hour at 20 miles	——	200,000 persons.
Railways required	4 tracks	2 tracks.
Speed of cars, 20 miles per hour	(Impossible)	200,000 persons.

Roebling's report says: "I propose a speed of 20 miles an hour, as being perhaps the one most likely preferred. But this may be increased to 30 or 40 miles per hour, with absolute safety." (Page 246, Franklin Institute Journal, 1867.)

To render the above plan most effective, the Manhattan loop should extend over Park Row, where a curvature with radius of 125 feet to 200 feet could be obtained. The Brooklyn loop could be built near Tillary Street, between Fulton and Washington Streets. This would practically connect City Hall with Borough Hall.

Pipe Made of Asbestos and Condensed Milk.

An inventor who lives in Orange, N. J., has invented a new kind of tobacco pipe. The stem and bowl are made of asbestos, either by rolling together asbestos paper or thin strips of asbestos forming a tube of the right thickness and dimensions for the bowl of the pipe, hollow at both ends. One end is filled in by strips of asbestos so cut and fitted as to occupy the opening. The stem is prepared in the same manner and is fitted with a mouthpiece. The strips of asbestos forming these tubes are coated with a paste composed of condensed milk and plaster of Paris. In order to burn out the paste the pipe is baked. The inventor states that any color from light brown to ebony can be obtained by varying the heat.

The Dominion Iron and Steel Company has, it is understood, decided to adopt at its works at Sydney, Nova Scotia, a new and inexpensive process for the manufacture of pig iron, utilizing waste iron ore, which costs from 60 to 75 cents a ton. Iron ore in this condition can be used only when it is solidified. For a great many years chemists endeavored to solve this problem, but it was only a few years ago that W. Owen, consulting engineer and foreign representative of Bruck, Kretschel & Co., steel manufacturers, of Osnabrück, Germany, made the discovery. Since then the process has been adopted by seven German and two or three English steel companies with eminent satisfaction. The waste is first solidified, usually in bricks, and in this condition is placed in blast furnaces, when pig iron is produced. The plant which the Sydney steel company proposes to install will cost about $8,000, and will have a daily output of about 75 tons. It will be the first of the kind erected on the continent, and the company will have the exclusive rights for the Dominion of Canada.—George Hill. Vice-Consul-General, Halifax, Nova Scotia.

Correspondence.

The Unsanitary Cake of Soap.

To the Editor of the SCIENTIFIC AMERICAN:

In the last number of the SCIENTIFIC AMERICAN I noticed an article by Mr. G. F. Shaver concerning disease dissemination through toilet soap, as used in public toilet rooms, etc.

It seems quite incredible that the Americans who are so strict and scrupulous in hygienic matters, should have overlooked such a serious evil, which is so very simple to prevent. It struck me as rather strange, therefore, when I came to this country a year ago, and found to my surprise, that even in the first-class hotels the common cake of soap—going every day through a hundred different hands and so getting thoroughly impregnated with germs—seemed to enjoy its existence.

Is there anything simpler and cleaner than the device now in use in nearly every public toilet room in most of the countries abroad? The cake of soap is a thing of the past, and its place is taken by a handy little soap-powder distributer fixed on the washbowl. This apparatus is generally made out of nickel-plated brass, having a cylindrical form; the standard size is, as far as I can recollect, about 4½ to 5 inches high, its diameter being about 1 to 1½ inches. On the top is a flat knob and in the base a small opening. By pressing the knob, the distributer will deliver through the opening a small quantity of antiseptic soap-powder, which is collected by holding one hand under the apparatus. This distributer is not only used in public toilet rooms, but can be found on the washstands in very many private houses. HUCK GERNSBACK.

New York, March 7, 1905.

Do Animals Think?

To the Editor of the SCIENTIFIC AMERICAN:

Mr. Burroughs, in an interesting way, tells us why he thinks that animals do not think, in the February number of the Harper's. He writes: "We are too apt to speak of the lower animals in terms that we apply to our own kind. We can hardly avoid it, but all modern comparative psychologists account for all their actions without attributing to them any of the higher faculties. A certain situation leads to a certain act, not because the animal thinks about it as we do and is conscious of its purpose, but because certain sense impressions give rise to certain impulses, and these impulses result in the act. There is no mental process, no mental image at all in the matter, any more than there is in a man when he instinctively dodges a blow or responds to a fine day or to the odors of his dinner. Sense impressions do it all. . . . We so habitually impute thought to animals that we come unconsciously to look upon them as possessing this power. We know that under similar conditions we think, and therefore we impute thought to them, but of mental images, concepts, processes like our own, they probably have none. Innate or inherited impulse, which we call instinct or internal stimulus, explains most of the actions of the animals. An internal stimulus is applied, and the reaction is quick. Does not man wink, dodge, and sneeze, laugh and cry, and do many other things without thought or will? To adapt means to an end is an act of intelligence, but that intelligence may be inborn and instinctive, as in the animals, or it may be acquired, and therefore rational, as in man. We know that animals do not think in any proper sense as we do, or have concepts and ideas, because they have no language. Thinking in any proper sense is impossible without language; the language is the concept. Our ideas are as inseparable from the words as form is from substance. We may have impressions, perceptions, emotions, without language, but not ideas.

"Animals know only things through their senses, and this knowledge is restricted to things present in time or space.

"Reflection, or a return upon themselves in thought—of this they are not capable." It is very evident to the merest novice in the study of mental philosophy that Mr. Burroughs is no adept. He makes definitions wholly original. He affirms without supporting evidence. And then, too, he affirms that with regard to animals lower than man that is true of all, including man.

For illustration, he says: "Animals know only things through their senses," when, as a matter of fact, material things—and there can be no immaterial things—can only be known through what are scientifically called the sensory nerves.

He affirms that animals know only things through their senses present in time or space; in other words, that they have no memory—a statement entirely contradicted by multitudinous instances, as cited by eminent psychologists, such, for instance, as Lewes and Romanes.

Again, Mr. Burroughs affirms that thinking in any proper sense is impossible without language. He settles the question between the nominalists and realists with this dictum. I should like, with all due deference and modesty, to show that there are plausible reasons for doubting his *ipse dixit*. As the result of a small study of brain phenomena, we have concluded that all that we denominate thinking is due to the presence of reflected images, retained by the nerves of the brain, of outward objects or forces.

That a word first impinges on the nerves of the brain, making there an ineradicable impression. And a word is either perceived as sounds or figures of letters. The impression remains, and comes before the cognizing *ego* as a congerie of sounds or figures.

Mr. Burroughs says that thinking is impossible without language. By language he evidently means words composed of alphabetical symbols of sound. We think him mistaken. We believe that it is possible for an architect to design a cathedral without recalling the name of a single constituent necessary for its construction. We believe that a geometrician is almost entirely independent of language in its alphabetical sense.

We believe that the deaf and dumb think entirely with the images of sensible phenomena.

Thinking is not necessarily voluntary either, as Mr. Burroughs concludes. If so, the great majority of human beings do no thinking or very little. Even Herbert Spencer's great works were the issues of involuntary action of that brain of his, as he tells us in his autobiography. Most of the greatest works, literary and otherwise, were the product of human brains acting without order from the individual will. As the stomach produces in digestion blood and bile, as the generative organs produce human beings, so experience shows to great men their brains produce poems, books, temples. How could it be otherwise?

If a Shakespeare willed a great play, a Milton a great poem, it was because these came into their perception involuntarily first of all. No man that ever lived has willed into existence that which did not first exist. There is going on in these skulls of ours a vast deal that comes not into our consciousness for the arbitrament of our judgment and the action of our wills.

"To adapt means to an end is an act of intelligence, but that intelligence may be inborn and instructive, as in the animal, or it may be acquired, and therefore rational, as in man." (Burroughs.)

This is a very unphilosophical remark, we must confess.

To adapt means to an end is in man only rational because it is acquired, is certainly a very peculiar statement.

If an animal adapts means to an end, does the fact that this act of intelligence is inborn or acquired make it any the less an act of intelligence? How can we deny reason, which is the comparing of objects and drawing conclusions and forming plans, to the builder of a dam, be he a man or beaver? The adapting of means to ends by the spider, by the bird, by the beaver, the ant, the ostrich, and most other animals of the brute genus displays intelligence, and this is an attribute of mind.

Mr. Burroughs affirms that winking, dodging, sneezing, laughing, crying, are not thinking in men any more than in animals; that they are only the result of sense impressions.

I think it very hard to show that all we think and do, from sneezing to preaching, is not the resultant issue of sense impressions. "Of mental images like our own, animals probably have none." (Burroughs.)

The image of a chair or table must have the same appearance on the sense of a fly as on the sense of a babe in the cradle. Of course knowledge affects the conception formed of a table. A cat sees precisely the same image of a chair that I do, and forms a conception of it which includes its figure with the use which the cat may put it to. Our conceptions of the chair differ, but are they not both conceptions?

Yes; there is not the slightest doubt to be entertained that all our consciousness of thought and all thought, conscious or otherwise, is the result of the brain's activity of all the animal creation, each animal, from ant to man, having the sort of machinery of mind suited to its conditions and needs.

FRANCIS WASHBURN.

Newburg, N. Y., February 23, 1905.

A new type of stove, the object of which is the abolition of smoke, no matter what fuel is employed, has been demonstrated in London. The invention comprises a screen of tubular fire bricks, made of special material built up in the furnace in such a position that all the products of the fire pass through the screen. The latter quickly becomes incandescent, and flashes the gases as they pass through, thus preventing the formation of carbon. By the aid of this device, coal of the worst description can be burnt in the ordinary boiler with practically no smoke, and with a considerable saving in cost. For the purposes of demonstration, cheap damp coal dust was burned. The only result was a light gray cloud at the top of the chimney stack, which cleared away in a few seconds.