

Correspondence.

A Chance for Inventors.

To the Editor of the SCIENTIFIC AMERICAN:

In the July 29 issue of the SCIENTIFIC AMERICAN there is a short article under the title "The Dangers of Cheap Leather," which is of great interest to many shoe manufacturers of this city. I have had a large experience as a bottom finisher for twenty-five years and for the past two years and one-half have had a large amount of trouble in finishing the bottoms of shoes. The manufacturers are at a loss to remedy the evils that arise from a large majority of the leather now on the market, and would gladly welcome some method whereby the leather generally in use could be finished satisfactorily. The chief trouble is that the bottoms first lose the luster and in the course of from forty-eight hours to three days a white crystalline salt forms on the bottom and renders the bottom unfit. The leather has great absorption power and during the process of manufacturing when wet retains the moisture to a detrimental degree. This is a subject that is of great interest to thousands of shoemakers through New England, and if there is any method or chemical that will remove the preparation that is found in the leather it will be welcomed by both the manufacturers and shoe operatives of New England. Should you desire any samples of the leather I should be pleased to furnish them.

Brockton, Mass., August 14, 1905. C. A. BROWN.

The Reasoning Power of Animals.

To the Editor of the SCIENTIFIC AMERICAN:

As I regard opportunities offered in this column very precious in the settlement of controversies when they frequently arise, I would much appreciate space allowed to explain my position in connection with that fascinating question, "Do animals reason?" as per claims made in your issue of July 22, and again criticized—I believe hastily—in this column August 5. My conclusion that animals and small children do not reason is based on the undoubted fact that when they imitate complex acts which cannot be ascribed to instinct, they come by the necessary mental impulse wholly through subconscious processes. Reasoning, in the popular sense, is supposed to mean judgments born of conscientious mind processes—intellection, in other words. What subconscious mental processes are, we do not as yet pretend to know; but one thing is certain—they exist in both men and beasts, and they always accompany conscious processes. In the former conscious processes dominate the subconscious processes, and we are therefore said to come to the use of reason, while in the latter the reverse exists, and hence we say animals cannot reason. Suffice it to say, therefore, that when the famous cat saw the door opened many times for the same purpose on which was dependent its own welfare also, unconscious writ formed on its brain, of which process it was unaware, thought not consciously, and did not reason. When this impression, stamped there by provident Nature herself, was finally matured and ready to use, it suddenly became conscious to, and was thereafter successfully employed by the cat to imitate human acts to further its own ends. While I still believe the substance of my former argument is self-evident under these circumstances, that the bear is really hoping to find his way out without smashing the heavy iron bars, and that the scope of the imitative mind is very great, as described before, there remains one point requiring careful consideration, and that is that phase of mind we call intuition. My contemporary says: "This is a God-given faculty possessed by only a favored few people, who do not have to stop to reason." Intuition, as I take it, perforce, is at once a special gift and a universal faculty as well. On the one hand, men apparently conceive ideas from a "clear sky," but such genius could not manifest itself were not the mind already highly cultivated by much conscious effort—reasoning—and experience. While on the other hand, animals and small children become conscious of much knowledge by merely witnessing the intelligent movements of others, and in time, without thought or effort on their part, they suddenly discover that they also are competent to do the same thing, or, in other words, they begin to imitate. It is a general impression among psychologists that animals probably do not reason; they have no ideas as we have.

ALBERT F. SHORE.

Brooklyn, N. Y., August 10, 1905.

The Reasoning Power of Animals.

To the Editor of the SCIENTIFIC AMERICAN:

I have been much interested in the discussion in your paper as to the reasoning powers of animals, for I believe, this belief, being based on personal observation, that nearly all animals do possess the power of reason, and that this power is capable of development, depending on the animal's natural intelligence and on its association with man. Not only animals, but, I believe, birds, especially crows and parrots, can and do reason. When I was a boy at home we had

several different cats that could open the old-fashioned thumb-latch doors. This was so common among our cats that we thought nothing of it. Two years since I was in Washington County, Pennsylvania, on the farm of Mr. G. A. Hogg. Mr. Hogg owned many pure-bred draft horses—Shires and Percherons. Among the Shires were three two-year-olds, Cremona, Imogene, and Dainty. These, together with several brood mares and other young ones, were in a large hillside pasture. It was my habit to go to them, Sundays, to see how they did, and to take along a bucket of oats, the better to make friends with them, for, like men, the way to a horse's heart is through its stomach. The Shires were naturally more friendly than the Percherons; they would come to me from a distance from which the Percherons would not and so got, each time, the greater part of the oats. After some time Mr. Hogg sent out a three-year-old Percheron, Artless by name. She was put in the pasture, but, contrary to my expectations, would have little to do with those of her own breed, but ran with the Shires. One Sunday I went out, as usual, and had to climb the hill to the top to find the horses. As soon as they saw me the three Shires came up and soon had finished the greater part of the oats, the Percherons meanwhile remaining away at some little distance, in the shade of a clump of walnuts, and paying no attention to me. With them was Artless. After satisfying myself that all were well, I started back down the hill, followed by the Shires. Dainty kept looking in the direction of the Percherons and would stop and whinny earnestly, rather impatiently. This she did five or six times. Before I reached the bottom of the hill Artless came up on the trot—came directly up to me, put her nose in the then empty bucket, and, as much as possible, by looks and actions, said: "Where are those oats Dainty said you had?" I am no scientist, but this demonstrated to me that Dainty wanted Artless to have some of those oats and took pains to inform her that I had some and that she must hurry if she would have them, also that she reasoned how, and had language sufficient to convey this (to a horse) good news. Previous to this Artless had been rather shy and difficult to approach. I would have thought little of it had she been as friendly as the Shires, but she probably had not had a handful of oats since she had been in that pasture and would not come very near me.

It is my opinion that anyone, who has an eye for such things, and who has had experience with horses in our regular cavalry under all conditions, on drill, in the field, in the stables, corrals, and on the picket lines, at target practice, etc., will say that unless horses can reason it would be difficult or impossible to give an explanation of things they do. I believe everyone has witnessed the close friendship that many times exists among animals to others of their own kind, to other animals, and to the principal animal, man. Does it not require a reason and power of reasoning to form such friendship? Or is it all "dumb luck," instinct, and intuition?

I have spoken more particularly of horses, for I have observed them closer than other animals, but, as stated above, it is my belief that all, or nearly all, animals have the power of reason, in different degrees of development, and that education will further develop it same as in man.

HARRY S. SIMONS.

Monticello, Ky., August 10, 1905.

GRENADERS AND GRENADIERS.

BY LT.-COL. C. FIELD, ROYAL MARINE LIGHT INFANTRY.

One of the most striking points about the determined assaults on Port Arthur by the Japanese and the stubborn and heroic defense of that city by the Russians is the immense variety of warlike appliances that have been called into play by both sides. Some of these, such as electrically charged wire entanglements, represent the *dernier cri* in military art, while others, such as the noxious and poisonous-smelling compositions thrown into the Russian trenches by the Japanese, their bamboo mortars, and the armor shields carried by their pioneers when endeavoring to cut through the entanglements surrounding the forts of the defenders, carry one's thoughts back to quite medieval ages. Hand grenades, which have been practically out of date for a century, have been employed by both sides so extensively that it seems possible that their use and manipulation may enter into the general curriculum of the soldiers training in our own and other modern European armies. Time was when these deadly little missiles were carried by a number of the biggest and strongest soldiers in every infantry regiment, and for many years after they had fallen into disuse the grenadier company, composed of such men and wearing a distinctive uniform, formed the right company in every battalion, just as the light infantry company, containing the smallest and smartest scouts and skirmishers in the corps, formed the left one.

Nowadays the only grenadiers are special regiments, such as our own grenadier guards and other similar *corps d'élite* in the German, Russian, Belgian,

and other armies on the Continent. But as a badge, the grenade is still one of the most favorite ones in the world. With us it is carried by the grenadiers, fusiliers, Scots Grays, engineers, artillery, and marine artillery; it is almost universal in the French army, and is far from infrequent in the armies of Germany, Italy, and Russia.

The word "grenade" is a French word, meaning pomegranate, the little hand-thrown shells being about the size of that fruit—about 2½ to 3 inches in diameter. The precise date that these weapons were first invented seems uncertain, but it appears that they were made in large quantities at Arles in 1536. They were used at the siege of Rouen in 1562, and in that of Famagusta, in Cyprus, nine years later. At this period and for a long time afterward, though they seem to have been in pretty extensive use, there were no specially trained companies or regiments of grenadiers. Then, as now, they were specially intended to be used in trenches, at barricades, and at close quarters in narrow streets and passes. Nor was their use confined to the land service, as in December, 1652, we find the ordnance officials of the navy asking for "five thousand hand grenades at 2s. 6d. each." According to one description, the grenade at this epoch had a fuse which consisted of a wooden tube whose sides were perforated with numerous small holes. At the top of this tube was a piece of lighted slow-match with a bullet attached to its lower end. When it struck the ground the weight of the bullet would drag the lighted match into the perforated tube, and so ignite the powder and burst the grenade. To make the missile strike right side uppermost, so that the bullet would drag the match downward, the opening at the top had a bunch of box twigs attached, which acted in the same way as the feathers of an arrow or the stick of a rocket. Possibly the long pyramidal projection which is seen at the top of the grenade worn as a badge by some regiments represents this bunch of leaves, though it is generally supposed to represent the flame issuing from the fuse. In some cases this is very much larger and more spreading, and without doubt represents flames—much more flame than would be seen in reality. The French were the first to establish regular grenadiers, in the year 1667, when four men were selected in each company of the "King's Regiment" for training in the use of hand grenades. In 1670 these men were formed into a grenadier company, which was commanded by M. de Riotor, who thus enjoys the honor of being the first grenadier officer on record. In the same year thirty of the most senior regiments in the French service were also provided with grenadier companies. Eight years later we followed suit in this country, as is recorded in "Evelyn's Diary." He says: "29 June, 1678.—Now were brought into service a new sort of soldiers called 'grenadiers,' who were dextrous in flinging hand grenades, every one having a pouch full. They had furred caps with coped crowns like Janissaries, which made them look very fierce; and some had long hoods hanging down behind, as we picture fools, their clothing likewise piebald—red and yellow." Then, and for many years after, grenadiers carried, besides their bag of grenades, axes, firelocks, dagger bayonets, and swords. After throwing their missiles they were drilled to rush upon the enemy's defenses, ax in hand, on the order "Fall on." At first, our grenadiers wore a certain amount of armor—breastplates, at any rate. At the storming of Aughrim, in 1691, it is related that "the forlorn hope consisted of sixty grenadiers in breastplates." This must have somewhat impeded their activity, and in France, at any rate, as will be seen by the annexed illustration reproduced from a work published in that country in 1696, the grenadiers wore a very easy-fitting costume. In the description which accompanies this plate it explains: "The figure B shows the position in which those throwing the grenade should stand, so that by a single movement and in an instant, turning the back to the place at which it is intended to throw it, it can be done more promptly, for in any other posture at least two or three times as much time is required to throw it, which might be very hazardous to the grenadier." Hand grenades were employed in conjunction with an inflammatory mixture, the two being placed together in an earthenware pot covered with parchment, like a jam-pot, and provided with a fuse and a rope handle. This was then thrown into the enemy's works, the pot broke, the composition blazed up, perhaps started a conflagration, and at any rate igniting the fuse of the grenade, which of course exploded.

The fur caps worn by our first grenadiers before long gave place to cloth ones with a shorter hood. The latter adornment had quite disappeared by 1715, but the front of the cap, which was generally of the color of the regimental facings, was handsomely embroidered. With slight changes this high miter-shaped cloth cap lasted till 1765, when it was replaced by a fur one of a somewhat similar shape. The illustration, taken from an old print, shows a grenadier of 1745 wearing the cloth cap and in the act of throwing his grenade. The words of command at this period were: "Sling your firelocks—handle your matches—open your

fuse—guard your fuse—blow your matches—fire and throw your grenades—return your matches—handle your slings." Such detail one would hardly consider conducive to a rapid rate of fire. By the time the fur cap came into wear the grenadiers had to a very large extent given up the use of the hand grenade, but the grenadier companies were still composed of the biggest and finest men in the different regiments. Toward the end of the eighteenth century it became the custom to form grenadier and light infantry battalions provisionally from these companies of the different regiments employed together on an expedition or campaign. This proceeding, while certainly providing a few battalions of extremely high-class soldiers, must yet have had a bad effect on the force at large, every regiment losing its smartest and best men just when they were most required. In fact, the same evil effects must have been felt as (according to a German critic) were experienced by British infantry during the late Boer war on account of their picked men being drafted to the mounted infantry. "The infantry were then robbed more and more of their better ele-

time, too, it is interesting to note, the Blues also wore the fur grenadier cap. Abroad, the big fur grenadier cap had an extensive vogue in almost all armies, but at the present day the only foreign regiments wearing it are the Belgian grenadiers and gendarmerie, the Rus-

As for the grenade itself, the fighting in the Far East has shown it to be, with modern high explosives, a most formidable and destructive weapon, and it is possible that we may yet see a revival of the grenadier companies that gained such renown by their prowess in bygone times.

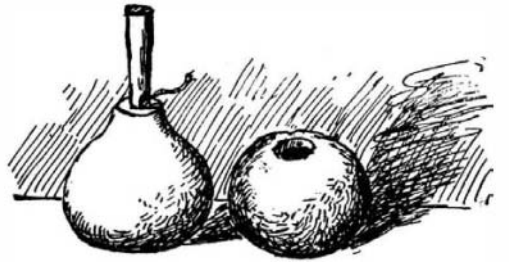
The electric traction line which runs from Murnau to Oberammergau, Bavaria, is some 10 miles in length. It has been equipped by the Siemens-Schuckert Company. The central station, which lies five miles from the terminus, has two turbines which are operated from the Ammer River. Alternating current dynamos are mounted on each of the turbines. The latter are of the horizontal pattern and carry a dynamo on either side, connected by elastic coupling. One of these generators gives simple alternating current for the traction line, while the other furnishes three-phase current for the local



Grenadier Cap Worn 1765-1800.

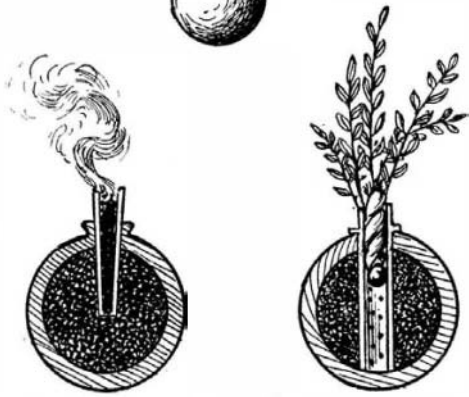


Grenadier of the 2d Queen's Regiment, 1687.



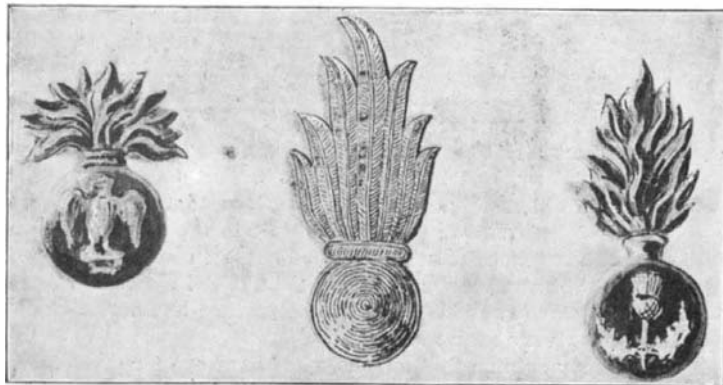
Earthenware Hand Grenade, 1751, closed by hardwood plug having channel for fuse.

Grenade with loop and cord.



Ordinary Grenade with fuse of slow-burning composition.

Grenade of 1750 with twigs and slow match.



1.—Royal Fusiliers.

2.—Royal Artillery.

3.—Royal Scots Fusiliers.

Various Types of Grenade Badges in the British Army.



Flintlock Musketoon or hand-mortar for discharging hand-grenades, with support.

ments. . . . and an increasing demand arose from all sides for mounted troops. So only the elements of least value remained behind with their battalions—men who were bad shots, with but little smartness about them." This must have been recognized before the end of the eighteenth century, for we do not find many instances of the practice in the early wars of the succeeding century.

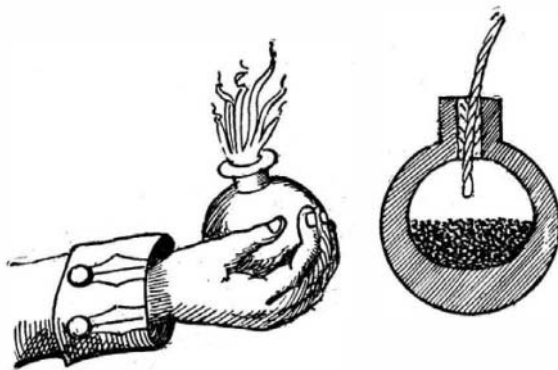
The pointed fur cap gave place to a larger, round-topped one with a brass plate and glazed peak and adorned with cords and tassels. In 1835 the plainer and bigger fur head-dress, much like what is now worn, but rather higher, came into vogue and has continued with modifications to the present day. At this

sian palace guard, the Danish guards, the Mecklenburg-Schwerin grenadier regiment, the Dutch horse artillery, and a New York veteran association known as "The Old Guard." It may be remarked, however, that the high eighteenth-century miter cap, but with a metal point, is still worn by the First Prussian foot guards, the First Prussian guard grenadier regiment, and the famous Russian Paul regiment of the imperial guard.

lighting. The electric road uses a tension of 5,000 volts and is one of the few electric lines in Europe which employ monophasic current. One pole of the dynamo is connected to the trolley wire and the other is put to earth. Two trolleys of arc form are pressed up against the overhead wire from the car roof by a compressed-air device. The air is furnished from the brake reservoir. Each car is equipped with two 80-horse-power motors. A motor works one of the axles by a double-reduction gearing. The car contains a transformer which lowers the current to 260 volts for the motors.



French Grenadier. From a Print Published in 1696.



Manner of holding the grenade in the British service, 1847.  
(Land service grenades: 1 lb., 13 oz.)  
(Naval service grenades: 4 lbs., 2 oz.)

Grenade of common green bottle glass as used by Spaniards, 1847. (External diameter 2 3/4 inches. Weight 10 1/2 oz.)



A "tinker's" Mortar from Grosse's Military Antiquities, 1801. "An uncommon engine supposed to be a tinker's mortar, which being fixed in a stick was used for throwing grenades."



A Grenadier of 1745.