Correspondence.

A Needed Patent Office Reform.

To the Editor of the SCIENTIFIC AMERICAN:

In your valued issue of the second instant you present an article on the "Proposed Amendments to Our Patent Laws."

In addition to the propositions of the National Association of Manufacturers of America, I desire to call your attention to an inconsistency in the present working of the Patent Office which forms a sufficient grievance for another amendment.

The injustice (and it is nothing less) to which I refer is the unnecessary time and delay consumed in getting an application for a patent through the Patent Office.

With a surplus of $300,000 accumulated during the past year, and a total surplus to its credit of more than $5,000,000, it would seem there is no excuse for submitting inventors to such long delays as is now the case in the examination of applications; especially, on the ground that the office is overworked, or that the force of examiners is insufficient to cope with the vast amount of business pouring into that office each day.

If more examiners are necessary to the proper dispatch of business, there is nothing to prevent the doubling or trebling of the present force, in the light of the resources at hand.

The writer has a number of applications for patents now before the Patent Office, and when he is told respecting one set of papers that this particular application "will come up for examination in about four months from the date of filing," it seems an absurd proposition for a government institution to make, which exists for and is backed and supported by an army of inventors, whose fees have enabled the office to pile up an unheard of surplus over and above its expenses.

Four months before one's application can reach an official examination! This is almost an insult to the inventive age, and certainly leads to the conclusion that there is large room for a grand reformation along this line, and that it is high time some action were taken looking to the correction of this evil and a betterment of this branch of our patent service.

In patent practice the great desideratum is the utmost dispatch consistent with absolute accuracy, and there is no reason why the United States Patent Office should not be so skillfully equipped as to be able to pass on each and every application in at least two weeks after the date of filing thereof.

To compel an inventor to wait four months or more, before he can know what the outcome of his application is to be, serves to tie his hands, and prevent him from marketing what might prove a valuable invention, and at the same time keeps out of his possession funds which are absolutely necessary to his work and welfare.

Were every inventor a manufacturer, then the time consumed in passing upon these applications would not so materially affect him, for he could manufacture his invention with the usual "Patent applied for" stamped thereon, and patiently wait the pleasure of the Patent Office; but when, as is now the case, inventors are dependent upon manufacturers, it is impossible to dispose of a patent which the Patent Office has not as yet granted; and as money is what the inventor needs, he is unjustly compelled to wait until the insufficient force of the Patent Office reaches and passes upon his application.

Unless some reform is inaugurated to correct this grievance, what is to be expected of the future, when the accumulation of applications at this date has put the examiners four months or more behind in their work? How does the office expect to cope with inventive expansion, if they find themselves handicapped with work at this stage? And why is that $5,000,000 surplus lying idle, when it might be expended in supporting an increased force of examiners, and thus facilitate the work of examination?

If the National Association of Manufacturers of America are seeking amendments to the patent laws of this country, they would do well to incorporate the above in their repertoire, and thus bring about a badly needed reform. WILLIAM E. HEATH.

Baltimore, October 9, 1897.

Electrical Show—Madison Square Garden Selected for the Second Exhibition.

Another electrical show has been planned for New York. Indications are it will be larger than the first, and for that reason the management lately signed a lease for Madison Square Garden for the month of May, 1898.

The exhibition company was incorporated in Albany last week. The officers are: C. O. Baker, Jr., president; F. W. Roebling, vice president; George F. Porter, secretary and treasurer, who, with L. F. Requa, C. H. Lieb, H. H. Harrison and J. W. Godfrey, compose the board of directors. Mr. M. Nathan, the general superintendent of the last show, will have the management of this.

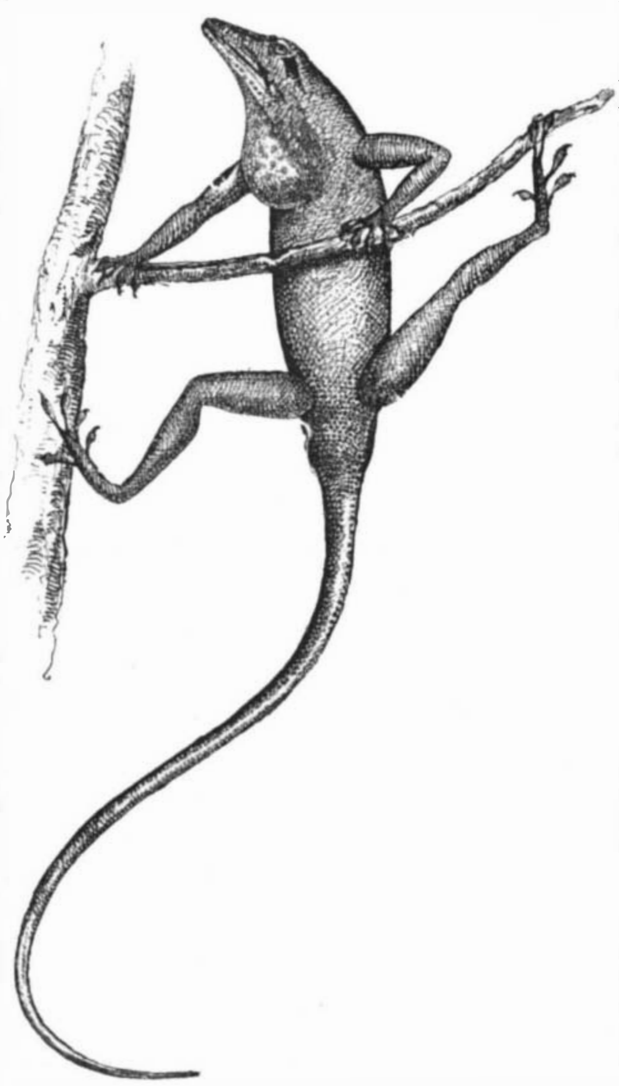
The new electrical inventions and improvements developed since the last show, and the interest and cooperation of many manufacturers already assured, will count for much toward making this a more complete demonstration of all the applications of electricity and its branches than was possible in the first exhibition in 1896.

THE COLOR CHANGES IN LIZARDS.

BY C. F. HOLDER, PASADENA, CAL.

The chameleon of eastern countries has attained a world-wide reputation for its wonderful faculty of changing color. In America we have a lizard, shown in the accompanying illustration, which is, if not so remarkable, one of the most interesting of this group of animals. Anolis principalis is best and most familiarly known in Florida and some of the Southern States, where it darts about among the vines and other vegetation, mimicking the dark green verdure and presenting a really wonderful illustration of this singular phase of nature.

At one time I possessed several specimens of the anolis, and endeavored, with poor success, to introduce these little animals into Southern California, hoping that they would adapt themselves to the conditions which prevail here, but my lizards simply became pets and apparently preferred the house, where they were provided with flies and other delicacies. These little creatures were about five inches in length, of a general dark green hue shading to gray, assimilating the various objects upon which they rested slowly but



AMERICAN CHAMELEON (ANOLIS PRINCIPALIS).

very decidedly. I arranged several little corrals, one with a white base, another with a gray, another with a green, and changed the occupants about. In ten or fifteen minutes they very materially would adapt themselves to the new tint, though they never became white, the change then being merely a fading out of all lines, leaving the body a faint gray. At night they became a beautiful green, which may be considered their normal color. The changes made in confinement I am confident were not so rapid as those when the lizards were in their native Florida, where moisture and hot days and nights gave them the exact temperature necessary for their best display.

There is something mysterious and even uncanny in watching the change of color. When placed upon a green twig the little creature would immediately draw itself out, extend its front and hind legs at full length and become to all intents a part of the twig or branch, so that it was difficult to distinguish it. Meanwhile the mysterious blush of green was deepening and stealing over its back and sides, making the resemblance still more striking. The natural assumption of one who had given the subject no especial attention might be that the anolis had glanced around, and perceiving that it was presenting a contrast not favorable to its personal safety, had assumed a color more protective. In other words, that there was some intelligent act associated with the change. When the little creature was blindfolded it assumed the same tint as at night, and did not change when placed upon the most striking colors, showing that the eye was the involuntary medium by which the different tints were obtained. The act of adaptation is perfectly involuntary, or made without the knowledge of the animal, being the effect which certain colors have upon the pigment cells of the animal. At least this is the generally accepted explanation, and the experiments which have been made with blind animals seem to show beyond question that the eye is the medium.

These peculiar changes, which are so well known in fishes and reptiles, can be understood by glancing at the pigment cells of a frog. The skin is seen to consist of two portions, the cutis and epidermis, the latter apparently being made up of cells. The cutis has large cavities among the nerves, which are commonly filled with pigment and are very sensitive, contracting and expanding in a remakable way. The pigment cells are called chromatophores, and vary in color in different animals and in the parts of each animal, and may be red, brown, green, yellow, black or various shades. The color of the chromatophores appears to change during contraction or expansion and constitutes a most complicated and delicate study. Thus, in a little fish (Gobius Ruthensparri), Heincke, the German naturalist, while watching its yellow pigment cells, saw them gradually expand and become black.

These cells are distributed all over the body with more or less regularity, and upon their contraction and expansion depends the prevailing color of the animal. Thus, if the pigment cells or chromatophores expand, the prevailing color will become black and the very light spots in the animal dull. On the other hand, if they contract, a reverse effect obtains. Exactly how these wonderful changes in all animals which adapt themselves to their environment are produced is not known, but it is assumed that certain colors through the medium of the optic nerve produce contraction or expansion, and the result is a protective tint or one which assimilates that upon which the animal is resting. The eye receives the stimulus or impression, which passes from the optic nerve to the sympathetic nerve, so reaching the various series of chromatophores. Thus, when a flounder is taken from the sandy bottom and placed on a black bottom, it at once grows darker; in other words, the color of the bottom has in the manner described caused a relaxation of the chromatophores, and the brown and orange colored ones have turned black or dark, thus aiding in the protection of the animal—a protection at once remarkable and interesting. Among the flounders this is very marked. In the octopus I have produced almost instant changes, waves of color being seen to pass over the animal. This is especially noticeable in the little squid cranchia, while the larger squids are marvelous illustrations of this faculty. The dolphin, so common in the Atlantic, is well known for its wonderful changes, not necessarily protective.

The little Florida anolis is easily domesticated, and two specimens kept by me became interesting pets, crawling about without the slightest fear; seeking the snug shelter of the binding of a book in cool weather, coming out to bask in the hot sunshine, showing themselves to be perfect thermometers.

It is doubtful if the anolis would thrive in Southern California as the nights are often very cool. All through the winter here all the reptiles enter what is known as a winter sleep or partial hibernation. At half past four, or as soon as the direct rays of the sun begin to be missed, the lizards leave the rock heaps where they have been sunning themselves, and crawl into the crevices and into holes in the ground, stretch out their limbs to the rear, stiffen, and enter what is apparently complete hibernation; but, as the sun rises the following day, they are warmed into life again and renew all their activity.

Automatic Coupler Law.

The Chicago and Alton Railroad and other roads recently filed petitions with the Interstate Commerce Commission asking for extension of time within which their cars, under the act of March 2, 1893, are required to be equipped with the automatic couplers and power or train brakes, the time fixed by the act being January 1, 1898. The commission has made an order fixing the hearing of such petitions for Wednesday, December 1.

The commission has also ordered that any railroad filing application for extension shall also make, on or before November 20, 1897, a statement under oath of the number of freight cars owned and the number of freight cars which will be equipped with automatic couplers and the number which will be equipped with power or train brakes by December 1, 1897, and the number of freight cars which have been equipped with automatic couplers and the number which have been equipped with power or train brakes each calendar year since the act went into effect.

Airship Crosses to France.

Cablegrams from France state that the balloon of Charles Pollock, who started from Eastbourne, England, October 12, across the Channel, descended safely near Domart, fourteen miles northwest of Amiens.

The Effect of Great Cold on Animalcules, Worms, Insects and Other Animals.

BY JAMES WEIR, JR., M.D.

That certain animalcules, worms, insects and other animals can and do experience no appreciable harm when subjected to extremely low degrees of temperature, the following experiments and observations would, unquestionably, indicate.

Until, comparatively speaking, a few years ago, freezing was considered to be absolutely fatal to all forms of animal and vegetable life. So universal was this belief that contaminated and filthy water was thought, by both scientist and layman, to be rendered potable after it had been subjected to great cold. Some ten or fifteen years ago, however, several severe epidemics of typhoid fever were traced directly to the use of ice which had been taken from ponds into which there flowed surface drainage. This observation occasioned an entirely new opinion to be formed.

In 1889, I subjected various cultivations of the specific germs of tuberculosis, typhoid fever, cholera and anthrax, by artificial means, to degrees of temperature far below any degree of cold that ever occurs naturally. These colonies were in bouillon, agar agar, and other culture media and were, therefore, easily studied. When the media containing germ colonies were gradually thawed out and then submitted to microscopic examination, no appreciable change in the various microbes was to be observed. When minute portions of these colonies were transferred to fresh culture media, the germs immediately began to increase and multiply, thus showing that they had not been killed or even injured by the intense cold to which they had been subjected. It is claimed that the germs of yellow fever and kindred diseases are destroyed by cold. If this is true (and I have no reason to think that it is not), this fact goes far toward demonstrating the truthfulnessof a proposition which I have long advocated, namely, that there are two kinds of microbes —the animal and the vegetable. It has long been known that intense cold is fatal to many organisms known to be vegetable, while, on the other hand, none of the microscopic animalcules are killed by the process of freezing alone.

Infusorians appear to be uninjured by great cold, even when it lasts for weeks at a time. An experiment, and one easily performed, will demonstrate to any one the truthfulness of this assertion.

Let the observer satisfy himself that the pond or ditch from which he wishes to take the ice necessary for this experiment contains the infusorian, say the "slipper animalcule" (Paramœcium); this he can do in October or November. Then, in the depths of winter, when the ice is thick on the ditch, after a hard and long-continued freeze, let him take a small piece of the ice (a portion containing confervoid growths will be necessary, as this particular infusorian seeks shelter thereon), gradually thaw it out, and then place a drop of the water or a bit of conferva beneath the object glass of his microscope. He will soon discover paramœcia full of life, and absolutely unaffected by their sojourn in their ice envelope.

Vorticellæ or "bell animalcules," so called from their bell-like shape, draw in their cilia and shrink upon or coil their stalks just before the water becomes congealed. This interesting performance can easily be observed if a colony of these animalcules is watched on the stage of a microscope. This observation, to be successful, must be carried out in a room whose temperature is about 18° F. A fragment of duckweed, alga, or any pond weed known to be inhabited by vorticellæ should be placed in a drop of water beneath the object glass. The stage and glass slide will rapidly become cold. Finally, the drop of water will freeze, but, just before congelation takes place, the vorticellæ will draw in their cilia, coil their stalks and sink to rest on the weed. If the slide be carried into a warm room and the drop gradually melted, the little creatures will soon begin to erect themselves on their stalks and to move their cilia in the act of feeding. A certain rhythmical pulsing of the umbrella (nectocalyx) of a medusa or jelly fish can be noticed as the creature swims in the water. This pulsing varies in frequency according to circumstances. When medusæ are placed in water whose temperature is being gradually lowered, at first this rhythmical motion will be accelerated. I have seen the nectocalyx under such circumstances pulsate so rapidly that its movements could hardly be counted. Gradually, however, as the water neared the freezing point, this pulsing would become slower and slower and finally cease. This inactivity would disappear, however, as soon as the temperature of the water became higher. Semper asserts that long-continued freezing is fatal to all infusory animalcules. Now this statement is misleading and indefinite, from the fact that he does not fix a time limit. I am certain that several days' freezing is not fatal to the infusorians which I had under observation. I have also found live infusorians in the sediment of ice water, the ice from which it was derived having been harvested several months previous to the time of examination. These forms were not adventitious, but were true fresh water infusorians (Paramœcium). The contractile vesicle (the infusory heart) of this little animal gradually slows its "pulse" as the temperature is lowered, and finally ceases all motion. Yet the creature is not dead, for, if judiciously thawed out, it will resume all of its functions. Rhizopods, rotifers and other animalcules likewise stand freezing with perfect impunity. In fact, all cold-blooded water animals appear to be indifferent to the lethal effects of extreme cold.

Last winter, while carrying on these investigations, I observed a very curious thing. I was examining a giant water beetle which was frozen in a lump of ice. I noticed, just below the head of this insect, an uncongealed drop of water; in this clear drop, not unlike kindred drops sometimes found in quartz crystals, I observed a little animal swimming freely about. I could not make out its genus through the intervening ice; so fractured the lump in order to obtain the animalcule. Unfortunately, it was lost and I cannot describe it. Had this creature an inherent quality which kept the water in its immediate vicinity in a fluid state, thus affording it safe domiciledaring winter, or was the drop due to some law of crystallization? The little mite seemed to be perfectly at home, no matter what gave rise to its miniature lake.

Some of the higher water animals, such as fishes and frogs, can endure great cold without harm. Not long since, I saw a carp (C. carpio) in the very center of a cube of ice. This fish resumed all the functions of life as soon as the ice melted and set it free. It is claimed by explorers that the waters of the North Polar seas are remarkably destitute of the lowest forms of life; indeed, of all forms. Yet that they are absolutely without life has not been shown, for even in the ice cold waters of the extreme North Arctic Ocean microscopic animalcules, to a limited extent, defy the benumbing and otherwise fatal touch of the Frost King!

Turbellarians, nematoids or thread worms undergo freezing without appreciable harm. Little worms will frequently be found in ice taken from ponds, lakes, etc. This has given rise to the idea that ice "breeds worms." These little creatures are simply nematoids which have become frozen in the ice and which have been liberated by liquefaction.

The common earth worm (L. terrestris) may be frozen stiff without experiencing any harm whatever. Several earth worms were taken by me from a vermicularium and placed in a jar containing earth. This was done early in autumn, so that the creatures might become accustomed to their surroundings by the time winter set in. Every now and then decaying vegetable substances, such as leaves, rotten wood, etc., were sprinkled over the surface of the earth in the jar; water was also occasionally sprayed in. Thus, the worms had an abundance of food and water. The jar was set out in the open air, though a roof of boards was placed above it to keep off the snow and rain. It was subjected to all the cold of a severe winter. On one occasion the thermometer registered —10° F. in the center of the jar for ten or twelve hours. As soon as the milder weather of spring set in, the worms began to move about, some of them laying eggs, thus showing that they had not been hurt by a temperature many degrees below freezing point. Again, several worms were taken from a vermicularium and surrounded by an envelope of dampened earth an inch in thickness; they were then exposed to a temperature of —10° F. for ten hours. When examined, they were found to be almost rigid; indeed, some were quite so, breaking in the fingers when they were bent. Yet these worms (that is, the unbroken ones), when gradually thawed out, showed no sign of injury.

Last autumn I saw a bumblebee take up her winter quarters beneath the bark of a locust tree. The fragment of bark under which she crept was slightly resilient, so that she was partly supported in her place by its elasticity. She was fully exposed on all sides, save her shoulders and part of her back, to the air; the piece of bark made a very efficient roof which kept off the snow and rain. During a cold wave, when the thermometer registered —6° F., I lifted the bark and removed the insect with forceps. I would not touch her with my fingers. I was afraid that their warmth might produce local temperature changes on her body, thereby inciting frost bite. She was, to all appearances, frozen through and through. Here was this insect (covered only with her own velvet robe), surrounded by an atmosphere whose temperature was a half dozen degrees below zero. The very tree on which she rested was being riven and split asunder by the intense cold. Was she alive, or did I hold in my forceps only a frozen, inanimate lump of gauzy wings, legs, body, intestines, etc.? This question was answered later on; in fact, on the fourth day of April, when she awoke from her long winter sleep and resumed her place in the economy of animated nature. I happened to be near when she awoke and came out on the bark. She carefully smoothed down her velvety body covering of black and yellow and essayed a short flight. She then flew to a pot of water and drank a long, deep draught. Finally, she flew about the lawn as if in search of something. And so she was. She was looking for a suitable spot in which to establish a nest. This she eventually selected near a rose bush and soon disappeared beneath the turf.

The common toad (B. lentiginosus), at the approach of winter, burrows an inch or two into the ground and, surrounded by the roots of grasses, weeds, or herbs, goes into its winter sleep. Last November I saw one take shelter beneath a tussock of couch grass (T. repens), boring its way beneath and between the tough roots by a rooting motion of its head. Its fore legs or "arms" and its fingerlike claws were also used to great advantage, as well as its muscular hind legs in excavating and shaping its winter "dugout." At one time during the winter the soil was frozen solid to the depth of four inches. During this cold spell, I carefully dug up the tussock of grass and, upon examination, found the toad stiff and, seemingly, frozen through and through. I replaced both grass and toad, packing the frozen earth about the roots as well as I could under the circumstances. On the 18th of March I again dug up the toad. It was, to a certain extent, torpid, but, otherwise, was entirely uninjured by the great cold through which it had passed.

A friend, on one occasion, was blasting out stumps on his plantation, when a large mass or ball of snakes of various kinds was unearthed and exposed to view, all of which, seemingly, were without life. It was very cold, in fact, some 8° or 10° below zero. This gentleman placed a thermometer in the center of the ball of snakes and found that it registered 5° below zero. He carried home a large black snake (Bascanion constrictor) and a small copperhead (Ancistrodon contortrix). The snakes were gradually warmed and soon gave such unmistakable evidence of returning animation that they were summarily dealt with. Now, an interesting question intervenes. These two species are, generally, very bitter enemies. Do they lay aside personal animosity at the approach of winter and seek one another for mutual protection, or do their natures change at or about the time of the inception of hibernation?

We have seen that animals may be frozen through and through and yet suffer no harm. Where, then, dwells the vital principle in these creatures—in what organ or organs? Reduced to a frozen mass, they yet hold within themselves the elements of life which only need the awakening touch of heat to be set in operation. Of what character is that mainspring, which, although, for the time being, completely locked as it is in the hard grasp of the Ice King, is, nevertheless, through the influence of warmth, set free, and at once resumes its power and puts in motion the phenomena of life?

When we come to examine the higher animals, we find that some of them are able to endure very great cold. In fact, it has been demonstrated that the internal temperature of some of these animals, during winter, approximates that of the external atmosphere. In the case of the zizel (Spermophilus citillus) Horvarth declares that he detected a temperature of 2° C. Says Semper: "The zizel, when lying in its winter sleep, always has the same, or nearly the same, degree of warmth as the surrounding air. In one case the temperature was 2° above zero, and a thermometer showed that its internal temperature was exactly the same; in another experiment the animal was sleeping in a room, at about 9° to 10°, for several days, and its internal temperature was 8·4°." Thus it will be seen that in this animal we have the wonderful phenomenon of a warm-blooded creature changing to a cold-blooded creature in winter, "since its temperature corresponds with that of the surrounding atmosphere." Most of the warm-blooded hibernating animals, however, keep up their internal heat by the oxidation of their fat; thus, the bear, the opossum and the raccoon, which on entering the winter sleep are remarkably fat, but which, when they awake in the spring, are thin and lean. Some rodents, however, show comparatively speaking very low temperatures; for instance, the ground hog, in which, on several occasions, I have detected a temperature as low as 60° F.

A Trolley Ride One Hundred and Twenty-four Miles Long.

The network of trolleys with which New England is now covered makes it possible for any one to ride for 124 miles on trolley roads. This is probably the longest trolley line in the world. Of course the trip would have to be made in a number of cars. From the residence of Mr. Henry H. Rogers, vice president of the Standard Oil Company, at Fort Phœnix, in Fairhaven, to Nashua, New Hampshire, the route is as follows: New Bedford, Fall River, Taunton, Bridgewater, Brockton, Braintree, Quincy, Boston, Malden, Melrose, Wakefield, Reading, Wilmington, Billerica, Lowell and Dracus, to Nashua.

PENMARCH lighthouse, on the Brittany coast, with its 10,000,000 candle power electric light, 180 feet above sea level and visible sixty miles away, is a monument to Marshal Davoust, Duke of Auerstadt, his daughter having given the French government $60,000 for the purpose.