8th. Malaria may be developed in previously healthy places by turning up the soil, as in making excavations for the foundations of houses, tracks for railroads and beds for canals. Such excavations when containing stagnant water may also serve as mosquito nurseries.

9th. In certain localities malaria seems to be attracted and absorbed by bodies of water lying in the course of such winds as waft it from miasmatic source. Such bodies of water may also arrest the passage of the mosquito, under certain circumstances, as in the absence of a strong wind to waft them over.

10th. Experience alone enables us to determine the presence or absence of malaria in any given locality. Conversely, the absence of the mosquito, it was claimed by Dr. King, appeared to prevent malarial disease.

11th. In proportion as countries previously malarious are cleared up and thickly settled, periodical fevers disappear. The consequent better drainage, disappearance of underbrush, and the more free play of fly catching birds may also contribute to lessen mosquitoes.

12th. Malaria usually keeps near the surface of the earth; it is said to "hug the ground." The same is true of mosquitoes.

13th. Malaria is most dangerous when the sun is down, and seems to be almost inert during the day. The mosquito is active at night; at rest by day.

14th. The danger of exposure to malaria after sunset is greatly increased by the person exposed sleeping in the night air. Persons while awake brush away mosquitoes; those asleep submit to being bitten.

15th. Of all human races the white is most sensitive to marsh fevers, and the black least so. The black man is less easily seen by the mosquito, and the odor and greasiness of his cutaneous secretions are assumed to be offensive to the insects.

16th. In malarial districts the use of fire, both indoors and to those who sleep out, affords a comparative security against malarial disease. Mosquitoes, attracted by the light, fly into fires and lamps at the cost of life.

17th. The air of cities in some way renders the malarial poison innocuous, for though a malarial disease may be raging outside, it does not penetrate far into the interior. Mosquitoes also, during their nocturnal flight, will be arrested by the houses, fences, lamps, and fires of the suburbs, so as to be prevented from penetrating far into the interior of cities.

18th. Malarial diseases are most prevalent toward the latter part of the summer, and in the autumn. Mosquitoes are more plentiful during those seasons.

19th. Malaria is arrested not only by trees, but by walls, fences, hills, rows of houses, canvas curtains, gauze veils, mosquito nets, etc. So are mosquitoes.

20th. Malaria spares no age, but it affects infants much less frequently than adults. Infants, however, from the care with which they are housed and covered with gauze to keep off house flies, and also shielded from mosquito bites. C. V. R.

THE EXTERMINATION OF VENOMOUS SERPENTS.

The appalling destruction of life by snake bite in India has for many years caused the minds of learned and ingenious men to be exercised in quest of some remedy which shall effectually cope with so terrible an evil. That their efforts have hitherto been directed rather toward discovering an antidote for the venom than to what is proverbially better than cure, viz., prevention, or, in other words, the extermination of the reptiles themselves, is not to be wondered at when collateral circumstances are taken into account—the exuberance of vegetation and smaller forms of animal life which afford the creatures shelter and sustenance, even in the immediate vicinity of human habitations; the intense susceptibility of the natives, both to the accident of the bite and its fatality, from various causes; their religious prejudices, which, at the outset, greatly hamper the success of Government rewards for the slaughter of certain species, as proposed by Sir Joseph Fayrer; and the fact that the multiplicity of venoms as well as species has only recently been recognized. The dense population, tolerance if not encouragement of the cobra, the habit of walking barefoot and consequent liability to be bitten on the ankle (the most dangerous situation in the body, owing to the large size and superficial position of the veins in that region), the low *physique* and apathy of the Hindoo, which cause him to lie down and die or trust to "charms" instead of resorting to prompt and vigorous measures—all these and many other conditions contribute their influence in keeping up the enormous death rate in India. As to the serpents themselves, many western species, especially among the *Crotalidæ*, are to the full as deadly as the krait, cobra, or daboia.

In a recent number of the SCIENTIFIC AMERICAN, it was suggested that the snakes might be lured to their own destruction by means of traps or the bait of poisoned food; or that some snare might be devised wherein they could be captured alive and so handed over to the authorities for killing by those castes whose tenets do not permit them to practice serpenticide. With regard to the first two proposals, it is to be feared that they offer little prospect of success. When we consider the character of their natural haunts—dense jungle or the crevices of rocks—and the difficulty of setting traps there, their uncertain rovings, and the special reasons which militate against the ordinary mechanical principles of such instruments (as the great distribution of their bodily weight, peculiarity of movement, and possibility of egress as well as ingress through small apertures), it will be seen that a specimen secured in this way would be as great a curiosity as the occasional sea gull which is reported as being caught by an oyster. Mr. Frank Buckland, however, has put on record a story which he heard about a cobra de capello being drawn from underneath the flooring of a bungalow by a fish hook and line, baited with a small frog.

Any scheme involving the administration of poison is even less hopeful, seeing that they can rarely, if ever, be persuaded to take any but living food. In the very doubtful event of some powerful drug thrown into a pond to which they are known to resort proving fatal to them, for every snake so destroyed there would be hundreds of other animals scattered around. Not only would it be next to impossible to get them to swallow poison, but they are extremely tolerant of its action when it is taken. Some time ago the writer wished to kill a captive rattlesnake (*Crotalus horridus*) by this method, and with that intent poured two drachms of Scheele's prussic acid down its throat. Scheele's preparation contains four per cent of the anhydrous gas, and the quantity was sufficient to kill at least twelve men in a few seconds. On the reptile it produced no apparent result whatever; the box, small and compactly made of thick wood with a tightly fitting slide, was closed directly the dose was swallowed, so that the occupant had the full benefit of the intensely sedative fumes. Four drachms more only served to make it a trifle dull and lethargic, and an ounce of chloroform in addition was given before it succumbed. I should mention that this rattlesnake was rather cold and torpid at the time, in which state it would be less receptive of toxæmic influences.

Possibly a pitfall of some sort would be the most likely institution to diminish the number of serpents in its neighborhood appreciably. A friend of mine, living in Brazil, had a large disused cistern near his house. The masonry was cracked, and allowed the water to leak away, but sufficient moisture remained at one end to provide for a colony of frogs and to form a drinking trough for birds and small beasts. Into this tank snakes often found their way, perhaps attracted by the prospect of food, perhaps simply overbalancing themselves at the edge, and were unable to scale the smooth plastered walls and make their escape. One morning between twenty and thirty little new-born jararacas (*Craspedocephalus atrox*)—a most venomous species—were discovered in the prison. The mother must have been a huge specimen, for she had taken advantage of an inequality of surface high up on the side of the cistern to aid her in getting out. Now, a structure of this kind sunk below the level of the ground in an infested district, and furnished with water, frogs, and a cage of rats, or some such small deer—necessarily protected by a cage to preserve them from other than ophidian marauders—might usefully co-operate with the active endeavors of the Government snake hunters, whose establishment is proposed, and who would visit the inclosure daily and add its nocturnal harvest to their spoils. This, again, would meet the views of those sects who are prohibited from killing; but it should be noted that the mild Hindoo is already fully alive to the desirability of reaping the proffered annas without prejudice to his spiritual welfare, and hatches all the snakes' eggs he can find by means of artificial warmth in earthen pots, feeding the young ones until they are big enough to earn the tariff reward.

For every one that may be expected to find its way into a trap, however arranged, a dozen might certainly be taken, living or dead, by those who would make a business of pursuit; and for capturing them alive there is no safer or better appliance than the "twitch." This consists of a simple loop of string passed through an eye at the end of a long crooked stick, and controlled by the hand. Directly a snake is seen it is hooked out into the open, if need be, away from all shelter, the noose dropped over its head and drawn up tight, and in that way it can be carried, powerless to do harm, or deposited in any receptacle which is ready for it. Collectors, too, would find this little apparatus far more practicable than the net or tongs. Places likely to form a resort for the deposition of eggs—situations which combine warmth, moisture, and protection, as a rule—should be diligently explored; and rocks or other fastnesses known to be their favorite breeding grounds should, if possible, be frequently disturbed by blasting. Catlin relates that near Wilkesbarre, in Pennsylvania, there was a cavern in the mountains inaccessible to man known as Rattlesnake Den by reason of the enormous numbers of those reptiles which made it their abode. To such an extent did they swarm in that locality that, although five or six hundred would sometimes be slain in a day by the expeditions organized for the purpose, in which the author took part, the bulk of the Crotaline settlers always managed to reach their lair in safety. On one of these *battue* days a happy thought struck Catlin. He had caught a rattlesnake uninjured, and while one of his companions pressed its head to the ground with a stick, he tied his powder-flask to the creature's tail and attached a slow match thereto. As soon as it was released the serpent immediately sped away to the cavern, dragging the flask behind it. A tremendous explosion presently followed, and death reigned triumphant in Rattlesnake Den.

In all probability, the acclimation or encouragement of certain animals which seek out snakes as their favorite food will do more toward effecting their extermination than anything else. The mongoose enjoys a reputed pre-eminence in this respect which is quite undeserved—it need hardly be said that the "antipathy" which it is supposed to entertain toward its prey is a chimera born of an argument by analogy to human prejudices. The ichneumon hunts snakes to eat them; so do various foxes, tayras, rats, civets, grisons, weasles, genets, paradoxures, and other members of the *Viverridæ* and *Mustelidæ*. Still more addicted to an ophidian diet are pigs; it is said that Mauritius was cleared of venomous species by a number of wild hogs turned loose there. Toads, frogs, fish, lizards, newts, and even slow worms devour young snakes; indeed, it is only their popularity as an article of food that serves to restrain their increase, for they are produced in broods of from twenty to a hundred or more. But their greatest enemies are birds. Peacocks, in particular, will desert the home where they are fed in a district abounding with snakes; not long ago, six pairs of pea fowl were employed to get rid of the vipers on an island off the west coast of Scotland, which they rendered almost uninhabitable by their abundance. Storks, pelicans, cassowaries, sunbitterns, cranes, falcons, and some vultures are also perpetually on the lookout for snakes, while the scientific title of the secretary bird, *Serpentarius reptilivorus*, sufficiently indicates its proclivities.

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Running as an Exercise.

Among the means which nature has bestowed on animals in general for the preservation and enjoyment of life, running, says Mercurialis, is the most important. Since, then, it is pointed out to us by nature, it must be in a high degree innocent. It is very singular that we should apparently do all we can—which, fortunately, is not much—to make our children unlearn the art of running. Our earliest physical treatment of them seems calculated to destroy their aptitude for it; in a little time, it is too often the case that the city boy scarcely dares look as if he wished to run, we prohibit it so strongly as vulgar, and when he is more grown up gentility steps in and prohibits it altogether. Medical prejudices and our own convenience contribute likewise their share, and never allow our children, boys and girls, to acquire an art innocent of itself and necessary to all. It is possible that a person may get injury from running, but the fault is not in the exercise, but in the person who runs without having had proper training and practice.

Negroes and Indians in a state of nature run daily in pursuit of game for food with a facility at which we are astonished, but they are not more liable to consumption on this account than those beasts that are so famed for swiftness. The body of no animal seems better adapted to running than man's. The nobler parts, which might be injured by an immoderate reflux of blood, are uppermost, and the laws of gravitation assist in propelling the runner forward. He has little to do but to strengthen his limbs by practice and concentrate his mind on the effort, and there is nothing severe in this, as experience has shown. Indeed, running may be made very beneficial to the lungs, and perhaps there is nothing better calculated to strengthen these organs, in those who are shortwinded, than gradual, careful training in this almost lost art. "As soon as children are expert in walking, turning, and the like," says the sagacious Frank, "running races under proper precautions is an excellent exercise for them." The principal objects of this exercise are to strengthen the limbs, develop the lungs, exercise the will, and promote the circulation of the blood.

Running was so highly esteemed by the old Greeks, that Homer observed that no man could acquire greater fame than by being strong in his hands, feet, and limbs; Plato recommends running, not only to boys and girls, but to men; Seneca, who expresses strong disapprobation of athletics, recommends running to Lucilius for exercise. The following rules may be observed:

Running should only be practiced in cool weather; as, for instance, in the late fall, winter, and early spring months.

The clothing should be light, the head bare, and the neck uncovered. As soon as the exercise is finished, warm clothing should be put on and gentle exercise continued for some time. It is not necessary to have a race course. The teacher of a school may take his pupils into the fields and find suitable ground for them. Then his pupils may exercise their bodies in other ways, acquire strength, agility, health, and the capacity of continued exertion; the will is brought into play vigorously, which is a great aid in the battle of life.

Care must be taken not to overdo, and thus, perhaps for life, weaken or injure the heart. The race, at first, should be short and frequently repeated, rather than long, and full speed should not be attempted for some time.

Running is well adapted to young and middle aged persons, but not to those who are fat. Sedentary persons may find great benefit in it after the day's work is ended. If they live in cities, a quiet spot in the park may be selected, and short trials adapted to the strength entered into. Invalids may do the same thing, only they must be more careful than the robust never to over-exert themselves.

Girls may run as well as boys, and, while they cannot go so fast, they can race much more gracefully and beautifully. Indeed, there can be few more attractive sights than that of a race between beautiful girls from ten to twelve years of age. After puberty, the change in the formation of the bones of the pelvis in girls renders running less easy and graceful. In ancient Greece girls were trained to run races as well as boys, and to their superb physical culture was in great part due the grandeur and beauty of Greek life during the years of their ascendency. The modern style of dress for girls after puberty is also entirely unsuited to running.—*Herald of Health.*

Tumefaction of Starches.

Some time since, Mr. W. H. Symons exhibited at the Royal Microscopical Society a hot and cold stage for the microscope, by means of which the exact temperature at which different starch cells swell or tumefy could be observed. By means of this instrument this observer determined the tumefaction point of a number of different starches, and as some of them are largely used by brewers, we give his results:

Starch.	*A few swollen.*	*Majority swollen.*	*All swollen.*
Potato	55° C.	60° C.	65° C.
Sago	64° C.	68° C.	74° C.
Bermuda arrowroot	62° C.	69° C.	73° C.
Wheat	60° C.	65° C.	70° C.
Maize	65° C.	70° C.	77° C.
Oat	65° C.	70° C.	77° C.
Rice	70° C.	75° C.	80° C.

It will be observed that, as a rule, the largest starch cells tumefy at the lowest temperature; and in accordance with this, rice requires the highest temperature of all the starches experimented on for the complete tumefaction of its cells. It was further proved by Mr. Symons that prolonged exposure to a temperature a little below that of tumefaction not only does not tumefy the granules, but enables them to bear a slightly higher temperature than they otherwise would do. When starch granules are gradually heated, the majority do not burst their integument by splitting it from the nucleus in all directions, as when they are subjected to a sudden rise of temperature, but a small bladder-like process is thrown out near the nucleus; and if the temperature be kept constant the swelling increases, although still confined to that portion of the granule, bursts, the granulose oozing out, and if sufficient time be allowed, the integument, still retaining the original size and shape of the truncated granule, is all that is left.

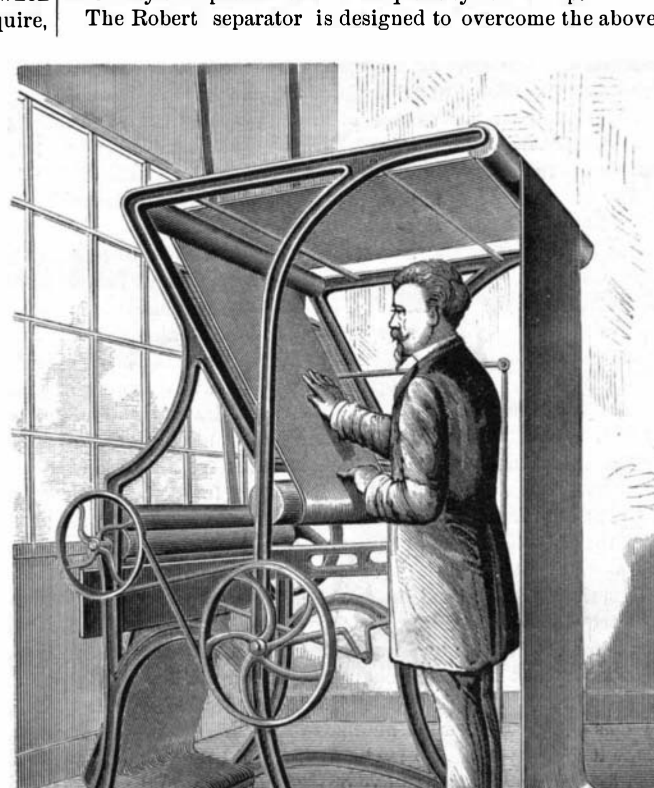
MACHINE FOR EXAMINING GOODS.

One of the most important duties in a mill or warehouse is that of examining the goods made or bought. With the best of machines and the most careful workmen faults and defects may occur, but, considering that all machines are not always perfect, and that all work people are at best only human, we must be prepared to find in every class of goods faulty parts. To detect this, to put the faulty pieces aside in order to draw the attention of the delinquent to them, and, if necessary, to fine him or her, and also to mark the goods as damaged and indicate a certain allowance on them—these are functions which ought to be intrusted to vigilant persons, and the task of examining the goods ought to be made as easy as possible.

In most cases the cloth is laid upon a table before a window, and layer after layer turned over by hand, which is not only a tiring but also a tedious proceeding, and, on that account, liable to be done sometimes inefficiently. We have, therefore, in many places seen a roller affixed to the ceiling of the room, and the cloth drawn over it by hand; this, when done before or behind a window, as the goods may require, shows all faults of weaving, but not always those of dyeing. A foreign machine maker has carried this arrangement a little further, and constructed a machine for the purpose, which is driven by a strap, so that the examiner has only to attend to his duty, and, his hands being free, can mark the cloth or brush it up, or otherwise attend to it more closely.

The construction of the machine will be easily understood; it is shown as placed before a window; the cloth is laid before it on a board, then passes upward through a couple of drag rollers, over a guide roller, and then in front and over a strong sheet of plate glass, and then over a pair of upper rollers down to the floor behind the examiner. The latter thus sees through the cloth as it passes the glass plate, and is able to detect all faults and blemishes of weaving; by means of a treadle he can put a brake on and stop the course of the cloth any moment, for the purpose of marking a faulty place or other reason, and his work being thus performed without bodily exertion, can be more thoroughly relied upon.

In our illustration the machine is shown driven by a strap, which is the most convenient arrangement in a mill; but as much of the work of examining goods is performed in warehouses, the machine is also made to be turned by a treadle, which the examiner has, in that case, to work by his foot, and thus can also stop the machine when required.—*The Textile Manufacturer.*



MACHINE FOR EXAMINING GOODS.

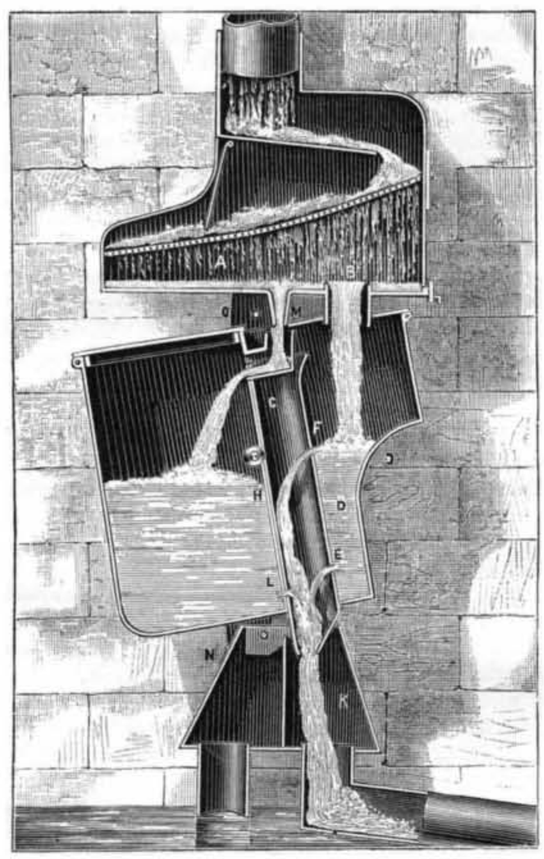
Heating by Acetate of Soda.

The heating of small pits and greenhouses is, in spite of the numberless apparatus in use, a source of trouble. To such folk—and their number is legion—the new plan of heating by acetate of soda seems as if it might be developed into something serviceable. According to an article in *Nature,* the plan is largely adopted on the London and North Western Railway for foot warmers.

The duration of heat in a warming pan with acetate of soda is claimed to be four times that of hot water alone. This is due to the amount of heat required in the first instance to change the acetate of soda from a solid to a liquid state, which heat is liberated as the acetate gradually resumes the solid form. It is stated that only about half the heat is required to produce the same effect as in the case of hot water. The acetate does not require to be renewed except at long intervals. To restore the heat in the pans after cooling, they have simply to be plunged in boiling water for half an hour.

ROBERT'S AUTOMATIC RAIN WATER SEPARATOR.

In a goodly number of countries where water is scarce the precaution is taken to collect rain water in cisterns, whence it is drawn in measure as it may be needed. In certain slightly favored countries such water constitutes nearly the sole resource of the inhabitants. It will be understood, then, how important it is to collect it, and especially to preserve it. The first and greatest precaution to be taken is to admit into the storage reservoir only the second water, for the time which elapses between successive showers allows the roofs and other surfaces that collect the water to become dirty and thus foul the first water that falls. And such water, if care be not taken to lead it into the drain, will dirty and pollute the entire quantity stirred up.



ROBERT'S AUTOMATIC RAIN WATER SEPARATOR.

The Robert separator is designed to overcome the above named annoyance automatically and regularly. It prevents the first rain water that has washed the roofs and gutters, from entering the cistern, and leads it into a special reservoir or carries it to the drain.

The annexed figure will permit the very simple arrangement of the apparatus and its mode of operation to be readily understood. It is situated at the base of the leader, and its dimensions vary with the superficies of the roof to be drained. It includes a stationary and a movable part. The former of these, which is connected with the bottom of the leader, carries a movable perforated disk for arresting the solid particles, and an outlet, B, at the lower part. The separator, which is movable around a horizontal axis, is seen at C, and is divided into small compartments, D, into which falls the first rain water. E is an orifice proportioned to the surface of the roof, F is a wider orifice to permit the flow of water during ordinary rains, and G is a discharge pipe. During heavy rains the water fills the compartment, D, and bows over the upper orifice of the discharge pipe. H is a small orifice in the partition behind the pipe, G. When the entire amount of water that has fallen is unable to flow through E, it rises in the compartment, D, and, passing through the orifice, H, slowly fills the compartment, I. The apparatus is then inclined as shown in the figure, and the clean water changes its direction, passes through K, and enters the cistern. L is a small aperture near the bottom of the compartment, I, which permits the latter to empty, and M is a pipe through which flow the last drops of water when the rain ceases. N is a hook which prevents the separator from swinging and permits the whole of the water being sent to the drain when, for any reason whatever (a repair of the cistern, for example), it is desired to admit no more rain water.

When the apparatus is empty and the water begins to fall the latter is sent to the drain; but, as soon as the water increases, and the time has elapsed necessary to wash the roof, it flows through H, fills the compartment, I, and tilts the apparatus, and then begins to flow through K to the cistern. When the rain ceases, the compartments empty and the apparatus tilts anew to prepare itself to send to the drain the first water of the next shower, and so on. Everything is arranged, then, so that the cistern shall receive only clean water which has been freed from every kind of impurity that fouls the roof.—*La Nature.*

Test for Ammonia.

A sensitive test for gaseous ammonia is proposed by Gustave Kroupa. He dissolves magenta in water, and gradually adds dilute sulphuric acid, until the yellowish color passes into a yellowish-brown. Unsized paper is saturated with this solution, and then assumes a yellowish color, becoming crimson on exposure to the vapor of ammonia. This test is declared to be exceedingly sensitive, and as simple and easy to prepare as turmeric paper. The magenta test papers must be preserved from contact with the air, in closely-stoppered bottles; and it is not stated whether the test must be made wet or dry, or what minimum proportion of ammonia will be detected thereby, in order that it might be seen whether the new test possesses any advantages in this respect on the universally used turmeric test.

Examining Trainmen for Promotion.

A Jersey City paper gives the following account of the way promotions are made on the New York Division of the Pennsylvania Railroad: For the past three weeks twenty-nine brakemen and baggage masters on the Pennsylvania Railroad have been attending school in the reading room of the Jersey City depot. In anticipation of a big passenger business the coming spring and summer, the company has thought fit to supply itself with more conductors. Capt. Osborn, the ticket receiver at Jersey City, who has the railroad ticket business at his finger's end, is instructing the class of twenty-nine men. He shows the men the privileges accorded the different classes of tickets, and how to act when a passenger tenders a ticket which is worthless for passage.

Captain Osborn will soon begin to examine the twenty-nine men. This will take two weeks at least. A number of the men have been brakemen for ten or twelve years.

After each one in the class has undergone a rigid examination, Captain Osborn will recommend about ten of those who pass the best examination. The names he selects will be referred to Mr. Pettit, the superintendent. These men will then be sent to the general office of the company, on Fourth Street, where they will be subjected to another examination of a week's duration, which will be conducted by an examining board appointed by Max Riebenack, the general auditor of passenger receipts. This is the final examination, which decides the fate of the aspirant in the ticket technicalities of the position. After this the candidates for conductorships who have passed at the Fourth Street office go back to Jersey City, where Mr. Adams, the trainmaster, takes them in hand, and finds out what they know about transportation, how they would act to prevent accident, and what they would do in case of a smash up. If they pass in this branch, then they receive their commissions as conductors. As there are hundreds of different kinds of tickets, whose privileges and value are of several conditions, and the knowledge required of the aspirant as to transportation is very intricate, a man has to have a goodhead toget through. He must be possessed of natural intelligence, and must have acquired a vast amount of experience before he can hope to be made a conductor.

AN International Exhibition will be opened at Calcutta next December. Two thousand square feet of space have been reserved for American exhibitors.