

his apparatus may be constructed. In Fig. 2, piles are driven down into the mud, etc., until their lower ends meet hard pan, and above them the masonry of the tunnel is built, as shown, concrete being placed over all. The other plan, in Fig. 3, involves digging down directly to bed rock, and building masonry therefrom upward, filling in the lower part with concrete, up to the desired level of the tunnel floor.

The invention is covered by four separate patents, granted to Mr. John E. Walsh, of 333 West street, New York city, to whom inquiries for further particulars may be addressed.

# Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

### TERMS.

One copy, one year, postage included.....\$3 20  
One copy, six months, postage included..... 1 60

### Club Rates:

Ten copies, one year, each \$3 70, postage included.....\$37 00  
Over ten copies, same rate each, postage included..... 2 70

By the new law, postage is payable in advance by the publishers, and the subscriber then receives the paper free of charge.

NOTE.—Persons subscribing will please to give their full names, and Post Office and State address, plainly written, and also state at which time they wish their subscriptions to commence, otherwise the paper will be sent from the receipt of the order. When requested, the numbers can be supplied from January 1st, when the volume commenced. In case of changing residence, state former address, as well as give the new one. No changes can be made unless the former address is given.

VOLUME XXXII., No 19. [NEW SERIES.] Thirtieth Year.

NEW YORK, SATURDAY, MAY 8, 1875.

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### AN INLAND PENIKESE.

The success of the School of Natural History at Penikese is an encouraging indication of the growing demand for truly scientific teaching. Another indication is the favor accorded to Professor Shaler's project for an inland school of observation, to be located in the coming summer near Cumberland Gap, Ky.

Several conditions unite to make the site chosen a favorable one for an out-of-door school. The region has never been scientifically explored: the Gap is admirably fitted by Nature for the study of a great section of the fossil-bearing rocks of this country, from the Lower Silurian to the Upper Carboniferous, and for the investigation of the Appalachian system of mountains; and subsistence is incredibly cheap, milk ten cents a gallon, eggs five cents a dozen, etc. Last, but not least, the cooperation and assistance of the thoroughly organized staff of the State Geological Survey, of which Professor Shaler is chief, will be given to the enterprise.

The special object of the school is to teach students to observe; consequently only a limited number (25) of picked men will be admitted—graduates of colleges, teachers and others, capable of appreciating and profiting by the instruction given. Among the instructors will be Dr. Asa Gray, Professor J. D. Whitney, Rafael Pumpelly, and others, besides the members of the State Surveying Corps. The various departments of geology will be chiefly studied, but only with a view to the elucidation of the problems presented by the area under exploration. Some attention will also be given to the zoology and botany of the district.

As might have been expected, the applications have been far in excess of the number that can be accepted. If successful—and it can hardly fail to be—this camp school is likely to become a permanent institution, with a new camp ground every year.

### THE CHAIN OF CRIMINAL ENTAILMENT.

Having studied crime and criminals for thirty years, the New York State Prison Association concludes (in its annual report, just presented to the Legislature) that to reduce the criminal classes and break up the entailment of the evils of pauperism and crime, "which defy remedies and curative discipline in adult lives," two things are specially required, namely to sever the links in the chain of such entailed evils, and to instruct, train, and save all the children.

To use a homely saying, it is saving at the spigot and wasting at the bung to attempt the repression of crime solely through action upon adult criminals. So long as the chain of criminal entailment is unbroken, the most searching and rigorous police system possible is powerless to purge the community of evil acts and evil tendencies.

The judgments of the association are sound, so far as they go: but they do not go far enough. It is easy to point out the necessity of severing the chain of criminal entailment; the question remains: How is it to be done?

No one remedy will suffice for so complicated a disease of the social system. The structure of the chain is triple, and each element demands special treatment. The first element is heredity. The parent's crime is the child's inheritance, not absolutely, but as a rule; and the chances against the proper moral development of the progeny of the vicious are so overwhelming that it were better for the world were such children never born.

The second element is miseducation. By conscious teaching or unconscious example, the criminal classes are continually corrupting the honest and contaminating the pure. The child of virtue may thus become a monster of vice and the head of a line of evil doers.

The third element is what we may call moral atavism. Constitutional virtue is the product of long culture, the fruit of moral habits covering many generations. Yet, as in herds of blooded stock there will be an occasional reversion to the primitive type, so in good families there will now and then arise children in whose moral composition the barbarism of remote ancestry strangely dominates. Instead of being heirs of all the ages, such unfortunates inherit only savagery.

What the causes and conditions of such reversions are, no one knows, though the fact is painfully patent in the "black sheep" which afflict so many domestic flocks, boys and girls who turn out badly in spite of virtuous parentage and the most careful education. Time alone can cut off or dry up this source of crime.

The means for preventing the production of criminals by education or example are twofold: The careful training of all children in habits of industry and virtue, and the rigid seclusion of all offenders against the public weal. As the community now compels the absolute retirement from public intercourse of all persons afflicted with malignant infectious diseases, so in time, we believe, the morally diseased will be isolated, not for punishment, but as a necessary precaution against the corrupting of others: a measure that will be made possible by the relative rareness of crime when the most fruitful source of criminality—hereditary transmission—shall have been dried up.

Herein lies the great problem of prison management, to isolate the evil-disposed so as to prevent depredations against the life and property of the law-abiding and the moral purity of youth, while making the criminal classes self-supporting and, at the same time, furthering so far as possible their reclamation to paths of virtue. On these points the views of the association show an encouraging progress toward what we have heretofore styled the scientific treatment of criminals.

Touching hereditary crime, the suggestions of the association are palliative merely. Given children born with a criminal bias, the best thing undoubtedly is to counteract, so far as may be, their evil tendencies by proper training in childhood and moral surroundings in later years. So far, good: but the time has come when preventive measures also should be considered. Is it possible to lessen the number of the inheritors of crime-compelling organizations by making their generation less frequent? In plainer words, can the community prevent known criminals from completing the chain of criminal entailment?

X, a male, and Y, a female, are convicted criminals, come of criminal parentage. In all human probability their children will be criminals. Has the community any right to allow the future to be afflicted with their pernicious progeny? We say: No, no more than they should be allowed to erect a house or build a dam in such a way as to imperil life and property ten years hence. That the resultant evils can be prevented in the one case as surely as in the other (not absolutely, but very largely), we are confident. The question is: Which of the several possible ways of doing it is most consistent with our modern views of what is just and profitable?

The summary execution of criminals of every grade would soon put an end to hereditary crime: so too would the Spartan custom of killing all suspicious or undesirable infants. But these remedies are so horrible, so obnoxious to our moral sentiments and sense of justice, that they are not to be thought of. Two other methods remain: To set apart all criminals permanently, in communities or colonies, with the sexes separated, as lepers are treated in the Sandwich Islands

or to eliminate their power of propagation, as suggested in our article on the generation of the wicked.

So long as the criminal classes are so numerous, their isolation is beset with many difficulties. The crime committed, not the character or moral needs of the criminal, determine the period of his seclusion. To sever the chain of heredity, the convict's imprisonment would have to be for life, regardless of the severity of his crime or the thoroughness of his subsequent reformation. This would require the capacity of the penal colonies to be immense and very burdensome to the innocent, since it would be only under peculiarly favorable circumstances that the isolated communities could be made self-supporting. Nevertheless prisons and penal colonies will always be needed, if not for punishment, at least for the separation of the criminally infected from the morally healthy, for the safety of youth.

Use would be found for them also as alternatives to the last named plan for breaking up the entailment of crime. The criminal might have the choice of the two preventives of heredity, loss of freedom with sexual isolation, or the enjoyment of civil liberty with sexual impotence. In either case the terrible stream of criminal entailment would largely cut off at its source.

The surprising favor with which the suggestions made in "The Generation of the Wicked" have been received throughout the country shows that thoughtful men are everywhere dissatisfied with the costly insufficiency of our present methods of dealing with crime, and convinced that they need to be not merely reformed but radically changed. The Prison Association might find it profitable to push their investigations into this field of inquiry also.

### PICTURES BETTER THAN STORIES.

We are constantly endeavoring to impress upon our readers the advantage which a picture possesses, either as a direct substitute for verbal description or as explanatory of the same. A rough sketch will, in nine cases out of ten, convey one person's idea to another more clearly than pages of labored, written details; and this is why we ask people who send us questions about machines, or mathematical or mechanical problems, to use their pencils as much as possible; while we counsel others who cannot sketch to acquire some knowledge of that very useful accomplishment. Time is a very valuable commodity; and the mechanic or professional man, whose leisure time is seldom great, has little liking for poring over a long description when half a dozen lines, in the form of a sketch, will enable him to seize the gist of the idea in perhaps as many seconds. This is one of the reasons why we advise the inventor, who has a new idea to show to the world, to exhibit it by a picture whenever possible, and to distribute that picture widely among the people whom his production is likely to interest.

The value of pictures, or rather their superiority over words, as story tellers, is excellently illustrated by a couple of incidents which we find related in a foreign contemporary. In a village in India, recently, it became necessary in the course of some engineering operations to transport an enormous mass of metal, weighing several hundred tons, from one point of the town to another. Ordinary means were out of the question; and as the engineers found themselves unable to devise any process, they did the next best thing, and wrote to other engineers in England who were constantly supervising such work. The latter, instead of writing out nice large pages of foolscap, beautifully embellished with Greek letter formulae and red ink, quietly waited until the next big piece of metal which they had to transport offered a favorable opportunity. Then they prepared a camera, and photographed every step of the operation, together with all the tools and appurtenances and forwarded the prints from the negatives to India. These the engineers in the far-off country followed, and with little difficulty accomplished their task.

Another instance is that of a bridge, also to be constructed in India but not yet completed. This work involves the placing of very heavy weights and certain difficulties incident to the rapid changes of level of the water to be crossed. At the present time just such another bridge is in process of erection in London, and the assistance of photography is again called in. As the London bridge advances toward completion, photographs are constantly made; and so when the Indian engineers begin their work, they will be in possession of a set of guides of invaluable assistance to them.

### SOME CURIOUS RESULTS OF EXPERIMENTAL SURGERY.

The power of the lower forms of animal life to withstand mutilation is well known. Cut an angle worm in two, and the tail end will reproduce the head and the head a tail. Other worms may be cut into many pieces and each fragment will straightway develop a complete worm. A polyp will endure decapitation a score of times, a new head growing on every time. In like manner, the stomach of one of these creatures is capable of developing all the other parts. Still lower in the scale, the normal method of multiplication is by division, and elementary cells of more highly differentiated organisms seem to retain more or less of the primitive character. By virtue of this inheritance, spiders reproduce their lost limbs and crabs their claws. In the higher forms of life, the power diminishes so far as complex organs are involved; still it is retained to a much greater degree than is commonly supposed.

Pull out a hair or a finger nail, and it will grow again. Remove a portion of the skin and it will be renewed, unless the wound is too broad or the life of the surrounding parts too feeble. Even then it is possible to transplant to the denuded surface minute particles of skin from other parts, and in a short time these epidermic islands will extend their borders until the wound is covered and the sore heals with scarcely