SAVING SIGHT OF CHILDREN - Oculist Describes Simple Means of Curing Defective Vision of 5,000,000 Pupils in the Public Schools By W. H. Bates, M. D.

CAN SLIDES BE STOPPED?

Culebra Cut Is the Chief Element of Uncertainty About Completing the Panama Canal on Time

By J. I. C. CLARKE.

CAN the canal be opened in October of this year as Col. Goethals has recently said?

There are three great factors to be considered in reference to concluding the work. These are the locks, the Gatun dam and the Culebra cut.

The locks are so far forward in construction—side walls, centre walls, gate leaves and internal machinery—that their completion eight months hence is fairly certain. Here the day's work may be computed accurately. The working force is highly skilled and adequate; almost every pound of metal needed is in sight. The triple locks at Gatun on the Atlantic end, the single locks at Pedro Miguel and the double locks at Miraflores may be counted on without fail to do their part in carrying out the great organizing engineer's prediction.

The Gatun dam itself is complete now except for riprapping its lake face, and this is in progress and should be done before August. The spillway of the dam awaits some of its gate work and the electrical machinery for motoring the gates of the spillway and the locks, but no anxiety need arise about these being ready in time. Meantime, however, as the time advances the water will be rising in Gatun Lake and feeling with its multitudinous penetrating fingers for any weakness in the dam's mile and a half of length, its half mile of thickness at the bottom and 400 feet at the high water level. This problem of sufficing strength of the dam, over which much ink has been shed in criticism and explanation, naturally concerns the whole canal, but does not concern the great concrete work of the spillway, which is inserted across one of the natural low hills of the country, while the dam on each side of it joins that spillway hill with another hill on either side. That the dam will stand is now the universal belief. No event short of an earthquake is at all likely to interpose here between the Colonel and his predicted passage for the first ship.

In the nine miles of the Culebra cut, if anywhere, a tinge of uncertainty enters into the prediction. As is often said in the Canal Zone the higher you go among the officials the more certainty is expressed that everything here will come out all right and on time. And this should be reassuring to all who take the matter to heart. They are the responsible men. In all things else they have proved themselves skilful, practical, resourceful and conservative in opinion, however bold and unflinching in action. Lower down you may meet with a shaking of the head, a shrugging of the shoulders, sometimes a cautious doubt and occasionally an emphatic "No, sir!" As for my own opinion (however little it may be worth) after traversing the whole enormous excavation below and viewing it from many points above, with officials at my elbow to elucidate and explain, I can see nothing that cannot be excavated and cleaned up by mid-November of this year.

Now it may be true that Col. Goethals in naming October does not expect to clean up every pint of slidden material visible and in immediate prospect in the cut; that the dredges may be relied on to do that. Certain arresting forces to the sliding tendencies will, it is confidently believed, be in action as soon as the water is let in. A counter or supporting pressure against the rock walls of thirty-one tons a running foot will be present when the cut is filled with water. Against the bottom of the cut, which in places shows a tendency to rise, the great weight of water will provide a counter weight. No wonder, then, that Col. Goethals desires to see the water flowing in.

Another and significant factor in this matter of letting in the water is that the temporary Gamboa dam at the Atlantic end of the Culebra cut is not expected to hold in the waters of the Gatun Lake beyond a certain height. Well before the danger point is reached the small dam must be blown up and will be.

Of the actual contemplated rock excavation scarcely more than 3,500,000 cubic yards remains to be done at this writing, and the work is in full progress. There are in addition, however, fully 7,000,000 cubic yards of slide material now in the cut, with probably more to come. These are the two real factors in the problem. The leading engineers made light of them, and surely they know, or come near knowing.

The Culebra cut seen from the division engineer's office at Culebra stretches between the hills to right and left like an elongated S, the curves having been taken to get the advantage of natural depressions. Between Gold Hill and Contractors' Hill the cut has been deepest; that is, it required the removal of a greater amount of material than elsewhere to reach the bottom of the canal level, namely, some 312 feet. At other places the original surface was 240 feet above the canal level, with an average cut of perhaps 160 feet. Let it be understood that through the nine miles of the cut the width at bottom is 300 feet; that the prism of the canal proper is 45 feet high and 311 feet wide at the top. Here, then is a very steep angle. Fortunately, however, the cut is through hard rock for the greater part. Above the prism on the east side is a berm bank forty feet wide, and the original design was to carry up the flare on each side until it was 670 feet wide, making a slope of 3 on 2. Beyond the berm bank is a minor canal known as the eastern diversion, designed to carry off the waters from the hills which in the rainy season would have poured into the cut, making work there impossible. It has served its purpose admirably but is one of those pieces of foresight seldom mentioned.

Nature, however, angry, as one may suppose, at the disturbance of arrangements made long since for separating the oceans, would have none of these slope figures. The upper reaches of the diggings were through moderately soft stuff, and where the hills were high on either side trouble began. As early as the days of the French canal the earth began sliding at Gold Hill, and as the cut went lower and lower has kept it up in great volume. During the progress of the work there have been in all about thirty slides, earth and rock from a few thousand cubic yards up to a million coming down at a time.

Dealing successively with these as a surgeon might with any abnormal growth a terminology has grown up. There are, for instance, "pocket slides" of small dimensions which crumble down over a limited, well defined area. These, it is found, become "dead" only when they have reached the "angle of repose," which, by the way, is not always the same angle, but depends upon the position of the buttressing rocks in situ. The pocket slide is generally a "gravity slide," which explains itself: there is a body of loose material that wants to fall and has nothing to stop it till it flows over the berm and into the cut, sometimes taking a bit of the berm with it and occasionally breaking down the edge of the diversion canal.

But the great slides are more complex. Here mightier forces are engaged. The superincumbent masses of the mountains press downward and outward for their support in ways that can only be guessed at, for geology seldom has presented more puzzling conditions. Earth movements are seen in which great masses bearing large trees on their surface have moved uphill over a knob at the crest to go slowly down toward the cut. One such tree at Cucaracha has moved still standing upright for a hundred feet on a slope upward and is now going down at an angle over the hill.

The general observation is that these eccentric movements occur where there is a fault in the harder rock strata. The dip has been broken by some upheaval of the past, one stratum being downward of the rocks themselves, which, shivered and split in line after line and in every sort of chaotic tumbling, are coming down in enormous quantities. It buried a steam shovel as it came, but no human being was overtaken.

The slides never come unexpectedly. The signs are given long in advance. Cracks begin to show parallel to the canal. These widen very gradually and at last the earth and rock, argillite or tufa go out and the shovel begins to take them away until they are "dead."

There is a most unsocial slide at Empire, on the west bank of the cut, the division beyond Culebra. It chose for its starting point a building put up by the French at the top of the hill for an observatory and at present in use by Col. Gaillard for his headquarters as division engineer, with his staff, including his very able assistant engineer, A. Stanton Zinn, who has been with the canal from the beginning and whose information and courtesy are unfailing. At this point the bank is very steep and it has been sliding apparently with a special eye to undermining the engineer's offices. So close did it come to the house a year ago that the Colonel sent a number of men up with saws who cut off about twenty feet of it, including the glass encased observatory. Then the slide kept its counsel for a while, but about six weeks ago started afresh. I found the Colonel sitting about two feet from the edge on top of one of the little concrete blocks on which the observatory rested. He was gazing across the cut. He showed me the cracks in the earth behind him up to the very boards of the house.

"It will probably go down that far," he said calmly.

"These cracks are widening perceptibly. Don't start; there is no danger. It is a slow affair. On the 2d of January it began, however, to move rapidly. I saw it go down there," pointing to a vacant spot a few feet off, "four feet in seventeen minutes. You know there was quite a bit of lawn outside the house."

"Where is it?" I asked.

He pointed downward, and there it was about eighty feet down the sharp slope of perhaps 250 feet to the canal. It was a lawn broken into long waves parallel to the cut and into squares by transverse fracture, going down slowly but surely. It had deposited already about 65,000 cubic yards in the cut. There was a small tree upright and green among the descending grass.

"Did it grow there?" I inquired.

"Not at all," replied the Colonel, "it is a young eucalyptus tree and was growing on January 1 alongside its brethren," pointing to a half dozen young trees beside the house! The slide will probably get that house.

The Colonel finally had business in the cut and took himself down the side by a series of marvellous ladders or stairs that stand almost upright. It is his custom to climb down, inspect to his heart's content as far as Culebra, and then motor back to Empire, when he climbs the hill to his home, where the Colonel's wife has a most remarkable collection of orchids.

"We deal with the slides as they come," said Mr. Zinn, "and that is the only way. We have thirty-seven steam shovels at work, each taking out 50,000 cubic yards daily. As you may have observed we have a couple of shovels shearing off the top of a hill near the Cucaracha slide. That will no doubt save trouble in the future, and we may do more of that work. I have no doubt too that the continuous dynamite explosions do much to keep the slides going."

Blast after blast was going off in the cut and the earth vibrated after each.

"Those," said Col. Gaillard, "are merely the small ones to break up the larger rocks after the main drillings. It is after working hours that we set off the main charges. Every evening we explode from five to eight tons of dynamite. The explosions are not so noisy, but you can feel the earth tremble for miles, and see it, too, in the vicinity of the big blasts.

"We set off twenty-seven tons of dynamite at one time, when President Roosevelt was here," he added.

"It was the great noise," said I; "was there much of a landslide thereafter?"

The Colonel said "H'm!" and looked across the cut.

"Many of the engineers of greatest repute in the world," said Mr. Zinn, "have examined the matter of the slides, but not one has suggested any other treatment than to shovel them up. We are not frightened by them; we know them pretty well."

And Mr. Zinn went on to figure out that this canal would be ready by November 1 at latest. When one comes to think of that enormous cut as a whole and how little of its nine miles the slides have occupied one gets a comforting thought. For comparison, too, on a small scale we have the fifty miles of cuts made for the Panama Railroad fifty years ago through just the same kind of soil and rock and clay. Nature certainly had a fine time making the material through which the canal is cut. It is geologically as mongrel as the races that have inhabited the region.

So the tremendous story goes on to its final chapter. You want to stand down in that deep man made valley in the rocks, to hear the throbbing of the engines and grim mouths of the steam shovels, each hoisting up its seven ton cupful and emptying it on the flat cars; then every two minutes or so to see the locomotives laboring with the long dirt trains of many cars out to Balboa, where they are making land in the Pacific Ocean in exchange for the path they are making for the water. The air vibrates with explosions near and far. The men, mostly black men, are busy as ants. The long drills are driving new holes in scores for fresh blasts till the whistle blows at 5 o'clock. A great boom goes up; the ground seems split under your feet, and you know that the steam shovels will be at it again at 7 in the morning, and the sun goes down in gold and the moon rises in silver and you are thrilled and confident that the great work will go through in spite of all obstacles. A sense of greatness, fitness, cleanness is in the air, and you may really be proud you are American.

THE NOW CELEBRATED CULEBRA CUT, INTO WHICH GREAT SLIDES OF ROCK AND EARTH FROM THE MOUNTAINSIDE MUST BE PREVENTED FROM EMPTYING, TO MAKE THE CANAL PERMANENTLY SAFE AND OF COMMERCIAL UTILITY. From Topographic Model, Copyright 1913, Howell's Microcosm.

SAVING SIGHT OF CHILDREN

Oculist Describes Simple Means of Curing Defective Vision of 5,000,000 Pupils in the Public Schools

By W. H. BATES, M. D.

THERE are five million school children in the United States who have acquired defective sight and the need of glasses. It can be prevented. If it were $5,000,000 to be saved would you be interested? Surely the sight of each child is worth $1.

In 1903 the eyes of the school children of Grand Forks, N. D., were examined. One-fourth of them had defective sight. The superintendent, J. Nelson Kelly, was interested and desired prevention. At my suggestion a card used for testing the sight, a Snellen test card, was placed permanently in each classroom where all the pupils could see it and the children requested to read daily the smallest letters they could see from their seats with each eye separately, covering the other eye with the palm of the hand in such a way as to avoid pressure on the eyeball.

Results: One year later the eyes of the school children were again examined. The teachers who had carried out these simple directions not only prevented their pupils from acquiring poor sight but they had cured many children with defective eyes.

In one classroom of forty pupils, first year children, 6 to 8 years old, the teacher noted that at the opening of school in the fall all the children could see the writing or letters on the blackboard, but before school closed in the following spring all, without exception, complained that they could not see the writing or letters on the blackboard from their seats when distant more than ten feet. This had been her experience each year for fifteen years.

The eyes of her pupils were first examined in the spring of 1903. All had difficulty in reading the small letters of the Snellen test card at a distance of twenty feet. Thirty of the forty children were relieved almost immediately in less than five minutes, when the eyes were tested by showing them with the aid of the same test card how to regard distant objects properly without making an unconscious effort. The sight of these children was preserved and the remaining ten defectives cured by the teacher by exercises in distant vision with the aid of the Snellen test card.

This teacher afterward used the card continuously for eight years and stated that as a result no more children in her room acquired defective vision. Her success in benefiting the eyes of school children was also achieved by more than fifty other teachers in Grand Forks and other parts of the State of North Dakota.

The use of the card was beneficial in other ways, and relieved tired, restless children, tired eyes, tired and aching heads quicker than a recess. The teachers themselves found relief from eye troubles by the use of the Snellen card. The exercises in distant vision with the aid of the Snellen card required less than half a minute daily and were not objectionable in any way, to my knowledge.

In another class room, after testing the sight of all the children, the teacher inquired about the sight of one of the boys. I said that his sight was all right; that he was slow in reading the letters of the test card, but after some encouragement he read the smallest letters the normal eye should see at his distance from the card.

The teacher was incredulous and told me very emphatically that she was positive that the boy was near sighted. She declared that his vision for all distant objects was poor: he was unable to read the writing or figures on the blackboard, he did not recognize people at a distance or see the maps, charts or diagrams on the walls. The teacher told me that I was wrong when I said that the boy had good eyes and was not near sighted. She said further that I may have made the mistake because the boy might have learned the letters of the test card by heart or had been prompted by another pupil. She asked me to test him again.

The second test of the boy's sight was made carefully under her supervision, the sources of error she suggested were met, and I found the boy's sight was normal.

The teacher now took a hand. She tested the boy's sight with the writing on the blackboard and he readily read what she had written. Then she wrote additional words and figures on the blackboard which the boy read equally well sitting in his seat. She asked him to tell the time by a clock twenty-five feet away, which he did correctly.

It was a dramatic situation. The children were intensely interested. I was impressed by the teacher's surprise when she was finally convinced that the boy's vision had suddenly become normal. Three other cases in this class were similar, all with defective sight which became normal immediately when their eyes were tested with the Snellen test card.

The teacher asked for an explanation. I told her that when the children looked at the blackboard or other distant objects and strained or made an effort to see better they focussed their eyes for a near point and consequently could not see distant objects clearly; and that while testing the sight with the Snellen card I educated them to use their eyes properly for seeing objects at a distance.

It was interesting also to me to find that the few moments devoted to testing them were sufficient to relieve these children so that their sight for distant objects became normal. This teacher at once realized that the Snellen test card was valuable in relieving and preventing defective sight. At her request a Snellen card was placed permanently on the wall of the classroom where all the children could see it from their seats.

In four public schools of New York city, with a total attendance of ten thousand pupils, the Snellen cards are on trial for the prevention of defective sight. They were introduced less than a year ago. Many of the teachers did not use the cards at all and their pupils acquired defective sight. Other teachers were more conscientious and did what they could, recommending the children to read the small letters daily from their seats and with each eye.

The records of Miss U. V. Dillon, teacher of the ungraded class in Public School 183, are valuable. She had tested the sight of her pupils when they entered in the fall, as was required by the board, and later every three months. In the beginning twelve had defective sight. Three months later there was no change found in their sight. Soon after she began the exercises in distant vision with the aid of the Snellen card six almost immediately improved and obtained normal vision or were cured before the close of the school year.

Following the lead of Miss Dillon other teachers in the New York schools have improved the sight of many children without glasses, and of course prevented the children with normal sight from acquiring defective vision. The fact that school teachers in Grand Forks, N. D., in 1903 and later, up to the present time cured near sighted children without glasses and the teachers in New York city and elsewhere have likewise cured defective sight is offered as evidence that school teachers can prevent their pupils from acquiring defective vision. Prevention is easier than cure.

In conclusion, let me urge the use of the Snellen card in all schools for the prevention of defective vision and the need of glasses.

MODELLED BY PREHISTORIC MAN; CLAY FIGURINES OF BISONS

These figurines were possibly made 20,000 years ago. They are (at back) a male bison, with the female in front strongly outlined. Both of them, it is claimed, are the first prehistoric clay figures whose discovery has been recorded. The models were found by Count Begouen in the cave called the Tuc Ditboubert, in the district of Montesquieu-Aventes (Ariege). The finds are a male and female, respectively 26 and 30 inches long. They are almost intact, although somewhat cracked by the drying of the clay. They seem to have been attached to the cave wall. They have the appearance of bas-reliefs. The Academy of Inscriptions at Paris passed upon the authenticity of the find and French scientists are still busy congratulating the discoverer.