Loss in Stoppages of Electric Cars.

Prof. H. S. Herring, in The American Electrician, says: From a large number of tests I found that the difference between making a stop and start at a station and running past it varies from 75 watt hours to 100 watt hours according to the grade and load, the average for ordinary conditions with a partially loaded 7½ ton car being 85 watt hours per stop. These tests were made by running the car over a road on which definite stopping places were designated, and a different number of stops made on successive trips, each trip being repeated for the same conditions until the readings agreed. The car was loaded with sand bags and weighed on car scales. These values, being obtained from about 100 such tests, are fair average results, but cannot be depended upon for any particular case, as conditions may cause a very large variation. But as an illustration of how these small values aggregate, the following figures may be interesting: Assuming the cost of electrical energy at 1 cent per kilowatt hour, one stop would cost 0·085 cent, nearly one-tenth of a cent. At this rate, the cost of making one extra or unnecessary stop on each trip for fifteen trips daily would amount to 1·28 cents per car per day, and $4.67 per car per year; for fifteen cars, $70 per year; and for 100 cars, $467 per year, merely for one extra stop per trip. This does not include the cost of brake shoes and wear and tear nor the capital invested in the increased size of the power house. Taking an actual instance of an engine house located where two lines of cars pass the door, thirty cars making fifteen round trips a day and each car passing the engine house twice on each round trip, it was found that on this same basis it costs the railway company for electrical energy alone seventy-six cents per day or $278 per year to stop its cars at this one place. Even should the assumption of one cent per kilowatt hour prove too high, yet the results are important.

In reference to the effect of careful handling of the controller, I would say that the difference between the kilowatt hours per car mile required by two motormen is very marked. A number of experiments were made in order to obtain some data. A good average motorman was selected and instructed to run his car in the usual manner. The other motorman was instructed to run the car in the most careful manner, allowing it to "drift" as much as possible and to use the brakes as little as possible. The same car was used in both instances, and was run on regular schedule time, making the same number of stops. The careful motorman used only 80 per cent of the kilowatt hours used by the "regular," although the latter was not careless, but rather above the average motorman. The difference of 20 per cent in the kilowatt hours used by these two motormen represents average conditions and not exceptional ones, but for the sake of avoiding possible exaggeration and allowing that such expert motormen cannot be readily obtained, it would be perfectly safe to halve this figure and take 10 per cent as the amount of energy that can readily be saved by more careful handling of the controller, while on most roads the larger value, or at least 15 per cent, could be saved without doubt. A few calculations based on a saving of 10 per cent may be of interest, being the gain that would result by using less power on the line. Taking the average performance in city running on a ten-mile, fifteen-car, fifteen-trip road as 1,300 watt hours per car mile, a 10 per cent saving amounts to 1·3 cents per trip, 19·5 cents per car per day, $71.20 per car per year, and $1,067 per year for the entire road, or for a company operating 100 cars this amounts to over $7,000 per year.

PRACTICE WITH THE HORIZONTAL LIFE LINE.

A SCHOOL FIRE DRILL.

It is the policy of many schools not to let pass any opportunity which school life may offer to keep the students constantly employed in those forms of right activity which may interest them to make the most of themselves; hence the military drill which is found in so many schools.

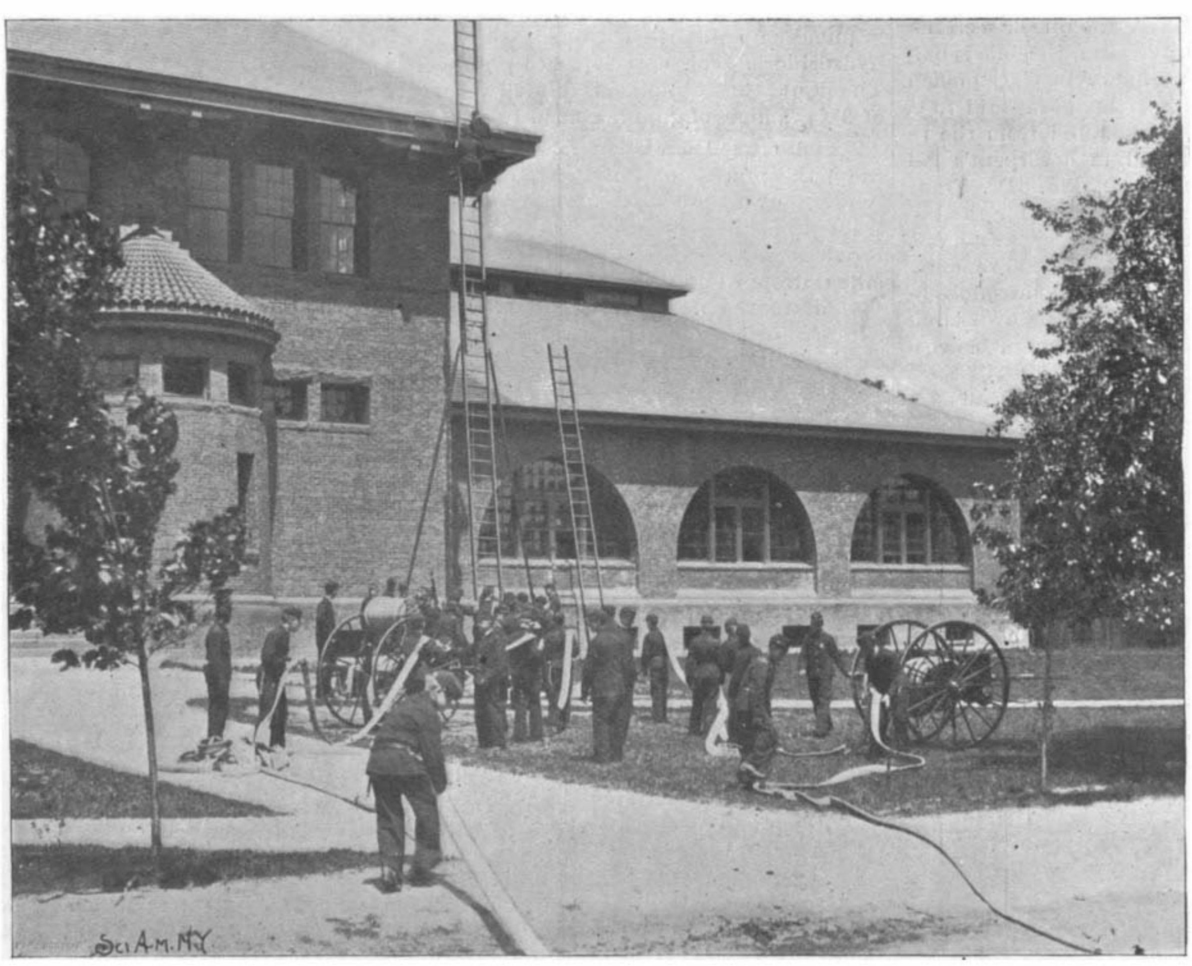
We illustrate and describe a system which combines both military exercise and a useful training of the faculties. It is the fire drill as practiced at the Cambridge Manual Training School for Boys, Cambridge, Mass. There is little doubt that a drill of this kind possesses more usefulness as an educational force than even military drills. As the chairman of the Boston Board of Fire Commissioners recently said regarding the school: "Instead of theoretical soldiers, they are making practical firemen. The modern methods of fire fighting are sufficiently scientific and exacting to produce as large results, whether physical or disciplinary, as any sought by military drill."

As mentioned in the SCIENTIFIC AMERICAN for September 18, 1897, this school furnishes the nearest approach to a school of fire extinguishment of any institution in the world. It is not, of course, expected to make firemen of the boys, but to give them coolness, courage and promptness in emergencies, and they also gain what so small a portion of the public have—a clear appreciation of the gravity of fire risks in cities and towns and intelligent ideas in regard to the prevention of fires.

The drill was arranged by the late Harry Ellis, superintendent of the school. It was introduced at first as a voluntary element, chiefly for the sake of the physical exercise and recreation it furnished, but the results were so satisfactory that it is now required from all the boys, excepting those who are physically unable to undertake it.

Every part of the drill is under the personal supervision of some instructor who has a thorough knowledge of all its details, and who is held responsible for the discipline of the boys and their officers and for the safety of all during the drill. As a preliminary, the pupil, on entering the class, is given a course of lectures explaining the use of a knowledge of fire prevention and fire fighting, the present methods employed and the improvements needed. Each boy is examined physically to find out his weaknesses, if he has any, so that they may be corrected. Simple marching movements are first introduced, and considerable time is devoted to the "setting up exercises" as practiced in the regular army. The boy is next given a belt and a long police club and instructed in the club drill. Later a sword made of tough wood is substituted for the club and instruction is given in single stick exercises similar to those of the navy. As a part of this preliminary drill, each boy is required to attend a course of lectures at the school given by skillful surgeons upon the various ways to render first aid to the injured. The pupil then begins work with the fire drill. The boys are formed into a battalion divided into hose companies, ladder companies, an engine company and an emergency corps. After this the pupil begins work, which includes holding and jumping into life nets from heights varying from eight to twenty-two feet; different forms of rope work, involving about all of the known methods of life saving, erecting and climbing ladders and the various ways of handling ladders; different forms of drill for fire hose, including coupling, carrying lines through buildings and up ladders, handling and use of nozzles, hose strips, spanners, etc.; shooting the life lines and other exercises tending to secure acquaintance with the different forms of fire or emergency apparatus.

To become a non-commissioned officer a private must have been on drill one year and then have passed a severe examination regarding his knowledge of military movements, Red Cross emergency work, handling of fire apparatus, etc. At the end of the second year, by passing another examination, he may become a sergeant.



FIRE DRILL—GETTING THE HOSE READY TO CARRY UP THE LADDER.

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The lieutenants and captains are taken from the third and fourth year students only. The school is provided with the very best equipment. Alarms are given from fourteen boxes. The department is accustomed to second and third alarms and also to the "recall" or "all out" in use in large cities. Upon a first alarm one ladder truck and one hose company respond and the other apparatus follows when called by a second or third alarm. In the basement of one of the buildings is the fire drill room, which contains a ladder, truck, three hose carriages, an engine, an emergency wagon loaded with life lines and other articles needed for the drill.

The drill tower shown in our engraving is forty feet high and is arranged as a three story building, with stairways, window casings, etc. It is furnished with shelves on the outside from which jumps varying from eight to thirty feet may be made into the life net. Overhanging timbers are arranged at the top to support heavy iron rings to which ropes may be fastened for practice with the life belt. Near the tower are standards for horizontal life lines. One engraving shows the students practicing on these lines. This is most admirable exercise. Our other engravings show practice with the life net and the students preparing to draw a line of hose up to the roof of a building.

It is to be hoped that fire drills will be established in other schools, as it promotes alertness of body and mind, coolness and courage, and the benefits of discipline are increased. There is an element of dash about it which appeals to the ardor of youth and implants a sense of responsibility, while the constant chance of practically exploiting their acquisition gives it a realism which military tactics as an adjunct of general school training does not possess.

FIRE DRILL—PRACTICE WITH THE LIFE NET.

THE FIRE DRILL TOWER.

THE FEET OF CHINESE WOMEN.

The small foot of the Chinese woman, which the Celestials call by a name signifying "golden lily," has always excited the curiosity of Europeans.

I have no intention of passing in review all the motives that have been adduced in order to explain why the Chinese have for ages past mutilated the feet of women, since one is just as unlikely as the other. It is not until about the age of four or five years that they begin to produce this distortion. The result is gradually obtained by the use of tighter and tighter bandages that produce in the organ a double movement of antero-posterior flexion upon itself and of rotation of the last four toes and their metatarsal bone around the first metatarsal. The effect of this first movement is to break the foot into two parts—one of them anterior, comprising the toes and their metatarsal, and the other posterior and comprising the calcaneum. The scaphoid bone, which in this work plays the part of a hinge, is entirely put out of joint. It is always more or less displaced and raises the skin of the foot, which, at this level, sometimes ulcerates (Figs. 1 and 2).

The accompanying figures, reproduced from photographs, represent the foot of a young lady of twenty. Its length is 6¼ inches, and its weight (with 2¼ inches of the ankle) 14 ounces. Viewed by its external face, it represents a rectangular triangle of which the hypotenuse, formed by the bone of the foot, is slightly convex at the level of the scaphoid bone. At the union of the third posterior and of the two third anteriors, its lower edge shows a cavity one inch in depth, resulting from the forced flexion of the foot upon itself. The lower face, of generally triangular form, shows us the arrangement of the deformed and compressed toes, which rest upon the ground through their dorsal surface. The nails are thin and atrophied, with the exception of that of the second toe, which looks like a claw. The diagram in Fig. 3 gives better than any description an idea of the deformation of a Chinese woman's foot.

After the foot has attained a sufficient degree of atrophy, and at the cost of considerable pain, the young Chinese woman has not yet finished suffering. She has to keep her feet constantly bandaged in order to be able to walk, and even then a long walk is impossible. The atrophy of the foot brings about an atrophy of the leg, which is reduced to the state of a skeleton, the muscles disappearing and hardly anything remaining but the skin and bone.

This atrophy of the leg contributes in a great measure toward increasing the trouble of walking and balancing. The Chinese woman can walk only with a shoe made to fit the form of her foot. This is provided with a flat heel which alone serves as a point of support for the entire body. The point of the foot does not touch the ground, and the women walk somewhat like club-footed persons. They are not very steady upon their feet, and when they become aged have to use a cane. They walk with their arms slightly extended and performing the office of a balance pole; and with the pelvis thrown back and the breast slightly forward, they seem to be endeavoring to preserve their center of gravity. When their heels are close together, the slightest push may upset them. A foot is so much the more appreciated in proportion as it is smaller. The one that I photographed belonged to a woman of the people and was relatively quite large. Among the rich Chinese ladies it does not exceed 5¼ inches, and the woman is prouder of her foot than of her face.

The Chinese woman is very modest when it is a question of her feet. I have several times attended mandarins' wives who were afflicted with foot troubles, and who consented only with great hesitation, and in blushing, to allow themselves to be examined; and even then they so arranged themselves as to expose only the ailing part.

All Chinese women do not have deformed feet. This mutilation is more frequent in the south than in the north, and in cities than in the rural districts. The Manchoo women are not authorized to bandage their feet; and on this subject there are very formal imperial orders.

Some of the missionary societies, and especially some of the female missionaries, have for some time past been waging a war against this so-called barbarous custom. They even addressed Tsoung li-James, beseeching that minister to transmit their request to the Emperor; but he answered them that the Son of Heaven gave his subjects the right to do as they pleased.

The Chinese regard a deformed foot as a thing of beauty. What would Queen Victoria say were she to receive a petition signed by numerous Celestials asking her to forbid the English damsels to wear corsets?—Dr. I. I. Matignon, in La Nature.

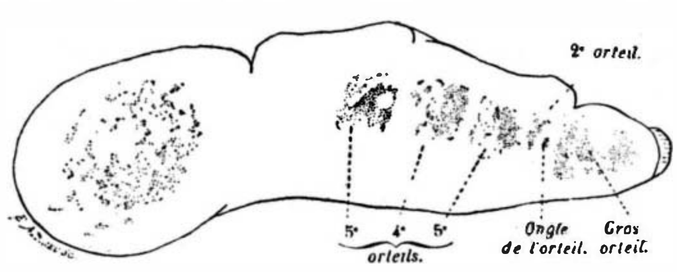

Fig. 3.—OS CALCIS AND DISTORTION OF THE TOES.

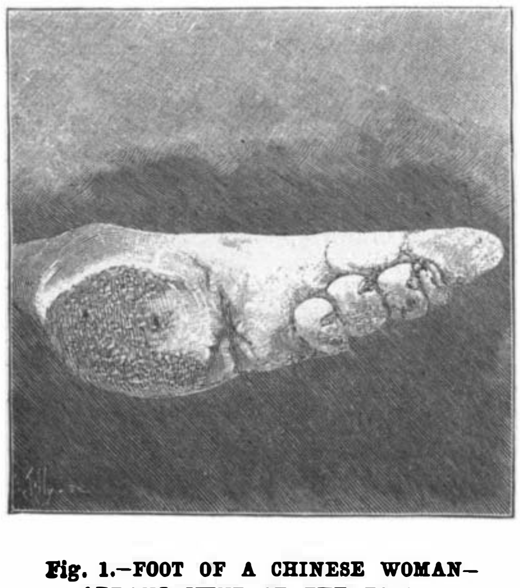

Fig. 1.—FOOT OF A CHINESE WOMAN—ARRANGEMENT OF THE TOES.

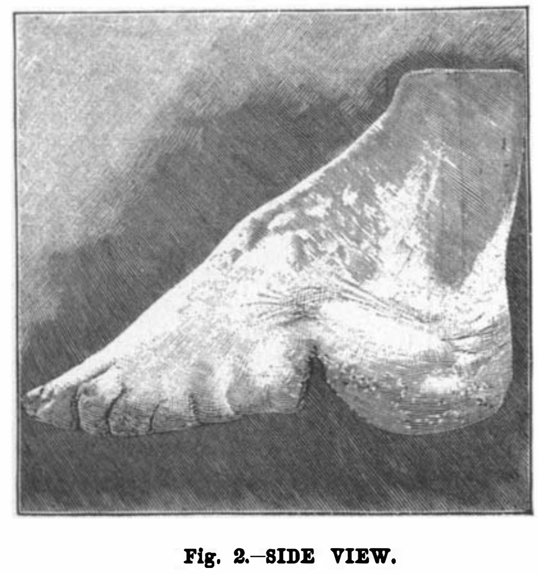

Fig. 2.—SIDE VIEW.

AT the Pennsylvania State College, Center County, Pa., a column has been erected which is composed of 281 samples of building stones procured from 139 localities in the State. The base block is of conglomerate 6 by 6 by 2·5 feet; the base of column is 5 feet square; the height of column is 32·7 feet; and the weight 53·4 tons. This polylith, constructed by the School of Mines, forms a comprehensive display of the natural resources of the State in structural materials, geologically arranged. It is a prospecting guide to the explorer for stone, and furnishes a comparative test of its durability by an equal exposure of all the quarry products to atmospheric influences.

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