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Physical Development in America.

For eighty years we have existed as an independent power among the nations, asserting by brain force and nervous skill our equality with the older races from which we sprang, and doing credit to the Teuton and Celtic tribes (who were our originators), in point of intellectual power and vigorous thought. This statement is one which we believe will be acknowledged by the most prejudiced commentator on our social system. But while we proudly indite such a fact, we are also compelled to acknowledge that we have deteriorated in physical development. The causes of this deterioration have been a consequence of our independence; for to prove that we were capable of doing what in the revolutionary days we said we could achieve, it was requisite that for a time we should forget our personal materiality, and think only how best to use the "dweller in the temple," regardless of the temple itself. Having now, however, proved the position that our forefathers assumed and being able to keep it with the exercise of an ordinary amount of brain force, it is necessary that we should look to the walls of the temple, in order to preserve it in that sound and weather-proof state that its Grand Designer intended it to be.

Nearly every lecture this season has had something bearing on this question; and there is in the press a mighty surging, that indicates truly the waves of argument that are to come, and wash muscle, bone, and sinew into the American child. On every hand we see it exciting good men's attention; and even from the pulpit we have heard, so to speak, muscular Christianity, preached. Pure health in a normal man is more the natural balance of thought, feeling, and bodily vigor than the mere absence of disease, and with us this balance has been somewhat impaired, and would we keep that power to go a-head as we wish—would we show that our thoughts are good or great, our principles noble or sublime—we must keep in healthy action and perfect tune the instrument through which they reveal themselves to the outer world. This is the body (the frame-work) that contains our individuality—"the house we live in."

That pleasant philosopher, Dr. O. W. Holmes, says in a recent number of the *Atlantic Monthly*, "—the strong hate the weak. It's all right. The arrangement has reference to the race, not the individual. Infirmary must be kicked out, or the stock run down." Harsh as this may appear, it is true; for we cannot afford, our bodies being necessary agents to effect the objects of our wills, that they be constitutionally weak, and incapacitated for the labor they have to do, and that the will commands, or the thought inspires them to perform. There is a bodily insanity as well as a mental one; and as excess of any kind induces the one, so does want of air, exercise, and equalizing action produce the other.

There is another grand cause of bodily infirmity in this country, and that is, the vast amount of quack medicines which are annually swallowed by persons, for purposes honest and dishonest, and which, if they do not inflict punishment on the partaker of them, yet surely stamp upon the offspring—our future greatness—the mark of a father's folly or a mother's weakness.

We have no fear, however, that there will be a sufficient number to look on the melancholy side of the question; therefore let us prefer, as pioneers, to show the road to health and national *physique*. This physical education must begin with the young; and to their improved condition, the result of training, must we look for an athletic American people.

The first grand necessity of life is fresh air; and we can assure many persons who act as if they thought the reverse, that fresh air will not ordinarily kill babies, in fact, the youngest child should have as much fresh air as possible, should be loosely clad, and allowed to crawl about a great deal. The educational system should include the gymnasium, and regard the art of calisthenics as a very fundamental part of learning. Boys, and even girls, should be encouraged in vigorous sports—flying the kite, bowling the hoop, or similar games. We sometimes count, in one day, half-a-dozen or more target companies passing our office, to shoot for prizes at some suburban lager bier garden; and we have thought how much better it would be, and how much more good it would do the country, were those young men to try their skill at leaping, vaulting, throwing the hammer, or anything that called forth muscle, rather than shooting at a painted board. And it would be more patriotic, too, for the use of the gun is quickly acquired, should it ever be wanted for war; the muscle and strength to use that gun are not to be had quickly, but are the results of constant activity and exercise.

Our habits are, also, altogether too sedentary, and the ladies, we say it respectfully, are too much within doors, and know too little of rustic roads and the pleasure of country walks. Let them, therefore, try and walk a little more; as much from the cities as possible, and as little into them. Oh! if the ladies would but make walking a fashion, what a blessing it would be. Again, we want more ventilation in our schools, churches, and houses, and the sanitary condition of our cities is capable of great improvement. Better drainage, more water facilities, and a system of ventilation in the humbler portions of our own city, would, we are sure, reduce the mortality two per cent in one year; and the good that they would do, by improved general health, is incalculable.

We think that we are right when we say that man should not only be intellectually the superior over the brute creation, but that as an animal, he should be the first; and this is only to be obtained by exercise, fresh air, and cleanliness. We wish sincerely to see the American a splendid specimen of physical development, and this is to be impressed on the American mind more strongly than it has ever yet been. In some measure we look to the public schools to start the movement, by affording the pupils every facility for the exercise of their bodies as well as minds. The instructors of the young must learn the laws of hygiene as well as logic, and teach gymnastics in conjunction with the Latin or French grammar. If they will but do this, it will be a grand step towards giving the children better ability to think and study, by being the possessors of healthy bodies, and it will much aid physical development in America.

Boiler Explosions.

In our last issue we merely related the circumstance of the explosion at Belcher's Sugar Refinery, at St. Louis. The boiler which exploded was one of a gang of fifty, as stated in the published testimony taken on the occasion. It was an upright, twenty-five feet high, and contained seventy-five flue tubes. The effect was like an underground explosion of gunpowder. A piece of the boiler weighing 3,500 pounds was projected through the roof of the house high into the air, and carried to a distance of sixty yards, where it fell upon the roof of the main building of the refinery and came crushing down on the floor below; another piece weighing 1,600 pounds was also carried to a great distance. The building was of brick, three stories high, and 125 feet long, and had walls eighteen inches thick, which came tumbling down after the explosion, as if by a collapsing action. There were four gage cocks on the boiler; and one of the firemen, in evidence, stated that he tried the upper one fifteen minutes before the acci-

dent occurred, and the water was flush with it. The chief-engineer, Thomas Shepherd, stated that all tubular boilers were liable to foam, and the gage cocks might not have furnished a test of the quantity of water in the boiler. He had often tried the cocks of a locomotive boiler, and from the test, it appeared to contain plenty of water, while actually it contained but very little. All the steam pipes of the boilers were connected together, so that the pressure was alike in each, namely, 75 pounds on the inch. The engineer, when asked as to his opinion regarding the cause of the explosion, stated that it might have been caused by gases formed in the boiler.

The foregoing is the substance of the evidence given before the Coroner's jury, and from the statement of the chief engineer, it is evident that persons who ought to be better informed on the subject, still entertain the opinion that explosive gases are generated in steam boilers, and that explosions may occur from them. Water is composed of two gases—hydrogen and oxygen; these cannot be decomposed in a steam boiler unless the iron is red hot, in which state it has such an affinity for the oxygen in the steam, that it separates from the hydrogen and unites with the iron, thereby setting the hydrogen free, but this latter gas is not explosive, therefore it could not have caused the explosion.

In our opinion, the explosion was caused by the want of a sufficient quantity of water in the boiler, whereby its flues became red hot, and when fresh water was admitted a vast quantity of steam was suddenly generated, the pressure of which tore the boiler across at the over heated line where it was weakest. The sudden expansion of the steam would cause the boiler to be projected upwards with the terrific violence described as having occurred in this case.

When water is first admitted upon red hot iron, it assumes the spheroidal condition, and steam generates slowly, but as the metal cools, the water spreads out and the steam forms with electric rapidity, and generates an intense pressure. A cubic inch of red hot iron at 1,172 degrees will convert a cubic inch of boiling water into 1,700 cubic inches of steam; and 20 square feet of red hot boiler plate six-eighths of an inch thick, at a bright red heat, will convert a cubic foot of water in a few seconds into 1,760 cubic feet of steam. It is easy to conceive, therefore, how dangerous it is to allow the water to become too low in steam boilers, and it is also as easily to be understood what risk there is in cooling the plates suddenly when they become red hot.

In the arrangement of a gang of boilers, each should have its own water pipe, yet it is not uncommon to find a series of boilers so arranged that the water is fed into one exclusively, and the whole being connected with water pipes, the feed has to pass through from the first into all the others.

In a letter recently received from a correspondent, he states that he has two cylindrical boilers thus connected, and it frequently happens that the water will be very low in one, while it shows a full gage in the other. Such an arrangement of boilers is undoubtedly the frequent cause of explosions.

The New Light.

The publication of our article on page 109 of the present volume, *SCIENTIFIC AMERICAN*, on "The Wonder of the Age," has exposed us to the infliction of several attempts to extinguish our humble taper of science by a deluge of letters on "Hill's New Light." One of these correspondents has really the temerity to charge collusion between us and the Buffalo (N. Y.) Gas Company—a body of whose existence we were scarcely aware before, and with whose members we are about as well acquainted as with those of Solouque's cabinet. He acknowledges authorship in the pamphlet on "The Wonder of the Age," and, of course, this affords an explanation for his refined and sensitive expression of feeling. We have also

received a letter from the patentee, which is unexceptionable in its tone. He dissents from our views of its nature, and seems to have come to the conclusion that it burns the air different from other lights. The phenomenon of combustion in Mr. Hill's light is precisely similar to what it is in any other gas light—every scientific man knows this. Several of the letters received place great stress upon the intense heat obtained from this light, and on this head predicate its economy as a substitute for coal in smelting, &c. Such views are not correct, because the most intense heat obtained from the combustion of any substance is from hydrogen gas, of which there is a greater amount in alcohol than in the Nubian oils; and it would therefore upon this principle of reasoning, be much cheaper for fuel. We have seen no cause to modify the remarks heretofore made by us on this subject; they were candid, and free from all personalities, and were based upon an examination of the light and a full acquaintance with the invention.

The Death of Henry L. Ellsworth.

This melancholy event took place on the 27th ult., at the residence of the deceased in Fair Haven, Ct.

He was twin brother to the Hon. Wm. W. Ellsworth, formerly Governor, and now Judge of the Supreme Court of Errors of Connecticut, and the two were the youngest children of the Hon. Oliver Ellsworth, of Windsor, Ct., second Chief Justice of the United States. After graduating at Yale College in 1810, and studying law with Judge Gould at Litchfield, he married the only daughter of the Hon. Elizur Goodrich, of New Haven, and settled at Windsor on the estate of his father, in the practice of his profession and the pursuits of agriculture. He was appointed by Gen. Jackson, as President Commissioner among the Indian tribes to the south and west of Arkansas. While employed in this service he made extensive circuits towards the Rocky Mountains. In one of these he was accompanied by Mr. Washington Irving, who thus obtained the materials of his remarkable work upon our western prairies. At the end of two years, Mr. Ellsworth was called to Washington, and placed at the head of the Patent Office.

At the expiration of about ten years, Mr. Ellsworth resigned his connection with the Patent Office, and established himself at Lafayette, Indiana, in the purchase and settlement of United States land.

About two years ago, Mr. Ellsworth found his constitution sinking. He therefore determined to remove to his native State. He recently visited Lafayette for the adjustment of his affairs, and, in less than a week after his return, was seized with an attack which ended his life, in the sixty-eighth year of his age.

For many years we have enjoyed the personal friendship of Mr. Ellsworth, and he seldom, if ever, came to this city without making us a sociable visit. He was also a strong friend of the inventor, and ever evinced a deep interest in the progress of legislation for the benefit of this very useful class of our citizens. He was also a warm supporter of the *SCIENTIFIC AMERICAN*, and we are indebted to him for repeated evidences of his confidence in our teachings, professions, and practices. In the death of Mr. Ellsworth, we feel that we have lost a valued friend, and our country has lost one of its most useful citizen. We shall miss his cheerful face, and intelligent conversation. Peace to his ashes!

HARDNESS OF ALLOYS.—Professors Calvert and Johnson, of England, in experimenting upon various alloys, find that copper 49.32 parts, and zinc 50.68 parts, has a hardness nearly equal to an alloy containing 90 per cent. of copper, that it is as rich in color, and they give it as their opinion that it is not a mere alloy but a definite chemical compound. They recommend it for bearings as being equal to the best brass, and considerably cheaper.