will be of exceptional beauty and magnitude. The majority are of the modern gothic order, and much ingenuity of design is manifested in constructing the flat-roofed buildings so as to avoid the unfinished appearance incident to the abrupt termination of the façade. Three great structures are to be erected by the New York Mutual Life, the New England Mutual Life, and the Equitable Insurance, companies, which are to be of magnificent design, and, with the new Post Office and Rialto building, are to be completely fireproof throughout. There are also a number of warehouses and other mercantile edifices, which in many instances are more spacious and elegant than those which they have replaced.

The same energy which has made Chicago rise from a heap of ruins into a grauder and even more magnificent city than before, has within the short space of a year blotted out the recollection of an almost overwhelming disaster, by labor which seems all but Herculean. Hardly had the story of the calamity ceased to be the current topic of thought before workmen were busily laying foundations, and this in the face of losses which dealt a blow to the entire business community of the nation. Not only the people of Boston, but of the whole United States, may well be proud of such indomitable enterprise. It adds but another proof, to that already shown by our unfortunate war, that in this country we know neither the extent of our energies nor of our resources, until the same are put to the trial which demands their strongest action.

PHYSICAL AND MENTAL OVER-CULTURE.

A noted British novelist, now on a visit to this country, in one of his most popular narratives, exemplifies the case of an athlete who, by a severe course of training, has brought himself to a high state of physical perfection, in order to compete in the lists of a foot race. When the time arrives for the test of his powers of endurance, the runner begins his task; but ere he can reach the goal, his overtaxed system gives way, and he falls stricken with paralysis, a hopeless bodily wreck. Instances of similar kind in reallife are but too common. The death of the celebrated oarsman Renforth while at the thwart is still within public recollection, and the decease of Heenan, the once famous pugilist, is a more recent exemplification of the retributive action of Nature when the laws by which the confines of the possibilities of human muscular effort are transgressed.

A man's body may be compared to a finely adjusted and accurately balanced steam engine, and his vital energy and mental power to a constant motive force acting upon a uniform area of piston. It needs no demonstration to prove that an engine has a certain fixed capability; it can develope so many horse power, and then reaches its limit. If we make more ponderous wheels or stronger rods and shafting, equal to the performance of much more arduous work, and then expect that the same power, merely by operating such heavier machinery, will produce increased results in overcoming greater burdens, common sense tells us that we look for an impossibility. And yet this is precisely what we seek to accomplish by causing exaggerated muscular development. We destroy the equilibrium of the machine; and as a result, the action of the power by which it is set in motion is either weakened or arrested. The physical seats of vital energy in the human frame are in the so termed vital organs: as in the overtaxed steam engine the molecules of vapor dash and expend their force against the piston unproductive of any motion, so in the body; one part (the heart) unable to drive the increased flow of blood required for the augmented needs of other members, becomes overwrought and eventually diseased; the lungs, equally unable to maintain the process of burning up the effete matter poured into them by the veins, degenerate and waste away; and the brain, failing to establish the connection between motor nerves and will, shatters by paralysis the delicate mechanism. All, in fine, are causes which as surely arrest the motion of the human machine as does the load beyond its powers that of the apparatus of iron and steel.

The case of Heenan illustrates these truths perhaps as forcibly as any that can be cited. The man was a model of physical perfection, not ponderous in build or gigantic in frame, but to all appearances one in whom the parts of the body, while cultivated to their full extent, remained in statuesque symmetry. And yet despite the capacious breast and broad shoulders—points in themselves supposed to indicate almost unlimited strength of lungs—these last mentioned members, in the constant strain upon the system, proved unequal to their task, and fell prey to the wasting and insidious disease which resulted in death.

While, with such evidence as this before us, the tenets of the ultra advocates of "muscular Christianity" may well be questioned with reference to the benefits derivable from the attainment of a so called high physical condition, on the other hand, it is true that no less dangerous results are to be apprehended from the converse practice, the development of the mind at the expense of the body.

Again referring to the steam engine for a simile, let us consider the consequence, supposing that working parts and load remained constant, of our crowding into the cylinders an enormous steam pressure. Manifestly there would be either a much more rapid wearing out of the machine, caused by the overwhelming power, or more probably the complete breakdown. Thus it is with the individual who, by excessive study and brain work, overweighs the balance in the contrary direction, and, by neglecting to maintain the equilibrium of mind and body, succumbs to the impoverishment of his physical system. Illustrations in point are to be found among the members of every profession, among the students of every institute of learning. Young men, ambitious to gain scholastic honors and spurred on by the applause of preceptors and friends, too often find failing health and despondent spirits the precursors of permanent bodily infirmity, induced by overstrict application, too many hours of study, absence of simple and nourishing food, and neglect of wholesome exercise. Undeterred by premonitions of Nature, toward the close of their course, in order to reach a coveted prize—as valueless to them in after life as it is intrinsically worthless—they tax their energies beyond their powers of endurance. Then, as the runner in the race or the oarsman at his oar physically breaks down at the moment of trial, so the overworked brain succumbs when it is subject to the final strain. The student, whose hollow eyes, pale face, and wasted form denote nights of unvaried toil, finds his powers inadequate to do him justice, and his memory fleeting at the hour when he desires their firmest aid; and he endures the bitter experience of seeing others, intellectually beneath him but physically his superiors, withstand a trial before which he fails.

Study is to the mind as exercise is to the body: both alike act as developing powers, but neither body nor mind can be carried to a relative excess of cultivation except at the expense of the other. "*Mens sana in corpore sano*" does not refer either to pundits or prizefighters. It means a mind well balanced, well organized, and varied in ability, coupled with a body healthy, vigorous, and strong—the one capable of grappling with the highest thoughts and ideas, the other with the deepest ills and obstacles incident to every walk in life.

BOILER EXPLOSION.

While a commission of scientific experts are busily engaged in expending $100,000 in discovering the occult causes of boiler explosions at one extremity, comparatively speaking, of this city, at the other end of the town a body of laborers, headed by an engineer, endeavor to lift and transport a steam boiler (with a blazing fire under it and subjected to a heavy pressure of steam) by means of crowbars placed underneath. As a result of which (in the opinion of the engineer directing the job), and attributable to the canting of the apparatus from one side to the other, causing sudden flows of water to the highly heated surface of the boiler, thus too rapidly generating steam, a terrific explosion ensues, seven persons are slaughtered, and a dozen or more seriously wounded.

The scene of the tragedy was in Fourth avenue, near 128th street, at which point the tunnel for the underground track of the Hudson River and other railroads is in process of construction.

The boiler was of the upright tube style, about 6 or 7 feet high and 44 inches in diameter. It had a square fire box, with horizontal tubes in the upper portion and vertical tubes from the top of the same to the boiler head. The fracture took place in the center of the shell; the largest fragment, some 1,000 pounds in weight, landing in the fourth floor of a building 550 feet distant It is stated that the boiler had been recently tested to 120 pounds pressure, and was considered in every way safe, while the engineer positively asserts that the gage, just previous to the accident, did not show any extraordinary amount of steam.

PHOSPHOR-BRONZE.

Combinations of phosphorus with bronze alloys are not new to the chemical laboratory. Phosphurets of copper were produced in the middle of the last century, and have since frequently been examined and their properties carefully studied.

Without considering many minor investigations which have been made regarding this important alloy, we may here note at once that the most complete researches are those of Messrs. Montefiore-Levi and Kunzel, of Val Benvit Nickel Works, near Liège, Belgium. As far back as 1860, this firm was engaged in an elaborate inquiry into the means of improving gun bronze, and in 1868–70 conducted a very extended series of experiments for the Russia government. The results of these as well as of subsequent trials are well summed up by M. Dumas in a note to the French Academy of Sciences. He says: "The characteristics of the alloys change. The color, when the proportion of phosphorus exceeds ½ per cent, becomes warmer, and like that of gold largely mixed with copper. The grain and fracture approximate to those of steel. The elasticity is considerably increased, the absolute resistance under a fixed strain becomes in some cases more than doubled: the density is equally increased, and to such a degree that some alloys are with difficulty touched by the file. The metal, when cast, has great fluidity, and fills the mold perfectly to the smallest details. By varying the dose of phosphorus, the particular characteristic of the alloy which is most desired can be varied at will."

We can now proceed to the consideration of the most recent data obtained from experiments lately concluded or actually in progress in Europe, and reported in a recent issue of the *Engineer*. In Germany trials are being carried on at the Royal Academy of Industry in Berlin, to ascertain the qualities and capacities of the metal under heavy strain, and especially the comparative resistance to often repeated strains, whether tensile or inflecting. A bar of phosphor-bronze tried under a constant strain of 10 tuns per square inch resisted 408,230 pulls of this amount: while a bar of ordinary bronze broke before the strain of even 10 tuns per square inch had been attained. A bar of phosphor-bronze under 10 tuns of strain resisted 862,980 bends, while the best gun metal broke after 102,650 bends. Another bar of phosphor-bronze, now being tested under 9 tuns strain, has thus far resisted 1,260,000 bends. In Austria, the following comparative results have been obtained:

	Absolute resistance.	Point of elasticity.	Stretch in percentage.
Phosphor bronze	81,795 lbs. per sq. in.	54,915 lbs. per sq. in.	1·6
Krupp cast steel	72,258 " "	14,450 " "	11·0
Ordnance bronze	31,792 " "	5,562 " "	15·0

Best English copper sheets lost during six months immersion in sea water 3,058 per cent. Phosphor-bronze sheets lost only 1·158 per cent.

In Belgium, Messrs Montefore-Levi & Co. have carried on a large series of experiments, proving that the presence of oxide of tin and suboxide of copper lessens the tenacity, elasticity, and tensile strength of the bronze. Shavings of old bronze were melted, and a bar cast at 1595°C. The remaining liquid bronze was poled, and a second bar cast at 1668°C. The remaining metal was de oxidized with phosphorus, and a bar then cast at 1614° C. The three castings were made out of the same crucible and in the same manner, into three iron molds. The results found were that the old bronze had tripled its tenacity, 6·8 as against 2 per cent, and considerably augmented its absolute resistance (2384 to 1613).

In England, Messrs. Alexander Dick & Co. have recently established, in London, a special foundery for phosphor-bronze casting, and are also to produce sheets, wire, etc. Experiments, made for this firm by Mr. D. Kirkaldy and carefully tabulated, show the great superiority of phosphor-bronze for all articles hitherto manufactured of ordinary bronze or gun metal. What steel is to wrought iron it seems that phosphor-bronze is to ordinary bronze. Another table gives the tensile strength and resistance to torsion of various wires, showing also a large superiority in these particulars of the alloy over other metals. In fact, referring to the increment of tensile strength gained by phosphor-bronze when drawn into wire, it is considered that the same is astounding; and the *Engineer* adds that, even with a large margin reserved for probable error, enough remains to prove that phosphor-bronze, drawn into wire or laminated into sheets, must prove, if practicable to be produced with perfect uniformity, a most important addition in future to the list of our constructive materials. Having pliability, with a tensile strength approaching that of steel, the specific gravity of bronze, and nearly the electric conductivity of copper, it cannot fail to have important applications for the electric telegraph engineer. For small articles, now made of brass, such as curtain rings, picture frames, etc., the same, cut from spirals of phosphor-bronze, with the ends soldered so as to avoid annealing the wire by conducted heat, would be an immense improvement. Although experiments toward using the alloy for artillery are incomplete, it is probable that further investigation may demonstrate its fitness for that purpose. We have already published a long paper on its employment for tweers, for which it offers the advantages of greatly increased toughness and density, and consequent great resistance against change of temperature and the influence of molten masses. Finally, should copper become cheaper, say to double the cost of an equal weight of wrought iron, phosphor-bronze might be used in place of iron in shipbuilding. It is superior to Muntz yellow metal, a substance patented by John Scott Russell for the latter purpose, in that it does not become crystalline and brittle, while its passive strength is four or five times as great

With our vast deposits of copper, notably in the Lake Superior region, there appears to be every facility for the prosecution of investigations leading to the manufacture of this important and valuable alloy in the United States. We therefore consider that the subject merits the careful attention of American metallurgists, who, we trust, at no distant period, will contribute the results of their own experiments to those thus far adduced by their brethren of the old world.

SCIENTIFIC AND PRACTICAL INFORMATION.

A NEW ELECTRIC LIGHT.

M. Ladiguin has recently invented a new plan for electric illumination, which is quite simple, and which, it is believed, may be advantageously used for lighting mines, as there is no danger of its causing the explosions incident to such localities. It consists in a bit of charcoal or other poor conductor attached to a wire communicating with a magneto-electric machine. The charcoal is enclosed in a glass tube in which the air is replaced by a gas which will not combine with the carbon when the same is brought to a high temperature. The tube is sealed, and the machine set in motion by a small steam engine or other motor, when the charcoal gradually becomes incandescent, emitting a pleasant and quite brilliant light, the intensity of which, it is said, may be graduated at will.

THE ACTION OF ANTISEPTIC SUBSTANCES UPON VIRUS.

M. Davaine has recently examined the following substances, which he classes in regard to their power as antiseptics in the subjoined order: Ammonia, silicate of soda, ordinary vinegar, and carbolic acid; then caustic potash, chloride of oxide of sodium (?), hydrochloric acid, permanganate of potash, chromic acid, sulphuric acid, iodine. The power of ammonia, of vinegar, and of carbolic acid being represented by 1—200, that of iodine would be by 1—12,000. Iodine should therefore be considered as the best antiseptic to be employed in the treatment of maladies such as malignant pustule, boils, carbuncles, and the like, when, not having become localized under the form of a simple pustule, they have taken up a certain extension. Injections of 1-6000 of iodized water are recommended.