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Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural inventions	1	Inventions, mechanical	7
Aspirator and compressor*	11	Inventions, miscellaneous	7
Astronomical notes	11	Inventions, new	11
Baby elephant takes a bath	7	Iron, effect of age on quality	3
Bath, shower, portable, new*	6	Lamp, electric, improved*	5
Boiler explosions, prevention of*	4	Leadville mines and railroads*	6
Canal boat, improved	10	Magnets, corn	10
Carpetings, etc., printing gold on	5	Materials, resistance of, exp. on	10
Chloral hydrate, simple test for	7	Maxim's gas machine*	1
Chloroforming during sleep	5	Mechanical inventions	7
Corn magnets	10	Natural history notes	7
Dipper, watering, improved*	5	Navigation in fogs*	3
Drowned, perseverance with the	7	Oil tanks, cannonading of	3
Electric lamp, improved*	5	Ore separator, Edison	5
Elephant, baby, takes a bath	7	Photoglyptic process, new	11
Engineering inventions	10	Phyllirhoe Bucephala*	7
Epidemic, strange, a	2	Ruggles, S. P	7
Exhibition, internation. Sydney*	8	Shower bath, portable, new*	6
Explosions, boiler, prevention of*	4	Slate washer, novel*	5
Fires in New York	11	Specimen, rare, lost	1
Fogs, navigation in*	3	Steamer, little, remarkable	2
Fruit, preserving app. for*	5	Steamers, large, collision between	3
Gas machine, Maxim's*	1	Stevens Institute of Technology	5
Gas making, simple process*	1	Sydney Industrial Exhibition*	8
Genesee Falls, utilization of	5	Tree growth, force of*	7
Horology, report of judges*	8	Trees and shrubs, care of	7
International exhibition, Sydney*	8	Washer, slate, novel*	5
Inventions, agricultural	1	Watches, Am., superiority of	2
Inventions, engineering	10	Watering dipper, improved*	5

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 285,

For the Week ending July 3, 1880.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—The New Railway up Mount Vesuvius. 6 illustrations. Plan of road.—General view of mountain and railway.—Side view and end view of passenger car.—Mount Vesuvius Railway.—Map showing railway, mountain, crater, and surrounding country.—The carriage road and railway..... 3735
The St. Gothard Tunnel.—Notes on the junction of the two galleries. By Dr. CALLADON..... 3736
The St. Gothard Tunnel.—Conditions and causes of air currents in the tunnel..... 3736
Protection of Ships from Loss by Fire and from Loss by Sinking. Recent improvements in the construction of ships and steamers. 3738
Regenerative Stoves.—A Sketch of their History and Notes on their Use. By JOHN N. HARTMAN. An important paper read at the Pittsburg meeting of the American Institute of Mining Engineers. 1 figure..... 3738
Cowper's Hot Blast Stoves. 2 full page illustrations of hot blast stoves for a pair of furnaces.—Plan and cross section of stove.—Plan and cross section of furnace.—Plan and cross section of gas downcomer.—Sectional elevation of stove and downcomer..... 3739
Wilson's Lock-up Safety Valve. An important improvement. 10 figures..... 3742
Working Low Grade Ores..... 3742
The Largest Concrete Tank in England..... 3742

II. ELECTRICITY, ETC.—Siemens' Improvements in Electric Railways. 4 figures. Siemens' combined steam and electric railway.—Siemens' electric mail railway..... 3743
Difference in the Actions of Positive and Negative Electricity.. 3743
Forces Exciting Electricity..... 3743
The New Electrical Middlings Purifier. By THOS. B. OSBORNE. 5 figures..... 3744
Physical Society, London. Photo-electricity.—Electrometer key.—Air in water.—Steam thermometer..... 3745
Atmospheric polarization. Influence of terrestrial magnetism.. 3745

III. HYGIENE AND MEDICINE.—Lead Poisoning. Clinical lecture by Dr. WM. PEPPER. Effects of a cosmetic of carbonate of lead.—Symptoms of lead poisoning.—Affinity of lead for nerves and muscles.—Treatment of lead poisoning..... 3745
Recent Investigations of the Blood..... 3746
The Pulse. Lecture on the pulse in health and disease, by Dr. T. A. MCBRIDE..... 3746
Some Early Symptoms of Insanity..... 3747
An Improved Method of Applying Antiseptic Vapors..... 3747
Treatment of Phthisis by Inhalation of Borax and Salicylic Acid, 3747

IV. CHEMISTRY AND TECHNOLOGY.—Detection of Starch in Cane Sugar. By P. CASAMAJOR..... 3747
Double Lever Cement Testing Apparatus. 1 figure..... 3748
Prediction of Chemical Elements..... 3748
Oil of Sage..... 3748
Bronzing Iron..... 3748
Rust Preventing Compound..... 3748
Argentine Sheep and Wool..... 3748

V. NATURAL HISTORY, ETC.—Brain of Limulus Polyphemus. General anatomy of the brain.—Internal structure and histology of the brain.—Comparison of the Limulus brain with the brain of other arthropods..... 3749
An Unfortunate White Whale. A live whale with a broken neck 3749
Ethereal Oil of California Bay Tree. By J. M. STILLMAN..... 3749
Forest Trees of North America. Prof. Sargent's catalogue (continued from SUPPLEMENT No. 234). Cedars, Red Woods, Firs, Spruces, etc..... 3750

THE SUPERIORITY OF AMERICAN WATCHES.

The extract from the report of the judges in horology, at the Sydney International Exhibition, with the diagrams showing the comparative merit of the watches tested, given on other pages of the current issue of the SCIENTIFIC AMERICAN, cannot fail to interest our readers. There were ten exhibitors, and the inherent and comparative merits of the various exhibits were rated under ten heads on the basis of 100 points "for the highest degree of excellence." There were British, German, French, Swiss, and American competitors; and while the scores of the nine European exhibitors footed up totals ranging from 76 to 686, their average being 389½, the total of the Waltham Watch Company was 981. In detail this remarkable score stood thus: Originality, 98; invention and discovery, 95; utility and quality of material, 95; skill in workmanship, 93; fitness for purpose intended, 100; adaptation to public wants, 100; economy, 100; cost, 100; finish and elegance of cases, 100; time-keeping qualities, 100. Total, 981.

The timekeeping tests were made, as the report points out, by Prof. H. C. Russell, Astronomer Royal at the Sydney Observatory; and it is especially noted that while the majority of the watches tested had been made for exhibition purposes, and specially prepared for that end, the exhibit of the American company was the ordinary and regular product of the factory, such as is finished every day. Another evidence of the superiority of the American system, as emphasized in the report, is the fact that a sixth grade Waltham watch, one of the cheapest tested, showed a better performance than many very expensive and otherwise first class watches of other makes.

The moral of the victory is happily drawn in the following editorial review of the contest and its lessons, by the Sydney *Morning Herald* of April 14, last:

"The report of the judges in horology, which we published on Saturday last, was a document of more than ordinary interest. The slightest glance at it will show that the judges brought no small amount of ability and industry to their task. In many other classes of exhibits judging must, to no small extent, be a matter of opinion. There is no absolute test by which one photograph, for example, or one oil painting can be decided to be superior to another. In exhibits of this kind much must be left to the taste of the critic. Watches and chronometers, on the other hand, can be submitted to the minutest tests. The care and trouble which these require are not small, but the issue is sufficiently important to warrant all the labor which the judges in horology brought to their work. Time-keepers that can be relied upon in all weathers and in all climates, and that are within reach of all classes, are a luxury of no common order, but to a large number of persons they are a necessity also. In these fast days, when everything must be done to time, it is for a variety of purposes found necessary to make accurate divisions, not merely of the days and hours, but of the minutes and seconds also. The verdict which the judges in our Exhibition have pronounced on the Waltham watches is one of which any company might be proud; but the facts on which the verdict is based are as interesting to the public at large as to the parties immediately concerned. One of the secrets of American progress lies first in the invention of machinery, and then in its application to almost all descriptions of industry. It is the bringing of machinery to every branch of watchmaking that is enabling Americans to beat the world in this as well as in many other things.

"There has been a general belief that a machine-made watch is not to be compared to one that is hand-made, and that on this account the English watch must always hold its own against the American. This belief will have to be given up, if it is not given up already. It has now been established that machinery can be used for the purposes of watchmaking with quite as much success as for those of agriculture. The Americans are showing that they can make better watches than the Swiss or the English, but, what is of equal importance, they are showing that they can make them for less money. The boast of the Yankees is that they can turn out work cheaper and better than anybody else, and that for that reason the world must take their products. It would be difficult to prove that in some departments the boast is wholly without foundation. The American mechanic is paid better than the English mechanic, and yet the work which he turns out can, as a rule, be sold for less. The reason is, not only that he works harder, but that the assistance of machinery enables him to produce the largest result by the smallest amount of labor.

"Mr. Brassey, who believes that the workmen of his own country are equal if not superior to any in the world, maintains that an English mechanic can do more work than an American mechanic. The American really does more, because the inducements to industry are greater, and because he has better machinery. The success of the Waltham Company has furnished a striking instance of this. This company has now not only well-nigh driven foreign watchmaking companies out of America, but it has shown that it can more than compete with them on their own ground. This arises partly from the fact that it can turn out the best work on a large scale, but also from the fact that the principle on which it operates enables it to do all this economically. The Waltham Company claims to have arrived at simplicity, uniformity, and precision in the manufacture of watches, and the report of our judges shows that its claim is well founded. One of its discoveries was that a simple instrument, where simplicity is possible, will cost less and be worth more than a complicated one. Another was that the making of all instruments of the same grade exactly alike, so that the part which belongs to one belongs to the whole, will not only facilitate manufacture, but will greatly economize it. A third was, that these properties of simplicity and interchangeability are the best guarantees of perfect exactitude. The success which the Americans have reached in this as well as in other branches of industry, ought to excite the gratitude rather than the jealousy of the world. Any company or nation that shows how a maximum of efficiency can be reached by a minimum of labor confers a benefit on mankind. This our American cousins have done in other spheres besides that of watchmaking. There are branches of the prosperity of the Americans that are traceable to the extent of their territory and the fertility of their soil; but the triumph of their machinery has been the result of their inventiveness and of their enterprise, and for that reason it points a moral that Australians might profitably observe."

A REMARKABLE LITTLE STEAMER.

There is soon to set sail from London for New York a new and remarkable little steamer of 70 tons gross burden, named the Anthracite, designed to exhibit the advanced engineering ideas of Mr. Loftus Perkins, of England. The distinctive peculiarities of this steamer are the very high steam pressure that she carries—350 to 500 lb. to the square inch, and the small consumption of fuel—one pound of coal per hour per horse power. A trial trip of this new little boat was lately made of 46 miles, during which 350 lb. steam pressure was steadily maintained, 132 revolutions per minute of propeller, and a speed of eight knots per hour. Other vessels, some of larger size than the above, have been built on the Perkins system, and are running in England. One of them, the yacht Emily, carries 500 lb. boiler pressure. Most of our readers are familiar with Mr. Perkins' system, which has been fully described in our columns. Those who may wish to refer thereto are directed to an interesting article by Mr. Perkins, with engravings, published in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 81, July 21, 1877; also to the description of the steam ferry boat, run on this principle, given with three pages of engravings in our SUPPLEMENT No. 217.

Engineering theory and practice have for a long time plainly pointed to high steam pressures as one of the surest ways to economy of fuel. Twenty five years ago our ocean steamers carried only 16 lb pressure to the inch, and burned 5 to 6 lb. of coal per hour per horse power. To-day they are carrying 75 lb. pressure, and burning 2½ to 3 lb. of coal per hour per horse power.

In 1840 the Britannia, one of the finest steamers of the Cunard line plying between this country and England, burned 5,291 lb. of coal for each ton of paying freight she carried, her speed, then considered fast, being 8½ knots per hour. In 1877 the Britannic, speed 15·6 knots per hour, burned only 551 lb. of coal per ton of freight carried.

Although our present steamers are making fast time and are very economical as compared with the earlier vessels, still it is a lamentable fact that on the largest and finest of them, furnished with all the latest improvements and best appliances to secure economy, worked by the most careful and intelligent engineers, we succeed in putting into our steam only about one tenth of the heat realized in our boiler fire, the remaining nine tenths of the heat being lost. Only in proportion as we make our steam hotter, and expanding it more, shall we economize in fuel. In this respect the voyage of the Anthracite is designed by her owners, we presume, to be an eye-opener for steamboat owners, not only in this country but throughout the world. If a little bit of a boat like this, 84 feet long, 16 feet beam, and 10 feet deep, can carry its own coal and water across the Atlantic, with a pressure of 350 to 500 lb. to the inch, and on one pound of coal per horse power, the natural inference is that our great steamers, when fitted on the same system, will realize far better results. The change from three pounds of coal to one pound per horse power means a saving of two thirds in the coal bill, which is always an enormous item in the expenses of large boats. We ought to add that another peculiarity of the Anthracite is that she uses the same boiler water over and over, only a trifle of fresh water being supplied to make good the slight waste. Our New York steamboat men, who have to pay so dear for Croton water, will be likely to examine the water tank of the Anthracite with interest.

A STRANGE EPIDEMIC.

On the night of Tuesday, June 15, a remarkable epidemic fell upon several towns in western Massachusetts, the town of Adams suffering most severely. Out of a population of 6,000, several hundred—variously estimated from 600 to over 1,000—were prostrated by a disease resembling cholera morbus. The symptoms were first dizziness, then great nausea, followed by vomiting and prolonged purging, and in some cases delirium. A belt of country two or three miles in width and several miles long was thus afflicted, beginning at the west, the whole number of victims being estimated at from 1,200 to 1,500. No deaths are reported.

The cause of the epidemic is not known, but seems most likely to have been atmospheric. For some time the weather had been dry and hot. A heavy local rain fell during the evening, and was followed by or attended with a sudden and great lowering of the temperature. A chilly fog hung over the belt of country invaded by the disease, and a heavy "swampy" odor and taste were in the air.

The malady reached its climax in about twenty-four

hours. It was first suspected that the water supply had been somehow poisoned, but many people who had not used the water were prostrated, while others who used it freely escaped. Adams has hitherto been regarded as an exceptionally healthy town, and the surrounding country is high and wholesome.

CANNONADING OF OIL TANKS.

On the morning of Friday, June 11, lightning struck an oil tank belonging to the Tidioute and Titusville Pipe Line, at Titusville, Pa. The fire thus kindled, raged until Sunday night, consuming 200,000 barrels of oil, crude and refined, and destroying property to the amount of $1,500,000. The most appalling feature in this fire was the successive "boiling over" of oil from burning tanks of the liquid. To empty rapidly a tank containing 20,000 barrels of oil, while the latter is on fire, is no easy matter. The pipes connected with the tanks were utterly inadequate to remove the oil rapidly enough to rob the "boiling over" of its terrors. A happy thought suggested itself on Friday to Mr. D. R. Herron, of the Titusville Battery. Obtaining permission, Mr. Herron brought out one of the Parrott guns of the battery, loaded it with solid shot, and began firing against the three-eighths iron sheets of the distant blazing tank. The first shot glanced, but subsequent volleys pierced the shell of the tank, releasing a large quantity of oil that otherwise would have fed the flames. The battery then moved on to the Emery tank, also burning, and lastly to the Acme tank. Large rents were made in all these, and the liberated oil ran harmlessly down into a stream. This novel target practice greatly shortened the duration of the fire at these tanks, and so drained them that the flames died out for want of fuel, and no "boiling over" resulted.

The peculiar attraction for lightning which these iron oil tanks appear to possess has been several times referred to in our columns. Whenever a thunderstorm passes fairly over one of them it seems to be devoted to destruction. Millions of dollars' worth of property have thus been destroyed. No practical safeguard has yet been suggested.

Ordinary buildings, when properly provided with rods that are well grounded in the earth, are comparatively safe from lightning. Structures made of iron and simply resting upon the earth, without rods, are also exempt from electrical damage. Such structures always present a continuous body of conducting material for the free passage of electricity to earth. Why is it, then, that iron oil tanks form such conspicuous exceptions to our common experience with lightning? Rods put on other structures save them; but rods have been put on oil tanks, masts with rods have surrounded the tanks, but the tanks were exploded by lightning all the same.

We will repeat a possible explanation which we have heretofore given. From every oil tank, according to our theory, there is a constant escape of light hydrocarbon vapor, which forms a permanent cloud or column, rising to a great height above the tanks, far above any rod that could be erected. This vapor rod is a conductor, which the lightning naturally follows, sets on fire the vapor, and explodes the tank.

A column of heated air or vapor rising from a chimney is well known to be a conductor for lightning; the rise of hydrocarbon vapors is illustrated by the balloon.

If the theory we have outlined is correct, the remedy for the electrical explosion of oil tanks is to be found in such a treatment of the oil, or such a construction of tank, as shall prevent any escape of the light vapors.

NAVIGATION IN FOGS.

The disastrous collision of the Sound steamers Narragansett and Stonington was quickly followed by one at sea, by which two great passenger ships escaped instant destruction almost by a hair's breadth.

Shortly after noon, Monday, June 12, the National Line steamship Queen, bound from London to New York, and within 300 miles of her journey's end, ran into the Anchor Line steamship Anchoria, on the way from New York to Glasgow. The bow of the Queen struck the Anchoria on the port side, about twenty feet abaft the foremast, smashing a great hole through the iron hull. Two compartments of the Anchoria filled immediately, but the partitions stood firm, and the other compartments sufficed to keep the vessel afloat. The bow of the Queen was badly crushed, and her forward compartment was flooded. Fortunately the bulkhead proved stanch, and the ship was saved. The fog was very thick, and both ships were going at full speed. It is said that the captain of the Anchoria mistook the whistle of the Queen for that of the Anchoria's companion vessel, the Victoria, which left New York at the same time, and was probably not far away, and before the error was discovered the ships were too close to avoid the catastrophe. Had the sea been rough or the partitions less stanch, both ships must have gone to the bottom almost instantly.

The passengers of the Anchoria were transferred to the Queen, which was least hurt, and the two ships sailed together for New York, arriving Tuesday noon.

These two collisions, coming in such quick succession and imperiling so many lives, give terrible emphasis to the dangers attending navigation in foggy weather. They make very pertinent also the query whether the means now employed for discovering the position and nearness of unseen vessels are at all commensurate with the necessities of the case, or with the means already known, and known to be well calculated to prevent such dangers. In a dense fog the ordinary ship's light is visible scarcely more than a ship's length; and as it proved in the case of the Narragansett and Stonington, the time between thus sighting an approaching vessel and the instant of collision is fatally brief. The recent test of electric headlights for ships in this harbor clearly demonstrated the possibility of projecting a beam of electric light through the densest fog for a thousand feet or more, and through ordinary fogs a distance several times as great.

Except in very rough weather the steam whistle can be heard a long distance, but it is liable to be a treacherous guide. It is not always possible to determine by the ear alone the direction from which a sound comes; and it would seem that a mistake of this nature was made on the Stonington, since the order intended to change her course away from that of the Narragansett only served to precipitate the collision. Had the whistle of the Queen signaled her course it could not have been mistaken for that of a ship sailing in the opposite direction, and the safety of two great floating hotels and their occupants would not have been imperiled thereby.

Means for the better penetration of fogs, for determining the direction of unseen sources of sounds, and for enabling steamers to announce to all within hearing the course they are pursuing, seem therefore to be imperative necessities on shipboard. The first is furnished by the electric headlight, with a system of projection similar to but more efficient than that used on locomotives. The last would be provided by an efficient code of whistle signals to indicate the several points of compass. The second need is supplied by the instrument figured in the accompanying illustration.

PROFESSOR MAYER'S TOPOPHONE.

The aim of the topophone, which was invented and patented by Professor A. M. Mayer, last winter, is to enable the user to determine quickly and surely the exact direction and position of any source of sound. Our figure shows a portable style of the instrument; for use on ship-board it would probably form one of the fixtures of the pilot-house or the "bridge," or both. In most cases arising in sailing through fogs, it would be enough for the captain or pilot to be sure of the exact direction of a fog horn, whistling buoy, or steam whistle; and for this a single aural observation suffices.

Every one has twirled a tuning fork before the ear, and listened to the alternate swelling and sinking of the sound, as the sound waves from one tine re-enforce or counteract those from the other tine. The topophone is based upon the same fact, namely, the power of any sound to augment or destroy another of the same pitch, when ranged so that the sound waves of each act in unison with or in opposition to those of the other.

Briefly described, the topophone consists of two resonators (or any other sound receivers) attached to a connecting bar or shoulder rest. The sound receivers are joined by flexible tubes, which unite for part of their length, and from which ear tubes proceed. One tube, it will be observed, carries a telescopic device by which its length can be varied. When the two resonators face the direction whence a sound comes, so as to receive simultaneously the same sonorous impulse, and are joined by tubes of equal length, the sound waves received from them will necessarily re-enforce each other and the sound will be augmented. If, on the contrary, the resonators being in the same position as regards the source of sound, the resonator tubes differ in length by half the wave length of the sound, the impulse from the one neutralizes that from the other, and the sound is obliterated.

Accordingly, in determining the direction of the source of any sound with this instrument, the observer, guided by the varying intensity of the sound transmitted by the resonators, turns until their openings touch the same sound waves simultaneously, which position he recognizes either by the great augmentation of the sound (when the tube lengths are equal), or by the cessation of sound, when the tubes vary so that the interference of the sound waves is perfect. In either case the determination of the direction of the source of the sound is almost instantaneous, and the two methods may be successively employed as checks upon each other's report.

It is obvious that with such a help the pilot in a fog need never be long in doubt as to the direction of a warning signal; and if need be he can without much delay, by successive observations and a little calculation, determine, approximately at least, the distance of the sounding body.

EFFECT OF AGE ON THE QUALITY OF IRON.

Professor Bauschinger, in 1878, tested iron taken from a chain bridge built in 1829, and found that fifty years of use had not perceptibly altered its quality—either its strength or its elasticity—as reported at the time of its erection. He also examined metal from another bridge built in 1852, and found that the average quality remained as given by Von Pauli at the time of its erection.

Professor Thurston, testing pieces of the wire cable of the Fairmount Suspension Bridge, recently taken down at Philadelphia, after about forty years' use, found the iron to have a tenacity and elasticity and a ductility fully equal to the best wire of same size found in the market to-day.

He therefore concludes that iron subjected to strains such as are met with in properly designed bridges does not deteriorate with age.

A COLLISION BETWEEN LARGE PASSENGER STEAMERS.

During a fog near midnight, June 11, two of the large passenger steamers plying on Long Island Sound, Stonington line, between New York and Boston, came in collision, while running at considerable speed. One of the boats, the Narragansett, was struck near the middle, her side cut open, and a smoke-pipe knocked over, which made a down draught through the furnace, driving out a great sheet of burning gas into the cabins and between decks, by which the vessel was set on fire, at the same time the opening in her side caused her to begin to sink. Some three hundred passengers were on board, and a frightful scene of confusion followed. Happily there was a plentiful supply of life-preservers, some life-rafts, and a few life-boats. There was delay in lowering the boats, but the rafts, life-preservers, chairs, and other floatables served to support most of the unfortunate people, who, to escape the flames, were obliged to leap quickly into the water. About fifty lives were lost; the remainder were rescued by boats from another steamer, the New York, also by help sent from the other damaged vessel, the Stonington.

It seems remarkable that so many were saved. This calamity illustrates the necessity for further effort on the part of inventors to discover new and improved means for fog signaling, saving life, preventing the spread of fires, and keeping vessels afloat. Most of the large local steamers that communicate with New York are veritable palaces, built regardless of expense, and supplied with every known reliable appliance for safety; but the occurrence of accidents like this and their disastrous results show that much remains to be done before navigation, even upon smooth waters, can be considered secure.

The life-rafts of the Narragansett seem to have proved more useful than the life-boats in rescuing the drowning people, the rafts being more quickly and easily launched, requiring less skill, etc.

The upperworks of our river and Sound passenger steamers consist at present of a mass of light, dry woodwork, forming cabins that are very comfortable and commodious for travelers, but highly dangerous in case of fire.

The collision of river steamers above described was followed a few hours later by a collision between two great ocean steamers, accounts of which we give in another column.

Honors to an Aged Chemist.

The chemists of Germany are collecting money for the purpose of presenting a gold medal to Prof. Woehler on his eightieth birthday, which will be July 31, 1880. Prof. Woehler is one of the most distinguished as well as the oldest of living chemists. Himself a pupil of old Berzelius, a contemporary of Liebig, and the loved instructor of many of our best chemists, his name is equally respected on both sides of the Atlantic. Profs. Jay and Chandler, of Columbia College, New York city, two of his former pupils, are receiving contributions from those who wish to join in this well deserved memorial.

Perseverance under Difficulties.

A good lesson to young people inclined to exaggerate the hinderances to their success in life, and to think that their chances are too poor to justify honest exertion, is furnished by a young colored man of Columbus, Ohio, F. P. Williams by name, now serving in that city as census enumerator. Several years ago he was run over by a train of cars, his arms being so mutilated that both had to be taken off near the shoulder. Lacking hands he learned to write legibly by holding his pencil between his teeth. He writes quite rapidly, and in his work as enumerator takes an average of 200 names a day.