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(Illustrated articles are marked with an asterisk.)

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Detailed table of contents for the supplement, including sections like 'I. BIOGRAPHY', 'II. BOTANY', 'III. CHEMISTRY', etc., with page numbers.

THE CENTENNIAL OF THE SIGNING OF THE CONSTITUTION OF THE UNITED STATES.

Mr. William E. Gladstone has given it as his opinion that the Constitution of the United States is the most remarkable work produced by the human intellect in modern times. The centennial of the signing of this instrument was celebrated with great pomp in Philadelphia on September 15, 16, and 17, 1887.

The different trades of the city made a fine display in a parade upon the first day; workmen executing the operations of their trade, both in the old and in the modern ways, were carried on floats or great trucks through the streets. The Carpenters' Club bore a banner which ninety-nine years ago had been carried in the first anniversary of the framing of the Constitution.

The chairman of the Centennial Commission, Mr. John A. Kasson, after calling for silence, during which Bishop Potter pronounced an invocation for the nation, addressed the assemblage. He was followed by the President and Justice Miller. The latter delivered a long and carefully prepared address upon the Constitution.

The number of people who participated in the different parts of the display cannot be estimated. It is doubtful if so extensive a celebration of this nature has been seen in this country.

Our readers should not forget that in this celebration was included the anniversary of the foundation of our patent system. In the Constitution are those famous articles on which the patent statutes were based, and on which their weight reposes.

POSITIONS OF THE PLANETS IN OCTOBER.

VENUS

is morning star, and is a superb object in the morning sky, rising on the first of the month about an hour and a quarter before the sun, and at its close nearly two hours and a half before him.

SATURN

is morning star, and is easily found making his way among the small stars of Cancer, and forming a triangle with Pollux and Procyon. He is in quadrature on the 29th, being at that time 90° west of the sun.

on the 1st at 12 h. 21 m. A. M.; on the 31st, he rises at 10 h. 31 m. P. M. His diameter on the 1st is 16'6", and he is in the constellation Cancer.

MARS

is morning star. He is near the bright star Regulus on the 10th, and may be readily seen in the small hours of the morning of that day as a small, ruddy star north of his brighter companion.

NEPTUNE

is morning star. He is near opposition, near his least distance from the earth, and in excellent position for telescopic observation. He may be found about 5° south of the Pleiades.

URANUS

is evening star until the 6th, and then morning star. He is in conjunction with the sun on the 6th, rising and setting with the sun at that time, and being at his greatest distance from the earth.

JUPITER

is evening star, and sets so soon after the sun that he will soon become invisible. He makes a close conjunction with Alpha Libræ on the 26th, at 1 h. A. M., being 34' north of the star.

MERCURY

is evening star. He reaches his greatest eastern elongation on the 27th at 3 h. A. M., and is 23° 58' east of the sun. He is far enough from the sun at that time to be visible to the naked eye, but his southern declination will make him a difficult object to find.

An Arrival of Cholera at New York.

On Sept. 23 the steamship Alesia arrived at New York from the Mediterranean with four passengers sick with Asiatic cholera, there having been eight deaths on board from the disease during the voyage.

The ship has been thoroughly washed and fumigated, and the cargo and baggage put through a special process of cleaning by sulphurous acid gas, in much the same way as rags are disinfected. The cholera has prevailed for many weeks past at Genoa, Naples, and Palermo, there being many new cases daily at Naples, of which 70 per cent were proving fatal.

An Electric Whistle.

M. Zigang has devised a trumpet worked by electricity and designed to warn or signal vessels, trains, or tram cars. It consists of a trumpet tube and a sounding plate which is vibrated by the electric current passing through an electro-magnet having its poles close to a soft iron armature carried by the plate.

The New Commissioner of Patents.

The N. Y. *Tribune* concludes that the new Commissioner of Patents, Benton J. Hall, of Iowa, is about as hard-working an officeholder as any this administration has discovered. He climbs up the Patent Office steps every morning as the clock strikes nine, and often stays until long after four o'clock. The slippery chairs and sofas which adorn the commissioner's office are held down continually by attorneys, waiting to transact their business with the office, in place of the former crowds of reform congressmen with Democratic principles and good-looking young women whom they wanted to get into office. The commissioner has made some effort—though not so strenuous as might be—to cut the deadwood out of the examining and clerical forces left him as a legacy by his predecessor. In brief, he seems to recognize the fact that the Patent Office is not a political office, that it is supported by the money of a particular class, the inventors. So well supported, in short, that a yearly dividend of twenty per cent is realized from the fees paid in, while there is an accumulated surplus of \$3,000,000 in the Treasury. Every week's issue of the *Official Gazette* contains from one to three of the commissioner's decisions on points of office practice, tending to bring about uniformity in the same among the different divisions. If the stories told by the attorneys are to be believed, something of that kind is badly needed. The office is slowly catching up with the work, but no great gain can be expected, I am told, with the present force. While the number of laborers in the patent vineyard remains stationary, the crop of applications is growing heavier every day. The coming Congress ought to do something to remedy the existing state of things.

And the editor might have added that a great injustice has been done inventors and others transacting business with the Patent Office, owing to the indifference of congressmen in past sessions of legislation. The encomium of the *Tribune* upon Commissioner Hall is just, and reminds one of the Patent Office administration under the commissionership of Judge Mason and Judge Holt, which was a good while ago, but whom a few of us live to remember with satisfaction.

Chilled Armor for Land Defenses.

The Gruson Works of Buckau-Magdeburg have recently published a book of some size, written by Engineer Von Schuetz, in which the system of construction of chilled cast iron armor for use in the protection of earthworks and in the making of turrets for land batteries, as devised by Dr. H. Gruson, some years ago, is described at length, and an account is given of the results of the experiments which have been made, from time to time, by several European governments, to determine its efficiency in resisting the impact of the heaviest modern ordnance. This work has been translated into English by Commander Grenfell, R.N., and we are indebted to the courtesy of Captain Piorkowski, Dr. Gruson's representative in this country, for an early copy. The subject and the matter of the work are of exceedingly great importance to a nation which, as is the case with our own, is destitute of the most ordinary means of defense in the event of a foreign attack either by land or sea. So serious is our case that, as remarked in a private letter from the admiral of the navy, just received and lying under the hand of the writer, if we desire to learn what advances have occurred during the last twenty years, we must go to England, France, Germany, Russia, and even to Constantinople, to study those of the scientific and mechanical departments of the military and naval establishments, and not to our own army or navy. This work of Dr. Gruson would seem to illustrate such advances in the defense of coasts.

Dr. Gruson's armor is simply a chilled cast iron shield, of which the body is a strong normal iron, while the surfaces on the exposed side are chilled like the "tread" of an American car wheel. Such enormous masses are handled, in this case, however, that correspondingly enormous chills are needed, and the manufacture of these plates becomes a matter of extraordinary difficulty and cost. All the resources of a great establishment are drawn upon, and all the ingenuity, knowledge, and experience of an able staff are called out in the prosecution of the work. Chilling, as is well known, probably, to most of our readers, consists in the casting of a peculiar quality of cast iron, known as "chilling iron," in contact with a large mass of cold iron forming that part of the mould which is to form the surface to be chilled. The sudden abstraction of heat prevents the isolation of the carbon in graphitic form, as would otherwise occur in the slow process of cooling naturally, and insures its retention in the combined form, producing a steel layer of considerable depth. The depth so secured is dependent upon the quality of the iron and the efficiency of the "chill," as the iron mould is called. The latter must have great thickness and good conducting power to give best results in these applications. Successfully carried out, this process gives a surface harder than

tempered steel over a strong and massive interior, the best possible combination, apparently, for an armor plate.

Dr. Gruson constructs large fixed turrets and land batteries of such plates, and the results of trial indicate them to be more reliable defenses than any wrought metal, whether iron or steel, or "compounded," yet introduced. The weight of these shields is too great for use in naval construction. The first trials were made in 1869, at the Tegel range, and it was found that all shots fired against the chilled plates broke into fragments, and that the plates bore the hammering with remarkable success. The experimental committee reported that the chilled armor was well adapted for its use. Later trials confirmed this opinion, and the Prussian government at once gave directions for its adoption in important lines of frontier defenses, and Austria, Italy, and Holland followed its example. In all these trials the chilled iron shot were found superior, if well made, to any steel shot, except in one or two cases in which makers like Krupp and the Ternitz company had either succeeded in securing an exceptional quality of steel or had found remarkably effective methods of tempering. Plates were tested of from 13.77 to 49.21 inches thickness, and were attacked by guns varying from 6 to 17 inches caliber, throwing shot weighing from 61 to 2,205 pounds. The thickness of plate was usually not far from three times the diameter of the bore of the gun to be resisted. The energy of impact was, in the case of the largest gun, over 47,000 foot-tons, which was only obtained, however, by firing at short range—150 yards. In all such cases, the shield is subjected to more severe trial than would be likely to be met in actual battle. In trials last year at Spezia, with the 100 ton gun, the shot weighed a ton and the powder charge 327 pounds, the velocity of impact being over 1,700 feet per second. The maximum penetration was four inches, the plates finally breaking up under repeated blows.

The method of proportioning is to give the plates a maximum thickness in inches equal to from one-fourth to one-third the fourth root of the energy of the attacking shot measured in foot-tons. The total weight of each plate of which the armor is composed is not far from the weight of the gun expected to be used in the attack.

The system of defensive armor here described is one in which we have a peculiar interest. We have in the United States, in the "Salisbury," and "Hanging Rock," and other brands, the best chilling irons in the world, and it would seem very possible that this may prove to be the best system for our purpose yet devised. It is especially one which we may hope to obtain permanent advantage from, as it seems probable that its advantages over other forms are not likely to be soon lost.—R. H. Thurston, in *Science*.

How to Get Rich.

In answer to a request of the Boston *Herald* to write some practical hints for young men on the acquirement of wealth, Gen. Benj. F. Butler responds as follows:

A difficult task is set me, as circumstances under which young men commence life are so widely varied. But I think that more young men fail in the investment of what they earn or receive than in any other way to acquire property. The temptations to speculate are so great, and the desire to become suddenly rich so strong, that I believe eight out of ten, if not more, of young men are wrecked at the very beginning.

If a young man is earning something more than the expense of his living, and has no object in view, he is likely either to increase those expenses carelessly or to loan his money to his friends, and in so doing in the majority of cases he will lose both friends and money. So that the best thing that he can do is to have an object, gather up his money, and to have a call for it which shall be a profitable one. He makes no investment because he says, "I have got so little money that it won't come to anything. I will wait until I get more;" and in waiting, generally, what he has goes.

When a young man has a very little money, let him buy some property, preferably a piece, however small, according to his means, of improved real estate that is paying rent. He had better buy it when sold at auction, under a judicial sale, paying in cash what he can, giving his notes for the balance in small sums coming due at frequently recurring intervals, secured by a mortgage on the property, and then use all his extra income in paying up those notes. It is always safe to discount your own note, and if the notes come a little too fast, as soon as he gets anything paid his friends will aid him when he is putting his money where it cannot be lost, and where the property is taking care of the interest, and in a very short time he will find that he has got a very considerable investment. He will become interested in it, save his money to meet his notes, and he will directly come into a considerable possession of property, and hardly know how it came to him. That is, he will have had a motive for saving, and will get the result of that saving, and will not be tempted to enter into speculations.

Nothing is so safe for an investment as improved real estate. Nothing is likely to grow in value faster. In the last 50 years 90 per cent of all the merchants and traders in Boston have failed. In the last 50 years 90 per cent of all the business corporations have failed or gone out of business, so that their stock has been wiped out. In the last 50 years all the improved real estate on the average has paid its interest and taxes and quadrupled in value. If a young man's father can give him anything to start him in the world, he had better invest it in that way and let it accumulate and earn his living, and he will be richer than if he had gone into business. Jay Gould is said to have started from a mouse trap seller to become a millionaire. Assuming that to be true, he is only one of 60,000,000 of people; and if any young man thinks that he is going to imitate Jay Gould, there are 60,000,000 chances to one that he won't succeed.

The rule I would lay down for a young man is, never do a mean thing for money. Be prudent and saving of your money. Be careful to have no interest account running against you, unless you have an equal or greater interest account running in your favor. Work diligently, and you are sure of a competency in your old age; and as early as possible, if you can, find a saving, prudent girl who has been brought up by a mother who knows how to take care of a house, and make a wife of her. She will aid, and not hinder you.

I claim no originality in this advice, and will relate you an incident in my own experience to illustrate it: In my earliest practice in my profession I was quite successful in earning money, and I had a small balance in the Lowell Bank, at the head of which was Mr. James G. Carney. The bank was directly across the hall from my office. I stepped into the bank to deposit a little money on one occasion, and Mr. Carney said to me: "Why don't you invest your money?" "Invest," said I; "I have nothing to invest." "Oh, yes," he says; "you have quite a little sum of money, and I see that your young friends come with your checks occasionally, evidently borrowing it. Now you had better invest it." "How can I invest it?" "Invest it in real estate." "I know nothing about real estate." "Go to the first auction and buy the property. You cannot be much cheated in that, because you will have to give very little more than somebody else will be willing to pay for it. Give your notes for it, save your money, collect your fees, pay your notes as they become due. See that the property is improved property, so that the rent will keep down your interest account, and when you get any other money, invest it in the same way, and if your notes press upon you a little faster than you can pay them, why we will, when we find that is what you are doing with your money, discount your note and give you a little more time, so that you can pay it up. This will necessitate the prompt collection of your bills, for I know that you would rather work and earn a hundred dollars than dun a man for it, unless you have a pressing need for it. You have not even asked for a little bill that we owe you in the bank, which shows me that you do not promptly collect your dues." I followed the advice and bought a number of pieces of property in that manner, and I never did exactly know how they were paid for, but they were, and in a few years I owned some twenty different pieces of property in Lowell that came to me in that way. I can only say that I wish I had been wise enough to have continued this course through life.

I do not think that I need to extend these suggestions any further, because if a young man won't mind these, he won't any others, and I cannot suggest any better ones.

I am, yours truly,

BENJAMIN F. BUTLER.

Farming by Gaslight.

Howard County farmers residing in the vicinity of the great Shrader gas well, near Kokomo, Indiana, go on record as harvesting the first wheat by natural gaslight. A dozen self-binders and men shocking wheat was truly a novel scene, which was witnessed by hundreds of people, who surrounded the fields of grain in carriages. The constant roar of the Shrader well can be distinctly heard eight miles away, while the light can be plainly seen at Burlington, fifteen miles west of here. The estimated flow of gas from this well is 15,000,000 cubic feet every twenty-four hours.—*Indianapolis Journal*.

Steam Pipe for Heating Purposes.

The *Master Steam Fitter* gives the following rule for finding the superficial feet of steam pipe required to heat any building with steam: One superficial foot of steam pipe to six superficial feet of glass in the windows, or one superficial foot of steam pipe for every hundred square feet of wall, roof, or ceiling, or one square foot of steam pipe to eighty cubic feet of space. One cubic foot of boiler is required for every fifteen hundred cubic feet of space to be warmed. One horse power boiler is sufficient for forty thousand cubic feet of space. Five cubic feet of steam, at seventy-five pounds pressure to the square inch, weighs one pound avoirdupois.