attached, the wire was magnetized inductively simply by the magnetism of the earth, and changes in its magnetism were made by applying weights and strains, the changes being then indicated by the magnetometer.

SCIENTIFIC AND PRACTICAL INFORMATION.

DISCOVERY OF A NEW ELEMENT.

At a recent session of the French Academy of Sciences, M. Wurtz presented a communication from M. Lecoq, announcing the discovery of a new simple body, a metal analogous and allied to zinc and cadmium, and found in blende or sulphide of zinc in Spain. The existence of the substance was revealed by spectral analysis, two lines appearing which could not be traced to any other other element. The lines are situated in the violet, the region in which the brightest zinc lines are found; one is very brilliant and takes, in the table of wave lengths, the 417th place; the other and weaker one has its wave length represented by 405. The new metal has not been reduced from its combinations, so that its physical characteristics remain undetermined. It has been obtained, however, in the state of hydrochlorate and sulphate, and its distinctive features have been so clearly recognized, showing its marked difference from either zinc or cadmium, that there is considered to be no reasonable doubt as to its existence. The discoverer patriotically names the new metal gallium in honor of France.

TESTING POTABLE WATER FOR ANIMAL MATTER.

Most of our readers are already aware of the danger arising from the use of water which contains animal excreta, or other animal matter in a state of putrefactive decay. Although no certain test has yet been found for these matters, it is not difficult to detect the decomposition products which always accompany them, and when the latter are absent we may safely conclude that the former cannot be present. This indirect analysis involves testing for carbonate of ammonia, nitrous and nitric acids, phosphoric acid, chlorine, and sulphuric acid.

The test for carbonate of ammonia is best made with a few drops of corrosive sublimate solution, or a little of the Nessler test. Nitrites are detected by slightly acidifying the water and adding a starch solution which contains iodide of cadmium. To test for nitrates, acidify with a few drops of dilute sulphuric acid, immersing in it for a minute a rod of zinc or cadmium, and then adding the starch and iodide of cadmium. Phosphates are detected with most certainty by a few drops of a concentrated solution of acetate of uranium.

JAPANESE BRONZES.

M. E. J. Maumené writes as follows: We recently received bronzes from Japan, the composition of which presents great interest. Their origin has been well and precisely established; they come from public monuments and from temples of habitation where great luxury reigned, which is attested by the dimension of most of the pieces imported, and which were destroyed during the great religious and political struggle which ended a few years ago.

We had occasion to analyze these bronzes, and here are the most striking results:

	No. 1.	No. 2.	No. 3.	No. 4.
Copper	86·38	80·91	88·70	92·07
Tin	1·94	7·55	2·58	1·04
Antimony	1·61	0·44	0·10	"
Lead	5·68	5·33	3·54	"
Zinc	3·36	3·08	3·71	2·65
Iron	0·67	1·43	1·07	3·64
Manganese	"	trace	"	"
Silicic acid	0·10	0·16	0·09	0·04
Sulphur	"	0·31	"	"
Waste	0·26	0·79	0·21	0·56
	100·00	100·00	100·00	100·00

The complex alloys thus formed are all of a granulated texture, blistered on the interior surface, full on the exterior surface (which can be readily polished with a file), showing a varied shade, which is sensibly violet when antimony is abundant, red when iron is present, etc.; all the specimens were cast in slight thicknesses, from 0·195 to 0·468 inch, and the molding was well filled. It appears from analysis that these alloys were not made with pure metals, but with entire minerals. We should, says the author, consider these bronzes as resulting from direct employment of copper pyrites and antimonial galena mixed with blende; and the calcination was not always complete, as the presence of sulphur in specimen No. 2 proves.

Antique alloys, Greek, Roman, old French, etc., present indications of the same nature: but we have never observed so great a complication and such clear proofs of the simplicity of metallurgic work.—*Comptes Rendus de l'Academie de Sciences*, 1875.

NEW AFRICAN EXPLORATIONS.

Mr. H. M. Stanley, the reliever of Dr. Livingstone, is now chief of an African exploring expedition fitted out by the New York *Herald* and the London *Daily Telegraph*. Letters recently received from him have appeared in those journals, from which the first tidings of his labors may be gleaned. Starting from Zanzibar on the coast, he began a journey of 720 miles to the great Victoria Nyanza lake. His progress was impeded by hostile savages, by the unknown nature of the country, and by the fearful mortality among his followers, 126 out of the 300 men which composed the expedition falling in battle or succumbing to disease; despite these obstacles, however, the march was accomplished in 103 days, an incredibly brief period when it is considered that by the natives the distance is counted as a nine months' journey. Launching his sectional steamer on the lake, Mr. Stanley began his explorations; and of those undertaken in April and May, the results are now reaching us.

The most important discovery thus far made is the verification of Speke's description of Victoria Nyanza as one great inland sea. This is contrary to the later decisions of many eminent geographers, who believe the lake to consist of a number of small bodies of water united by streams or tracts of frequently overflowed marshy country: a new view upheld by Speke's comrade the explorer Burton, and even by Dr. Livingstone himself. Stanley now, however, demonstrates Speke's account to be strictly accurate, and thus secures to that explorer the fame of being the first discoverer of the true source of the Nile.

PRESERVATION OF MEAT BY COMPRESSED AIR.

We recently described a discovery of M. Bert, relative to preservation of meat through keeping the same in a hermetically sealed compartment under a pressure of several atmospheres. M. Reynoso proceeds a step beyond M. Bert, and announces that, if the meat be removed from the compressed gas after remaining therein for several weeks, it may be exposed to the ordinary atmosphere indefinitely without decomposition. This was accidentally discovered through a fragment of flesh from the compression apparatus being left unnoticed in the laboratory. M. Reynoso finds that the meat dries slowly, keeping its color, odor, and consequently its fleshy taste.

The Relation of Patents to the Various Industries.

At a recent meeting of the New York Society of Practical Engineers, President James A. Whitney delivered an address on "The Relation of the Patent Laws to American Agriculture, Arts, and Industries." Passing over those portions of this address which present, in a concise and forcible manner, the several arguments and authorities in favor of these laws, we would direct especial attention to the following interesting historical and statistical information regarding several important American inventions. "Beginning with the printing press, we learn that the one used by Franklin over one hundred years ago gave but one hundred and thirty impressions an hour; as the result of successive patented improvements, this capacity was so advanced that in the year 1847 a machine had been perfected—the Napier double cylinder press—by which from twenty-five hundred to five thousand impressions an hour could be made—the former of large, the latter of small, newspaper size. It was then believed that with this machine the limit of speed had been reached, and yet the public demand for more newspapers and periodicals was advancing rapidly. It was at this juncture that the American inventor Richard M. Hoe brought forward his improved printing machinery, and, as the result of his genius and mechanical skill, it was soon brought to so great perfection that, in the year 1861, one of the New York papers printed a daily edition varying from one hundred and fifteen to one hundred and thirty thousand copies, all printed in four hours and a half. Though it is not claimed that this was the work of a single press, yet to have accomplished the same work on Napier presses would have required five additional forms of type, each at the cost of one thousand dollars a week, or two hundred and sixty thousand dollars a year. Another kindred invention, and one effecting even a greater relative improvement, was the Chambers folding machine. This was the invention of Cyrus Chambers, to whom the first patent was issued about the year 1859. In the year 1874, seventy-two of these patent news folders, for folding newspapers alone, were in use. Regarding the work accomplished by these machines in the several departments of paper, magazine, and book making, we read: "The cost of running these machines was $2 a day each, and each accomplished the work of five men. The same work by hand cost $8.75 per day, being a saving of $6.75 a day for each machine, and these newspaper folders alone, during the original term of the patent, effected an economy of labor amounting to upward of $1,165,000. During the same period the paper folders for duodecimo publications saved in labor more than $353,000; for octavos, more than $139,000: for quartos, more than $64,000; and for 32mos, more than $522,000—making from this one patent alone, in less than fourteen years, a saving of human toil and exertion amounting to more than $2,243,000. Thomas Silverthorn, the poor mechanic who invented the copper-toed shoe, little knew the significance and value of this simple idea. Through its adoption, it is estimated that from $6,000,000 to $12,000,000 are annually saved to the country, and yet the humble inventor had to wait for his good fortune until his patent was extended, when it was bought by a company for $67,000. Henry Burden, the inventor of the first successful machine for the manufacture of horseshoes, was able to sell a finished shoe, including the iron, for four and one half cents, whereas to make the same by hand would have cost sixteen cents, not including the iron. While the absolute benefit to the public by this invention cannot be calculated, it is known that the gain to the government alone during the late war amounted to $4,000,000. Under the head of "Profits of Patentees compared with Profits of the Public," the following interesting facts are presented: There is now in common use a little staple for fastening the rods to the slats of Venetian blinds. It has corrugated shanks to hold in the wood without clinching, and for this reason requires so much less iron in its manufacture that in five years' trade, in this country alone, it is estimated that five thousand tuns of wire have been saved. Seventy-five tuns of these little staples are used in the United States every year, at a yearly saving to the public of $100,000, while $20,000 was all that the inventor, Byron Boardman, received as his share. We are forced to pass over without mention many equally interesting and significant facts, of all of which Mr. Whitney makes use in comfirming his views regarding the value of patents in fostering industry by rewarding the inventor, showing at the same time that the gain to the latter is by no means excessive compared with the saving to the public. A closing illustration enforcing this claim, and one which will be readily recognized by the housekeeper, may here be cited: Formally, when a tin can was soldered up, it was difficult matter to open it, but in 1859 John W. Masury hit upon the idea of making a portion of the cover of very thin metal, which could be easily cut through with a knife. Ten millions of these cans are made yearly. The Borden Condensed Milk Company use ten thousand each and every working day in the year. The invention is largely used in the paint trade, as it enables paint to be put up in liquid form, ready for use, therefore saving the painter's time and trouble in mixing paint. The United States Circuit Court decided the value of this improvement to be not less than three cents for each pound can; but the inventor granted licenses under the patent for a royalty of one quarter of a cent per pound can, that is to say, for every twelve cents the public gained from the invention, the inventor was content to gain one cent."

The above (from *Appleton's Journal*) contains only a small portion of Mr. Whitney's address, which abounds in interesting statistics, exhibiting on the part of the author a remarkable degree of research. We shall take occasion to make further extracts in a future issue.—EDS.]

Subterranean Festivities.

We acknowlege the receipt, too late, however, to enable us to get there, of a ticket to a grand "Basket Picnic and Subterranean Ball," given October 13, 1875, in the bowels of Leavenworth Mountain, within Marshall Tunnel, vicinity of Georgetown, Colorado. Our invitation says:—

"For the information of visitors it may be stated that the elevation of the Tunnel is 9,500 feet above the level of the sea, and the dance hall is 810 feet in from the mouth of the Tunnel, and is 500 feet below the surface. From the mines cut by this tunnel millions of dollars have been taken—

And below this argentiferous floor
Are many, many millions more.

The exercises will be opened by a brief address from Commodore Stephen Decatur.

Guests are privileged to ride on the palatial rock cars from mouth of tunnel to hall.

The festivities will be prolonged until ten boxes of wax candles are consumed."

Effects of Heat on Steel Wires and Rods.

Professor W. F. Barrett has found that, if steel of any thickness be heated by any means, at a certain temperature the wire ceases to expand, although the heat be continually poured in. During this period also the wire does not increase in temperature. The length of the time during which this abnormal condition lasts varies with the thickness of the wire and the rapidity with which it can be heated through. It ceases to expand, and no further change takes place till the heat is cut off. When this is done, the wire begins to cool down regularly till it has reached the critical point at which the change took place on heating. Here a second and reverse change occurs. At the moment that the expansion occurs, an actual increase in temperature takes place, sufficiently large to cause the wire to glow again with a red-hot heat. It is curious that this after-glow had not been noticed long ago, for it is a very conspicuous object in steel wires that have been raised to a white heat and allowed to cool.

The Electric Light as a Military Signal.

The roof of the Siemens-Halske factory at Berlin, was recently the scene of a series of experiments with the electric light, which filled all the streets in the vicinity with a crowd staring with astonishment at a supposed wonderful natural phenomenon, up in the clouds. The apparatus, which gave a light so powerful that ordinary writing could be read by its illumination at a mile distance, was arranged with an inclosed mirror, so that the rays were projected against the clouds, which served as a screen. In front of the mirror the signals were made, and these were repeated, of course on a gigantic scale, in the clouds. The light is to be adopted to the German army for night signaling.

The Force of Expansion.

The boiler stack (60 feet in hight) of the Ohio Iron Company, of Zanesville, recently fell with a sudden and heavy crash, killing one of the furnace men instantly. The boiler had just been heated up, after having been cold, when the stack gave way. It appears that the gas flame had destroyed the inside lining of the stack, and had partly destroyed some of the brick and weakened the brickwork, so that, when the stack became suddenly heated again, the expansion resulted in the demolition of the whole structure.

New Oil Car.

A. P. O'Dell, of Oil City, Pa., is the author of a new oil tank car, which, if it fulfils the expectations of the inventor when put to a practical test, will greatly lessen the cost of transporting oil to the seaboard. The tank is swung underneath a platform, which can be used as an ordinary gondola car for carrying freight on the return trip. At present the tank cars have to be returned empty, which is a dead loss in freight.

To render glass impervious to the direct rays of the sun, but not so opaque as to exclude light, powder some fluorspar and mix it with sulphuric acid, and rub the mixture on the glass with a piece of lead. Then heat the glass on some stove or other arrangement by which the fumes can pass up the chimney; and when cool, wash the plate with a dilute solution of potash, and rinse in water