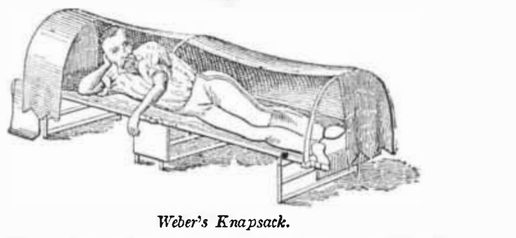
USEFUL AND CURIOUS INVENTIONS.

Below we give engravings of a number of ingenious inventions, extracted from the pages of Knight's "New Mechanical Dictionary."* These devices, as will be seen, relate to various subjects, the selection being governed either by their novelty or their peculiar adaptation to the various purposes for which they are designed.

KNAPSACKS.

Of these, in Figs. 1 and 2, we give two ingenious exam-

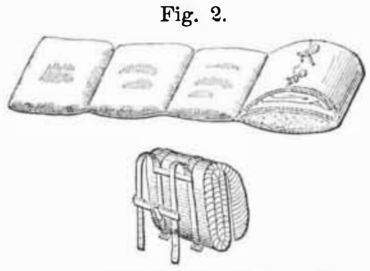
Fig. 1.



Weber's Knapsack.

ples. Weber's invention, Fig. 1, has a frame which may be changed into a couch, the cover forming a shelter. The central section has jointed and folding sides. Frodsham and Levett's knapsack, Fig. 2, consists of an india rubber casing, made watertight and containing a bag of finely cut cork, so as to convert it into a life preserver. A pocket is made in the rubber casing to contain articles of clothing, thus forming a knapsack, which, when unrolled, becomes a bed, the combined articles serving as a pillow.

Fig. 2.

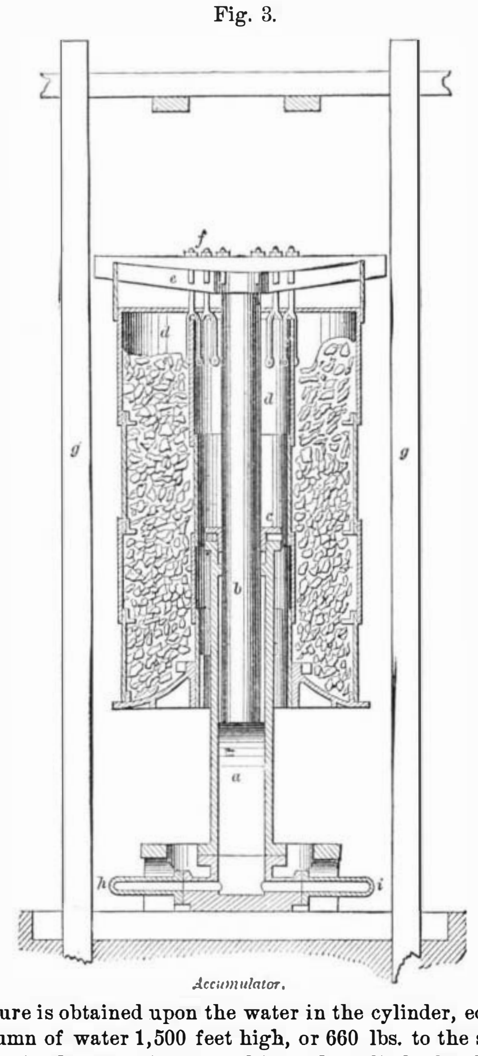


Frodsham and Levett's Knapsack.

ACCUMULATOR.

This is an apparatus used in working hydraulic cranes and other machines where a steady and powerful pressure of water is required. As shown in Fig. 3, it consists of a large cast iron cylinder, *a*, fitted with a watertight plunger, *b*, to which is attached a loaded weight case, *d*. Thus a

Fig. 3.



Accumulator.

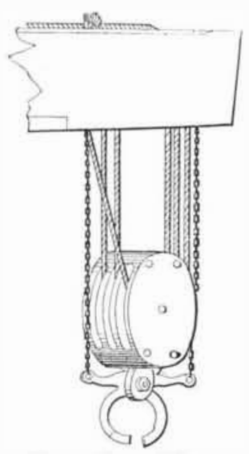
pressure is obtained upon the water in the cylinder, equal to a column of water 1,500 feet high, or 660 lbs. to the square inch. As the water is pumped into the cylinder by the engines through the pipe, *h*, the piston with the weighted case rises, being guided by the strong wooden framework, *g*, and is made to regulate the amount of water pumped in, by actuating a throttle valve in the steam pipe of the pumping engine, which it closes after having reached a certain hight. When the cranes, etc., are in operation, the water passes from this cylinder through the pipe, *i*, to those actuating the motion of the cranes, and the weighted plunger naturally descends, always keeping up a constant pressure upon the water. In descending, the same causes the throttle valve to open again, and the water is again pumped in.

AN ANCHOR TRIPPER

of ingenious construction is represented in Fig. 4. The anchor hangs from a clutch ring on the catblock, which is suspended below the cathead. When the fall is cast loose, the block descends, and the clutch is opened by the chains, which are attached to the cathead and to the projecting levers or prongs on the respective halves of the clutch. A single motion, the slackening of the fall, operates the tripper; the clutch is opened when the chains are made taut, by the descent of the block.

*Published in numbers by J. B. Ford & Co., New York

Fig. 4.



Duncan's Anchor-Tripper.

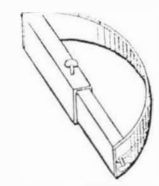
THE ARCOGRAPH.

Fig. 5 is an instrument for describing arcs of circles without the use of centers. A thin pliable strip of metal has its ends attached to a wooden bar which may be sprung into the required shape and then fastened by set screws. This device is susceptible of many variations, and is useful as a template or marker for different purposes.

ANGLE JOINTS

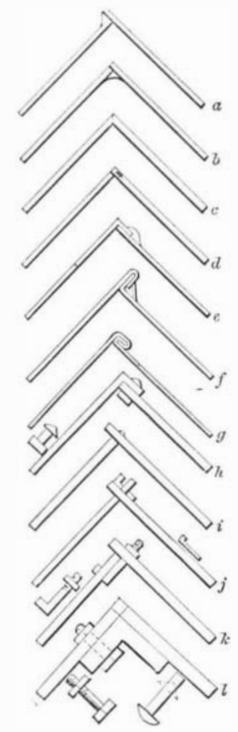
differ according to the material, thickness, purpose, and exposure. In Fig. 6 we give representations of several forms. *a b* are joints which are entirely dependent upon solder; such are used with tin ware and sheet lead. *c* is a miter joint. It is used for thicker metals with hard solders. *d* is a butt joint, otherwise similar to *c*. *e* is a lap joint; the metal is creased over the hatchet stake or by the spinning tool. It requires solder. In the

Fig. 5.



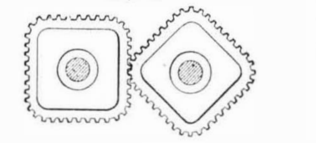
Arcograph.

Fig. 6.



Angle-joints.

Fig. 7.



Angular Gearing.

joint shown at *f*, one plate is bent rectangularly, and the other is doubly bent, so as to recurve back on itself, lapping around the edge of the other. It needs solder to keep it from slipping apart. *g* has a fold to each plate; these lock upon each other and require no solder to perfect their hold, although it may be added to make the joint airtight and watertight where the closure is not absolutely perfect. *h* is a riveted joint, one plate being bent to lap upon the other. This joint is called the folded angle, and is common to all kinds of work. In *i* the edge of one plate is formed into tenons which enter mortises in the other, and are there riveted. *j* resembles *i*, except that the tenons are prolonged so as to be retained in the mortises by cotters. In *k* one plate makes a butt joint with the other, and is attached by L-formed rivets or screw bolts, the heads of which are riveted to one plate, while their screw stems pass through the other plate, and are fastened by nuts. At *l* two plates are shown, secured by being bolted or riveted to an angle iron, which is straight or bent into sweeps according to the shape of the object.

In Fig. 7 is represented a mode of

ANGULAR GEARING.

The wheels are quadrilateral, and the speed of the driven wheel is variable. The driving wheel, rotating at regular speed, will impart a quicker rate to the other wheel when the angle of the former is in contact with the flat side of the latter, and conversely. This device has been used in printing presses.

STEVENS' ALTISCOPE.

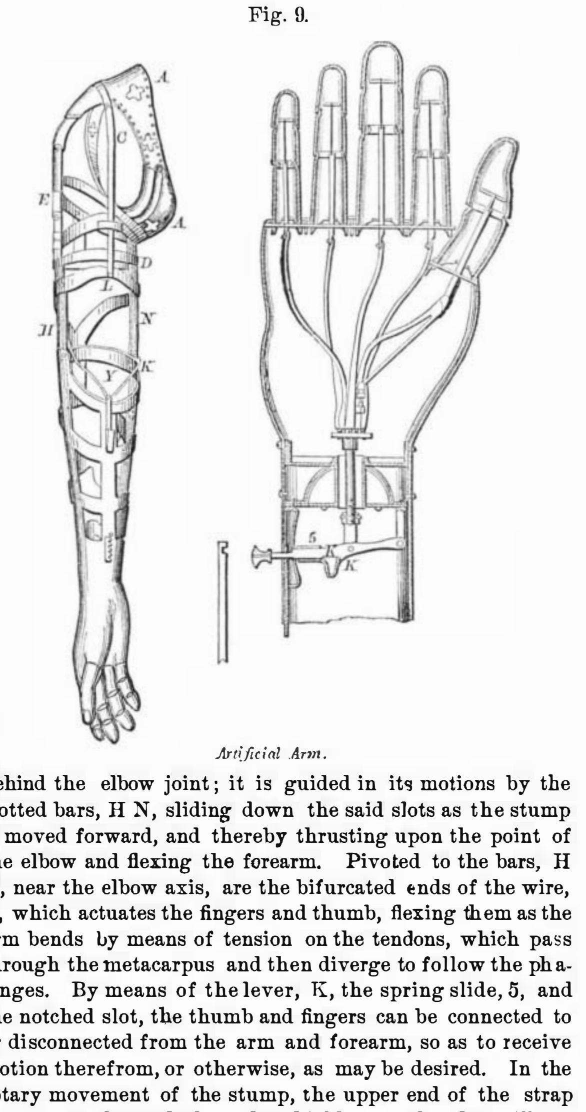
This invention, represented in Fig. 8, affords a means of training guns to a given angle with the axis of the vessel or on an object, while the gunner remains beneath the deck. There is attached beneath the deck, to the pintle of the pivoted gun, a graduated index plate by which its horizontal bearing may be read. A telescopic tube, with two rectangular bends and with reflecting mirrors at the angles, is so placed as to be used from beneath the deck; two of these may be so situated as to form a base of sufficient length to obtain, by simultaneous observation, the distance by triangulation. Two screw propellers, working in contrary directions, rotate the vessel so as to bring the guns to bear on the required point. The upper and lower limbs of the telescopic tube are parallel; the one above the deck is presented toward the object, the other to the eye. The image of the object, after being twice reflected, reaches the eye of the observer, whose body is not exposed. This device entered into other ingenious appliances connected with the Stevens battery.

A large amount of ingenuity and inventive skill has been directed toward the replacing, by mechanical devices, of members of the body lost through accident or disease. In Fig. 9 we give an

ARTIFICIAL ARM

and hand, in which there are arrangements for moving the fingers and thumb. The shoulder cap is the basis for the various movements. The strap, C, is hinged to the cap, A, and connected by a rod to the ring, L. The straps, D E of the upper arm, are also hinged to the cap and the lower part of the upper arm; from the ends of the straps, D E, proceed the slotted bars, N, to whose lower end the forearm is pivoted. The three straps mentioned are the means of suspension of the arm, forearm, and hand, and the stump of the natural arm within this outer skeleton is the means of imparting motion to the forearm, wrist, and fingers. The ring, L, is connected to the strap, C, and hinged to the forearm

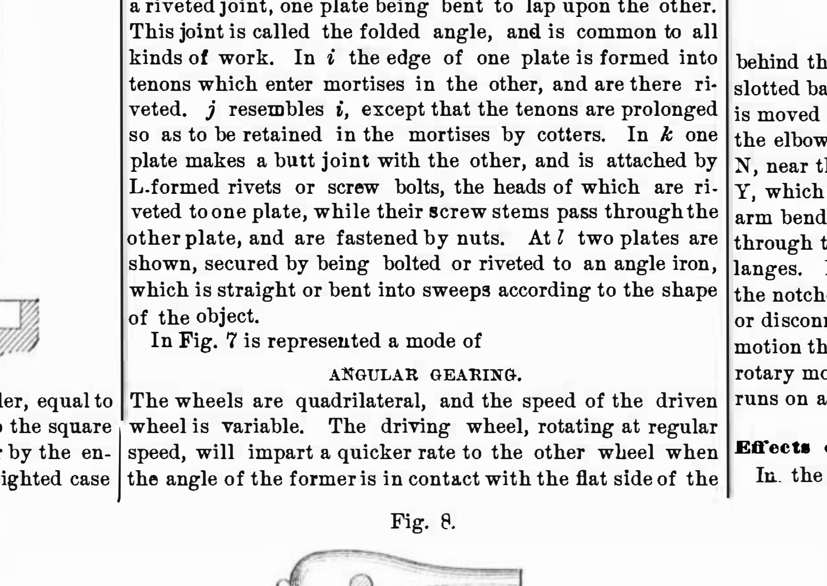
Fig. 9.



Artificial Arm.

behind the elbow joint; it is guided in its motions by the slotted bars, H N, sliding down the said slots as the stump is moved forward, and thereby thrusting upon the point of the elbow and flexing the forearm. Pivoted to the bars, H N, near the elbow axis, are the bifurcated ends of the wire, Y, which actuates the fingers and thumb, flexing them as the arm bends by means of tension on the tendons, which pass through the metacarpus and then diverge to follow the phalanges. By means of the lever, K, the spring slide, 5, and the notched slot, the thumb and fingers can be connected to or disconnected from the arm and forearm, so as to receive motion therefrom, or otherwise, as may be desired. In the rotary movement of the stump, the upper end of the strap runs on a rod attached to the shield, A, under the axilla.

Fig. 8.



Stevens's Altiscope.

Effects of Stress upon the Magnetism of Soft Iron.

In the physical laboratory at Glasgow University, Sir William Thomson stretched steel and soft iron wire, about twenty feet long, from the roof. An electro-magnetic helix was placed round a few inches of the wire, so that the latter could be magnetized when an electric current was passed through the former, the induced current thus produced in a second helix outside the first being indicated by a reflecting galvanometer. When steel wire was used, the magnetism diminished when weights were attached to the wire, and increased when they were taken off but when special soft iron wire (wire almost as soft as lead) was used, the magnetism was increased when weights were put on, and diminished when they were taken off. Afterwards he discarded the electrical apparatus; and by suspending a piece of soft wire near a magnetometer consisting of a needle, a small fraction of a grain in weight, with a reflecting mirror 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	100·0

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 confirming 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 acknowledge 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 furnacemen 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