the form of guarantees. The spirited policy of the Czars has been well received by the Russian people, and now a greater and more formidable scheme is announced to the public.

In another column we give the details of the project, as set forth by a valuable European cotemporary. The mountains of the Caucasus bisect the territory which lies between the two seas; and the construction of the contemplated canal will be much simplified by using the river Manitscha, which flows westward into the Sea of Azov, and the river Kooma, Kouma, or Kuma, which flows, in the other direction, into the Caspian Sea. Moreover, a considerable part of the length of the river Manitscha is a long, deep, and wide lake; and these aids to the formation of the canal, reduce the entire distance, 441 miles, to very manageable dimensions. The cost in Russia, where labor is very cheap, is estimated at the moderate figure of $60,000,000.

M. Blums, the Russian topographer, who presided over the commission mentioned elsewhere, has published, in the *Golos*, a statement that the work will require the services of 32,000 men, to complete it in the specified time, six years.

At present the navigation of the Caspian Sea is left almost entirely to Persian vessels, and the report of the trade on this great inland lake shows that 824 vessels, of a united tunnage of 68,910, entered the harbors in the year 1869.

Plans and details for the prosecution of this work were found in the Imperial archives after the death of Peter the Great, and show how entirely he was convinced of the value, of such a work, to the interests of the great empire which he regarded with a fatherly pride.

The determination and courage of the Czar's government, and the great abilities of Russian engineers, as well as the importance of the work to the material prosperity of the empire, promise a speedy execution of this last great addition to the wonders of the nineteenth century.

THE HASSLER OCEANIC EXPLORATION.

One of the most important expeditions ever fitted out in the United States is now being organized in Charlestown Navy Yard, under the control of the United States Coast Survey, to whose superintendent, Professor Pierce, the credit of originating the idea is due. The *Hassler*, a vessel 165 feet long, well fitted and of ample power, is to convey a corps of scientific men, her officers and crew being selected especially with a view to their fitness for such service. The obj ct of the voyage may be briefly described as the investigation of the greatest depths of the Atlantic and Pacific oceans, of the origin of the deep sea currents, of the varied character of the water as to temperature, weight, and chemical elements, as well as of the fish and other animal life peopling the depths of the sea.

We are informed that the party will proceed first to the South Atlantic Ocean, and afterwards to the West Indies, to discover, if possible, the origin of the Gulf Stream. The next movement will be to ascertain the greatest depth of the Atlantic, and to search out the mysteries of the bottom. Returning to Rio di Janeiro for supplies, the *Hassler* will next proceed to the Atlantic coast of Patagonia, to trace the course of the South Pole currents. Proceeding by way of Magellan's Straits to the Pacific, a similar investigation to that made in the Atlantic will take place; and the ship will then go to San Francisco, where the scientific corps will leave her. She will then be engaged in the survey of the Pacific coast, and afterwards sail to Puget Sound, and perhaps to Alaska.

We look for important discoveries and results from this expedition. The physical features and character of the oceans are little understood, and it is impossible to solve the problems of the currents unless charts of the ocean bottoms, with some approach to accuracy, can be prepared, and some knowledge of the formation of the earth under the waters be obtained. Ocean navigation is now one of the largest industries in the world, and the interests of the commercial, mechanical, and scientific classes are all involved in its prosperity. Precise and detailed information as to the movements of the tides and currents which affect the transit of ocean going vessels has long been looked for, and there seems to be a great probability that it will soon be obtainable.

The scientific members of the party will be led by Professor Agassiz, and the dredging operations will be conducted by the Count de Pourtalés. The physical experiments will be under the charge of Dr. Hill, late President of Harvard University; the chemical inquiries will be made by Dr. White, of Philadelphia; and the geological and zoölogical department is intrusted to Dr. A. Steindacher. Professor Agassiz is in hopes of obtaining a large number of specimens which will add to our information of the *fauna* and *flora* of the deep.

The *Hassler* will, in all probability, sail from Charlestown, Mass., on about the 25th of November, and we shall keep our readers informed of her movements and of any discoveries that the distinguished body of scientists may make.

USES OF GLASS IN ARCHITECTURAL DECORATION, ETC

We have been much interested in the inspection of a miniature model of a bed chamber and its furniture, which an ingenious designer and personal friend has fabricated, and the prominent feature of which is the use of glass for decoration. The effects produced are very startling, unique, and beautiful.

The mantelpiece and its brackets are of highly polished and beautifully clear glass, attached to a base of black marble. The cornices are also of glass, the curved parts being of pressed glass, and the parts which are angular in section being ground and polished. The play of prismatic colors is hightened by reflection from the curved portions of the cornice, producing an effect wholly indescribable, but, in our opinion exceedingly beautiful.

The cornice is made in short segments, held at the ends by gilded supports of ornamental design. The walls are papered with delicate lavender with fine stripes of gold, and the upper edge passing under the glass cornice is without other border.

The ceiling has for a center piece a flat oval mirror, with an ornamental gilt frame, and from the center of this frame descends a small gas chandelier proportioned to the size of the model, profusely embellished with prismatic pendants and provided with Liliputian gas burners. The furniture is of polished black walnut, and is upholstered with lavender colored satin. The floor is furnished with a painted carpet, the colors of which harmonize with the general tone of color throughout the apartment.

The model has convinced us that for interior decoration, where expense is not regarded, a most beautiful effect can be produced on a large scale, as well as in the model, where the ornaments are somewhat out of proportion to the dimensions of the room.

Glass, when of the proper thickness, is scarcely more brittle than marble, and it has the advantage that it can be molded into the proper form, so that the greater cost of the material would be nearly or quite compensated for by the saving of labor.

The hint thus given may prove valuable to decorators, and is, we think, at least worthy of consideration.

A WORD ABOUT REPAIRS.

The inevitable waste and wear which always, in the end, necessitate the abandonment of everything in its day useful to mankind, is compensated for and retarded by repairs. But in the attempt to do this, there is often much time and money uselessly squandered.

One of the principal causes of loss is delay in making timely renovations and substitutions; another is injudicious ways of repairing; and, lastly, repairing that which it were wise to abandon altogether. Instead of at once correcting what is amiss in a tool or a machine, many will let it run as long as it is possible to work with it, when it is often found impracticable ever to make it serviceable again; or, if not so badly injured as this, that one deficiency, which it would have cost little to supply, has caused many worse than the first.

In making repairs it is often thought a poor mechanic will do just as well as better and more costly skill. No greater mistake can be committed. We assert that the mechanical ingenuity, ready command of resources, knowledge of the adaptability of means to ends, skill of eye and hand, common sense, and sound judgment—which go to make up an accomplished mechanic—are more necessary in a repair shop than anywhere else. Here it is not the same old routine, day after day, the making and putting together of forms so familiar as to require little original thought; but every job varies in some particular from every other, and each must be repaired in a different way. It requires brains as well as manual skill to do this kind of work in a creditable manner, and every manufacturer will find it policy to put a first class mechanic in his repair shop.

Lastly, in constantly stopping old machines to patch them up into make-shifts, there is often more money sunk than would supply their places with new ones. Many people estimate the cost of repairs only from the cost of material and labor; but in many cases the time lost in repairing is the largest element of expense, especially when the stoppage of one machine entails the stoppage of many others.

In repairing machines the following rules ought, therefore, to be observed: First. Repair as soon as anything gets out of order. Second. Intrust none but good mechanics with repairs. Third. Be careful not to continue repairs when machines cease to be worth them.

BOOKS FOR MECHANICS.

That sort of egotism which prompts mechanics and inventors to neglect the means of personal improvement and advance in their professions, supplied by books, has prevented many from achieving the measure of success to which their natural endowments entitle them, and is at the present day seriously affecting the condition of mechanics in general. Mechanics, as a rule, read newspapers, stories, and some history, but as a rule they neglect the books replete with technical information touching directly upon their peculiar avocations. They are wont to scoff at the idea of learning an art from books, and to place reliance upon their personal experience, in preference to any knowledge gleaned from the records of others' experience.

Now we do not deny the paramount value of personal experience. That which we have ourselves seen, we know; that which we read may at times mislead us; but when personal experience has been guided and shaped by reading, it must inevitably be more complete, its results better classified, and its value enhanced far beyond that of the knowledge of the man who has only explored his limited field of research without any guide.

A man might in time learn all about the streets, alleys, parks and suburbs of New York by unaided observation, but a well edited guide book would save him nine tenths the labor necessary to accomplish such a task without assistance.

We therefore advocate the use of books by mechanics, not as a substitute for personal experience, although they are in this way often very valuable; but we urge their use principally on the ground that they assist in enlarging and systematizing personal experience and preventing waste of time in the search for facts already discovered.

Every man engaged in any industrial occupation should gather about him a library, even though small, of works relating to his business. Verifying the facts stated in these books by his own experience, or, it may be, discovering that some things stated as facts are errors, cannot fail to enlarge his mind and supply him with practical resources for emergencies, which will not only increase his self respect but increase the pecuniary reward of his efforts. So true is this that we do not recollect a reading mechanic who did not rise in his profession, and who, though perhaps not acquiring fortune, failed to secure the respect always accorded to manifest superiority.

SCIENTIFIC INTELLIGENCE.

HOW TO TEST PURE GLYCERINE.

Thomas Koller gives, in a German journal, the methods for detecting the impurities of glycerin. Pure glycerin is neutral, and leaves only a slight residue when evaporated in a porcelain capsule. The adulterated article may leave considerable black residue, and react acid. Pure glycerin, when cautiously mixed with an equal volume of oil of vitriol, is not browned even after the lapse of several hours; the impure often browns immediately. A solution of oxalate of ammonia does not even produce a cloudiness when mixed with pure glycerin, but may give a precipitate with the impure. Pure glycerin, treated with nitric acid and nitrate of silver, yields no precipitate; sulphide of ammonia sometimes gives a black color in adulterated glycerin. Pure glycerin, in large and small quantity, is as clear as water; impure often shows different shades of color, according to the extent of its contamination. Pure glycerin rubbed between the fingers gives no greasy feeling, while the impure resembles fat. The freezing point of pure glycerin is near zero, while the impure may become solid at the same temperature as water. For the purification of glycerin, add ten pounds of iron filings to every 100 pounds of the impure liquid, and occasionally shake. In a few weeks, a black gelatinous sediment will settle and the supernatant liquid will be perfectly clear, and can be condensed by evaporation.

MALTIN.

A French chemist, Dubrunfaut, described, in 1868, a substance having all the properties of diastase, to which he gave the name maltin. According to his account, it possesses remarkable properties in promoting the fermentation of beer, and it has been strongly recommended in medicine. It is made by precipitating an extract of malt with tannic acid, filtering, washing well, and drying ready for use. Victor Griessmayer, reported in the Bavarian *Brewer's Gazette*, has been repeating some of the experiments of Dubrunfaut, and finds that although the aforesaid maltin possesses some of the properties attributed to it by its discoverer, it cannot be practically employed in brewing. He says: "Maltin is diastase of a decidedly platonic character." From these recent researches it would appear that the noise made about maltin is more in the nature of a trade speculation than of a genuine contribution to science, and that its medicinal character can probably be consigned to the same worthless category as its fermenting property.

"COSMOS."

Victor Meunier announces that *Cosmos*, so long conducted with such signal ability under his editorial management, and suspended during the siege of Paris, is to be discontinued, and in its place he will publish a weekly journal to be called *La France Scientifique*, the subscription price of which is to be ten francs per annum. The well known ability of the editor will ensure to subscribers a full return for the price of subscription.

A NEW ZINC PAINT.

M. Artus, connected with the Belgian Zinc Company, has prepared a zinc white, made up with silicate of potassa or soda and used to paint zinc and other objects. The material is something in the nature of a cement or artificial stone, and will withstand the action of the air, sun, and water. It can be employed to advantage on metal roofing, also on plaster, brick, and wood. Its chief value will be in rendering wood, paper, and tissues uninflammable, and for this purpose ought to be generally known. The value of the mixture for cements will also attract attention to it, and we shall probably hear of its extensive use as a constituent of artificial stone. The heat of rooms under roofs painted with this mixture was found to be 10° less than under the unpainted metal.

PRODUCTION OF BISMUTH IN SAXONY.

According to Wagner, it appears that Saxony produces 32,000 pounds of bismuth annually, and, as the yield of this metal in other countries is unimportant, Saxony rules the market of this article. A few years ago the pretended discovery of a method of making gold from bismuth led to the purchase of all there was in the market on the part of a credulous London firm. This produced considerable fluctuation in the price at the time, but as the firm were subsequently glad enough to get rid of their useless purchase at any price, the supply soon became abundant.

OXYGEN FOR PHARMACEUTICAL PURPOSES.

Dr. Baudrimont, in France, has published a lengthy paper on this subject. The author repeats the advice, long given by chemists, to calcine the black oxide of manganese previous to mixing it with the chlorate of potash, and to carefully pulverize the latter before mixing. He finds the proper proportions to be equal weights of these materials, and recommends the precaution of providing as wide tubes as possible, of washing thoroughly, of previously testing the chlorate, and of operating upon small quantities at a time.

A NEW REAGENT FOR COPPER.

The new reagent, proposed by Mr. Tamm, is obtained by

dissolving, in distilled water, equal weights of sulphocyanide of ammonium and bisulphite of ammonia. When this is added to a liquid containing copper, it immediately precipitates white sub-sulphocyanide of copper, as an insoluble powder readily washed; while scarcely any other metal is affected by it. It appears to us that this combination of a sulphocyanide with a sulphite is capable of application in photography and ought to be tried. Its value in separating copper from other metals appears to be well ascertained.

GASES ABSORBED BY COAL.

Ernst von Meyer finds that the gases absorbed by coal are chiefly the following: Carbonic acid, marsh gas, nitrogen, oxygen, and hydrocarbons. He publishes a table with the interesting statement that more nitrogen is retained by coal than any other gas. If it be true that anthracite coal absorbs more nitrogen than oxygen, we have the germ of an important application, as this method could be employed to effect the separation of the nitrogen from the oxygen in the atmosphere, and lead to a cheap way of making oxygen. It may be worth while for some one to repeat the experiments with a view to attaining this desirable result. We give below the table of gases found by Meyer inclosed in coal:

Carbonic acid	16·9	22·4
Marsh gas	20·4	22·3
Nitrogen	53·3	48·0
Oxygen	1·7	4·1
Heavy hydrocarbons	7·7	3·2
	100·0	100·0

[Special Correspondence of the Scientific American.

HOLLY'S SYSTEM OF FIRE PROTECTION AND WATER SUPPLY.

WASHINGTON, D. C., Nov. 11, 1871.

The most severe conflagration that ever occurred in New York city was that of 1835, and $20,000,000 of property were destroyed. The late fire in Chicago destroyed, it is estimated, $200,000,000. Lake Michigan and Chicago river encircled the city, but were as impotent to save it as were the exhausted firemen and broken engines. They only environed the awful scene or steamed under the falling cinders.

The property of the Chicago Fire Department cost about $700,000, of which sum the fire engines and auxiliary apparatus cost about one half. The annual cost of maintaining the department was nearly $500,000. The water works were admirable of their kind, and cost considerably over $3,000,000. They embraced the famous tunnel extending far out into the lake, and a large and handsome building within which powerful machinery lifts the abundant waters to the top of a stand pipe 136 feet high. The gravitating pressure of this column of water was relied upon as the power for supplying the ordinary demands of the city through more than 200 miles of street mains, and also to furnish, in case of fire, twenty steam fire engines through a thousand hydrants. Was this the best system of fire suppression Chicago could have had? Might she not have been spared this terrible affliction? Cannot water be concentrated on a burning building so promptly, and in such measure, as to insure the rapid extinguishment of the devouring element, even under the adverse circumstances of high wind and severe cold? These are questions now very anxiously asked.

On a recent visit at Saratoga, I took occasion to examine the new water works of that place, and found the apparatus and general arrangement to be the same as was introduced into Lockport, N. Y., in 1863, Auburn in 1865, and still more recently into thirty cities in ten different states: Buffalo, Binghampton, Dayton, Covington, Minneapolis, Cumberland, Atlanta, etc.

The reservoir at Saratoga is about a mile from the village, and is formed by damming a small but abundant stream; and I learned, to my surprise, that it is several feet below the average level of the main streets. Just below the outlet of the reservoir, and situated on a still lower plane, is the well built and tasteful structure containing the machinery; and a glance at its nature, large proportions, and superior workmanship is sufficient to answer some of the questions of an interested visitor. The whole is known as "Holly's System of Fire Protection and Water Supply," and consists of a series of powerful rotary forcing pumps, worked by turbine wheels below, driven by water from the reservoir, or by a massive steam engine, according as circumstances require. In this case the water power is sufficient during more than half the year. The simplicity of the system is apparent to any observer, and experience has shown its economy and efficiency.

Its leading feature consists in this, that, independently of what is called a "gravitation supply," whether from an elevated reservoir, or a stand pipe constantly filled from a source on a lower plane, the mains of a city can be supplied with water in exact proportion to the demand; and in case of a conflagration, a power of propulsion can be given far exceeding in steadiness and degree that attained by any other means. By combining, with pumps so admirably constructed and arranged, a hydrostatic pressure regulator, the whole is placed under such perfect control that in twenty seconds the pressure can be increased from the ordinary measure, say sixty pounds to the square inch, to double that amount, or even triple, if required.

A telegraph line connects the works with the headquarters of the fire department in the town; but aside from this communication, a most delicate and automatic one exists in the apparatus itself, for the opening of a single hydrant in the most remote street is instantaneously indicated by the regulator, causing, at the same time, a bell to ring for the information of the engineer. Just after the works were completed in July last, a fire broke out in a hotel situated between the Union and the Clarendon, seriously threatening both; and about the same time another fire started, several blocks distant, among very combustible buildings and material. The village itself was in great danger, and, when both fires were speedily brought under control, the citizens were of the opinion that the works had, on that one occasion, saved the entire cost, and that the three steam fire engines heretofore depended on could not have been equal to such an emergency.

The following are the more evident advantages of the Holly system:

1. Dispensing with all locomotive fire engines.

2. A gravitation supply not needed, nor even an artificial reservoir, where a lake or river is at hand. At Binghampton the water is drawn directly from the Susquehanna, and at Cumberland, Md., from the Potomac.

3. The water is applied to a fire much more speedily than in any other way, or as soon as a hose can be attached to a hydrant.

4. The water is thrown more rapidly, and from one fourth to one third greater distance than by a steam fire engine; and the stream is steady and not exposed to irregularities and failures from the effect of extreme cold or defective machines.

5. Every building can have within it an effective extinguisher, and every private hydrant and water cock becomes a fire engine, effective in proportion to its size.

6. The propulsion is so great that long hose can be used, even half a mile, with entire success.

7. The great reduction of insurance rates—twenty-five and even fifty per cent in some cases.

Mr. Holly has devoted himself for years to devising improvements in the construction of pumps and their application to fire prevention. The records of the Patent Office show at least ten patents issued to him, one as early as 1849. Wherever adopted, the system has proved valuable and effective.

Replaceable Pivots for Watches.

When, heretofore, watch pivots have broken from their stems or spikes, it has been customary to bore into the remaining end of the spindle and insert a new pivot into the socket thus prepared. The boring of the very small spindles is a matter of difficulty, requiring delicate handling. It often happens that the spindles or axles break out while being bored, or that the boring tools break off during the operation and remain in the spindles, thus making the latter useless. When this occurs, it is necessary first to soften the spindles for boring, and then reharden them, thus adding still more to the cost and difficulty of repair.

The invention of Mr. Simon B. Simon, of New York, consists in the production of repair pivots, having tubular sockets, so that they may be slipped upon the ends of the spindles or stems when required, thus dispensing with the necessity of boring the spindles.

Electric Pyrometer.

A most ingenious and valuable application of the known fact that the resistance of metals, to the galvanic current, increases directly as the temperature, has lately been devised in Germany, The resistance of a platinum wire having been determined, a cylinder of clay is surrounded with such wire, and covered with a tube of the same earth. The coil is connected with a two cell Daniell's battery, and also with an indicator for the determination of the resistance, and subjected to the heat of which a test is required. Such an instrument would be valuable in temperatures at which mercury would evaporate and glass melt.

HOW TO ACQUIRE A GOOD MEMORY.—We read too much and think about what we read too little; the consequence is that most of the people we meet know something, in a superficial way, about almost everything. Not a tenth part of what is read is remembered for a month after the book or newspaper is laid aside. Daniel Webster, who had a rich store of information on almost every subject of general interest, said that it had been his habit for years to reflect for a short time on whatever he read, and so fix the thoughts and ideas worth remembering in his mind. Any one who does this will be surprised to find how retentive his memory will become, or how long after reading an interesting article, the best portions of it will remain with him.

As daylight can be seen through very small holes, so little things will illustrate a person's character.

Inventions Patented in England by Americans.

From October 19 to October 30, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.]

ANIMAL TRAP.—W. H. Chase (of New York city), London, England.
HARVESTER.—W. F. Goodwin, Metuchen, N. J.
ORDNANCE.—N. Thompson, Brooklyn, N. Y,
PAPER BOX MACHINERY.—H. R. Heyl, Philadelphia, Pa.
PHOTOGRAPHIC PICTURES.—F. A. Wenderoth, Philadelphia, Pa.
PISTON, ETC.—S. L. Wiegand, Philadelphia, Pa.
PRESERVING WOOD.—N. H. Thomas, New Orleans, La.
ROVING FRAME.—E. P. Morgan, J. H. McMullen, York, Me.
SEWING MACHINE.—D. Mills (of Brooklyn, N. Y.), Aston, England.
STEAM PACKING.—G. M. Cruickshank, W. R. Smith, Providence, R. I.
TRANSMITTING POWER.—W. F. Goodwin, Metuchen, N. J.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.