It is thus seen that with the heavy oil, steam can be got up in about the same time as with coal; the combustion of the oil is not specially difficult to control; and that the consumption of oil, as compared with that of coal, is only about one half by weight.

It is stated that the fire brick used to line the furnace suffered severely from the intense heat, but the effect upon the tubes, c., of the engine do not seem to have been yet noted.

These experiments do not give much encouragement that liquid fuel will ever be adopted except in special cases. The price of such fuel could not be kept at its present figure were it in general demand for this purpose, and therefore its use would not probably result in any economy over that of the best coal.

THE ECONOMY OF STEAM ENGINES.

Many persons, using steam engines, fail to appreciate the value of inventions designed to produce economy of fuel. It is true that sanguine inventors and unscrupulous agents of stock companies often promise savings that cannot be realized in practice, but no one should condemn, wholesale, all devices of this character, because from lack of judgment he has been once deceived. Neither should he reject offered assistance because the promised savings are ridiculously large. All matters of this character should be decided on their merits. Some may be valuable though overrated.

The coal bills of a steam engine foot up rapidly, and a very small percentage of saving will pay for a great many improvements. It is easy to show that it is true economy to sell an old steam engine for scrap iron and purchase an improved engine at full market rates rather than pay for the extra coal required by the former. For instance, there are few engines working of the old style, regulating by the throttle valve, that furnish an indicated horse power for four and one half pounds of coal per hour. This is equivalent to say five pounds per hour for each net or effective horse power. An engine developing eighty net horse power would then require ($80\times5\times10=$) 4,000 pounds of coal per day, or say 4,200 including banked fires at night. This for a year, or 300 working days, would equal ($4{,}200\times300\div2{,}000=$) 630 tuns per year, which would cost, in many localities, upwards of four thousand dollars. Now, a new engine, with cut off adjusted automatically by the governor, of a size capable of furnishing economically eighty net horse power, costs from $4,000 to $4,500. So it is safe to say that engines constructed with no regard for economy, require yearly, for fuel alone, an expenditure of money equal to the first cost of a new engine. This would be true, also, in many places where fuel is cheap, if the original cost of the new engine were reduced by the sale of the old one, even for scrap iron.

From the above, then, it is evident that if the new engine saves only ten per cent of the fuel, this saving is continually paying ten per cent interest on the cost of the engine, while the work is being done the same as before. This is as good as most investments; but when it is considered that any engine, with modern improvements, will save thirty and even forty per cent of the fuel, as compared with the results above mentioned, the rate of interest becomes correspondingly large, and the engine is paid for by the saving in fuel in three years or less, or in four to five years when fuel is much cheaper.

Similar considerations apply with equal force to steam boilers, and to many of the details of construction of both engines and boilers. Any device that saves fuel saves money; and if it do not introduce complicated parts liable to derangement, it should be encouraged.

The simple feed-water heater is a good example of this, and saves on the average ten per cent of the fuel.

LIEBIG ON FERMENTATION.

Liebig has finally broken through the silence with which he has borne the attacks upon his theory of fermentation on the part of many chemists during the last ten years, and has come out with one of those exhaustive and convincing replies that recall the best days of his great intellect.

The reticence he has observed has emboldened some of the younger chemists to disclose weak points in their attacks, while others have looked upon the dead lion as a harmless creature, and have incautiously come too near his claws. All this small game is scattered like chaff before the wind with trifling effort, and the whole power and force of his argument is leveled at the French Academician and renowned champion of the new school, Professor Pasteur, of Paris.

For ten years Pasteur has had it his own way, and the views published by him have been fast gaining in popularity until they appeared destined to be accepted by a majority of scientific men everywhere. Liebig's paper is therefore a perfect bombshell in the camp, and as soon as the smoke has cleared up, and the fragments have been collected, we shall probably have about as nice a fight as has been witnessed among chemists for many a day. In the meantime we propose to give an analysis of what Liebig says in defense of his old theory of fermentation. It is difficult to make an abstract of so learned a paper, but we shall endeavor to render the subject intelligible to our readers.

Pasteur announced, nine years ago, as the result of his experiments, that Liebig's explanation of the action of yeast on sugar was entirely without scientific foundation.

According to Liebig, "a fermentable body is one which, by itself, or simply dissolved in water, does not undergo any decomposition, but when in contact with a putrescent body, is resolved into new products, or enters into fermentation. As fermentation is produced by the communication of motion from the atoms—not the molecules—of the putrescent body, to the atoms of the fermentable one, the process requires time; and the same is true of putrefaction itself. And as the ferment can only act so long as its atoms are in motion, so its power of exciting fermentation must cease as soon as its own decomposition is complete, and not before. Hence a given weight of ferment can only cause the fermentation of a limited quantity of sugar, or of any other fermentable compound."

On the other hand the views of Pasteur on fermentation are as follows:

"The chemical process of fermentation is essentially a phenomenon of life; it begins and ends with it; an alcoholic fermentation without simultaneous organization, growth, and development, that is, without continuous life, is impossible."

He regards fermentation as a chemical process accompanied by a physiological one; the duration of life of the ferment limits the splitting up of the atoms of sugar. Liebig says that there is nothing new in this view of the process. It was fully understood and explained by him in his chemical letters twenty years ago, and then, as now, he did not care to adopt it.

The action of ferments on fermentable bodies, says Liebig, is analogous to that of heat on organic substances. Their decomposition at high temperature is always the result of a change in the position of their atoms. Acetic acid is converted by heat into carbonic acid and acetone, just as sugar is split up by yeast into carbonic acid and alcohol; the carbonic acid resulting from the decomposition of the acetic acid contains two thirds of the oxygen, and the acetone all of the hydrogen, in the same way as the carbonic acid of the fermentation of sugar includes two thirds of the oxygen, while the alcohol contains all of the hydrogen.

The formation and increase of the yeast plant is dependent upon the presence and absorption of nutritious matter that develops the living organism; but in the process of fermentation there is an action independent of, and outside of, any products that the living organism can assimilate. The vital operation and the chemical action are evidently two phenomena, that in their interpretation ought to be considered separately.

To the opinion of Pasteur that the decomposition of sugar in the process of fermentation rests upon the formation and growth of the cells of the yeast plant, is opposed the fact that yeast will produce fermentation in a pure solution of sugar; and as yeast consists in the main of a substance rich in nitrogen and sulphur, also containing considerable quantity of salts of phosphates, it is difficult to comprehend how, in the absence of both of these constituents in the sugar, the growth of the plant cells can be promoted; and it would be equally difficult to explain how the beer yeast exerts the same decomposing action upon numerous other bodies as upon sugar.

Liebig has carried on an extensive series of researches in order to determine the action of yeast upon a great variety of substances, and he also cites the labors of the best chemists of Europe to show that his views of the action of yeast and leaven to produce fermentation is founded upon scientific principles, while the explanation of Pasteur is wanting in every element of theory and fact. It is so popular, not to say fashionable, to refer every vital action back to the formation of cells, and the building up of protoplasm, and to intimately connect life and matter together so as to gradually support the doctrine of spontaneous generation, that the publication of Liebig's great paper must be looked upon as a timely protest against the tendencies of the age. And it may serve as an intimation to younger men of science, anxious for fame, that the old methods of research are sufficient to furnish us with satisfactory explanations of the phenomena of nature without the necessity of having recourse to the supernatural or to the materialistic doctrines of the so-called protoplastic school.

The first part of Liebig's paper, which is all that has appeared, is devoted to fermentation; the second portion is to be occupied with the question of the origin of muscular force, and will be looked forward to by physiologists with great interest.

We shall not fail to inform our readers of the progress of the controversy, if anything practical grows out of it. A passage at arms between such men as Liebig and Pasteur cannot fail to attract the attention of scientific men everywhere, and it is not a little singular that the great German chemist should be ranged on the side opposed to the materialistic views so commonly attributed to his countrymen.

POSITIVE PHILOSOPHY.

The able exposition of the positive philosophy made by Prof. Fiske in his lectures at Harvard will do much toward clearing up many popular errors. As we have taken occasion once or twice to speak of those lectures in terms of commendation it may not be amiss to briefly state some of the prominent features of this system, premising at the outset that whatever we can say within the limits of an article like this must, of necessity, be of the most fragmentary and incomplete character. Evidently a system, the exposition of which in a university course of lectures compels the lecturer himself to condense to the exclusion of much almost essential to the clearest conception of his subject, cannot be discussed in a newspaper editorial. We shall therefore make no attempt at argument or illustration, and confine ourselves to giving, if possible, a glimpse of the fundamental principles upon which the system rests.

The first of these is the doctrine of the relativity of all human knowledge; by which is meant that all the human mind can either perceive or conceive, are the relations which do or may exist between phenomena.

Second, this system recognizes a limit to human knowledge and thought, and fixes the limit between the observation of relations and the attempted study of the essential nature of things.

It says you may find out the *how* of existence by experience and observation, but from the nature of the case it is impossible for the human mind to determine the *why*. You may perceive and classify phenomena, but the ultimate underlying causes you can never know because the human mind is incapable of forming any conception of such causes. You may see and feel the effects of what is called matter by the manifestation through it of what is called force, but both matter and force are merely names for the unknown and the absolutely unknowable. That these categories of existence are unknowable cannot, of course, be inferred from any knowledge of matter and force, since these are unknown; but from the constitution of the human mind, which cannot conceive the ultimate causes which these categories, matter and force include.

Hence it concludes that human study and knowledge must lie wholly this side of matter and force; must concern itself wholly with relations, manifestations, or phenomena; while the *noumena*, the ultimate causes, must remain a sealed book

Now as all phenomena may be made the subject of demonstration it follows logically that this test must be demanded by all thinkers of this school, for the establishment of all the *facts* of science, before any inferences are allowable. Before reasoning from an asserted phenomenon, it demands to *know* the existence of the phenomenon.

The positive philosophy maintains that whatever conflicts with our direct perception of relations cannot be admitted as true; as to conceive anything is to perceive clearly the relations it bears to other things, and the relations of its parts to each other. Thus no man can believe at one o'clock that at three o'clock it will be two hours earlier than at one o'clock; this conflicts with his direct perception of relations. Such a proposition is inconceivable, and therefore would be rejected as false by any sane mind.

But while the positive philosophy insists that fundamental facts shall be demonstrated (we use the term not in the mathematical sense) it does not exclude inferences from facts, or deny that there may be causes antecedent to all facts; it only denies the capacity of the mind to deal with such causes.

Finally, it makes a distinction between belief in the sense in which the term is most ordinarily employed, and *knowledge*, but upon this point we cannot do better than to quote from the third lecture of Prof. Fiske:

"A necessary truth is one of which the negation is inconceivable after all disturbing conditions have been elimnated.

"A belief of which the negation is inconceivable is necessarily true, within the limits of human intelligence.

"This test of inconceivability is the only ultimate test of truth which philosophy can accept as valid.

"By a singular freak of language, we use the word *belief* to designate both the least persistent and the most persistent coherence among our states of consciousness—to describe our state of mind with reference both to those propositions of the truth of which we are least certain and to those of the truth of which we are most certain. We apply it to states of mind which have nothing in common except that they cannot be justified by a chain of logical proofs. For example, you believe, perhaps, that all crows are black, but, being unable to furnish absolutely convincing demonstration of the proposition, you say that you believe it, not that you know it. You also believe in your own personal existence, of which, however, you can furnish no logical demonstration, simply because it is an ultimate fact in your consciousness which underlies and precedes all demonstration. So with the axioms of geometry. If asked what are our grounds for believing that two straight lines cannot inclose a space, we can only reply that the counter proposition is inconceivable; that we cannot frame the conception of two straight lines inclosing a space; that in any attempt to do so the conception of straight lines disappears, and is replaced by the conception of bent lines. We believe the axiom because we must believe it.

"It is only in this latter sense in which the word *belief* is employed in the canon of truth above stated, and when Mr. Spencer says that a given proposition is inconceivable he means that it is one of which the subject and predicate can by no amount of effort be united in consciousness. Thus that a cannon ball fired from England will reach America is a proposition which, though utterly incredible, is not at all inconceivable; but that a certain triangle is round is an inconceivable proposition, for the conceptions of roundness and triangularity will destroy each other sooner than be united in consciousness. And manifestly we can have no deeper warrant for the truth of a proposition than that the counter-proposition is one which the mind is incompetent to frame. Such a state of things implies that the entire intercourse of the mind with the environment is witness in favor of the proposition and against its negation."

The reader must not, however, be led to suppose that with the disciples of this any more than in any other system of philosophy perfect agreement exists. So long as human minds differ in character, so long there must be differences in opinion, but the fundamental doctrine of the relativity of human knowledge is the foundation of the system, and is now very widely accepted by the best thinkers.

A MILE A MINUTE.

C. P. L. writes from Minnesota, asking "Are railroad locomotives, with six and one half feet drivers, capable of exhausting fast enough to allow them to run at the rate of one mile in a minute?"

This question opens an interesting and somewhat disputed subject. Locomotives with drivers smaller than those men-

tioned have, in exceptional cases, run as rapidly as a mile in a minute, with moderate loads. Such speeds are, however, uncommon in this country, and though a few locomotives were used a while here with drivers seven feet in diameter, they were all changed, and the prevailing size is now from five and a half to six feet for passenger traffic. In England, however, where the average speeds are higher, locomotives have been made with drivers nine and ten feet in diameter, and many are still running which are seven feet and upward.

In order to attain a given power a large driver requires proportionately large cylinders, and consequently great weight. The general introduction of the link with its incidental steam cushioning, and the more general understanding of the principles involved in balancing the reciprocating parts, have made it possible to greatly increase the number of strokes per minute made by locomotive engines. This permits the use of smaller drivers, but at the same time makes it difficult to obtain a desirable area of port to prevent excessive back pressure. A port area one tenth that of the cylinders give excellent results for a piston speed of 600 feet per minute. It is difficult to make the ports larger than this, for the reason that the length can scarcely be more than the diameter of the cylinder, and an increase of width involves tremendous wear on the valve and links; so occasionally the above proportion of port has been used for piston speeds of 1,000 feet per minute, and the attendant disadvantages are believed by many engineers to be less than in the system based on very large drivers.

SCIENTIFIC INTELLIGENCE.

PREPARATION OF STRONTIUM.

Benno Franz prepares larger quantities of strontium by decomposing strontium amalgam at a low red heat in a current of dry hydrogen gas. It is best to perform the reduction in an iron Rose crucible with a perforated cover. To prepare the amalgam, heat sodium amalgam in a saturated solution of chloride of strontium to 194° Fah. (90° Cen.), and repeat the operation several times. Collect the product and dry between layers of blotting paper. The amalgam of strontium is more rapidly decomposed than the corresponding sodium or barium compound, and must therefore be carefully sealed up until ready for use.

Prepared in this way, strontium is a faintly yellow metal, similar to barium, and can be easily hammered to thin leaves. It oxidizes in the air very rapidly; if held in the hand it evolves heat to such a degree that it soon becomes necessary to drop the metal. It burns in the air with intense light and remarkable scintillations. It fuses at a gentle red heat, and is not volatile at a clear red heat. The specific gravity of the metal is 2·4.

RED DYE FOR LEATHER, IRON, WOOD, ETC.

M. Pushner recommends picric acid for this purpose.

Dissolve 4 grammes picric acid in 250 grammes boiling water, and add, after cooling, 8 grammes aqua ammonia. For the second bath, dissolve 2 grammes of crystallized fuchsine in 45 grammes alcohol, and dilute with 375 grammes hot water, and finally add 50 grammes of ammonia. As soon as the red color of the fuchsine has disappeared, mix the two baths and immerse the articles to be dyed. For ivory and bone the bath ought to be made slightly acid with nitric or hydrochloric acid. On adding gelatin to the bath it can be used as a red ink.

RECOVERY OF OXALIC ACID FROM MADDER.

Madder contains considerable oxalic acid in combination with lime, which is set free by the hydrochloric and sulphuric acids employed in the extraction of the coloring matter. By conducting the acid after the removal of the dye into water saturated with milk of lime, we shall obtain a voluminous precipitate of the oxalate of lime. This can be again decomposed, by an equivalent proportion of sulphuric acid, and after filtering off the sulphate of lime, the oxalic acid can be recovered by evaporating in leaden pans and afterwards purifying by successive crystallizations.

IF THE EARTH WERE TO STAND STILL.

If the revolution of the earth on its axis were to be suddenly stopped, the temperature of everything would be raised to such a degree as to be incapable of existing in any other form than vapor. When a bullet strikes the target it becomes so hot that it cannot be held in the hand. Its velocity is at the rate of 1,200 feet a second, but what must be the heat produced when a body like the earth, moving at the rate of 90,000,000 feet a second is suddenly arrested! It would soon be converted into a sea of fire and all life would become extinct.

It is not probable that this catastrophe will take place in our generation, but as the light of the sun is said to be due to the combustion of worlds in its atmosphere, our time may sometime come to add fuel to the flames.

PURIFICATION OF GLYCERIN.

To purify glycerin which has been for sometime in use, add 10 pounds of iron filings to every 100 pounds of the impure liquid; occasionally shake it and stir up the iron. In the course of a few weeks a black gelatinous mass will collect on the bottom of the vessel, and the supernatant liquid will become perfectly clear, and can be evaporated to remove any excess of water that may have been added to it.

The employment of glycerin to improve the taste of wine is now very extensive. It is preferred to sugar for the reason it cannot be fermented. Hence the necessity of having a perfectly pure article.

OZONE.

This mysterious element appears capable of many uses, and a way to make it in large quantities and at reasonable rates, would be welcomed by a large class of manufacturers.

At a recent meeting of the Lyceum of Natural History in New York, Mr. Loew exhibited a method by which it was claimed that ozone could be obtained in any quantity. He assumed that during a certain stage of the combustion of gas, ozone was generated which was afterwards destroyed in the upper part of the flame. By tapping the cone of light at the right point, we can draw off the ozone. This was accomplished by blowing through the flame of a Bunsen burner and collecting the product in a long glass jar. In this way sufficient gas was collected in the jar to show by its odor and by the usual tests that ozone was present. This method of obtaining ozone is entirely new, and if it should prove to be practicable, will be an important discovery.

It has recently been discovered that if picric acid be projected into a jar of ozone, an instantaneous explosion takes place. This is certainly a curious and unexpected reaction and may lead to new applications of ozone as an explosive agent for powders prepared for the purpose. The whole question of the existence and properties of ozone is still very obscure, and now that the author of the leading researches upon it, Professor Schoenbein, is dead, we must patiently wait for some new investigator to take up the subject.

PATENT OFFICE DECISIONS.

SEED PLANTER.

In the matter of the application of D. W. Hughes for the extension of letters patent granted to him for improvement in hand seed planters Nov. 20, 1869.—Applicant is the inventor of a cheap, simple, and useful device for planting seed by hand.

The novelty of this device is sufficiently established, and the utility is evident. During the seven years that applicant made use of his invention by manufacturing and selling the planters, he realized a net profit of some $12,000. It appears that a large number of machines have been manufactured without his consent, the royalty upon which, at the rates which he established would amount to about $12,000 more. If the seven years, during which time he received nothing from his patent, had been diligently employed, and proper precautions had been taken against infringers, the patentee would doubtless have been able to realize a profit of from between $50,000 and $100,000 from his invention. The years of the war were the harvest time of the manufacturers of agricultural implements. As stalwart farmers were metamorphosed into soldiers, wood and iron were transmuted into farmers.

The applicant now seeks an extension of his patent for seven years, in order to regain the seven lost years of his original term. It becomes important, therefore, to inquire how these seven years were spent. Since the patent was never sold, but has been, from first to last, in the hands of the patentee, the burden is on him to show that the benefit which he might have derived from the use of his invention during half of the life time of his patent was not lost through any fault or neglect of his.

Applicant was a machinist. He resided in Palmyra, Missouri, and carried on the manufacturing of these implements. In 1856, he sold of these planters 100; in 1857, 800; in 1858, 1,500; in 1859, 2,000. Here was a rapid increase of sales, and every indication of a growing and prosperous business. In 1860, however, applicant concluded to abandon this business, and to go into mining in New Mexico. This he did, leasing his patent to a firm in Palmyra for one year.

Upon the breaking out of the war, he returned to the States, to make some purchases for his mines. He appears to have made no inquiry after his lessees or their business; but shortly afterward, under pretense of a desire to communicate with New Mexico *via* Texas, he voluntarily went, by way of St. Louis, Louisville, and Nashville, to Memphis, Tenn., which city was at that time in the hands of the enemy. At that place he went to work in a gun factory, but presently departed for Jackson, Miss., where he was engaged "most" of his time "in making, altering, and repairing patterns of different kinds, such as cotton presses, machinery, ordnance stores, cannon castings," etc., understanding that he was, by virtue of his employment, exempt from conscription.

About six months before the taking of Jackson by the United States forces, applicant went to Montgomery, Ala. His principal reason for leaving was, that he "expected Jackson would be taken, and there would be some fighting." He adds, "I feared getting hurt." In Montgomery, he engaged in manufacturing machinery on his own account, and by his machinery making castor and peanut oil. Subsequently he manufactured artificial limbs. After the war, there being no more danger of getting hurt, he returned to Jackson, where he remained until 1867, when he came North, and in 1868 and 1869 again made and sold his planter.

Once, and once only, during the war, he attempted to leave the South. He walked up the railroad, how far he does not say, when, finding he could not, within the enemy's lines, exchange their currency for United States notes, he "turned back, and concluded to remain, until the war was over."

It is only necessary to state, in order to complete this story, that applicant's father and brother, finding this abandoned invention lying idle, took it up, upon their own responsibility, and manufactured about one thousand machines per annum, and made money at it, while the owner of the patent was turning gun barrels, and repairing patterns for ordnance stores and cannon castings, and manufacturing artificial limbs for his country's enemies.

He now asks that that country may be taxed for seven years more, to enable him to reap from this invention the profit which he lost while endeavoring, to the extent of his ability, to destroy the Government whose favor he invokes. The novelty of the demand to be paid, in this form, for his services to the enemy, is only equaled by its effrontery.

The extension is refused.

SAMUEL S. FISHER, Commissioner.

PAVEMENT.

In the matter of the application of Louis S. Robbins for letters patent for improvement in street pavements.—This invention is alleged to consist in a new form of block for wood pavements.

Before the invention of applicant various forms of block had been used, the purpose of which was to provide a channel between the blocks at the top, and extending about half way down, which should be filled with concrete, and, by interrupting the surface of the pavement, form a foothold for the feet of horses.

One of these forms was made by cutting a piece from the upper half of the block on opposite sides, so as to form a shoulder, and so that, when two blocks were abutted, the lower halves would be united to form a solid foundation, while a channel would be formed between the upper halves of double the width of the shoulder upon each of them. This was illustrated in Stead's English patent, and Perkin's rejected application.

Another form was that shown in the patent of Nicolson, Long blocks and short blocks were placed in alternate rows, so that the base was solid as before, while a channel was formed between the upper portions of the long blocks.

Applicant forms a shoulder upon one side of the block only. His block is one half of Stead's block, or Stead's block represents two of his placed back to back. He places the blocks in rows, so that he obtains the usual solid base and channel near the top.

In all these cases the concrete is poured into the channel or space between the upper portions of the blocks, and rests upon the solid shoulder; or, as in Nicolson's case, upon the top of the short block. The space between the blocks is, in Stead's case, in the center of the channel; in Nicolson's, on both sides of the channel; and in applicant's, on one side only.

Here are slight differences in construction, but identity of principle. All of these blocks accomplish the same purpose in the same way, or substantially in the same way.

This is not the case of a difference of form involving a new mode of operation. It is a mere difference in the mode of constructing a channel, which, when made, is of the same form as those already well known. The duplication of the shoulder in the block would not have been an invention, and I do not think the omission of one shoulder involves more thought, or a higher quality of thought, than the addition.

The decision of the Examiner-in-Chief is affirmed.

SAMUEL S. FISHER, Commissioner.

UMBRELLA.

In the matter of the application of R. O. Lowry for letters patent for improvement in umbrellas.—The applicant states as follows: "The object of my invention is to produce an umbrella that will neither absorb water nor lose its colors. To accomplish this, I first make my umbrella water-repellent and fast-colored, or either, by means of the application thereto of soap, or of soap and gelatin, in combination with alum, or sulphates, or acetates alone, or with salt or other substances having a saline quality.

"What I claim is, an umbrella having its cover made water-repellent and fast-colored, or either, by means of the application thereto of soap, or soap and gelatin, in combination with alum, or sulphates, or acetates alone, or with salt or other substances having a saline quality, as herein described."

The reference is to a provisional specification No. 542, of 1857, in England. As no patent was granted, the objection cannot be that the invention has been pretented abroad, but that it has been described in a printed publication.

This invention was for an improvement in umbrellas, by the use of a peculiar fabric. "For this purpose the weft used is of single yarn, produced from dressed or hackled silk waste, dyed by preference in the hank, sliver, or rove. The warps are of cotton or linen yarn, by preference doubled, or what is called lace cotton yarn, suitably dyed. These warp yarns are put through a solution of what is known as aluminous soap, to give the same a resisting power against rain [etc.]."

Applicant, in argument, states that his process consists in treating the entire fabric first with soap, and afterward with alum, or sulphates, etc. In this way he claims that the soap becomes curdled, or a compound is formed insoluble in water, which renders the umbrella water-repellent. He argues that the aluminous soap referred to in the reference is so vaguely described as to be incapable of identification, and insists that if it was a soap as stated, it must have been soluble in water, and must have attracted the water instead of repelling it; that the language, "put through a solution of what is known as aluminous soap," in no way describes his process, nor could such manipulation have produced the result at which he aims.

There would be great force in this position if applicant had described his process in his application as he does in his argument. I am inclined to think that the term "aluminous soap" in the reference, does not import a treatment of the fabric first with soap and then with alum, nor do I believe, the result of the two modes of treatment would be the same.

But applicant, in the actual description of his process, is as wide of the mark as the English specification. The substance of his entire description is that he makes his umbrella water-repellent by means of the application thereto of soap, in combination with alum. Now, would any one infer from this language that he meant to treat his umbrella first with soap, and then with alum? I think not. If sufficient alum were added to curdle the compound, before application to the umbrella, it could not be applied at all. The only fair inference would seem to be, that so much alum only was to be combined with the soap as not to destroy the quality of the article as soap; in other words, to use "aluminous soap" like the Englishman.

In view of this description of the process, I think the reference was pertinent.

The decision of the Board of Examiners-in-Chief is affirmed.

SAMUEL S. FISHER Commissioner.

NEW BOOKS AND PUBLICATIONS.

A TREATISE ON ASIATIC CHOLERA. By C. Macnamara, Surgeon to the Calcutta Ophthalmic Hospital. London: John Churchhill & Sons, New Burlington street. Calcutta and Bombay: Thacker, Spink & Co.

This work is a large octavo, embodying conclusions drawn from fifteen years' experience and practice in the endemic area of cholera. The work commences with a definition and description of the disease, its various forms, and the modes by which it is transmitted. This is followed by an historical account of cholera, containing particulars of the most destructive epidemics on record, with their bearings on the etiology and mode of propagation of the disease. The geographical distribution of the disease is next given, with the countries hitherto exempt from it. The important subject of meterological influences, as influencing or retarding the spread of the disease is next discussed, and forms a most interesting and valuable portion of the work. The characteristic features of Asiatic cholera, post mortem conditions of the bodies of those who have died at various stages of the disease, the etiology of cholera, and, finally, its symptoms and treatment are discussed at length. The latter discussion includes the consideration of preventive measures, based on the laws of communicability of cholera, quarantine, purification of water, and disinfection. This work is an important one, and will, doubtless, become an accepted authority upon the subject of cholera.

TOWNSEND'S FOLDING GLOBE. Patented February 16, 1869. Manufactured and sold by Dennis Townsend, Felchville, Windsor county, Vt.

This is a novel and ingenious invention and publication, designed to place a cheap and convenient substitute for the revolving globe. The surface is composed of ellipsoid segments, the edges of which are attached to each other by tapes, and the whole may be flattened together so that it may be placed within the covers of a book. When it is desired to use it by drawing upon small rings inserted at the poles the whole assumes the globular form, presenting to view seas, mountains, continents, and other geographical features of the globe.

NATURAL HISTORY OF THE HUMAN RACES, with their Primitive Form and Origin, Primeval Distribution, Distinguishing Peculiarities, Antiquity, Works of Art, Physical Structure, Mental Endowments, and Moral Bearing. Also, an Account of the Construction of the Globe, Changes of its Surface, Elevations of its Mountains, and Subsidence of Land; together with other interesting matter. Illustrated by Colored Plates of each Type. With numerous Engravings representing their varied forms. By John P. Jeffries. One volume, 8vo; pp. 380; cloth. Price, $4·00. Published by S. R. Wells, 389 Broadway, New York city.

This book contains a great deal of rare and valuable information concerning the history of our race, and in respect to which the mass of mankind know but very little.

THE MEDICAL ADVISER. A Full and Plain Treatise on the Theory and Practice of Medicine, especially adapted to Family Use. By Rezin Thompson, M. D., Member of the National Medical Association, and author of "Thompson on Fever," etc. Chicago: Jones, Jenkins & Co.

We have received from the National Publishing Company specimen pages of this book. It promises to be a hand-book of useful sanitary information for domestic use. It is to be illustrated with engravings representing parts of the human anatomy, botanical specimens, parasites peculiar to certain diseases, etc., and gives plain and simple directions for the treatment and prevention of ordinary diseases.

PHOTOGRAPHIC MOSAICS FOR 1870. Philadelphia: Benerman & Wilson.

We advise every photographer to supply himself with a copy of this admirable little book. It is a complete record of the progress made in the art during the past year, and contains many valuable recipes and instructions.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

WOOD-BENDING MACHINE.—James W. Martin, Philadelphia, Pa.—This invention relates to a new and useful improvement in machines for bending wood, designed more especially for bending handles of umbrellas, parasols, and canes, but applicable to many other purposes.

STEAM ENGINE.—J. E. Culver, Hudson City, N. J.—This invention relates to a new high pressure engine, which can be worked either by steam alone or by water and steam combined.

COMBINATION TOY.—Robert Went, Williamsburgh, N. Y.—This invention relates to a new and useful improvement in a combination toy, and consists in operating (on two wheels which revolve on an axle) a revolving swing and revolving horizontal tables, both swing and tables being designed for any figures representing children, birds, or animals.

MACHINE FOR FORGING AUGER BITS BY MEANS OF ROLLS.—James Swan Seymour, Conn.—This invention relates to a new and useful improvement in a machine for forging or forming the tips or cutting ends of auger bits.

PUMP.—Morgan P. Hall, Gayville, Ill.—This invention relates to a new and useful improvement in pumps for raising water and other liquids.

SELF LOCK FOR BASEMENT GATE.—James A. Clark, New York city.—This invention has for its object to furnish an improved lock for basement gates, which shall be so constructed and arranged that it can not be opened from the outside of the gate and will always lock itself when the gate is closed.

SPOKE-SMOOTHING MACHINE.—Horatio Keys, Terre Haute, Ind.—This invention consists of an improved arrangement of apparatus for slowly moving the spoke held in centers at the end lengthwise along, and turning it in contact with a polishing belt moving rapidly across it, the said apparatus being guided by a pattern to move the spoke to or from the belt according to the variations in the shape of the said spokes, so that the pressure against the belt will always be the same and the effect thereby rendered uniform. The invention also comprises a certain means for reversing the movements of the spoke carrying devices, for moving the spokes longitudinally back and forth; also, certain means for throwing the spokes away from contact with the belt at the end of each longitudinal movement, and for automatically stopping the longitudinal movements at the end of the same in each direction.

FLOUR BOLT.—A. J. Dibble, Franklin, N. Y.—This invention consists in the substitution of coarse oil cloth at the tail end for the silk commonly used thereat for separating the tailings from the bran, and in the addition hereto over the said wire cloth and on an enlarged portion of the reel, of