air to the exterior of the flame. The wick carrier, D, Fig. 2, page 355, is formed of two concentric shells connected by ribs, and the outer shell, Fig. 3, isspecially grooved, in order that it may fit the projecting thread on the pipe, C. The central air pipe, A, has a groove extending longitudinally along its outer surface, and the inner shell of the wick carrier has a projection which fits in said groove. The carrier is thus prevented from turning when the pipe, C, is rotated to elevate or depress the wick. The direction of the air currents toward the flame is indicated by the arrows.

In applying the cylindrical wick to the burner, the part intended to project below the ribs of the wick carrier is slit to allow of its passage. This does not impede the flow of fluid through the wick or affect the flame. It is claimed that perfect combustion of the fluid is accomplished, and a brilliant white light produced, free from smoke and unpleasant odor. Patented March 26, 1878. For further particulars relative to manufacturing on royalty, address the inventor, Mr. Charles M. Lungren, 708 Lexington street, Baltimore, Md.

GAS MOTORS.

The name of gas engine is now generally applied to any motor wherein a detonating mixture is employed as a source of power. This mixture is commonly composed of air and illuminating gas in proportions varying between extended limits, starting from seven parts air to one of gas, this ratio furnishing the necessary oxygen to consume the combustible elements. The effect of the heat suddenly produced at the moment of inflammation is to expand the gaseous products of combustion, increase their pressure, and render them capable of exerting considerable effort. The temperature after explosion depends upon the composition of the mixture. Gas motors have many points of similarity to steam and hot air engines, as in all the movement is due to the expansion of a gaseous fluid, the essential differences residing in the manner in which heat is communicated to the intermediary agent. While in the steam engine the heat is devoted to the transformation of water into steam in an exterior apparatus, and in the hot air engine the dilatation of air is produced in a furnace independent of the cylinder; in the gas engine the heat is developed within the cylinder itself, and in the midst of the gaseous mass which serves as the motor fluid. The energy is produced at the moment needed, and there is no storing up of heat. Hence it will be seen that the gas engines find a special applicability in cases where continuous work is not required.

Simple as is the principle of the machine, its practical realization is a complex difficulty. The heat developed by the inflammation is rapidly communicated to the air in excess and to the products of combustion, so that instead of a gradual expansion an explosion takes place, the violence of which cannot be reduced by augmentation of the air cushion. Hence the sudden shocks incompatible with the regular and equable motion which the motor should have. In addition to this obstacle is the rapid heating of the cylinder, and consequent radiation of heat which is thus lost.

The first successful gas engines made abroad were those of Hugon in 1858 and Lenoir in 1860. The Otto & Langen machine, subsequently constructed, reduced considerably the expenditure of gas, but it was insupportably noisy, and therefore came into no extended use. Of the most improved gas motors existing abroad at the present time, M. Armengaud gives full details in a paper recently read before the French Société des Ingénieurs Civils. In the Lenoir engine the mixture of gas and air is admitted into the cylinder at atmospheric pressure, which is maintained until the piston has made half its stroke; the admission of a spark determines the explosion. In the new systems of Otto and of Simon, the detonating mixture is compressed first; and exploded by an ignited gas jet when under this pressure. The inflammation is thus gradual, and a progressive explosion is caused. Without going into the details of the separate machines, it will suffice here simply to point out the essential features. In the new Otto engine the piston advancing first draws in the mixture of gas and air. The valve is then shut and the piston returns, compressing the mixture (to about two atmospheres). As soon as the end of the stroke is reached a gas jet ignites the compressed gas, and the piston is thus caused to advance. On the return stroke, the cooled and expanded products of combustion are driven out. An important feature is the arrangement of the valve, so that at first a mixture of 15 parts of air to 1 part of gas is admitted, and afterwards one composed of 7 parts of air to 1 of gas, this causing slow or retarded combustion, the more explosive material being nearest to the gas flame at the moment of ignition. The loss of heat due to radiation in this engine is stated to be but 42 per cent as against 85 per cent in the Lenoir machine, and its efficiency three times as great. The expenditure of gas does not exceed, the inventor says (in high power machines), 23·9 cubic feet per horse power per hour.

The Simon engine, while based on the same principles as the foregoing, is differently constructed. The compression of the mixture is done in a separate cylinder, and the air and gas, after compression, are led to the motor cylinder. There the mixture at once meets an ignited jet, which inflames it. It does not enter the cylinder, however, all at once, but in small quantities, which are successively ignited, thus determining true gradual expansion. The heat developed is small, and a very limited quantity of water prevents overheating of the cylinder. The movement is regular and even. According to M. Simon, the expenditure of gas is 17·6 cubic feet per horse power per hour.

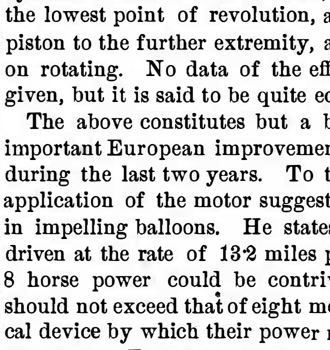
The Bisschop engine belongs to that mixed class which utilize the explosion to cause the ascent of the piston, and atmospheric pressure to determine its descent. The chief advantage of the machine is the mechanical arrangement, which allows of high piston speed. No water is used for cooling, this being effected by radiating surfaces representing five times the exterior surface of the cylinder. Up to the present time only small engines of this type have been built, chiefly suited for running sewing machines. According to M. Armengaud, the cost of operation is 2 cents per hour for the $\frac{1}{16}$ horse power, and 5 cents per hour for the $\frac{1}{8}$ horse power machine.

In the Ravel engine, the explosive force of the mixture is employed to move the piston, which is inclosed wholly in the cylinder, motion being taken from the cylinder and not from the piston, a paradoxical arrangement easily understood from the following. In each end of the cylinder is a chamber where explosion takes place, and the cylinder itself is hung on trunnions, which rest in journals, and which, prolonged, carry the pulley from which the power is taken. When the gas is exploded by a flame, the piston is driven to the opposite end of the cylinder. Its weight at the extremity then causes the latter to overbalance, and hence the cylinder rotates on its trunnions; as soon as that end reaches the lowest point of revolution, another explosion sends the piston to the further extremity, and thus the cylinder keeps on rotating. No data of the efficiency of the machine are given, but it is said to be quite economical.

The above constitutes but a brief summary of the more important European improvements made in the gas engine during the last two years. To these may be added a new application of the motor suggested by M. Dupuy de Lôme in impelling balloons. He states that his balloon could be driven at the rate of 13·2 miles per hour if a gas engine of 8 horse power could be contrived, the weight of which should not exceed that of eight men *plus* that of the mechanical device by which their power might be applied to a rotating shaft. The volume of the gas in his balloon is 121,926 cubic feet, the expenditure of which, supposing a portion were used to drive the engine, would be but 282·4 cubic feet per hour, or only about $\frac{1}{431}$ part of the total contents. During his experiment of February 2, 1872, M. de Lôme remained two hours in the air, using a propeller driven by hand. With the engine he might have traveled 26 miles in this period. For flying machines where large volumes are to be avoided, detonating mixtures of oil vapor and air would probably be found better suited as the source of power.

New Inventions.

Mr. Jonathan Miller, of Trenton, N. J., has made several improvements in Apparatus for Making Extracts, such as coffee, tea, etc., pursuant to the method patented by him May 2, 1876, one of which consists in providing a floating cover over the liquid to prevent evaporation, and the others tending to make the mechanical details more convenient.



The accompanying illustration represents a convenient Ironing Table, in which the ironing board proper is hinged and pivoted in such a manner that one end may be raised and turned to one side, for convenience in ironing shirts and similar garments. A hinged tray or extension is pivoted to the frame, serving to hold the water cup, sponge, hot irons, etc., and since it remains horizontal, whatever the position of the ironing board proper, there is no danger of such articles being overturned. Patented April 16, 1878, by Mrs. Emily A. Hill, of Princeton, Ind.

An ingenious Revenue Registering Device, the invention of Mr. S. J. Tucker, of Richmond, Va., is one of the results of the new liquor law of that State. It is intended for registering alcoholic drinks, but is applicable to other counting purposes. The mechanism for causing a full movement of the numbered disks and preventing them from being turned backward is complete, and in addition to the usual bell, a polygonal roller having faces of different colors is made to rotate so as to exhibit a new face through the outer case each time the revenue account is increased.

Mr. Wm. Riker, of Newark, N. J., has invented an improved Process of making Finger Rings, by which with few manipulations he is enabled to produce a solid gold ring having inlaid designs of different colors of gold, while its groundwork, edges, and internal periphery are of uniform color and quality.

An improvement in Boot Uppers has been patented by Messrs. S. W. Allen and Isaac Cook, of Tonica, Ill. The object is to furnish boots which will not wrinkle or shrink, which will enable the leather to be cut with less waste, and which will not need to be crimped. The forward part of the leg is made in two pieces, seamed to each other at their forward edges, and seamed at their lower ends with a lap seam to the vamps.

Mr. F. Feike, of Middletown, Mo., has invented an improved Fence, to be used in the beds of streams and rivers, which is claimed to resist the action of floods, and which may be cheaply and easily constructed. It consists of a number of slats or bars supported by suitable framework so as to present an upwardly inclined surface to the current.

In a new device for Fastening Bottle Stoppers, patented by Mr. G. F. Outten, of Norfolk, Va., the stopper is stiffly fastened to a sliding bail, and the lower end of the latter is connected with a stationary collar about the neck of the bottle by a pair of toggle arms, whose middle joint is thrown in, to lock the stopper down, or out to allow the bail to be slid up to disengage the stopper, a lever latch being employed to throw the toggle out, and a guide link being employed in connection with the bail to cause the latter to move to its proper position when the stopper is removed.

An improvement in Cigar Moulds, made by Mr. G. W. Hamilton, of Fredericksburg, Va., consists in casting the matrices in two parts, and in holding them together upon the bed plate by means of elastic blocks, which allow them to yield slightly when the dies descend. The invention further relates to the use of a temporary binder for wrapping the tobacco and for lining the moulds, and preventing contact of the tobacco therewith. The ends of the matrices have flanges for the purpose of securing them to the bed-plate.

Mr. W. Parkin, of Taunton, Mass., has patented a convenient Beverage Holder, for ice water, coffee, tea, etc., which is adapted for use on family dining tables or in restaurants. It is a vessel of cylindrical form and ornamental appearance, provided with a pump, and also having a lining or inner cylinder, between which and the shell of the holder is a dead air space to prevent the conduction of heat.

A simple Self-Lighting and Extinguishing Lamp, invented by Mrs. E. G. Haller, of Philadelphia, Pa., is constructed upon the general principle of utilizing a self regulating hydrogen gas generating apparatus provided with a stopcock and vent tube, arranged in the burner so that the flame from the vent tube serves when ignited to ignite the wick. The ignition is effected by the peculiar property of "spongy" platinum, and the apparatus is so simplified as to be convenient in use.

Mr. Z. N. Morrell, of Luling, Tex., has devised a portable Fire Proof Lint Receiver for the lint discharged from cotton gins. This lint is so combustible as to cause frequent accidents. The receiver is rectangular, constructed of sheet iron, and provided with doors, one of which is adapted to close automatically when the receiver is removed away from the gin. The body of the receiver rests upon a wheeled platform, to which it is secured by iron bars or rods passing through brackets affixed to the top of the receiver, so that they will support the top and prevent collapse of the receiver, in case it becomes red hot from ignition of the lint.

An improved Curry Comb, recently patented by Mr. L. A. Griswold, of Marshfield, Ohio, is made double, and is so constructed that the combs may be exchanged, thus forming four curry combs in one.

Mr. T. C. Thompson, of Evanston, Ill., has invented an improved Gaff for Vessels, which is provided with an end socket having locking devices to secure the gaff to the boom when lowered, thus preventing chafing of the sail.

In a new Pen, patented by Mr. W. M. Prince, of Pittsfield, Mass., there are two distinct nibs, which are so arranged that the same amount of pressure upon both nibs will produce a heavy and a light line, for convenience in ruling.

Mr. J. Homrighous, of Royalton, Ohio, has invented an improved Burial Casket, which is capable of being adjusted with facility to the required length. It is made in two parts, of which the foot section, being smaller than the other, is adjustable to a certain length in the head section, and the parts are connected by side and bottom screws.

A Coin Pocket Book, patented by Mr. A. L. Thurston, of West Salem, Wis., is formed with a flat frame, having recesses corresponding to the different denominations, and spring-cushioned caps moving in the recesses and working in connection with catches, which retain the coins at one side, but allow them to be slipped out easily at the other.

BOILER CORROSION.

There is an evil which is very often confounded with, or improperly considered in connection with, the formation of scale or crust in boilers. This evil, perhaps of equal magnitude, but proceeding from entirely different causes, is corrosion.

As it very frequently attacks the external surface of boiler plates, it can readily be seen that it is not always inseparably connected with impure feed water, and as it is perhaps most marked in conjunction with the use of so-called "pure natural waters" (that is, those leaving no solid residue on evaporation and having no action on test paper), it will be seen that to rush blindly into the use of such "pure" waters as a remedy for incrustation is not always safe.

Careless setting in too much lime (perhaps impure lime) often badly corrodes the plates of land boilers externally. This trouble calls for very simple prevention. Where the foundations are too damp and undrained, moisture sometimes reaches the plates through the lime or through the ashes. As ashes frequently contain strong alkaline salts, they can by long cold contact, if moist, badly corrode the plates.

It is known that when wood or soft coal is imperfectly burned, there is a distillation of pyroligneous acid; and by injudicious use of wood in starting fires, or by too heavy charging of coal, such distillation may take place, the soot in the flues and tubes becoming so impregnated with acid as to attack the metal. Even the fine dust of ashes, containing sulphuric acid derived from the pyrites in the coal, may produce the same effect.

Where brass cocks or connections are bolted to or screwed into the boiler shell, there is often corrosion caused by galvanic action, there being the essentials of a galvanic series—an attacking fluid, and two metals unequally attacked by a fluid. This action is intensified by the heat, and by any leak which may exist.

All these troubles exist on the outside—that is, the "fire" side of the boiler. Inside, the influences are more complicated, mysterious, and serious; but reason and experiment will baffle them.

Now sea water corrodes iron and steel plates quite rapidly, dissolving in a month 105·31 grammes of steel from a plate 40 centimeters square; and in the same time 99·30 grammes from an iron plate of the same size. Iron kept in water containing carbonic acid gas oxidizes rapidly with escape of hydrogen gas, proving the decomposition of the water, apparently by galvanic action, or rather by what is called catalysis, where one element, not itself attacking another, causes a third to do so. Dry oxygen does not corrode bright steel or iron; damp oxygen slightly corrodes them. Dry carbonic acid has no action thereon; damp carbonic acid forms a white carbonate of iron on them. Dry carbonic acid and oxygen have no effect, while damp carbonic acid and oxygen have a very rapid oxidizing action.*

Distilled water, free from air or gases, does not corrode iron, it being very difficult to get a bright blade immersed therein to do much more than slightly spot with rust; and careful examination of these spots generally shows at each point an impurity in the iron sufficient to induce a galvanic current, just as a piece of zinc or copper placed against the iron would do. Trying lead plates, it is found that while distilled water free from air eats off in two weeks, from a square meter of surface, only 1·829 gramme, the same quantity of the same water aerated dissolved away 110·008 grammes.†

The presence of chlorides of magnesium, ammonium, sodium, potassium, barium, and calcium dissolved in water largely increases its rusting action on iron. The magnesium chloride is the most active of any one of these; but in conjunction with lime carbonate is also active; as are mixtures of the calcium chloride with that of sodium or of barium.

The chloride of magnesia solution is of all these, however, about the only one that attacks iron at 212° Fah. when there is no air present.

Considerable trouble is often caused where the injection condenser is used, and the condensed water contains slight quantities of lime and magnesia salts, which, at say 150° Fah., form soaps with the grease brought over from the cylinders, etc. At higher heats these soaps decompose into free fat acid (generally oleic), and a basic lime soap, which at still higher temperatures may be carbonized. The soap adheres to the boiler surfaces, and the acid attacks the iron, which darkens the scale.

Even if there be no salts brought over, the destructive distillation of fatty matters is, while giving no scale, none the less injurious and destructive than in the case last cited.

Where the water contains lime and magnesia salts and fat acids, the remedy is lime water and caustic soda, which remove both the fat acids and the magnesia.

There are so many cases where boilers fed with "pure natural water" have been rapidly corroded away, that steam users congratulating themselves that they are free from the evils of scale should see if they are not using pure water containing gas in solution, and if there be this trouble, it may be cured by a regular dose of whitewash, or by mixing calcareous water with the soft gas-holding water.

When pure distilled water is used there will be no contained gas and should be little trouble from corrosion. Perhaps for marine purposes it will be impossible to escape corrosion without employing copper boilers, and even then we are not so sure about it.

* The reader will see that the influence of dampness, etc., in air is of importance as regards the corrosion of parts of iron railway bridges, and other similar structures, especially where not well painted.

† It will be seen that this has a bearing upon the water pipe question, but we will not discuss that now.

SWISS TESTIMONY TO THE ADVANTAGES OF OUR PATENT SYSTEM.

Hitherto anti-patent men have found their strongest argument against the recognition of any property right in inventions in the practice of Switzerland. "Here," they have said, "we see the benefits of free trade in ideas. Switzerland wisely refuses to allow her industries to be taxed and overridden by patent monopolists. See how prosperous she is—how successful her manufactories—how skillful her artisans! Be wise and profit by her example."

At first thought, nothing would seem more reasonable than to suppose that a manufacturing country which should reserve to itself the right to appropriate the inventions of all nations without payment of inventors' fees would be so much in pocket, at least. But the experience of Switzerland, where the experiment has been tried under the most favorable conditions possible, does not make the supposition good. On the contrary it has proved decidedly a losing game; and the loss has fallen where it could least be afforded—on the industrial character and productive capacity of her artisans. The Swiss workman has dropped behind in the contest for mastery, and Switzerland's trade is departing in consequence.

Take, for example, the shoe trade. The largest shoe factory in Europe is at Shoenwerth, between Bâle and Zurich. It was set up for its owner, Mr. Bally (one of the Swiss Commissioners to the Philadelphia Exhibition), by American mechanics; and it is stocked with the best American machinery. Mr. Bally is a man of exceptional force and business ability. He has visited this country often, and is familiar with American methods of organizing labor. He is careful to secure promptly every new invention bearing on his business. He has no royalties to pay; and he pays his workmen less than American rates. Yet he cannot compete with New England, even in Swiss markets. He has lately recounted his experience in this connection in a pamphlet addressed to Swiss manufacturers; and he traces the inability of his workmen to compete with Americans to their inferior intelligence and skill, an inferiority mainly due, he is quite sure, to the lack of the stimulus of a patent system. He tells his countrymen very frankly that their industries are seriously overshadowed by those of America, and that their industrial salvation must be looked for, largely, if not mainly, in a patent system approximating ours. He says: "We must introduce the patent system. All our production is more or less a simple copy. The inventor has no profit to expect from his invention, no matter how useful it may be. On the contrary, each one has the right with us to appropriate to himself an invention, to copy it, to the great injury of the inventor. It is evident that this absolute want of protection will never awaken in a people the spirit of invention, but on the contrary it accustoms them more and more to copy that which belongs to their neighbors, and that is not to the honor of our country. The want of protection for new inventions is a great disadvantage to us. The State ought not to hesitate to add to its resources this new resource. But at the same time we must remember that an invention is valuable in proportion to the facility with which it can be made available, and so it is essential that the grant of patents be accessible to inventors of the most moderate fortunes."

In an appendix to a French edition of this pamphlet, Mr. Edward Dubied, from the standpoint of the watch manufacturer, quite as strenuously insists on the immediate adoption of a good patent law. After reviewing several lines of production in which American competition has brought things to a desperate pass in Switzerland, he says:

"At this rate, there is no reason why all our industries should not be overwhelmed, one after another, by those of America; and yet, when we ask what wages are paid the workmen in the latter country, we learn with surprise that they are three times as much as those which our workmen, both artisans and farm hands, receive. The conclusion from these facts is that our intelligence and productive power, compared with those of America, are as one to four—a proportion which we must admit, if it is true that an American factory which pays its workmen three times as much as a Swiss factory, and has to give a much higher rate of interest for its capital, nevertheless can produce at less cost."

Two things are requisite, Mr. Dubied goes on to say, to get them out of the plight they are in. First, a good patent law; and second, an increase of the technical instruction of their artisans, foremen, and masters. He says: "Our readers are perhaps astonished that we insist upon a patent system as of the first necessity; but we shall justify this by proving that the protection of property in inventions develops the desire for technical instruction, while the absence of such legal protection is nothing more or less than a premium given to ignorance, to the detriment of inventive talent." Further on, he points out the secret of the educative influence of patent rights by showing that in patent granting countries intelligence, technical instruction, and inventive intellect have a real value.

Mr. Dubied's testimony is so strong and so much to the point, withal so pertinent to the discussion in progress here, that we cannot refrain from quoting his final words in this connection: "Messrs. Favreperret, Bally, and David, our Commissioners to the Philadelphia Exhibition," he says, "call for a patent law in Switzerland as a means for perfecting our industries. The author of these lines regards the institution of patents as the first and indispensable measure, without which any other will be utterly useless, for reaching the end that we all have in view. If he especially insists upon this point it is because he had the advantage over the gentlemen he has named, of spending twenty-five years as engineer and machine builder in a patent granting country—namely, France—before he established himself as a manufacturer in Switzerland. He can, therefore, bring his own experience to the support of their demand; and he assures his fellow citizens that a law for the protection of property in inventions would be a true magician's wand among us, completely transforming our system of manufactures, and raising us in a short time, in a natural manner, and with less effort than we should expect, to a level with the nations most advanced in the arts. . . . Away with those false principles which conduct an industry to certain ruin. Let us delay not a moment to obtain a good patent law."

We would respectfully commend these expressions of dearly bought wisdom to those gentlemen at Washington who are dallying with "those false principles which conduct an industry to certain ruin." The most enlightened minds of the most enlightened countries are convinced that the prime secret of American superiority in the industrial arts is due to a patent system, the inspiring, educating, and encouraging influence of which reaches every grade of society. Thus far it has been conducted with a view solely to the advancement of the arts through the encouragement of inventors. To "amend" it, as now proposed, so as to make the inventor the cat's paw of the infringer would be to cut the very heart out of the system, and put a summary check to our industrial progress.

A REMARKABLE PICTURE OF THE MOON.

There are perhaps few persons who, in passing up and down Broadway during the last few weeks, have not had their attention attracted to a remarkable and strikingly brilliant picture of the crescent moon exhibited in the show window of Messrs. Scribner, Armstrong & Co.'s book store. It was a happy thought that led Mr. Henry Harrison to attempt this painting, and the success that has crowned his efforts affords a most excellent example of the results that one may attain in such matters, when to the skill required for manipulation is joined an absorbing love for the object of representation as a subject of study. For it must be stated that Mr. Harrison is an astronomer; and while he has displayed in his painting all the sentiment and all the technical skill of the artist, that "high art" feeling which prompts the belief that "it is not the mission of art to represent nature, but only to use her as a means to express an ideal," he has subordinated to scientific accuracy; and herein lies the great interest and great value of his work. So, with a knowledge of the artist's motives and of the means that he employed to secure accuracy in the measurement of distances, and in the colors and contours of the objects presented in the lunar landscape, we can scarcely be impressed by any other feeling in looking at this canvas than that we are gazing, not at a mere picture, but at a reality—at the wildly desolate surface of the satellite as she might appear to us could she be brought within range of our unaided vision.

The canvas is unpretentious in size, being only 27x27 inches; the painting represents the moon about three and a half days old—*i. e.* "in her crescent"—with the terminator at Mt. Glacier, the edge toward the sun bathed in most brilliant sunlight, shading off into a light yellowish tinge, and then blending into the darkness of night toward the terminator. In the earthshine, or surface in shadow, may be seen some of the most prominent features, such as the craters *Copernicus* and *Tycho*, the *Apennine Mountains*, and nearly all of the *Meres*. The whole orb stands out in bold relief, against a dark sky blue background, the exact color of the field of the telescope an hour after sunset.

The moon has been a subject of topographical and pictorial representation by astronomers for ages past. Its entire surface has been surveyed and mapped in outline, more or less accurately, by Lohrmann, Herelius, Baer and Maedler, and Schmidt; drawings of single craters and casts of the whole planet have been executed by others, and the development of the photographic art has been the means of production, by Messrs. Rutherfurd and Draper, of lunar pictures nearly absolutely correct.

Yet, if we except some small water color sketches of some of the more prominent mountains and craters, reproduced in print to illustrate Neison's work on "The Moon," and a few others by the Astronomical Society in London, we believe that Mr. Harrison's is the first attempt to render a faithful picture in colors of the moon as it appears to us in the telescope, showing its delicate gradations of light and shade, its enormous circular caverns or pits strewn with bowlders, its level plains, its brilliantly illuminated towering peaks and crater walls, its ever varying terminator, and, above all, that lustrous sheen that is all its own, and that has made it recognized as the "silvery" planet. It is Mr. Harrison's intention to publish, in oil color chromos, a series of six *facsimile* reproductions of paintings of the moon in its progressive phases from the "three days' old crescent" (just noticed) to the "full moon" and "last quarter." We see no reason why (if the reproductions come up to the standard of excellence shown in the original) the venture should not prove a perfect success, through generous aid accorded him by all who are interested in the advancement of science and art.

American Petroleum Exports.

The exports this year have been larger than for any year previous to 1877, the total exports in gallons from January 1 to May 11 having been for five years:

1878.	1877.	1876.	1875.	1874.
76,623,252	87,252,268	72,024,491	60,542,620	71,176,609

Before 1874 the exports had never reached 60,000,000 for this period.

The distribution of the exports from the different ports is a matter of considerable interest, as it is now supposed to be substantially regulated by the contract of the Standard Oil Company with the railroad companies. Last year, it will be remembered, the proportion exported from New York increased enormously, largely at the expense of Philadelphia. This was chiefly due to a contest between the Standard Oil Company and the Pennsylvania Railroad, by which the former, controlling most of the petroleum to be shipped, refused to send anything over that railroad. That conflict broke out just about a year ago and lasted six months. Thus the part of the years for which the above figures are given was uninfluenced by this contest. New York exported 71·3 per cent of the total both years; Philadelphia, 15·2 per cent last year and 13·8 per cent this; Baltimore 9·8 per cent last year and 13·4 per cent this. New York has never, or at least not for several years, exported a larger proportion than this year; Philadelphia, on the other hand, has never exported a smaller proportion (28 per cent in 1876 and 17·2 in 1875); Baltimore, in spite of its increase, has not this year reached the proportion which it reached in 1876 (16·7 per cent). So far this year the reports show that 71·3 per cent of the whole has gone by way of New York, 13·9 by Philadelphia, 13·4 by Baltimore, and 1·4 by Boston.