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The Corliss Steam Engine.

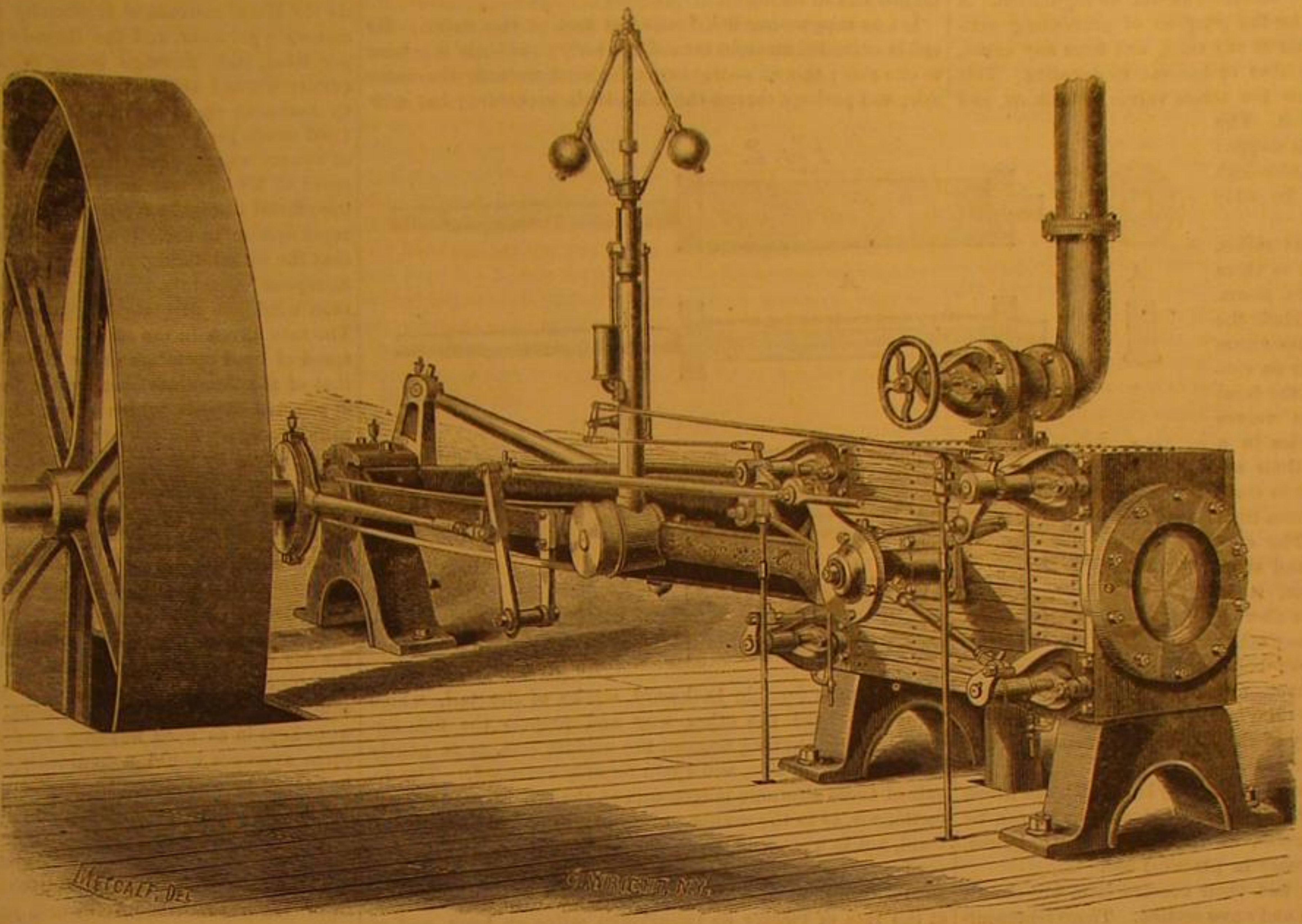
Probably no engine ever constructed has achieved a more enviable and widely extended reputation than the one we this week illustrate. It received the first competitive gold medal by unanimous vote of the International Jury at the Paris Exposition. It also took the first premium at the Fair of the American Institute, for 1869, and the inventor of the valve gear which constitutes the peculiar and distinguishing feature of the engine, and from whom the engine takes the name by which it is so widely and favorably known, has received a Rumford medal from the American Academy of Sciences in consideration of the merit of his invention.

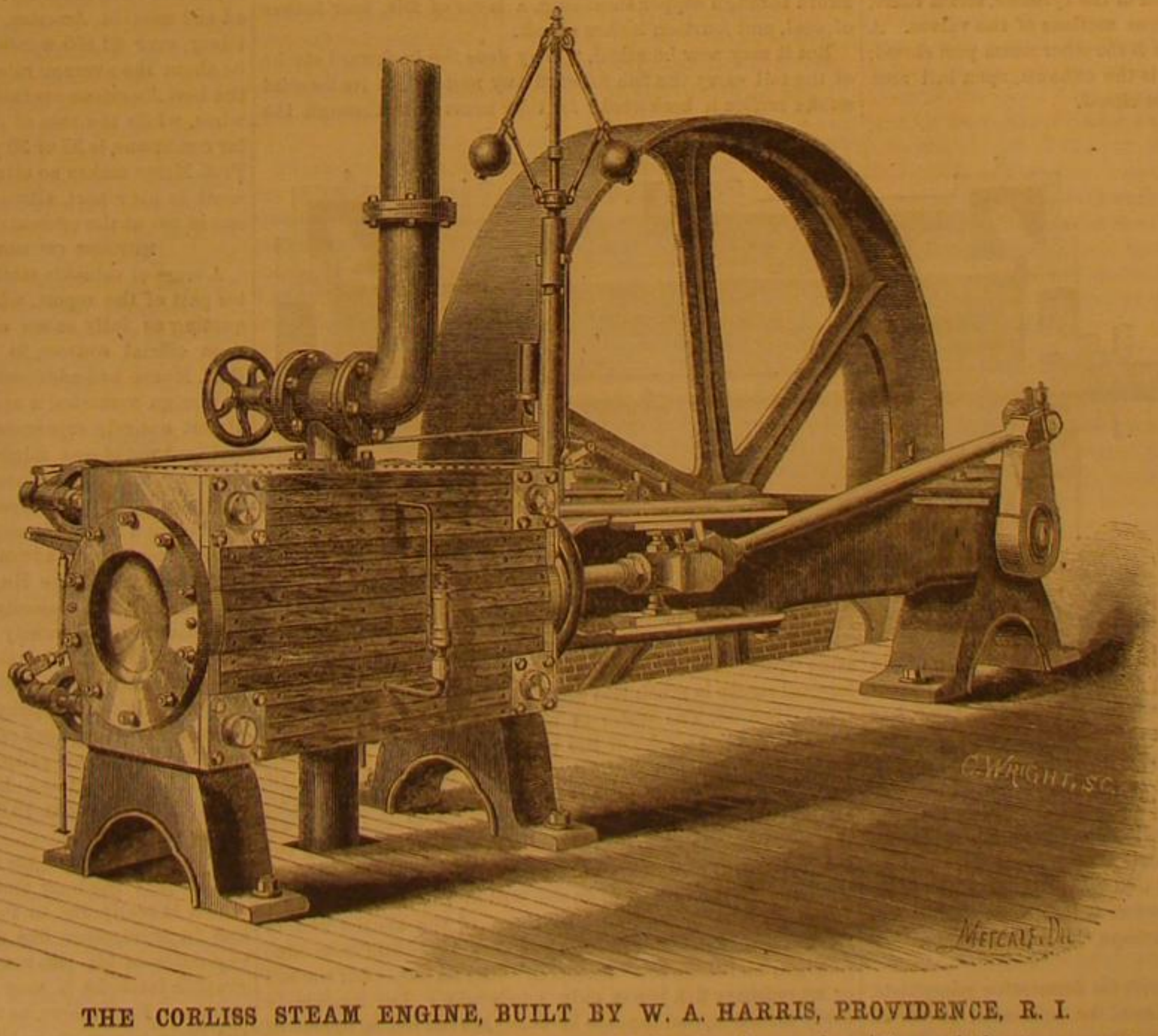
The engine was exhibited for competition at the late Fair of the American Institute, and a test was made with the results of which our readers have been made acquainted through these columns. A statement of the results, based upon the amount of coal consumed, and the useful work performed—the only reliable basis upon which a computation can now be made—will be found in our advertising columns, and we call particular attention to this statement as furnishing a more minute account of the tests than any thing else yet published.

The peculiar merits claimed for this engine may be summed up as follows:

A most prominent and valuable feature is the accessibility of every part, which will be at once seen upon inspection of the engravings.

All parts of the mechanism which moves the valves are outside of the steam chest, visible to the eye, and therefore any derangement can be seen at once. One simple eccentric moves all the valves; no complication of gearing being used for that purpose.





THE CORLISS STEAM ENGINE, BUILT BY W. A. HARRIS, PROVIDENCE, R. I.

The same valve admits and cuts off the supply of steam; no auxiliary valve riding on its back being necessary. This valve is placed on top in close proximity to the bore of the cylinder of the engine—say one inch—and opens directly into the clearance space; therefore there are no long passages to fill with live steam at each end of the cylinder.

The exhaust valve is situated *under* the cylinder, at the clearance space, and can therefore free the cylinder of water without the use of other devices, in the most thorough manner. This valve is also situated in close proximity to the bore of the cylinder of the engine, and therefore has no long passages there to fill with live steam.

The steam valve commences to open its port at one end of the cylinder when the eccentric is producing its most rapid movement, and as the motion of the eccentric is declining toward the end of the throw, an increasing speed is obtained by means of the wrist plate, which compensates for the slow motion of the eccentric. At the same time the steam valve, at the opposite end of the cylinder, commences to *lap* its port, by the motion of the eccentric, but by a reverse or subtraction of speed produced by the same wrist plate, which speed is constantly decreasing till the throw of the eccentric is completed. Or, in other words, the lapping and opening of the steam ports require, *each*, the same amount of throw of eccentric, producing, for instance, a lap of half an inch at one end of the cylinder, while the opposite end has an opening of one inch and one eighth. The exhaust valves are moved by the same eccentric and by the same wrist plate before spoken of, but they have a much greater travel, for the purpose of ridding the engine of the exhaust steam easily through the exhaust ports, which are as long and twice as wide as the steam ports, and therefore back pressure on the piston of the engine is avoided. The rapid opening and slow lapping of the exhaust ports are obtained as in the case of the steam ports, but much faster, as the travel is greater on the opening of the exhaust than on the opening of the steam port, to get a full and free opening. The lap on the exhaust port of this engine is about three quarters of an inch; opening one inch and three quarters.

The constant variations of load upon this engine, are communicated to the steam valves instantly by the governor; the valves being moved by a force distinct from it yet subjected to its regulation. Thus, the regulation is not only adjusted according to every momentary change in the demands of the engine, but is also effected with absolute precision by agencies purely automatic.

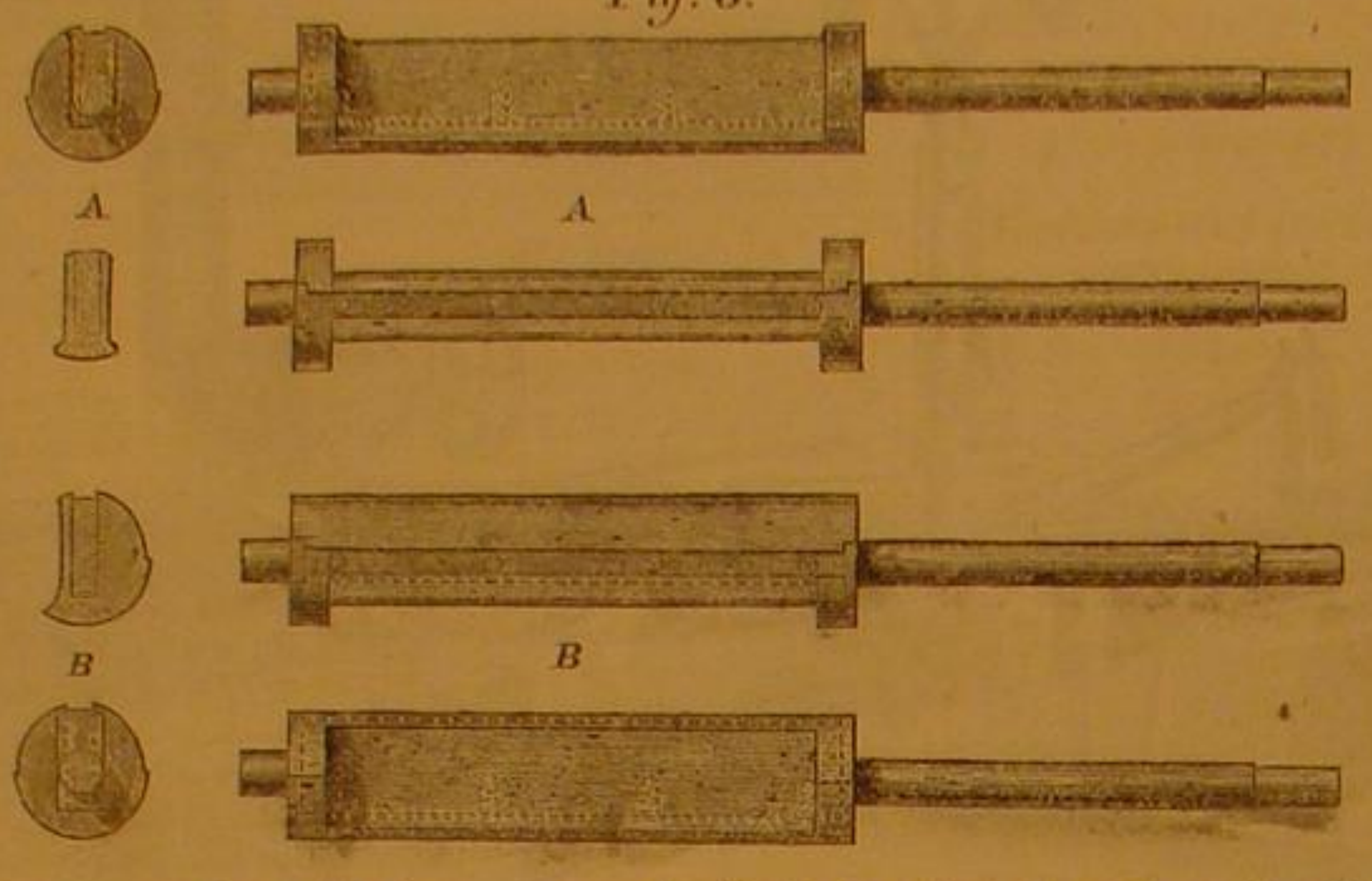
The governor in no case performs any labor; on the contrary, it only indicates the change required to the levers which move the valves. This does not task its powers. It puts forth only the force necessary to move a small *stop*. This movement is attended with the least possible friction, and the *stop* presents absolutely no resistance to the governor, except at the very instant when it is in actual contact with the lever constituting its fulcrum.

This momentary resistance, by the bearing of the lever on the stop as a fulcrum, occupies in an engine making sixty revolutions per minute, so small a space of time, that, compared with that during which the governor is left free to move the stop, it is practically nothing.

When the governor is combined with an auxiliary valve cut-off, as in some other engines, it is in fact converted into a connecting medium, and made not merely to indicate the point of adjustment but also to perform the labor of moving the valve to a certain degree; and it has to perform this duty after reaching through steam-tight packing or stuffing boxes. The packing in these stuffing boxes by use becomes hard, when new packing becomes necessary; or it leaks and it is necessary to screw up a little tighter; all of which must be done by hand, thereby putting the regulator under subjection or friction, variable, according to the judgment of the engineer. There is also the friction on the regulator in the auxiliary valve arrangement necessary to overcome the power required to move such valve through all its bearings, stuffing boxes, guides, etc., and under the pressure of steam. These distributing elements do not exist in the Corliss engine valve gear.

The governor is therefore extremely sensitive, as it is not saddled with two duties, *actuation* as well as regulation. A stop motion is provided for the purpose of preventing accidents should the regulator at any time, and from any cause, cease to perform its functions or become inoperative. This mechanism does not allow the steam valves to hook on, and therefore they cannot open. The result is that the engine is stopped by this mechanism *alone*, although the screw valve may be wide open.

Fig. 3.

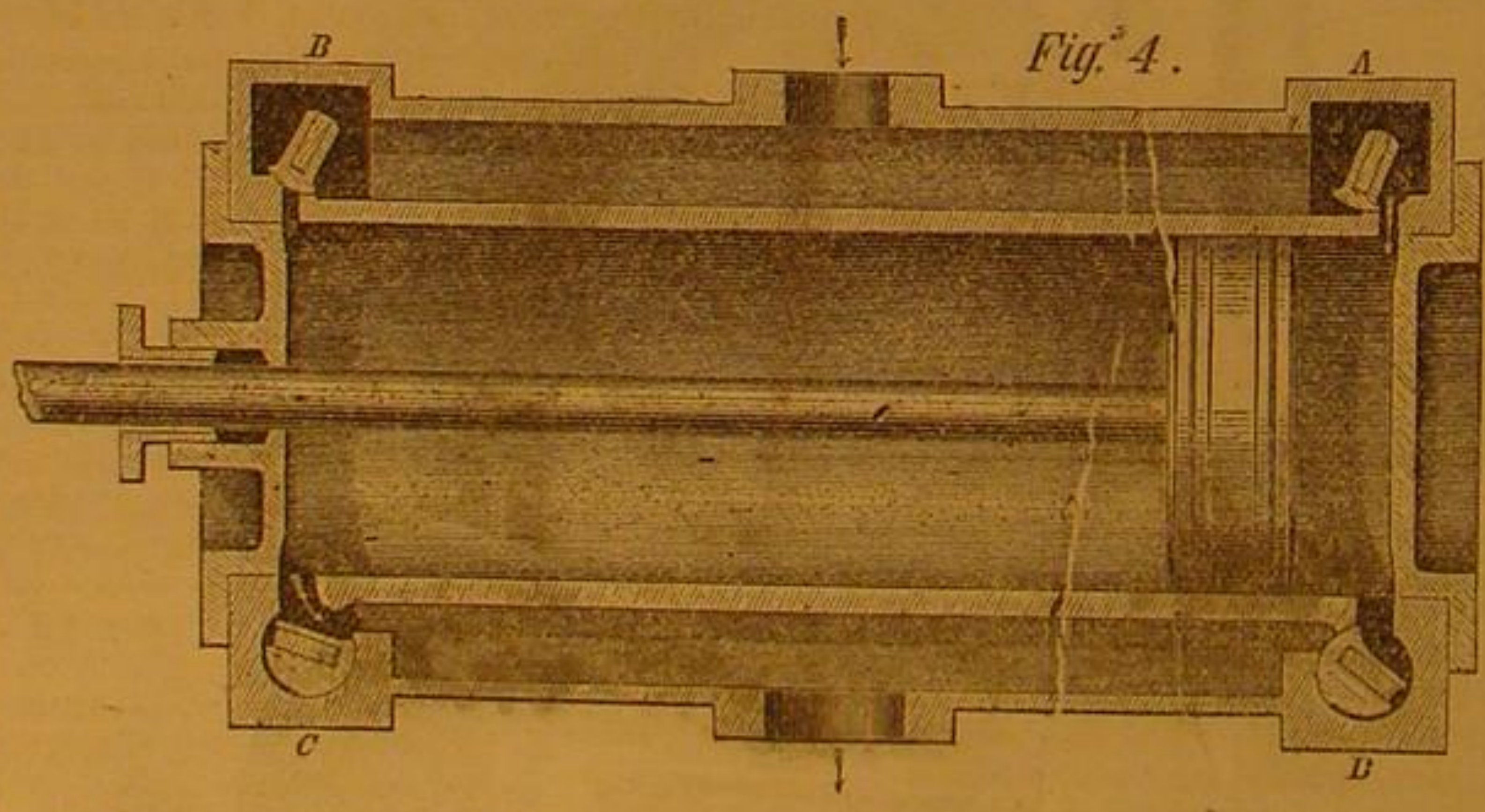


The valves are circular slides, motion being imparted to them by levers keyed to valve stems. These stems have a flat blade the length of the valve in the steam chest, and they oscillate on centers or fixed bearings in the front and back bonnets. The valves are fitted to these blades in a manner that admits of their adjusting themselves to their seats as the valve and seat from time to time become worn. The construction of the valve and stem is such that a valve can, it is claimed, be taken out in a shorter space of time than in any other engine, by taking out four bolts to remove the back bonnet, and drawing one key where keyed to the valve lever. Having four valves, either one can be adjusted independently of the other with great precision, and with the greatest of ease.

The valve gear can also be worked by hand with the greatest ease, and with 80 lbs. pressure of steam, can be run by hand, *backwards* or *forwards*, at the will of the engineer, which oftentimes is necessary in practical use.

The valves and blades, and their construction, are shown in Fig. 3, in longitudinal and cross section. Those represented by A show the steam valves, and B the exhaust valves.

Fig. 4 is a longitudinal section of the cylinder, steam chest, and exhaust passage, with cross sections of the valves. A shows one steam port open, and B the other steam port closed; the valves lapping the port, C, is the exhaust, open full area of port, and D the other exhaust closed.



It will be noticed also that the circumference of the exhaust valves, C and D, is partially cut away, thus reducing friction and allowing the acting portion of the valve to seat itself as it gradually wears. These devices are observed in the transverse sections of Fig. 3 as well as in the longitudinal section, Fig. 4. It will also be observed in the longitudinal section, Fig. 4, that the piston has traveled a very small part of the stroke, while the steam valve, A, and exhaust valve, C, have been opening the full area of their ports. The quick opening and closing of the steam and exhaust valves, and at the proper time (see Tredgold), with a positive mechanism for closing the same, has been a subject that has received the greatest amount of attention and thought from our most scientific engineers, and it is one of the principal subjects of the Corliss patent.

The workmanship of the engine is exquisite; that of the engine exhibited at the National Fair of the American Institute, which elicited commendation from every person competent to judge, was, as we are told by the builder, the same as that given to every engine before it leaves his works.

In style, as seen by the engravings, the engine must satisfy the most exacting taste.

Orders for machines, or requests for descriptive pamphlets, or for further information, should be addressed to W. A. Harris, corner of Park street and Promenade avenue, Providence, R. I., or at 49 Murray street, New York. [See advertisement on another page.]

How a Fish Swims.

Now, how does it swim? We have found that the successive or simultaneous removal of the dorsal, anal, pectoral, and ventral fins, only renders the fish's position unsteady; but he could swim as well as before. But if the end of the caudal fin be snipped off, its speed is diminished; if the entire fin is removed, it moves still slower, and with evident exertion, but bravely keeps it up until the tail itself has been cut off up to or beyond the anal fin; then at last the poor victim to science succumbs, rolls over and over like a log upon the water, gasps convulsively, makes a few desperate but ineffectual struggles with its abbreviated tail—and dies.

The sight appears more cruel than it is, for the successive cuts seem to disturb the fish very little; and as the whole is over much sooner than the dying struggles of a hooked fish, we may claim the right to make the sacrifice for our intellectual dinner—especially as it occurs by no means every Friday.

We have learned that a fish cannot swim without its tail. Let us now inquire how it swims with it. Very much as you scull a boat with an oar; but with the difference that in this case the oar is a part of the boat, and is flexible both in its length and in its hight.

Let us suppose our fish floating at rest in the water. Its tail is extended straight behind the body; suddenly it is bent to one side; this of course turns the head towards the same side, and perhaps carries the fish a little backward; but now comes a more forcible backward stroke of the tail, which turns the head the other way and propels the fish forward. Then, having reached the middle line, it is gently bent to the other side, and again forcibly extended. The result of these alternate movements of the tail in opposite directions is, as in the sculling of a boat, to propel the fish forward, not in a straight, but a zigzag direction. But the successive movements are so rapid that we notice only the resultant forward motion, which is in some species, as the salmon, at the rate of twenty or twenty-five miles an hour, and so powerful that the sword-fish has been known to thrust his sword through copper sheathing, a layer of felt, four inches of deal, and fourteen inches of oak.

But it may now be asked, "Why does the backward stroke of the tail carry the fish forward any more than its forward stroke carries it backward? for they must pass through the same space." There are four different reasons: First. The forward stroke is much less forcible and rapid than the backward. Second. The water is already moving; for the previous backward stroke of the tail from the other side to the middle line has forced the water in all directions out of its way, so that the the further stroke forward meets comparatively little resistance; but the backward stroke meets all the more and is therefore the more effective in sending the fish forward. Third. This and the fourth reason depend upon the form of the tail, or upon the will of the fish.

There are some tails, such as those of the sharks and of the sea-snakes, which are long and narrow and stiff from edge to edge; and these are "feathered" like an oar. But the tail or an ordinary fish is not only much wider, but flexible in every direction, and capable of being spread out or narrowed by the action of little muscles attached to the bony rays which support it. Now such a tail may be feathered, and probably is, when the fish is moving slowly; but for more rapid movements it is probable that the whole tail is spread out and hollowed backward for the backward stroke; but that upon reaching the middle line it is narrowed and made convex for the forward stroke, so as to offer the least resistance to the water.

Those fishes which have scales overlapping each other are aided in still a fifth way; for in the forward stroke the scales upon that side of the tail would be flattened closely together so as to present a plane surface; but in the backward stroke the edges of the scales would be raised a little from the bending of the tail, and would offer a roughened surface to the water.—*From "Beast, Bird, and Fish," by Burt G. Wilder, in Harper's Magazine for December.*

PROFESSOR MORSE'S OFFICIAL REPORT UPON THE TELEGRAPHY OF THE FRENCH EXPOSITION.

COMPARATIVE SPEED OF INSTRUMENTS.

In the comparison of the speed of transmission by the different telegraphic systems now in use, the anxiety of Prof. Morse to properly set forth the merits of his own invention in this report has led him to some conclusions which we cannot but regard as inaccurate. He states, that in France and Prussia the Morse instrument is officially rated at twenty to thirty messages per hour, and the Hughes printer at fifty messages per hour, each message being calculated as equivalent to twenty words; but, in the table given of the results reached by American operators in special trials, the minimum rate is 1,600 words per hour, which is equivalent to eighty messages of twenty words each; therefore, Prof. Morse claims that the speed of his own instrument has been greatly underrated in the official European reports, and that it is actually the most rapid system in use. It should be borne in mind, however, that the actual discrepancy between the skill of American and European operators, though very considerable, is much less than would, at first sight, appear from the above showing. The rate given in the official reports represents the average speed of good operators under favorable circumstances, while that of the American operators is the result of special trials of selected experts, which as might be expected, give a very high average. A much nearer approximation to the true rate is that given by taking the average of a week's regular work in the New York office. This was done about two years since, and the result, as far as "through wires," or principal circuits are concerned, was as follows:

The Morse instrument transmitted, in a day of ten hours, an average of 800 messages of twenty words each, or thirty messages per hour.

The combination (improved Hughes) printer transmitted, per day of ten hours, an average of 325 messages of 20 words each, together with 4,000 words of press news, the whole being equivalent to 52 messages per hour. If the American lines were kept in as good working condition as those of Europe, these averages would undoubtedly be much higher, as may be proved by comparing the maximum speed per hour which has actually been obtained and officially verified:

The Morse apparatus in England, 1,476 words.
" " " " America, 2,704 "

The combination instrument, in the hands of an expert operator, has transmitted 2,700 words per hour through a circuit of 240 miles, a distance fairly representing the average length of circuits in the country. The Morse apparatus, as constructed and used in America, cannot be made to record, with certainty, over $1,800 words per hour, and this we consider to be about the average rate attainable in continuous work by the best American operator, under favorable conditions of the wires, while the rate of the combination printer, under similar conditions, is 25 or 30 per cent higher. Singularly enough, Prof. Morse makes no allusion whatever to the latter instrument in his report, although it is, practically, the most rapid one in use at the present day.

NUMBER OF MORSE INSTRUMENTS IN USE.

A mass of valuable statistics is brought together in the latter part of the report, which want of space prevents us from quoting as fully as we could wish. From reports received from official sources, in reply to questions propounded by Prof. Morse, and addressed to the telegraphic administrations of foreign countries, it appears that the Morse instrument has almost entirely superseded every other one throughout the civilized world—as might be expected from its simplicity, economy, and effectiveness. The Hughes printer is considerably employed in Europe on important through lines, as the combination is in America, and for this class of work it possesses incontestable advantages. From the returns, it appears that about 200 of the Hughes instruments were in use in Europe in 1867, the majority of these being in France. A careful estimate, based mostly upon official reports, puts the whole number of Morse instruments, employed in Europe, Asia, Africa, and Australia, in 1867, at nearly 12,000. In America, the Western Union Company report that they employ 4,000, and the various other lines cannot have less than 2,000 in daily use, including the railway lines and those of competing companies, as well as a large number in Canada, making a grand total of about 18,000 instruments of this kind in use at the present time.

MORSE'S TELEGRAPHIC INVENTIONS.

Now that the long and bitter controversy, as to the credit which is really due to Prof. Morse for his various inventions and improvements, has almost entirely died away with the expiration of his patents and the consolidation of rival telegraphic interests, it may be well to impartially examine the claims of Prof. Morse, as set forth in this report, as well as in the little pamphlet published by himself in Paris, in 1867. The inventions or discoveries here claimed as his own, by Prof. Morse, may be briefly summed up as follows:

1. The recording or generic telegraph, operated either electro-magnetically or electro-chemically.

2. The telegraphic relay circuit, or the opening and closing of a secondary circuit by means of a primary circuit.

3. The dot and line alphabet.

4. The use of sounds as a medium of receiving telegraphic communications.

5. The system of automatic transmission by the use of metallic type, or of the embossed paper strip from the register, as a means of opening and closing the circuit.

6. The use of a printing wheel and ink as a mode of recording, generally known as the "ink writer."

It must be admitted by the unprejudiced reader that, in the report under consideration, Prof. Morse has, in most cases, brought forward sufficient and satisfactory evidence of his having been the inventor of the apparatus and devices above named. In regard to the electro-chemical system of recording and the mode of transmission by the embossed paper strip from the register, although very probably first suggested by Prof. Morse, they do not appear, by the evidence, ever to have been put in practical form, and this fact, therefore, in our opinion, does not detract from the credit due to Bain, who made the electro-chemical system a practical reality, or from that of Edison and Westbrook, who, at a more recent date, independently invented and put in operation, unknown to each other, modes for transmitting, by the embossed paper strip, which, although upon the same general principle, differ widely in the details of their construction.

The line of argument which has been adopted by some writers upon this subject—that of resolving the invention into its elementary parts, and showing that each detail was before known, and that, therefore,no credit was due to the man who combined them in such a manner as to produce a new result—is an exceedingly unfair one. Almost every great invention is a combination of devices previously well known, and, indeed, it is almost impossible that it should be otherwise.—*The Telegrapher.*

For the Scientific American.

ON MANGANESE AND SOME OF ITS COMPOUNDS.

BY PROFESSOR CHARLES A JOY.

It is difficult to trace the origin of the word manganese, the ores containing it were variously styled female magnets, black magnesia, alabandicus, from the City of Alabanda; mangadesum by the glass makers, and later manganesium, and finally manganese. But notwithstanding the antiquity of the name, it is safe to say that even at the present time very little is known about the properties of the metal, and it is for this reason that we have chosen to speak of it, in order to put together for convenience of reference, the various methods of its preparation, and the properties of the metal as accepted by the best authorities.

For a long time iron and manganese were confounded together, but after the Swedish chemist, Gahn, proved the existence of a new substance in the mineral pyrolusite, the analogy between the new metal, manganese, and the old metal, iron, at once suggested that the former could be reduced in the same way as the latter.

The oxide of manganese was heated with charcoal, and a complete reduction followed. The heat required was the same as that for the reduction of iron. The metal obtained in this way, like pig iron, was found to contain considerable silicium and carbon, and to be very brittle. Whether it could be made malleable by burning off the carbon and squeezing out the silicium in a puddling furnace has never been ascertained, as no one has ever manufactured sufficient metallic manganese to make the trial. If the first chemist who reduced an ounce of iron from the oxide by means of charcoal could see to what uses the brittle, easily rusting, unmalleable metal as described by him, is now applied, he would be slightly surprised, for in small quantities or in the form of powder, every chemist would be forced to say that iron would have to be kept hermetically sealed, or protected by naphtha from the action of the air. It may be that manganese in larger quantities and properly refined, purified, and annealed, would be capable of being hammered into thin foil or drawn into fine wire, but at present we have no positive knowledge on the subject.

Another method for the reduction of manganese is to fuse the chloride with an equal weight of fluor spar, and one fifth its weight of metallic sodium. When obtained in this way it has the color of cast iron; is very brittle and very hard. It will take a fine polish, cannot be scratched by a file, cuts glass easily, does not change in moist air, is not attracted by a magnet, and has no effect upon the magnetic needle; it cannot be wrought, but can be cast the same as iron, and its specific gravity when prepared in this way is 7·16.

This method has been severely criticised by our best chemists, and it has been objected that the metal obtained was in no way pure, and ought not to be accepted as disclosing the true properties of manganese.

Deville fused the metal to a crystalline mass, the powder of which decomposed water rapidly; its color very much resembled that of bismuth. The fluoride of manganese has been reduced by metallic sodium, and we have ourselves reduced the amalgam of manganese to a fine powder, but were unsuccessful in fusing it to a button.

Some authorities say that metallic manganese decomposes water at ordinary temperature; that its color is reddish white; that it oxidizes in the air, and must therefore be kept under naphtha the same as potassium and sodium; that it is slightly magnetic, and that it readily combines with silicium and carbon, and that its specific gravity is 8.

The metal is said to be easily attacked by acids. In reference to the alloys of manganese, not so much is known as could be desired. Its effect upon iron is, however, becoming more familiar, and has been made the basis of several patents. In this country, especially, the use of franklinite iron, containing a large proportion of manganese, is well understood, and the iron produced is valuable for many purposes. In England there are thirty-six patents involving the use of manganese in iron and steel, the earliest of which was taken out in 1799.

Dr. Prieger, of Bonn, has prepared alloys of manganese and iron, and manganese and copper. An intimate mixture of black oxid of manganese, powdered charcoal, and iron filings or turnings, is made in a black lead crucible holding thirty to fifty pounds. A covering is made of charcoal, fluor spar, and common salt, and the contents of the crucible exposed for several hours to a white heat. On breaking the crucible, the alloy of manganese and iron will be found as a perfectly homogeneous button. Two equivalents of manganese and one equivalent of iron, afford an alloy containing thirty-six per cent of manganese; four of manganese and one of iron, give about eighty per cent of manganese. Both alloys are harder than the hardest steel; they are capable of a high polish, fuse at a red heat, do not oxidize in the air, and only partially so in water; their color is between that of steel and silver. These alloys could be used for journal boxes or bearings of machinery, and would be useful in affording a method for the introduction of manganese to iron or steel castings.

The alloy of manganese and copper is prepared in a similar way, and is very hard. Its properties have not been sufficiently studied by our workers in metal, and it would seem to offer a good field for investigation. It will thus be seen that our knowledge of manganese is very limited. The specimen of the metal in the cabinet at Columbia College is very hard and brittle, and has a distinctly red color. It has been kept in a loosely stoppered bottle for several years without any signs of oxidation or absorption of moisture. It probably contains some carbon and silicium.

In reference to the applications of the compounds of manganese to the arts, it may be well to mention a few of them in this connection.

VIOLET COLORS.

A very rich violet color is prepared by fusing finely pulverized pyrolusite and phosphoric acid in proper proportions, digesting in ammonia, filtering, evaporating to dryness, and treating with water; a violet powder remains, called Nuremberg violet.

GREEN COLOR.

Manganese green is the manganate of baryta, and can be represented by the formula $3\,BaO, 2MnO_3$. It possesses a fine green color, and is much safer than arsenic pigments.

PERMANGANATE OF POTASH.

This valuable salt can be prepared by passing chlorine gas through a solution of the simple manganate. This is said to be a more economical way for its manufacture than the old methods.

PERMANGANATE OF SODA.

This salt is made on a large scale, by heating together 12 parts anhydrous caustic soda,36 parts soda lye of 1·337 sp. gr., 10 parts chlorate of potash, and 18 parts finely pulverized pyrolusite. This, and the preceding salt are of great value in chemistry, on account of the fact that they contain oxygen gas in a condition suited to the rapid oxidation of substances; a property that renders them available as disinfectants to destroy all bad odors, to be substituted for ozone in bleaching, and, in general, to be employed as powerful oxidizing agents. The salts are also valuable for the preparation of perfectly pure oxygen.

IN GLASS.

The use of manganese compounds in glass manufacture is one of the earliest applications of this element; but the fact that glass which has been bleached by it afterwards undergoes a marked change, and in the course of a few months has entirely different optical properties, is not generally known. The oxide of manganese is put in to counteract the effect of oxides of iron, but, in course of time, the oxide is acted upon by the light and air, and colors the glass red. Many a photographer has been puzzled to know why the glass of his skylight no longer lets light through so as to give him good pictures, and many a gardener has been troubled by the parched appearance of the grape vines in his conservatory, and by the decrease in the yield of grapes; both of these phenomena are due to the fact of the presence of manganese in the glass and the consequent red color. Red glass will not permit any chemical rays to pass, and hence the photographer can take no pictures. The same color will let heat through to parch and dry the vines, but the life-giving rays are cut off. Thus as our knowledge increases, we must order our glass to be made according to the laws of light as well as of chemistry.

SULPHURIC ACID.

When water impregnated with sulphurous acid is treated with sulphate of maganese, the sulphurous acid is changed to sulphuric acid. Here is a use of the oxidizing property of a compound of manganese that may offer a way to important manufactures. It works on a small scale, and probably would on a large one, if any one would try it.

OXYGEN.

The mineral pyrolusite, or black oxide of manganese, has long been employed to make oxygen, but the recent method of converting it into manganate of soda, and afterwards expelling the oxygen by heat, is less familiar to us. A better method than the manganate of soda is said to be the employment of the corresponding lime salt. By heating lime and binoxide of manganese in a current of air, the manganate of lime is formed, which is less likely to fuse than the soda salt, and hence is more readily made. If the air be passed over the lime for a considerable time, the permanganate of lime will form, and this bids fair to afford us the permanganates in a ready and cheap way, and also offers a method for isolating pure permanganic acid by decomposing the lime salt with sulphuric acid.

By mixing the permanganate with the binoxide of barium, we shall be able to prepare oxygen gas in the cold, by simply pouring an acid upon the salts in a flask, just as we make hydrogen by means of zinc and sulphuric acid.

We have gone far enough in our sketch to show that the applications of manganese are very numerous, and we may recur to the subject again at some future time, particularly as we have said nothing about its most important use in the manufacture of chlorine.

Improvements in Salt Making.

The old and usual mode of taking salt, when made, out of the pans is by a man standing on what is called a "hurdle" up each side of the pans, and with a long shaft, having a rake at the end, drawing the salt to the side of the pan, and then with a perforated spade lifting the salt out and putting it on to a bench, into carts, or into the stove-house. For the men to be able to do this work, the place being very hot from the steam and heat of the brine, they have to work nearly in a nude state, and to render the place a little colder they have to burn down the fires from under the pans for several hours before and during the time this work is going on; and when the quantity of salt has been taken out there has to be put into the pan a large amount of cold brine, which then renders it necessary to push the fires very much to get up the heat again. This causes a loss of time in making salt, and is very destructive to both pans and the brickwork surrounding the fires. Salt having to stay so long a time in the pans between the times of emptying them, and being a substance so naturally inclined to fasten itself to anything that is hot, a scale, from two to four inches in thickness, will form in a fortnight on the bottom of the pans, and requires to be hammered to break it. This scale often adheres so fast on the plates of the pans that they are twisted into all shapes and forms, causing breakages. They are also often burned into large holes, the leakages from which allow the brine to run into the fires and flues, and injure and destroy the brickwork so much that the repairs often amount to one-fifth of the value of the salt made. The work being so very unpleasant for the men and the repairs such a serious item of expense, Messrs. Hamer and Davies, having set up extensive new salt works at Wincham, England, determined to find out means to obviate these defects as far as possible, and they have, it is thought, succeeded, and have taken out letters patent for their improvements. They have now three pans at full work so successfully as to quite equal all their expectations. The salt is taken out of the pans by steam power instead of by men,and continued night and day alike. The salt being taken out so regularly prevents the formation of the scales, so that the pans need no hammering, and, therefore, no twisting of the plates, and also obviates the leakage and consequent destruction of the brickwork and filling up of the flues, as in the old method. All these improvements combined, more salt is made from the same quantity of fuel, and in less time, from the same dimensions of pans.

The mode in which this work is performed is by having a railway up each side of the pan, or by making the pan slide into a railway, and having a carriage across the pan, constructed with a shaft through the center, to which rakes are attached by one end; the other end of the rakes travel on the bottom of the pan. The carriage has a flanged pulley or wheel on each end, the same as a railway carriage, and travels from front to back of the pan, with the rakes that cover the whole width of the pan. The machinery is so arranged that the carriage is drawn backward and forward by wire ropes. When the rakes are at the front end of the pan, and begin to be drawn towards the back, they take the salt as it is made with them at the rate of about 20 ft. per minute until they arrive at the foot of an incline upon which the rakes travel, and on arriving at the top the salt drops into carts standing to receive it. The travel of the rakes at the foot of the incline changes, the speed being reduced to about two feet per minute while ascending the incline, so that the brine runs from the salt down into the pan, instead of in the old way on to the hurdles, and wasted, and it is quite hot when it gets into the pan again. The rakes having dropped the salt into the carts, the machinery is so arranged that the carriage is raised on one side, lifting the rakes up, and being held up by a leg or catch on each end of the carriage; a return motion takes place and the carriage and rakes go back to the front of the pan, at which place the catches or legs are set at liberty, and the rakes go down into the pan and commence another journey. Each double journey is made in nine minutes on a pan of 70 feet long and 26 feet wide. By this process the salt made is put into the carts every nine minutes, and when these are filled the stages on which they stand are so arranged that one man can take all the salt away from three pans and put it either into railway wagons, boats, or into the store-house, as may be required.

At this time the salt being made is the butter salt of the finest quality, and the advantages of the machinery employed in its production over the old plan are the following: The color is much better than that of the salt made in the usual way; there is very little scale formed on the pan bottoms, therefore the repairs needed are much less. In addition, it would appear that more effective control can be obtained over the flues, so that the smoke consuming principle can be much more effectively applied than previously.

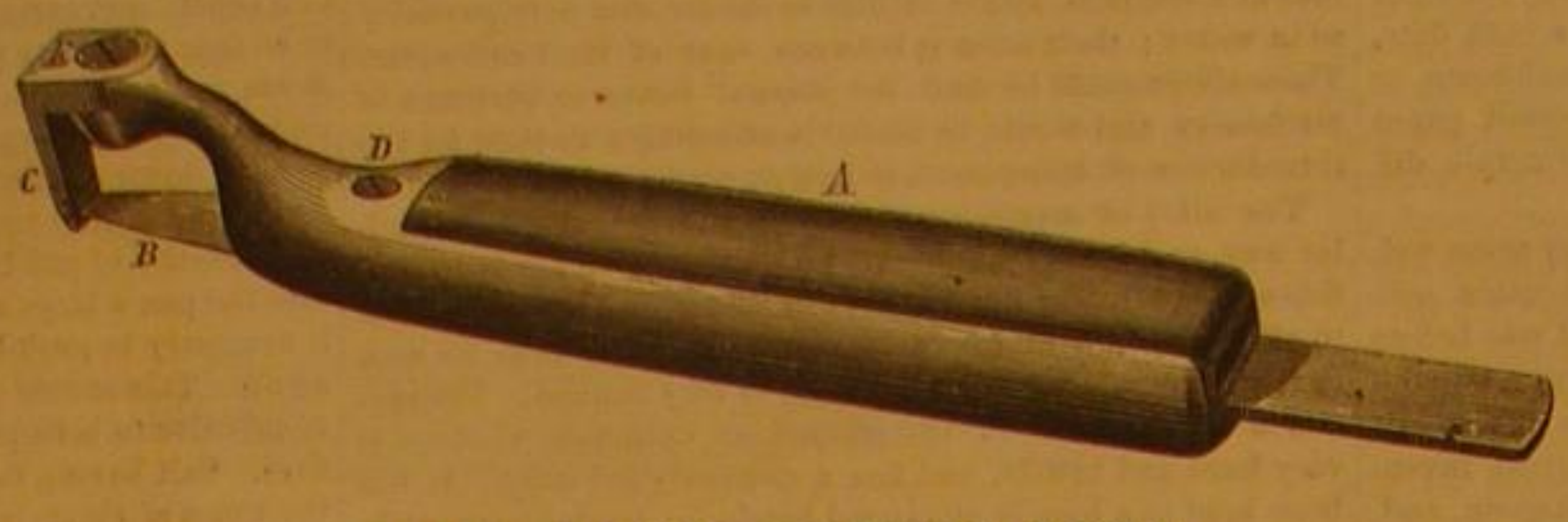
IT is said that a new description of lava is being thrown from the crater of Vesuvius since the last eruption, consisting of crystallized salt. This beautiful phenomenon has hitherto been unknown in volcanic natural history.

AVOID bathing in cold water or in a cold room, unless there is a full and quick reaction. Chillness after a bath is a sure indication that it was not properly taken.

Improved Shoemaker's Trimming Knife.

This is a very neat and useful tool, designed to obviate all danger of cutting the "uppers" of boots and shoes while paring off the edges of the soles, and also to provide for paring off the edge, at a uniform distance from the stitching, by unskilled hands.

It consists of a handle, A, having a knife passed longitudinally through its body; the protruding point, B, meeting an adjustable guard, C. This guard not only prevents the cutting of the "uppers" by accident or carelessness, but the point of the guard which extends beyond the point of the knife also acts as a gage to keep the knife at a constant distance from the stitching.



REIST'S PATENT TRIMMING KNIFE.

Very few have not at times found their uppers prematurely breaking away from their soles owing to the carelessness of the shoemaker while paring; but many have been led to believe they had, by accident, cut the upper in walking The truth is, that in a large majority of cases, the shoemaker is solely at fault. By the use of this simple tool all danger of cutting the uppers may be avoided.

The knife is withdrawn from the handle to sharpen it by simply loosening the screw, D, and the guard may be set to any required angle to suit the operator by means of the screw, E.

The testimony of a large number of practical workmen who have used the knife is unanimous in its favor as a time-saving and efficient tool.

Patented, January 21, 1868, by John Reist, of Philadelphia, Pa., who may be addressed, for further particulars, at 531 Race street.

An Enormous Canal Basin to be Built Between Piers One and Five, East River, New York.

There is at present a very important movement on foot among the great grain merchants of this city, which as soon as it assumes a tangible form will not only prove a great benefit to the metropolis, but will be of vast benefit to the shipping interest of the country. By a Legislative act certain basins and slips have been set apart on the East River side of the southerly end of the island for the exclusive use of the canal interests. This area commences at Pier No. 1 and terminates at Pier No. 5., and embraces within its limits Coenties and other large slips, but the space thus occupied is considered wholly inadequate for the wants of the grain traffic of this city, which, of late years, has assumed gigantic proportions, and has no other depot or harbor for its reception save the space mentioned. The company under whose auspices the improvements are to be made have secured the services of General Egbert L. Viele, who, after having taken a thorough survey of the locality and its requirements, submitted his plans for improvements to the directors of the Board, and they are deemed highly satisfactory.

The new basin will take in the same water frontage from Pier No. 1 to Pier No. 5 as formerly, but the projecting piers will be removed, and the bottom dredged to a greater depth to admit canal boats laden with grain during both high and low tide. Beginning at Pier No. 1, a solid granite wall two feet in width will be built, extending to the terminus at Pier No. 5, and thence out into the East River a sufficient distance to afford a secure berth for the accommodation of at least five hundred canal boats. At the upper extremity of the basin, it is designed to have erected one of the largest elevators in the country—surpassing even the mammoth elevators of Chicago and Buffalo. The structure will be of a hight sufficient to discharge grain from canal boats into ships. It will be composed entirely of iron and slate.

When this great basin is completed—it will require two years' time, as work will not be commenced until a few preliminaries are arranged—it will be the first of its kind in the United States, and it will prove a great blessing to the canal boat fleets, as well as an incentive to the city authorities and men of wealth to commence the building of docks and piers of solid masonry, instead of the present dilapidated wharves, which are a disgrace to a city so populous and wealthy as this great commercial mart of the Western hemisphere.

The necessity of this basin is shown in the fact that two thirds of the vast crops of the cereals grown in the West find their way to this city in canal boats from Buffalo, and from this port are shipped partially in bulk to Liverpool and Havre. Persons standing on the banks of the Hudson during the season of navigation cannot fail to notice the great fleets of canal boats under tow proceeding to their destination on the East River side, loaded down to their guards with grain.

A Step in the Right Direction.

The Chicago *Railway Times*, states that on the Pensylvania Railway uniformity of design and style in machinery is now the inflexible rule in every department and class of equipment and manufacture. The reform in this respect, begun ten years since in the car department, now extends to, and is very nearly realized to all the departments of the road. The end arrived at was, as then explained, "to get our entire equipment in each class uniform;" and what particularly commended it was, that it would dispense with a superfluous variety of patterns and duplicate work on hand for repairs. A larger view of late has presented itself, expressed by the superintendent of motive power and machinery, in his report for 1868, who says that its importance, "both as a measure of economy and increased efficiency cannot be too highly estimated; for, with such a system only can the cost of repairs of locomotives and proportions of engines out of service be reduced to a minimum." The superintendent of motive power and machinery is assisted by a mechanical engineer, in charge of the drafting room, after whose designs all work is made; and gages and templets are placed in the hands of all manufacturers for the company, with drawings of every portion, even to the seats for firemen and engineers in locomotives. As old stock wears out, it is cut up; and the numbers reappear on "standard" engines and cars of uniform pattern throughout. No deviation is permitted, at any one's will or caprice; all changes must be adopted generally. The system is not a novel one; it is only peculiar to the road in the extent of its application. When the new car shops are completed, the company will manufacture all its own cars; and the time is not distant when it will replace all failing engines, and make all necessary additions to motive power, after a system equally comprehensive. Indeed, it is calculated that in five years, instead of the *forty* different classes of engines now in use (456 at this writing; additions every week), there will be but *three* main classes—standard 8-wheel passenger, standard 10-wheel freight, and standard shifting. Each of the first two classes will have a "modification," the difference, however, consisting only in the diameter of the driving-wheel and the size of the boiler. An obvious result of the system will be the fact that many of the most important pieces of car or engine, being common to their class, will be *interchangeable*—in locomotives, for example, among castings, the driving-boxes, eccentrics, eccentric straps, etc., etc. The standard locomotive of the road is no less admirably adapted to its work and condition in style than in construction. Devoid of all the brass ornaments with which superfluous outlay it is customary to overload engines; painted a plain black, with number in gilt and a few neat gilt traceries. it is easily kept clean and its entire look is in keeping with the character of its work. The engineers who at first parted reluctantly with the brass and fancy painting would not now have them back. Their mistresses are admired not for adventitious charms, but for unpretentious, solid worth; for the relations "she" sustains to her lord and master are by no means without the refinements of sentiment and affection.

Running Street Cars with Tanks of Compressed Air.

The New Orleans *Commercial Bulletin* says a company has been organized in New Orleans to utilize several inventions for the application of condensed air, as a motive power for cars on city railroads, and is soon about to bring the design to a test.

The idea is that each car shall have two cylinders, or tanks, to contain the compressed air, which is to be used as a motor. These cylinders are to be on the top of the cars, and are to be be charged at the depot by an engine worked with steam. Metallic cylinders were first tried, but they were found to be too heavy, and the difficulty of the company has been to find a lighter material, available for the purpose. Paper cylinders have been determined on, and Capt. Roberts is engaged in making four to be used on the cars, two on each. They are made of strong sheets of paper, laminated to a thickness sufficient to bear the great pressure required to contain the air condensed into them. The several lamina are laid up with glue, and the paper fabric is strengthened with an envelope of cordage. In connection with these cylinders there is to be an engine, for which a special patent has been taken out, to receive the condensed air and rotate the wheels of the car.

One of the cylinders is finished, and has been subjected to a trial of three hundred pounds to the square inch without yielding. Three hundred pounds to the square inch, the inventor states, will suffice as a motor. He says he has with a platform car, experimented on a street railroad with far less power than that, and the experiment resulted satisfactorily. He used two old iron cylinders, weighing sixteen hundred pounds, which leaked through the riveting, and there were twenty-eight persons on the car.

Starting with but ninety pounds of pressure to the square inch, and with the weight of cylinders and men mentioned, he made three miles and a half in seven minutes and fifteen seconds. And as to curves, when the motor was reduced to fifteen pounds, to use his own words, he went around a street corner "as smoothly as a ball would roll on a billiard table."

On the Time Required to Discriminate Color.

In a recent number of Pfluger's *Archives of Physiology*, MM. Burckhardt and Faber describe an apparatus consisting of a pendulum of wood with a movable leaden weight attached, which has a slit at its lower end. While this slit vibrates behind a second narrow fissure, a momentary transmission of light occurs, the duration of which can be varied by raising or lowering the weight of the pendulum, or by increasing or diminishing the width of the slit. The source of light consisted of a milk-white glass plate illuminated by a petroleum lamp, and colored glasses of various tints were introduced into the slit of the pendulum. The intensity of the light was regulated and modified by the withdrawal of the lamp from the white plate, or by the interposition of smoked glasses, and in each experiment the observer was required to state what color shot across the slit. In the first series of experiments the intensity of the illumination required, when permanent, to enable the observer to state with accuracy the color perceived, was investigated; as well as the degree at which all perception of color ceased. In both series bright yellow occupied the first position; red and violet the last. It was also observed, that, with transient illumination, bright yellow gave the most distinct sensation with the smallest amount of light and the shortest duration. After this color, there followed with Burckhardt, yellow, bright blue, blue, green, grass-green, violet, red; and with Faber, yellow, blue green, grass-green, clear blue, red, violet. Fxperiments were then made to determine the intensity of the light requisite for the accurate perception of color, the duration of which was only ·0029 of a second, together with that required when the impression was persistent. They found the relation for all colors nearly equal in the same individual, though widely different for the two observers, the proportion being with Burckhardt as 173 to 1, and with Faber as 513 to 1. They conclude thence that the various colors must have the same or nearly the same brightness, in order, with a minimum duration, to yield a minimum sensation of color. The experiment with more protracted duration of the impression showed that the intensity of the excitation necessary to produce the least possible sensation of color, does not diminish proportionately with the increase of the duration of the stimulus.

Anvils.

The face or table of anvils as at present made is often defective, having frequently hard and soft places after hardening, which face should be equally hard all over its surface, and the steel in some instances not being properly welded to the iron part or butt which forms the lower part, the anvil is thereby rendered unsound and not fit for use. Some improvements recently patented by an inventor of Sheffield, England, have for their object the removal of such defects, and consist in so making anvils that the face may be equally hard all over when finished, and in so casting or welding the butt to the head or upper table that the parts may be thoroughly amalgamated and the anvil made more durable at a less expense than hitherto.

He first prepares a model of the size and shape of the anvil to be produced. He then places it in a box, covers it with composition, and fills up the box with sand in the ordinary manner. After the model is removed and the sand perfectly dry (this being done in the usual way), he first pours in the molten steel to form the face or table, then, through the same aperture (after the steel on the table is sufficiently cool), he pours in a very mild molten steel, which flows over the table and gives the requisite toughness and solidity to the steel beck. After a proper time has elapsed, he pours in through another opening the iron or metal, which also runs upon the steel and forms the lower part or butt of the anvil, and a perfect amalgamation takes place between the iron and steel. The casting being complete, it is then finished in the ordinary manner for castings.

To harden the work, a large metal bosh or trough, 6 in. or 8 in. deep, is formed, in which is inserted a number of perforated sharp-edged bars of metal, on which the anvil is allowed to rest on its face or upper surface, either flat or slanting. A sluice communicating with a reservoir of water is then opened, and a force of cold water is allowed to flow upon the face by an upward cast and to pass under the anvil and over the bars to any depth required. By these means a much harder and more regular surface is obtained than by the present mode of manufacture. After this the surface is ground in the ordinary way.—*Mechanics' Magazine*.

Quicksilver and Iron.

The difficulty of imparting to iron a complete and uniform coating of mercury by dipping it in a solution of mercury is well known. The process may, however, be very easily accomplished by cleaning the iron first with hydrochloric acid, and then immersing it in a diluted solution of blue vitriol mixed with a little hydrochloric acid, by means of which it becomes covered with a slightly adherent layer of copper, from which it must be freed by brushing, or rubbing with sand-paper, and washing. It is then to be brought into a diluted solution of mercurial sublimate, mixed with a few drops of hydrochloric acid. The article will now be covered with a layer of mercury, which cannot be removed even by hard rubbing. This layer of quicksilver protects the iron from rust, especially it be washed with spirits of sal ammoniac after the amalgamation. Articles for the laboratory, and for other purposes, coated with quicksilver in this way, and allowed to lie exposed with similar articles not so protected, retain their luster perfectly, while the others become covered with rust. This same process is especially applicable to the coating of the steel or iron instruments for which oil is generally employed, and will probably be found to resist the injurious effect of moisture much more perfectly than the oil.

EUROPEAN artificers have not hitherto been able to imitate with success the gongs and cymbals made in China; but it has recently been found that the secret of their manufacture consists in the bronze of which they are made being hammered into shape at a red heat, at which temperature it is as malleable as soft iron. A bronze containing 20 per cent of tin is very brittle when cold, but is tough and malleable when hot.

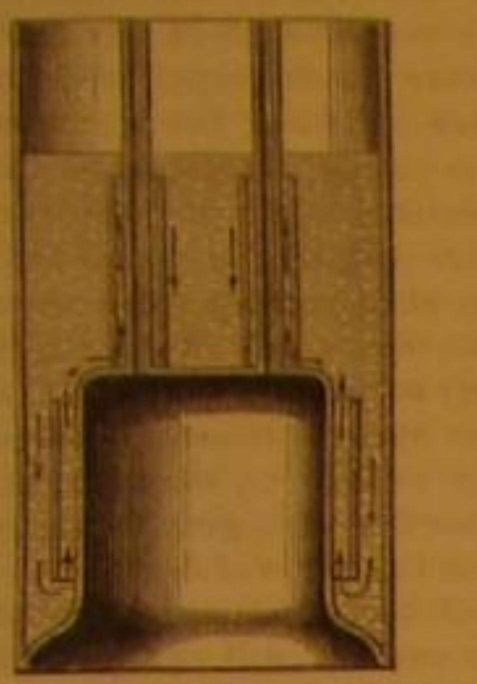
Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Design for a Vertical Boiler.

Messrs. Editors:—I beg permission to draw the attention of the readers of your valuable paper to an improvement in vertical boilers, which I designed several years ago, and which I believe will be of some interest to others engaged in boiler construction.

The annexed sketch represents the idea, only two of the vertical tubes being shown, and these out of proportion to the size of the boiler, in order to show the construction. The figure represents an ordinary fire-tube vertical boiler, with the following additions: each of the small tubes, of which there need be less in this than ordinary boilers, is surrounded by another tube, which terminates below the water line. These outer tubes are open at their upper end, and fastened in such a way to the top crown-plate of the firebox as to leave space for the water to enter below. The action is at once understood by every-one familiar with the subject. The water in the annular space being hotter than the outside of it, rises in the way shown by the arrows, and the colder water rom the outside takes its place. In such a way a constant circulation is kept up in this boiler, which is actually the vital question of every good boiler construction.



Considering the firebox as a tube of large dimensions, the same system is followed out here; and it is here of much importance, as the circulation of water and consequent disengagement of steam prevents the burning of these plates. The only place in which the water is comparatively at rest is in the lowest part of the firebox, where the solid matter will be deposited, to be removed through the manholes.

I believe that this construction has some merit, and as I do not intend to take out a patent for it, anybody who thinks fit is at liberty to use it; but I would like to hear the opinion of others about it.

A. Bernstein.

Chicago, Ill.

Solar Spots.

Messrs. Editors:—I addressed a communication to you a few days since upon the subject of solar spots; it was my intention at the commencement of that communication to give what I thought to be some of the proofs of the theory I offered in explanation of these spots; but fearing the article on the subject would be too long, I then deferred giving these proofs. I desire now to offer a few proofs of the above theory, which will, at least, seem as plausible as the theory itself.

First, to go back to the year 1777, nearly one hundred years ago, and note the appearance and progress of the spots on the sun's surface, and the various terrestrial phenomena attending the prevalence and absence of them, as observed from that time to the present. We find that during the greatest prevalence of these spots, a corresponding disturbance of the electrical condition of the earth was observed and made manifest in the magnetic needle by its variations, and also by the increase or decrease in frequency and magnitude of the auroral display, corresponding exactly to the increase or decrease of the solar spots. The variation of the needle and the unusual auroral exhibitions are both owing to a disturbed condition of the earth's electricity. Some of the auroral displays during the past summer have been unusually large and attractive. If the accounts are true, the magnetic needle is more sensibly disturbed than in other years. The spots on the sun are also larger than heretofore, and, consequently, the season of 1869 has been a season of lower temperature than usual—sensibly so. The electrical condition of the earth is more sensibly disturbed than in other years; the disturbance will probably be more marked next year than this.

These phenomena are owing to thermo-electrical causes; the larger the masses of solid matter on the surface of the sun become, the more the radiation of heat is diminished; and as electricity accompanies heat, a smaller supply of electricity is derived from the sun, which may materially affect the electrical condition of the earth. The earth must be regarded as a thermo-electric pile of large dimensions, but small intensity, and receiving a large supply of its electricity from the heat of the sun. Astronomers tell us that these solar spots are of large dimensions, at least in the aggregate 30,000 miles broad by 50,000 miles long, consequently must cover an area sufficiently large to very materially affect the radiation of heat from the sun to the earth.

Regarding the earth as an immense thermo-electric pile, it must be admitted that it cannot be otherwise than very sensitive to heat and cold, and, on parting with its heat, will therefore part with a corresponding amount of electricity, and in the present case, probably enough to account for the electrical disturbances on the earth. These unusual phenomena attending the electrical arrangement of the earth at the present time are owing to a reduced supply of heat and electricity from the sun. This supply owes its diminution to the increase of solid, condensed, or opaque matter on the surface of the sun consequent on its cooling. This solid matter obstructs the radiation of heat from the sun.

Another fact which may properly be considered as proof of the "Spot Theory" in question, is the glacial epoch, known to have existed on the earth; evidences that the earth once experienced a greater degree of cold than now, are abundant. There must have been several such epochs on the earth—in fact, a number corresponding to the number of planets whose orbits range within that of the earth, or nearer the sun. All these epochs may not have been properly "glacial," but periods of lower temperature corresponding to the accumulation of solid matter on the surface of the sun necessary to form successively all the planets whose paths are nearer the sun than that of the earth.

The increase of the spots on the sun of late indicate that another "glacial epoch" may not be an impossibility some future day.

I do not claim that this theory offered in explanation of solar spots is the correct one—so of the proofs; but I have been induced to offer them because I believe them to be new; and should this hypothesis fail to be established by further research, it may be of some value in provoking deeper investigations in the matter, but should it be of no practical value whatever, and wholly untenable, I shall be quite ready to abandon it.

C. A. Hoppin.

Loss of Life in Coupling Cars.

Messrs. Editors:—A few days ago an old and faithful engineer was killed at Goldsboro, N. C., while coupling cars. A wife and children were thus suddenly deprived of a husband and father, their sole support.

It is safe to say that a man is killed or injured every day in the year on an average upon the railroads in the United States while coupling cars. Among the list of patents published in your paper for several years past may be seen a number for coupling cars without the necessity of endangering life and limb by going between the cars. Why are not some of them in general use? Will none answer the purpose? If not, then let the public make it known through the press that they require such an invention, and American ingenuity will be sure to meet the demand. Have the class of men who work on railroads no friends to champion their cause, or is it "only a private" killed? The law provides for the safety of passengers and crew on the sea, but sadly neglects them on the railroads.

I was for years a passenger train conductor on one of the trunk lines between New York and Chicago, and have seen so many good men killed by useless man-traps that I feel it a duty to write to you in the hope that I may induce you to call attention to this subject.

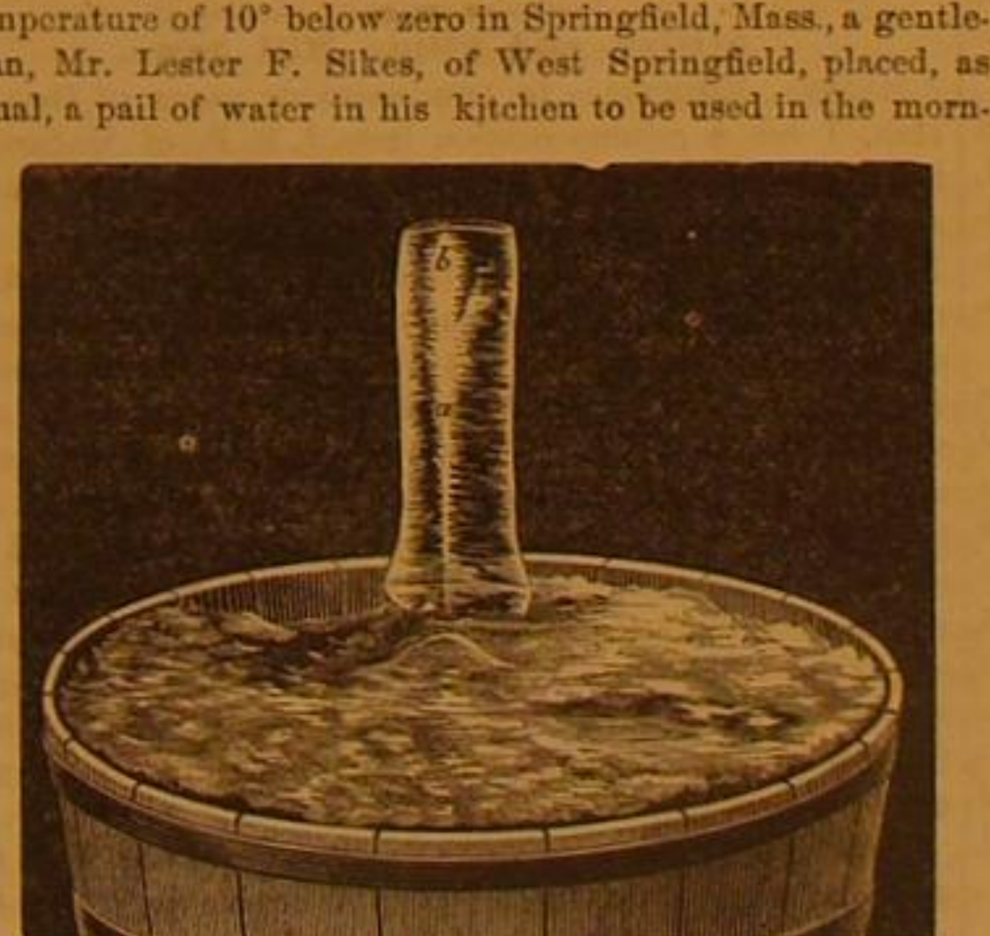
G. T. Nutter.

Newbern, N. C.

Singular Ice Formation.

Messrs. Editors:—I inclose a photograph of a remarkable ice formation to you, which, perhaps, will be of interest to you and many others.

On the nights of December 10th and 11th, when we had a temperature of 10° below zero in Springfield, Mass., a gentleman, Mr. Lester F. Sikes, of West Springfield, placed, as usual, a pail of water in his kitchen to be used in the morning. At 7 A. M., Dec. 11, this pail of water was found frozen over about one inch in thickness, and in the center of the ice surface was left standing a perfect prismatic column 5 inches high, 1¼ inch in diameter, with a flat top.



The white part marked *a b* on the photograph was the perfect image of a fountain jet. The pail was brought to me on Saturday; I cut the ice surface out and had it photographed because I thought it was a phenomenon worth preserving.

If any scientific man would undertake to explain how this remarkable formation took place, I am satisfied he would receive the thanks of many interested in nature and her doings.

Edward Wiebe, Pres. Humboldt Institute.

Springfield, Mass.

Cause of Typhoid Fever.

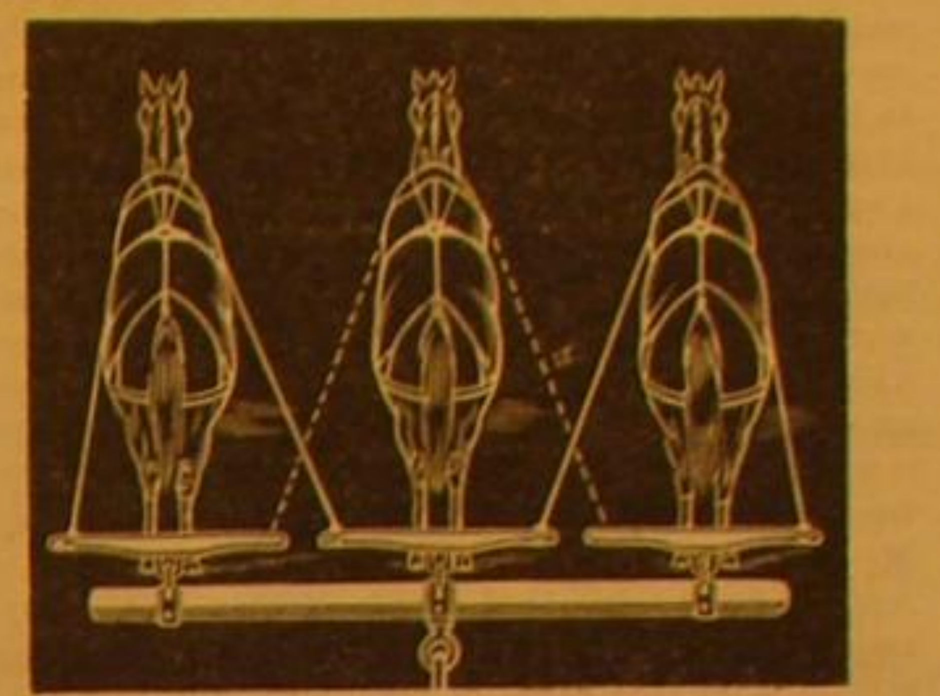
Messrs. Editors:—In your number of Nov. 27th, 1869, I have seen an article on the necessity of cleaning the sewers in order to avoid typhoid fever. There is something to add to your article. Dr. Hepp, druggist of the hospital and Medical Faculty of Strasbourg (France) found last year that typhoid fever is appearing as an epidemic in that city with the rain, or rather by the disappearance of the rain, and his observations of about twenty years taught him the following facts: There is a subterranean water layer, communicating with the rivers and fountains, at a pretty short distance under the soil, that increases with the rains, and when these are ceasing decreases in the same way, leaving organic substances in a state of decomposition which communicates a certain degree of impurity to the drinking waters. Epidemic typhoid fever always made its appearance in Strasbourg and in the surrounding places, when such was the case.

A. Veith, M. D.,
of the University of Strasbourg, France.

Natchez, Miss.

How to Hitch Three Horses to One Plow.

Messrs. Editors:—I notice in a recent number a communication from a St. Louis correspondent, in regard to hitching three horses to one plow. I will inform your readers how to do it. The sketch I send you explains itself. Instead of a double-tree I use a triple-tree, having three single trees attached, as shown.



The "lead horse" is in the middle, to which are attached "jockle-sticks" connecting the leader with the other horses to guide them; that is, if the driver wishes to use what teamsters call a single line. This method equalizes the draft perfectly.

Arthur Cunningham.

Cincinnati, Ohio.

Effect of Steam Pipes on Wood Placed in Contact With Them.

Messrs. Editors:—I send you a piece of common pine wood. Upon examination you will see the effects of steam heating pipes (for *two* winters) when brought into close connection with wood. We could send other specimens, showing a still greater "charring."

Whether or not steam pipes are dangerous is not for the writer to say, although he has taken the precaution of enlarging all openings for the passage of such conductors of heat. Thanks to you for agitating the question.

Pittsburgh, Pa. Subscriber.

[The wood mentioned varies in color from the natural tint of the wood through gradations from brown to black, although the black portions are very thin and lie wholly on the surface. The browned portions penetrate to some depth and the wood is so far charred that portions of it are easily crushed into powder by the fingers. An experiment shows it to be most easily ignited. In fact, it is nearly as combustible as tinder. On the whole, we are inclining to the belief that pipes carrying high steam cannot be placed in contact with wood without a risk. Our correspondent omits to state what pressure of steam is carried in the pipes which produced this effect. This is an important point, as it is desirable to ascertain at what temperatures these effects are produced.—Eds.

Who Get The Patent Office Reports?

Messrs. Editors:—The 25th number, last volume, of the Scientific American failed to come to hand, the first failure in the present year; will you please send me one? I would as soon do without a new coat as my Scientific. Can you tell me why so many of the Patent Office reports are sent to men who do not care anything for them, and so few to inventors, the very men who need them?

My lock is finished, and no man has been able to open it with the key in his hand. I have just sold the New England States for my patent heel cutter for twenty thousand dollars. My motto is "Never despair."

J. H. Bean.

Marietta, Ohio.

[The reason why so many get the Patent Office reports who do not value them, and that so many inventors, and persons who would prize and be benefited by having them, cannot obtain them, is that a proper distribution is not made by Congress. The members vote themselves too large a number for distribution among their constituents, and not half enough for the use of the Patent Office. The Commissioner should have the distribution of the bulk of each year's issue, that every patentee and applicant for a patent might be supplied from the Patent Office. Inventors are the persons most interested in these reports; it is their money that is appropriated for the payment of them, and they should be first served with them. The Commissioner has the names and addresses of many thousands of persons who would be glad of his annual report, and he has the facilities for the proper distribution of all that are published.

We hope Congress, in their next appropriation, will largely increase the number for the Patent Office, if the members are somewhat curtailed in the distribution. We are glad to know your good success in disposing of your patent. We like your motto.—Eds.

Curious Phenomenon in Artillery Firing.

Messrs. Editors:—In your Dec. 11th issue of the Scientific American, under head of "Curious Phenomenon in Artillery Firing," I would say that the resistance of the atmosphere on the lower half of the projectile was greater the upper half; also, the displaced air would have a tendency upwards, where it could make room for itself much quicker than downwards, as firing under water parallel with the surface, the bullet will come out of the water into the lighter air. J. WHITEFORD.

Junction City, Kan.

Law of Attraction.

MESSRS. EDITORS:—In a recent number of the SCIENTIFIC AMERICAN appeared two brief, but interesting articles in relation to the phenomenon of rapidly revolving bodies overcoming the force of gravitation. The first was a communication from R. H., setting forth the reasons why rail-cars can be easily thrown, or even blown by heavy gales from the track when the locomotive is running at a high rate of speed.

The second was a paragraph from the London *Globe*, in which it was asserted that a cannon-shot after leaving the muzzle of a rifled gun, sensibly rises above a horizontal line. In both the above named instances the revolving bodies have been raised, or thrown above the horizontal line by reason of a temporary suspension of the earth's attraction upon the *atoms* of those revolving bodies. A solution of this singular problem may be easily obtained by carefully observing the movements of that curious toy known as the gyroscope, or "Philosopher's Puzzle." Some years ago, mainly for my own amusement, I set to work in order to discover if possible how it was that a rapidly revolving wheel of iron could, by mere momentum, completely set at defiance the law of gravitation. My experiments were extremely simple and can be readily repeated by any one; but simple as they were, they were ample enough to satisfy my mind at least, that *magnetic attraction* is the true cause of gravitation and that the rapid reversion of the polarized atoms of bodies temporarily disturbs, or in other words, cuts off the earth's magnetic current thus producing such phenomena as we have seen in the car-wheel, rifled cannon-shot, and revolving gyroscope.

Now for the experiment. I started out with the assumption that the earth is a constant magnet, and that all bodies are attracted towards its surface by reason of magnetic polarity; that the only power which can overcome the earth's magnetic force, is motion; that revolving or gyratory motion as seen in the bearings of fly wheels, in whirlwinds, and even in the little gyroscope, is the most effective in bidding defiance to the force of gravitation. By moving a magnet near either of the poles of a common pocket compass, the needle can be made to oscillate according to the movement until, by increasing the motion, it can be induced to revolve rapidly on its axis and will so continue to gyrate independent of the attracting point until its momentum it exhausted when it will again obey the magnetic influence. In this it is quite apparent that the rapid reversion of the polar, or positive and negative points of the needle, for the time being completely disturbs or cuts off the attracting current of the magnet and that the motion must proceed until friction has reduced the momentum below the attractive power of the magnet. It must be borne in mind that the magnet is a *constant* force, while momentum, by reason of friction and other resistance, is constantly decreasing and must ultimately obey the superior power of attraction.

The same is true of the whirling rifle-shot, and revolving gyroscope. Each for the time has its rapid rotary motion, reversing the polarity of its particles and overcoming the attraction of the earth. But the earth is a powerful and constant magnet and ultimately asserts its control over the disturbing object.

In my experiments with the gyroscope, I found that the wheel could be made to revolve at any angle to the pedestal upon which the staff rested, but that, at ordinary velocity, it revolved better when the staff was placed horizontally. I further noticed, however, that when very great velocity was imparted to the wheel (it weighed one pound avoirdupois) it would immediately rise above the horizontal line, and so continue to rise gradually until it would attain a vertical position and fall upon the pedestal.

I think this may tend to explain the phenomenon of the rapidly revolving rifle shot rising in the air the moment it leaves the muzzle of the gun. W. F. STEWART.

San Jose, Cal.

Latent Heat of Metals.

MESSRS. EDITORS:—In an article copied from "Pynchon's Chemical Forces," under the above title, in the SCIENTIFIC AMERICAN of December 18, the old theory of latent heat is still adhered to, as explaining the phenomenon of the rise in temperature which takes place when a mass of metal or other matter is subjected to condensation, or to the lowering of temperature when subject to liquefaction or evaporation.

In the light of advanced science as laid down by such men as Prof. Tyndall and others, the whole theory of latent heat has been greatly modified; for while all bodies contain a certain amount of latent heat, it by no means follows that because a body rises in temperature upon being subjected to any mechanical force, the heat developed was previously stored up in the mass as "latent."

To say, therefore, that the quantity of heat which is given out by a metal when it is compressed is simply making apparent that which was before "latent," is an absurdity. Fortunately for us the researches of science at the present day have cleared up, to a great extent, the mystery which enveloped the study of the forces of nature and the universe, and the former theory of latent heat has been displaced by that of the undulatory or vibratory conditions of matter. It is now universally accepted that light and heat are but "modes of motion," or, rather, that the particles of "ether" which pervades all bodies and all space are in a state of oscillation, the oscillations being of different degrees of velocity and length, one condition resulting in that which, to our senses, is perceived as "light," another manifesting itself to us as "heat," with various intermediate degrees. Some of greater and some of less velocity, light itself being divisible into the prismatic colors, actinic and caloric rays, each particular class of rays resulting from a greater or less number and length of vibrations per second.

Therefore, in the phenomenon of the flash of light which is emitted by a bullet when striking a target, instead of its being an emanation of that heat which was before "latent" in the bullet or target, the true explanation would be, that the force exerted by the combustion of the powder against the ball is suddenly changed at the moment of contact with the target, from that of the *mass*, in a given direction, to that of moving the *particles* of the mass among themselves; or, in other words, the velocity of the mass has been changed to the velocity of the atoms composing the mass, and this velocity of the atoms is propagated and communicated to the ether and particles of the atmosphere, which motion gives us the sensation which we call "heat." Should the vibratory action thus generated be sufficiently energetic, not only heat but light will be evolved; and should the ball be projected with a motion equal to that imparted to a meteor before it enters our atmosphere, not only would heat and light be evolved at the moment of contact, but the particles of the ball would be set in such violent oscillation that the atoms would be torn asunder and dissipated in vapor.

All this is entirely consistent with the theory of the "conservation of force"—that nothing is lost, either in "motion" or force; so in the experiment of the Dahlgren guns, which was referred to in the article in question, instead of the heat being previously stored up in the iron projectile and made sensible by compression, it is simply the change in the mode of motion of the ball against the iron wall of the monitor.

So in the matter of friction, the heat which is given out by a rope rapidly running out over the side of a vessel, is really a leakage, as it were, of the force with which the rope is being dragged from its position, and this leakage is caught up by the particles of wood in contact with the rope, and they are set to vibrating. If the force or velocity—for velocity is power—be great enough, the side of the boat will speedily burst into flame.

The passage of a meteor through our atmosphere is another illustration of the same phenomena, the meteoric mass, moving with immense velocity, impinges upon the particles of the atmosphere, and it is at once retarded in its flight; but the original force is not lost, it only takes on another form, and the atoms of the meteor are set in motion with such violence that they burst into flames of dazzling brilliancy, and in many cases the whole mass is dissipated into thin vapor.

But it is needless to multiply examples, all the foregoing are but exhibitions of one and the same force under different degrees or conditions of vibratory action, and easily demonstrable according to the now accepted theories as laid down by scientists of the present age. J. P.

Cincinnati, Ohio.

Setting and Filing Mill Saws.

MESSRS. EDITORS:—In your valuable paper of December 11th, I see a communication from J. R. P., of Alabama, in regard to filing and setting mill saws, which conflicts with my views, based on twelve years' experience.

I file all splitting saws straight across, holding the file at right angles with the saw, on the under and upper side of the tooth; because, in the first place, if you file the teeth on an angle or bevel, it is very difficult to get them all alike, and if you do not, one tooth draws off more and works against the other, the saw runs harder, and is also more liable to knock the set out of the teeth. And, again, I contend that it takes more power to run a saw, filed in that way, because if a tooth is filed on an angle it has a longer cutting edge than when filed straight across. When filing square across, the file is held constantly in one position, and after a little practice it is easier to see when it is at right angles with the saw.

I swedge the teeth, of course, so they need but very little set; and to get that, I spring the tooth near the plate of the saw to get all the strength of the tooth, and set it to a gage on each side. When I start my saw it always points straight ahead, the tooth being swedged makes it wider at the point, and the saw always runs perfectly free, and if it dodges in striking a hard knot, the corners being sharp on the opposite side, it will work its way into line immediately instead of crowding further off.

In running saws in this way, I have less trouble, and make more and better lumber than those that file their saws flaring. S. P. WILLIAMS.

Rutland, Vt.

Two Driving Wheels vs. One for Harvesters.

MESSRS. EDITORS:—It is neither practically nor philosophically true that two driving wheels for harvesters are better than one, as the following facts will show: Two driving wheels on one axle must turn independently of each other, and the wheel that turns fastest must of necessity do all the driving. Consequently, when the machine moves on ever so small a curve, the outside wheel turns fastest, and not only does all the driving but must make a heavy side draft as the draft pole is then all on one side of the center of draft, so the wheel that runs over a stone or knoll, while the other runs on a level, turns faster and does all the driving, which, on rough or uneven ground, causes the side draft to be continually changing from one side to the other. Any one can satisfy himself of this by looking at the front end of the draft pole. He will see it knock first one way and then the other, as I have described. These are by no means all the difficulties; for while the driving is changing from one wheel to the other, the knives must stop until the lost motion caused by the room for play in the cogs, bearings, and boxes, is all taken up, and this, when they become much worn, will frequently be so much that the knives will not cut at all in tough lodged grass. It is like stopping and starting in the grass without backing the machine.

These are important objections which farmers and manufacturers should well understand, as they apply to all two driving wheel machines; but none of them applies to one driving wheel machines. It is only when two driving wheel machines are drawn in a straight line on smooth ground that both wheels drive at the same time, and this is the very time when they are least needed. The driving wheel of one-wheel machines is made a little heavier, with more face and more corks, so as to drive strong enough on any ground. I know many farmers are very much prejudiced in favor of two-wheel machines, as they call them, but I presume it is not because both wheels are drivers, but simply because they run on two wheels, in opposition to the old one-wheel machines with a rigid finger bar dragging on the ground.

All harvesting machines, when cutting grass, should run on three wheels, two besides the driver, and the axis of these should be in a line, or nearly so, with each other, so as to run and back easily, and to turn about without the necessity of lifting up the finger-bar, or tearing up the sod or turf, and also to prevent the finger-bar from dragging on the ground. If the draft pole be placed in the center of draft alike on both machines, the side draft will be far less in the one driving wheel machine than in the two. It will run easier for the team, turn about with less trouble for the driver, and do its work as well when cutting grass, all other things being equal. It is also far better in almost every respect as a combined machine or as a reaper. S. HULL.

Poughkeepsie, N. Y.

Curious Phenomena.

MESSRS. EDITORS:—Let me lay before you really curious phenomena witnessed in this vicinity on the morning of Nov. 25, and ask you, or some of your able contributors, to give us an explanation.

Mr. Hamilton, who owns the grist mill here, found his gate fast in the morning and sent for me to see what could be the matter. We soon got the gate open and the mill running He not long after sent me word that he could not shut the gate, and in one hour his mill stopped entirely under a full gate. The rack filled up with ice. He cleared this out again and again, and it as often filled up again. The ice accumulated on the rack and slides of the flume a foot or more thick. It appeared to accumulate on the gate, right in the current, under nine feet head. It filled the wheel all full and stopped it with power enough on it to drive two run of stones. There is a hole through the dam, the lower end at least seven feet under water, five feet by one and one half feet, with a timber running through the center, made to enable us to finish repairs. This filled up. The water ceased running over the dam and very perceptibly fell off till the ice disappeared, when it immediately rose again to its usual hight. This ice was a porous substance fibrous in formation; such as we see thrown up by the side of the road in the fall. In the hand it felt like crust snow. At about noon it all disappeared at once and the mill started at full speed. During this time the water seemed to have no power of motion. It changed to ice in a manner contrary to all the laws of ice formation. All up and down the sides of the channel, in the current the most as in the hole in the dam, on the rack, on the gate, and in the wheel.

Such are the facts. The phenomena are new to the old mill owners here. We would like an explanation.

Week s Mills, Me. REV. W. H. LITTLEFIELD.

[For the Scientific American.]

ARTIFICIAL LIGHT FROM THE PINEWOOD CHIP TO THE GAS CHANDELIER.

BY I. CANTINI.

Ere long we shall not be able to imagine to ourselves a city or town without gas light, or a country farm house without its petroleum oil lamp. The present generation is swimming in a sea of light. But these acquisitions are of recent date, and the remembrance of smoking lamps, dripping candles, candle snuffers, etc., is still fresh in our memory.

Dark and gloomy centuries lay between the pinewood light and the gas chandelier. Chips of pine wood afforded the first lights, but as soon as the combustibility of animal fat was discovered, the idea of filling it into a vase and putting a wick to it, almost suggested itself. This crackling, flickering light was transmitted from father to son, until the introduction of oil, which soon threw animal fat into oblivion.

Orientalists and antiquarians agree that the Assyrians, the Egyptians, the Jews, the Greeks, and the Romans, all used the oil lamp. Most wonderful designs for these utensils, made of stone, iron, and brass, have been discovered in the Pyramids, in the old temples of India, and among the ruins of Jewish cities. Of the lamps used among the Greeks and Romans, the excavations at Pompeii have furnished a rich assortment. Gold, silver, marble, precious stones—nothing was considered too costly an ornament for this necessary household article. Most of these lamps were works of art of the first order, and even the more common kind used by the lower class of inhabitants, made of *terra cotta*, are tasteful in form and artistic in execution. Even our modern industry has not been able to excel their workmanship. Yet these ancient lamps were not as practical as they were beautiful. A common lantern of our day affords a better light than the elaborately wrought vessels of ancient Rome and Egypt.

The art of refining oil was unknown to the ancients. As an especial luxury they mixed their oils with the essence of roses and with sandal-wood, which, however they disguised the bad odor of the oil, only diminished the strength of the light. The historians mention that Lucullus, and others, spent large sums for these perfumed oils, and yet the illumination of our most modest of shops and stores is of course far superior to that of the most magnificent of the palaces of ancient Rome. The gold and silver lamps were hung on fine worked chains from marble pillars, but the flame was small, and, besides smoking excessively, it flickered or went out entirely in a slight current of air.

From Rome the oil lamp passed into France, Germany, and England, where the pinewood chips, and wicks soaked in fat, were still in use. The inhabitants of Denmark, Scandinavia, and Scotland, when in want of pine wood, caught some fat bird, or other greasy animal, and set fire to it, and patiently endured the smell emitted from the burning carcass until it was burned to ashes.

The Roman lamp underwent but little change until the discovery of the tallow candle. The spare illumination explains in some measure the sober habits of our ancestors. They arose with the break of day, and retired when the present generation begins to get ready to go to places of amusement. The "curfew bell," derived from the French word *couvre-feu*, was not without its signification. Under William the Conqueror, every light had to be extinguished at eight o'clock, and no one was much incommoded by this law, for the people were generally too poor to pay for an extra quantity of oil.

The first step to introduce the tallow candle, was taken in the twelfth century, when the tallow torches came into use; during the following century the tallow candle was brought before the public, much in the same form and shape which it bears at the present day, only they used a flaxen wick, cotton being unknown at that age. These candles were, however, considered a great luxury, and used only by persons of high rank. Some fifty years later the wax candles were manufactured for the courts and royal palaces. When they were first used in churches their cost was enormous. A wax candle offered on the altar to the praise of God was considered a royal gift.

The price was still high up to the sixteenth century. The anecdote related of Oliver Cromwell, who one day found two wax candles burning upon his wife's toilet table and extinguished one, shows that even among the rich illumination formed an important item in the household budget.

The eighteenth century brought an essential change in this necessary household article, caused by the discovery of rape oil; olive oil had till then been used in Italy and France, and whale oil in the North; but rape oil was much cheaper, and thus afforded an opportunity to the poorer class to enjoy the the comfort of an oil lamp.

In the year 1783, the first great reform in the construction of oil lamps was devised. A Swiss, named Argand, who had been adopted by an Englishman in London, was the inventor of the cylinder-formed wick, which moved like a tube between two metallic pipes. This mechanism allowed an even current of air to feed the flame, the smoking of which was obviated by the addition of a glass cylinder, which latter not only prevented smoke, but also diminished the disagreeable smell of oil, and more than all, caused an increase in the strength of the light.

This new invention soon came into general use. The Gerard Brothers improved it greatly by placing the oil receptacle below instead of above the flame, which gave to the lamp a much more graceful form. They also introduced the milk-glass shades to break the glaring light. The next improvement appeared in the "Carcel" lamps; the "moderators" soon followed, which latter is still in use in many places where oil is burned.

With the improvement of lamps refining of oil also underwent an essential change. In 1790, vitriol was used in purifying oils, an invention which was made almost simultaneously in France and England. With every year the number of substances from which oil could be obtained was increased by new discoveries; but all these inventions were left far behind after the discovery of petroleum wells in America in 1845.

But tallow and wax, and even the most refined oils, are far surpassed by the gas light. The first attempts to burn gas were made by an Englishman named Murdoch, who distilled gas from coals and with it illuminated his house. In 1804, Mr. Murdoch introduced it into a factory at Manchester. A few years later the first gas company was organized in London, where it has been in use ever since. The fast progressing civilization of America did not tarry long in adopting this new invention, and the improvements in the art of illumination, which in America are almost a daily occurrence, prove that this western hemisphere will never have to pass through such an ordeal of darkness as that which for centuries has been allotted to the eastern world.

In the days of Shakespeare the theaters were illuminated by tallow candles, and the actors had to come forward between the acts and themselves perform the work of snuffing the candles. This always occasioned a great deal of merriment among the audience, who, having a moment before been moved to tears by their tragical speeches, were made to witness such a menial performance. To such Hamlet's and Othello's, our sperm candles and petroleum lights, not to speak of the gas, would doubtless have appeared as a gift from Heaven.

Some fifty years have passed since gas was first introduced and already dangerous rivals threaten to take its place. The electric and calcium lights, and various kinds of gas have been tried with very considerable success. Nobody believes, however, that the art of illumination has arrived at its climax of perfection. Undoubtedly the time will yet come when our city streets, bridges, and tunnels, will be lighted in a style scarcely inferior to daylight, a *desideratum* which might even now be attained were our officials as anxious to serve the public as to fill their pockets.

[For the Scientific American.]

THE CALABASH TREE.

BY JOHN RAMSAY GORDON.

The calabash tree is of the *genus* known to botanists as *Crescentia*. It grows in the tropical countries of South America, and also in the West Indies, in which parts it flourishes profusely. This tree attains a hight of thirty feet and arrives at a moderate age. The trunk and branches of it are very tough and ligneous, and the bark is very irregularly distributed on them, being found thicker in some parts than in others. As the branches are, in comparison with the trunk, disproportionately thick, they thus have a clumsy appearance, which is increased by their being studded with irregular protuberances throughout their entire length. They have a tendency to bend in the opposite direction to that from which the wind blows. Thus in the West Indies, where the prevalent wind is from the east, the branches of this plant are mostly curved towards the west. The leaves are of an oblanceolate form and of a dark green color. They do not grow in clusters like most others, but proceed separately from the branches, and even from the trunk, at almost regular distances on them. The flowers are of a pink shade streaked with lines of a bownish tinge. After the decay of these, nuts appear on the same stalk. The nuts are ellipsoidal in shape and are of a woody consistency. They extend in size from that of a walnut to that of a large pumpkin.

These nuts contain a pulpy kernel, in which there is an innumerable quantity of small flat seeds. When they are young they are perfectly green, but as they become older they assume a darker hue; and, although when unripe they can be penetrated by a penknife, yet they can only be divided by means of a saw, or some other forcible alternative, when they have attained maturity, as they are then of the woody consistency before mentioned; and, indeed, they are so hard, that the instrument employed in cutting them is very often blunted during the process.

In the West Indies, the natives convert the nut of the calabash tree into household utensils of many kinds. Of them they make drinking cups, sugar pots, baskets, divers ornaments, and dippers for water, and such are procured from the small nuts; of the large ones they make bath tubs for their infants and wash tubs for their clothes. The manner of preparing these nuts employed by them is as follows: They obtain a saw and cut out the shape of the article they require; then they extract the pulpy kernel, which they generally reject, and with a knife they scrape the inside of the nuts until they have cleared it of moisture; next, they scrape the wood of the interior with a piece of bottle-glass and polish it with sand paper. After this process has been completed they place them in boiling water, which they assert prevents them from becoming black within. If the exterior of the nut be required to be scraped, it is done before the hot water is applied.

Some of the aforenamed articles are painted with a variety of colors, but such consist only of the ornamental kind. Those that are intended for drinking purposes are not colored. The drinking vessels are formed by sawing off one end of the nut or by dividing it longitudinally, and, in the latter case, two vessels are obtained from one nut. The sugar pots are formed by sawing off the end of the nut and employing the piece which is cut off as a cover to the vessel, and it is attached to it by means of a bit of string. These articles they call their "Gobis" or "Govis." The dippers are formed by taking away a portion of the end of the nut, and inserting a wooden rod in a small hole in the side of the nut, to serve as a handle.

Some of these articles of household furniture are very tastily manipulated to captivate the eye. In the absence of a saw the negroes employ a piece of string and a stone to divide these nuts, and this is effected by tying the string round them and tapping gently with the stone on it till it enters; it is a tedious process but is often successful.

The kernel of the calabash is boiled into sirup by the natives, and it is asserted that this sirup is very beneficial to consumptive invalids, as it has a soothing quality. Occasionally the pulp is given to goats who are exceedingly fond of it and eat it with avidity.

The calabash tree is the haunt of iguanas, snakes, lizards, and all kinds of reptiles, which exist on the flowers, of which they are very fond.

On the subject of the foregoing article, the calabash tree, the works of the celebrated French writer, Pierre L'Abbat, are very interesting, and I think are worthy of perusal.

About Water Supply-Pipes.

A correspondent in the *Herald of Health* makes the following inquiries, and to which the editor sensibly answers:

"What can I use as a water supply-pipe? Is gutta-percha the best? How is galvanized iron? Is there not mischief in it, or in the zinc used to whiten it? Pure block tin is not to be had, for they will mix lead with it when the pipe is drawn, in order to make it more ductile. Is rain water, running through lead goose-necks from a roof, with sheet lead round the chimney (as is usually the case), preferable to well water as a drink?"

It yet remains for some one to achieve fame and fortune and confer an incalculable amount of good upon the race, by inventing water supply-pipes which shall possess the following requisites: 1. Entire freedom from corrosion by any and all kinds of natural waters. 2. Exemption from the action of air and moisture and a moderate degree of heat. 3. Flexibility, strength, and ease of joining. 4. Cheapness. The nearest approach to this standard, at present, is the tin-lined pipe. The objections to the tin-lined pipes are: 1. Where joints are made, the tin and lead come in contact with the water, and then, owing to galvanic action, the corrosion of the lead is more rapid than if tin was not present. 2. The tin lining is liable to cracks and flaws, which allow the water to come in contact with the lead, with the same result as at the joints. 3. There are some waters that rapidly corrode the tin itself, when it is not in contact with lead or other metal. If, as this correspondent states, lead is mixed with the block tin to make it more ductile, this is still another and more serious objection. Gutta-percha will not withstand the action of air and moisture, and is consequently useless. Iron rusts, and if galvanized, the water dissolves the zinc coating. [Pure water oxidizes, but does not dissolve the oxide of zinc. The expression, water dissolves zinc coating is calculated to mislead. Galvanized iron pipes may be used with safety under proper circumstances, and when the water is free from free acids, alkalies, chlorine, etc.—Eds. Scien. American.] The answer to the last question depends upon circumstances. If the well water is pure and soft, then it is preferable. If it is hard, choose the rain water, and filter it. If we adopt the rule not to use water which has stood or been long in contact with metal, we shall escape with slight injury.

The Hartford Steam Boiler Inspection and Insurance Company.

This company makes the following report of its inspections for the month of November:

During the month 510 visits of inspection have been made; 909 boilers examined, 822 externally and 144 internally; 57 have been tested by hydrostatic pressure. The number of defects in all discovered are 294, of which 57 are regarded as dangerous. These defects in detail are as follows: Furnaces out of shape, 20—4 dangerous; fractures in all, 19—6 dangerous; burned plates, 35—4 dangerous.

Mr. Fairbairn finds that the strength of iron plates diminishes one fourth at a red heat, and it is not difficult to understand that, at a very high heat, no reliance whatever could be placed upon iron when subjected to a strain; and although portions of the crown sheet from exploded boilers do not always indicate that they have been subjected to an injurious temperature, still this is true in some instances, and must be reckoned among the causes which operate to weaken steam boilers, and they are consequently in a condition inviting explosion.

Blistered plates, 51—2 dangerous; cases of incrustation and scale, 59—5 dangerous. Of cases of sediment and deposit several have been found, generally the result of exhausting into the heater. This difficulty has been especially true in certain cases where manufactured oils were used for lubricating the engine cylinders, and where there was considerable carbonate of lime in the water used in the boiler. Either use pure oils for lubricating or else run the exhaust somewhere besides into the well or tank from which the boilers are filled.

Cases of external corrosion, 52—7 dangerous; cases of internal grooving, 4; water gages out of order, 28—10 dangerous; blow-out apparatus out of order, 8—1 dangerous; safety valves overloaded, 15—4 dangerous; steam gages out of order, 15—3 dangerous; boilers without gages, 3; cases of deficiency of water, 6—1 dangerous; cases of insufficient or broken stays, 4—2 dangerous. One inspector reports that in one case nearly all the braces were broken from one boiler head, and another reports that in a boiler 5 feet in diameter, under heavy pressure, nearly all the braces in both ends were either broken or very loose. This difficulty may be set down as another cause of boiler explosions.

Force, and What It Is.

Professor Youmans, in a recent lecture delivered in Steinway Hall, in this city, om the "Dynamics of Life," stated some interesting facts. The lecturer pointed out the nature of force, showing that it was indestructible, although capable of change. Thus the force acting on the very center of the sun was never lost. It went forth in the form of light and heat; it raised up the plant; the plant was food for the ox; the ox was changed into muscle and nerve, which gave men power to strike the blow; the blow produced heat: so force was convertible. Force is never lost. By an easy transition, he passed to the storing up of force. He gave some remarkable instances of this storing, which is mechanical and molecular. Thus, one pound of coal has sufficient power in it to raise one pound of matter two thousand miles high. Then referring to a pail of water changed first into ice, then dissolved into water, which in turn was changed into steam, and subsequently separated into oxygen and hydrogen, he remarked that the force requisite to make these eight parts of oxygen and one of hydrogen into water was equal to the fall of one tun down a hight of five miles, the change of steam into water was represented by a fall of one tun 2,900 feet, of water into ice by a fall of one tun 433 feet. A knowledge of this fact caused Tyndall to observe that the force which a child carried in an apronful of snow was sufficient to hurl back an avalanche precipitated down a mountain side.

Prize Engraving.—The first large batch of engravings was mailed or expressed to all parties entitled to them, on the 29th ult., the postage and expressage being in every case prepaid. We have now a sufficient number printed and put up in pasteboard covers to meet each day's demand, and orders will hereafter be filled on the day of their receipt.

Improved Music and Book Stand.

Many an invalid will welcome the improvement we herewith illustrate ; but while it is a desideratum for feeble folk, it will be found a luxury which few, either sick or well, having once enjoyed, will be willing to resign. While as a music stand it combines all the advantages required in such a piece of furniture, it enables reading to be performed without fatigue, while the person is placed in an easy reclining position.

Our artist has so well delineated the comfort it supplies, that little remains for us but to point out the distinguishing features of the invention.

A tripod with hollow stem receives the standard which supports the desk, and a set-screw enables this standard to be adjusted to any hight required. It may also be turned on its vertical axis and fixed by the set-screw as circumstances require, and this adjustment may be made without raising the person from a reclining position. A disk of wood or other suitable material supports the table of the stand, the latter being fastened to the disk by a central pivot with a thumb-nut on the under side. This gives another adjustment.

CONLEY'S MUSIC AND READING STAND.

The disk which supports the table is hinged to the top of the standard at the rear portion and from the front descends an arc of a circle which passes through a slot in the standard where it is adjusted as desired by a set-screw.

These devices enable the desk to be set at any convenient angle to support a book for reading either while a person is sitting or reclining, so that the printed matter is placed directly in front of the eyes, and in such a position that no muscular effort is required to sustain the book or to keep the body in a position of constraint.

Still another great convenience is that the table may be adjusted in a level position and be used as an ordinary stand for medicines and other purposes desired.

It admits of any degree of ornament deemed desirable, is easily constructed, and durable, and hence has all the qualities calculated to secure popularity.

This invention was patented Nov. 30, 1869, through the Scientific American Patent Agency, by Edward Conley, of Cincinnati, Ohio. Address patentee at 121 Main St., as above, for further information.

WELLS' IMPROVED ECCENTRIC FOR STEAM ENGINES.

The object of this invention is to not only enable the ordinary adjustment for angular advance to be made, but also to permit a change at will of the length of the throw, and the travel of the valve by means of the eccentric, instead of effecting it through a link or any other device heretofore employed.

It may be considered as an eccentric within an eccentric the two eccentrics A and B in the engraving being locked together—except when unlocked for adjusting—by the bolts D C. These bolts are so placed that their heads, and the nuts opposite the heads, lap over the edges of both A and B, and when the nuts are screwed home the two parts are firmly locked together. These bolts also serve to keep the parts A and B parallel to each other.

The inner eccentric, A, being held to the shaft by a set screw, the greatest throw of the eccentric is obtained by turning the exterior eccentric or ring, B, until its widest part is in the position shown in the engraving, that is, upon the line of the greatest throw of the inner eccentric, A. The figures, ½, marked upon both eccentrics, indicate by their coincidence when this adjustment is accurately made. When the narrowest part of B is brought into the line of the greatest throw of the inner eccentric, A, the minimum throw is obtained, and accuracy of adjustment is indicated by the coincidence of the figures ½ on both pieces.

The whole forms a compound adjustable eccentric, which supplies a complete variable cut-off, and is very much simpler in construction than other devices hitherto adopted to secure the same end. With simplicity, increased durability and diminished cost are also secured. The device is free from elongated slots in the center, the effect of which is to weaken the parts, and it is adapted to use on shafts of uniform size throughout instead of being operated by a crank pin, as has heretofore been done in other devices made to secure the same end.

The improvement will attract the attention of engineers from its simplicity, and the advantages secured by it are obvious. Patented through the Scientific American Patent Agency, Sept. 21, 1869, by J. C. Wells, whom address for further information at Warren, Pa.

The Value of Mathematics.

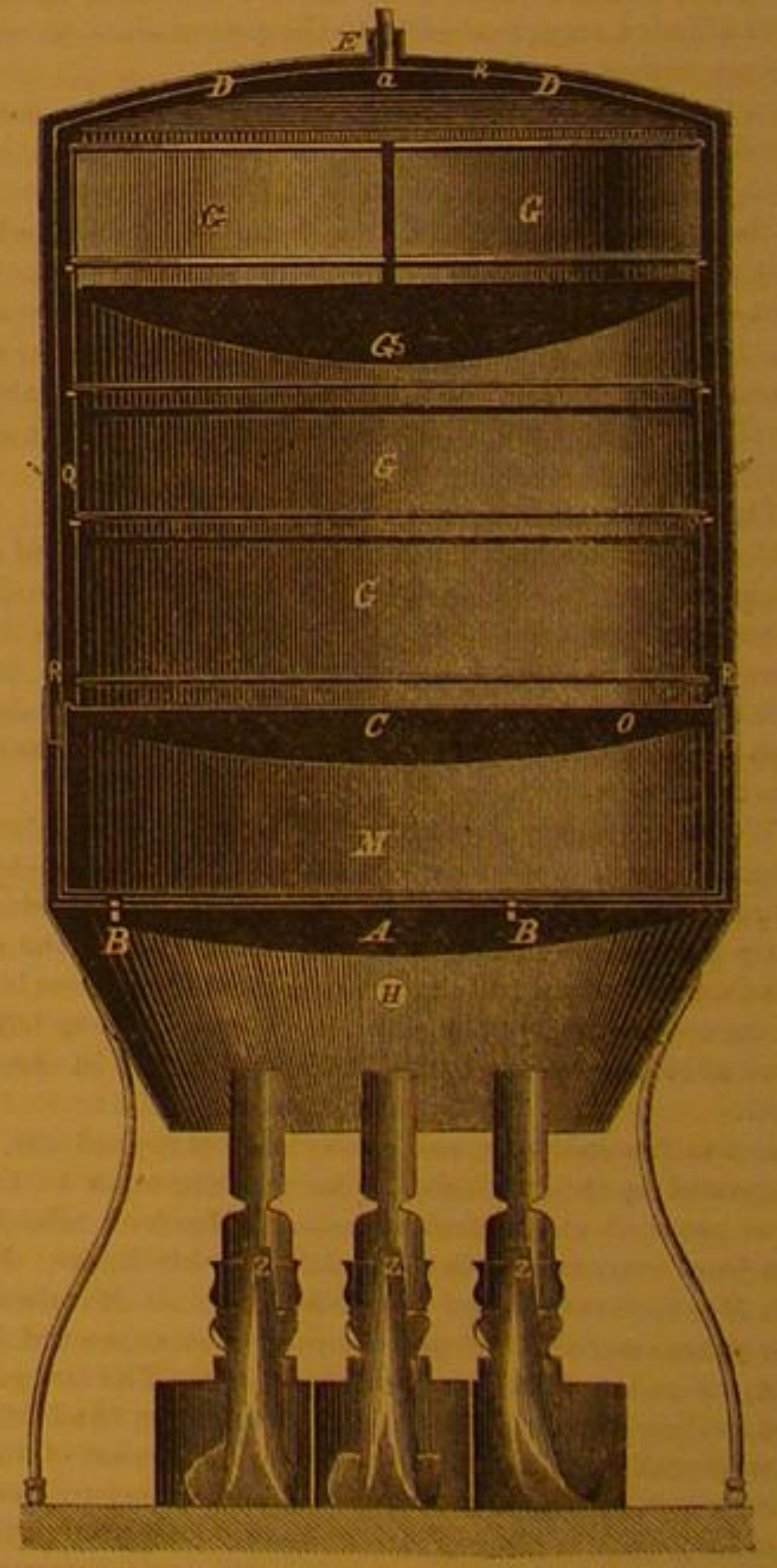
We do not recollect seeing an abler exposition of the value of mathematical study, and the use of mathematics as an instrument of investigation than the following extract from the tenth lecture of Mr. John Fiske, on the Positive Philosophy, delivered at Harvard :

"The logical utility of mathematics is not less obvious. The prevelent distaste for mathematics, coëxisting, as it does, in many persons with excellent reasoning powers, proves that the faculty of imagining abstract relations is ordinarily quite feebly developed. Not reason, but imagination, is at fault. The passage from premise to conclusion could easily be made,if the abstract relations of position or quantity which are involved could be accurately conceived and firmly held in the mind. Now the ability to imagine abstract relations is one of the most indispensable conditions of all precise thinking. No subject can be named, in the scientific investigation of which it is not imperatively needed ; but it can nowhere else be so thoroughly acquired as in the study of mathematics. But the excellence of mathematics as an instrument of mental discipline by no means ends here. It is, indeed, as Comte observes, a fallacy to suppose that greater certainty is attainable in geometry than elsewhere. Not greater certainty, but greater precision, is that which distinguishes the results obtained by mathematical deduction. Dealing always with definite or determinable magnitudes, its processes are characterized by quantitative exactness. It is not obliged to pare off and limit its conclusions, to make them tally with concrete facts ; but can treat of length as if there were no such thing as breadth, and of plane surfaces just as if solidity were unknown. It is thus the most perfect type of deductive reasoning ; and if logical training is to consist, not in repeating barbarous scholastic formulas, or mechanically tacking together empty majors and minors, but in acquiring dexterity in the use of trustworthy methods of advancing from the known to the unknown, then mathematical investigation must ever remain one of its most indispensable implements. Once inured to the habit of accurately imagining abstract relations, recognizing the true value of symbolic conceptions, and familiarized with the process of elimination as legitimately conducted, the mind is equipped for the study of quite other objects than lines and angles. The twin treatises of Adam Smith on social science, wherein, by deducing social phenomena first from the unchecked action of selfishness, and then from the unchecked action of sympathy, he arrives at mutually-limiting conclusions of transcendent practical importance, furnish a brilliant illustration of the value of mathematical methods and mathematical discipline.

"Bearing in mind these considerations,and recollecting also the extensive scope for inventive ingenuity afforded by the various devices by which algebraic expressions are utilized in the solution of physical problems, we may appreciate the emphatic statement of Sir John Herschel—a statement which he has thought sufficiently important to be printed in italics : 'Admission to the sanctuary of science, and to the privileges and feelings of a votary, is only to be gained by one means—sound and sufficient knowledge of mathematics, the great instrument of all exact inquiry, without which no man can ever make such advances in any of the higher departments of science as can entitle him to form an independent opinion on any subject of discussion within their range'."

SWEDISH COOKING APPLIANCES.

We illustrate on this page, from *Engineering*, one of a series of cooking utensils, recently patented in Sweden, and now being introduced into England. As will be seen in the engraving, the cooking stove consists of a sheet-iron base in the form of an inverted truncated cone, which supports an iron cylindrical vessel Upon the top of this is placed a nest of circular porcelain dishes, the one resting upon the other, and small recesses being cut at intervals around the base of each dish in order that there may be a free circulation of heat and steam. The nest of dishes is covered with a cylindrical casing of sheet iron, the lower edge of which fits upon the top of the iron vessel at the bottom before spoken of, and the whole is inclosed in an outer casing to prevent any radiation of heat. The apparatus stands upon a tripod, and occupies a very small area, the hight of the medium sizes not exceeding three feet, and the diameter being about ten inches. Either gas or oil may be employed for obtaining the necessary heat. If the former be found convenient a Bunsen burner is used, and the mixture of air and gas issues through a series of holes in the side of a circular burner, and is deflected so as to distribute the heat equally over the whole area of the vessel above. If, however, oil be employed, it is burnt in a lamp of peculiar construction with a flat wick bent in an annular form. In using the apparatus the circular iron vessel beneath the porcelain dishes is partially filled with water, and the material to be cooked being placed each in its compartment, the whole is inclosed in the inner and outer covers, and the heat being applied, steam is generated from the water, and circulates through the whole of the stove, until the food is ready. Besides the process of steaming, however, a dry heat can be obtained for roasting, baking bread, etc., by placing no water within the iron vessel.



In addition to this apparatus in its different forms, the conical base of the stove is adapted for coffeepots and other vessels required for ordinary operations on a small scale.

JET BLACK VARNISH FOR SHOES.—Dissolve 10 parts by weight of shellac and 5 of turpentine, in 40 of strong alcohol, in which fluid should be previously dissolved 1 part of extract of logwood, with some neutral chromate of potassa and sulphate of indigo. The varnish is to be kept in well-stoppered bottles.

JOHN CHINAMAN is a heavy purchaser of California produce Thousands of barrels of flour were sent to Hong Kong during November, and the latest advices by mail say there are many orders in San Francisco yet to be filled.

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Contents:

(Illustrated articles are marked with an asterisk.)

REPORT OF THE SPECIAL COMMISSIONER OF REVENUE—TINKERING THE INCOME TAX.

Protectionists, in what we regard the true meaning of that term, we do not greatly sympathize with a certain class who, styling themselves Protectionists, are purely and simply Prohibitionists. We do not wish to create monopolies, and a tariff which does this is, in our opinion, an excessive one. And while we do not regard the views of Commissioner Wells, given in his recent report, as sound either upon the tariff or on the subject of internal revenue, we have not the least shadow of sympathy with those who charge him with corrupt and unpatriotic motives.

The report bears upon its face the stamp of two things rarely combined in public office—great ability and honesty. We regard it as one of the most complete public documents ever issued from any department of the United States Government.

Conceding all this, we still must take exceptions to some of the views entertained by Commissioner Wells, and as we cannot find space to review all the points discussed in his report, we shall, in the present article, only touch upon the opinions of the Commissioner in regard to the income tax.

It is the opinion of the Commissioner, as well as that of the President, that the income-tax law, which expires in 1870 by its own limitation, should be re-enacted. No tax ever imposed in any modern civilized country has been more odious to the people than this. As a war measure it was borne with comparative equanimity; its continuance beyond the present year will be a most unpopular measure.

It will be unpopular, because, from its very nature, the burden it imposes will be, as it has been, more unequally distributed than any other the people are called upon to bear. Clerks living in humble cottages in the suburbs of large towns, and called upon by this tax, as has been ably shown in the January number of the *Atlantic Monthly*, to renounce what otherwise would constitute the sole pleasure fund of their families, do not pass, on their way to and from business, splendid mansions inhabited by men living at the rate or forty or fifty thousand dollars per year, and who have paid no income tax, without a feeling that sore injustice is committed.

The amount collected, and the number from which it is collected, show this tax to be, in the main, a tax on *small* incomes. The Commissioner remarks that only about a million of the population are interested in its removal, while thirty-eight and one half millions are interested in its continuance. The Commissioner has apparently forgotten the very large number who pay no income tax but who annually degrade themselves by artful dodging to get rid of its payment; and if he had remembered it, his knowledge of human nature would certainly have taught him that to these the tax must be even more odious than to those who, feeling the injustice, yet fulfill, honorably, the requirements of the law. But admitting that the many are interested in taxing the few, are we to suppose that Commissioner Wells considers this a good reason why the few should bear a burden from which others are exempted, while they share equally in the burdens imposed on the many? We do not believe he meant to be so understood. We think he means to convey the idea that the few who pay are more able to pay than the many who are, or have made it appear that they are, exempt. We think we could show this to be a mistake, but we must economize space.

The proposed modification of the law, reducing the tax to three per cent and at the same time reducing the amount of exemption for rent would increase the burden, and tax a great many small incomes now exempt. Commissioner Wells thinks this would favor the laboring population, by which it is supposed he means those who do heavy manual labor. If the commissioner has investigated the condition of the people employed in subordinate positions in various industries, as thoroughly as the positive tone of his opinions would warrant us in believing, he ought to know that, exclusive of the very lowest class of laborers, who live upon the earnings of small and miscellaneous jobs, etc., no class of people find it harder to make ends meet than married clerks in large cities, on salaries of from twenty-five to forty dollars per week. In the suburbs of New York, the rental of four small rooms on a second or third floor, anywhere within three or four miles of the centers of business, and in a respectable location, costs from three hundred to four hundred and fifty dollars. The necessary expenses of this class of people for clothing are much greater than those of laborers. The rental of such rooms is not a luxury, as the Commissioner seems to think, and as he would cease to think, if he should inspect a few of these homes. It is a necessity. In fact, there is nothing very luxurious about a salaried position of two thousand dollars, even in parts of the country where it costs least to live, much less in large towns where everything consumed has paid a tax, and where four or five profits have swelled the price on every article of consumption.

Something might be said upon the manner in which this tax has been collected. There is no doubt that much odium has attached to the law from the way it has been administered.

One of the last but not the least of the charges of arbitrary and unjust action which might be enumerated, is the decision of Commissioner Delano in regard to those people known under the general title of communists, including the Shakers, Oneida Communists, Rappites, etc., which refuses to grant to the individuals of such associations the one thousand dollars exemption allowed to all other taxable individuals under the existing law.

Whatever motive may have prompted this decision, it is illegal and unjust, and we do not wonder that the large number of peaceful and patriotic citizens composing these bodies feel greatly aggrieved by it. It has been argued that if the exemption were allowed no income tax could be collected from these associations; from which argument it is to be inferred that the tax must be collected by hook or crook, from somebody, and if the law will not enable the revenue officers to get it without a decision from the Commissioner then the law must be supplemented by a decision. In something of this spirit the law has been executed ever since its enactment, and in such a spirit it will be executed if Congress sees fit to reinforce it.

The law is opposed to the spirit of our institutions; the public are disgusted with it and detest it. Commissioner Wells favors a reduction of taxation; why not then remove the most repulsive feature of our internal revenue system? Congress should not attempt to tinker up a new act of the kind. Let the present law expire as intended by its framers, to be remembered as a doubtful precedent, for any future emergency that may arise. The country has long enough been disgraced and humiliated by it.

THE USE OF EYES.

A young friend of ours, about to commence a nautical career, was requested to call upon an "old salt" just previous to the sailing of the vessel in which the young aspirant was about to make his first trip to Hong Kong, in order to receive some useful advice. The call was accordingly made, and the somewhat laconic advice received, "Keep your mouth shut and eyes open." This advice followed, in its true meaning, is valuable to those who dwell on land as well as those who go down to the sea in ships.

The eyes are, perhaps, the avenues through which more information, in regard to external things, is gained than any other of the organs of special sense; but a very little observation will convince a careful student of human nature that most people are, to a certain extent, blind.

The horse dealer sees well, when he examines a horse. All the points of the animal, good, bad, or indifferent, come under review. An incipient spavin, or splint does not escape his questioning glance. He sees well, because he is interested to see. But this same sharp inspector of horses drives by trees, stones, brooks—walks about through myriad beauties without more than perceiving the outlines of objects, and

> "With eyes that hardly serve at most
> To guard their master 'gainst a post."

And he is by no means an isolated case of this kind of blindness. It may be found in all professions and trades—not even the journalist being an exception, though the full use of eyes is, to him, it would seem, if not an absolute necessity, at least something essential to highest success.

This want of power to see originates in the want of proper discipline. Men are born, if not totally blind, like puppies, yet, with eyes that, like all the other organs and faculties, need to be perfected by education. But the blindness of which we speak is mental blindness. "Men have eyes but they see not." They pass through this world of life and beauty with eyes turned inward. The marvelous panorama of nature passes before them without more than a careless and indifferent glance, now and then, and its details of beauty and grandeur are all unnoticed. The lessons of wisdom they might gain by simply looking and reflecting, are lost through neglect. The eyes will see if the mind commands them.

We presume a large proportion of our readers may convict themselves of this mental blindness, by the simple experiment of looking closely at all the natural objects presented to their notice during a single hour of their existence. Whatever these objects may be—stones, chips of metal or wood, leaves, roots, insects, bark, or what not—we venture to say, nine out of ten may see something in each they never saw before, if they will look with mind as well as eye.

Herein lies the main difference between the man with a full stored mind, and the man of little knowledge. Knowledge of natural things is mainly obtained by seeing. Humboldt was Humboldt principally through a judicious use of his eyes. One of the best habits a young man can cultivate is that of minute observation. Men, things, events, should be scrutinized, not allowed to flit by without attention.

This habit will make a man of small natural ability a match for the careless observer possessing far greater talent, and it makes the man of fine talents great. It made Bacon, Newton, Franklin, Cuvier, Linnæus, Humboldt, Faraday, Tyndall, Rumford, Helmholtz, and Huxley, great lights of science; and Watt, Stephenson, Arkwright, and others, the great mechanics whose labors have culminated in our present high civilization. In any capacity, whether in art, literature, or science, to be great, one must learn to see.

THE METRIC SYSTEM.

Our subscribers have a feeling of annoyance when, as occasionally happens, they see in our journal dimensions and weights expressed in the French metric system. We aim as much as possible to avoid this out of a consideration for the convenience of our readers, though we should, were we to consult our own feelings and convenience, be glad to give, in this manner, an impulse to the general adoption of this beautiful system in America, believing, as we do, that its great value will ultimately lead to its adoption throughout the world.

Notwithstanding, however, we thus, out of consideration for American readers, reduce, for the most part, the French notation to the English system, when we find it necessary to refer to European experiments and discoveries, we sometimes find ourselves obliged to retain it or accept the alternative of inaccuracy in recording current facts. In many cases these measures can only be approximately reduced to the English system, where an approximation will not well answer the purpose in hand.

As the metric system has been almost universally adopted now into the notation of experimental science, although in commercial transactions it has not been used to any extent outside of France, we, and all other journals of a technical character, will undoubtedly be compelled to use it more in the future than hitherto.

Enterprising and far-seeing publishers of school text-books are also adding, in new editions of works involving their use, tables of French weights and measures. They see how the tide is setting, and realize, as we do, that it is folly to attempt to stem it. We must advance with the age, or we shall be soon left out of sight. But while we shall not place ourselves in the rear of an advancing reform in this particular, we shall, as heretofore, use the metric system only where we regard it as essential to accurate statement.

THE GROWTH OF MONOPOLIES.

To the careful observer of current events, nothing in the whole category of results growing out of our peculiar system of Government seems more portentous, than the singular willingness on the part of the people to create gigantic monopolies by special enactment, and to place themselves completely at their mercy. The extent of our territory seems to favor the growth of monopolies. At least it gives scope for the organization of vast corporations who have but to ask in order to receive powers which, as circumstances have recently shown, render them almost independent of legislative control.

If these monopolies were confined to branches of business disconnected from such daily necessities as by their frequent occurrence make the public abjectly dependent upon the sources which supply them, their effects would be less grievous; but it is precisely in the supply of these daily necessities that the most giant monopolies exist, and have obtained the most unrestricted privileges; and it is such monopolies that now in the opinion of some of the most able thinkers of the age, absolutely threaten the liberty of the people.

The most formidable of these monopolies are, at present, railroad, express, telegraph, and gas companies.

In a recent article we have shown how little, as a rule, the public safety and convenience is regarded by railway corporations. Telegraph companies have hitherto laid themselves open to criticism chiefly on the score of high tariffs, but as the transaction of business, and the demands of commerce will necessarily increase public dependence on this means of intercommunication, the possibilities for encroachment upon public rights will also increase. All the elements for unrestricted imposition exist in them, and only wait for the proper time for full development. The gas companies, however, have carried the principle of receiving pay for that which they do not dispense to greater lengths than any other of the monopolies in question.

The official inquiries into the management of these companies last winter, instituted by the New York Legislature, while, as we predicted, they resulted in no relief to consumers, showed in the clearest light, and on the testimony of their officers, that the privileges granted to these corporations were such as the public can never safely grant to any individual or association of individuals.

The *World*, in a recent article reviewing the status of the gas companies of New York, thus sums up the case against them:

"The citizens of New York to-day stand perfectly helpless before the monopolists. They are compelled to pay for what they do not receive; and the thing that is foisted upon them for their money's worth is nearly worthless. The governments of the continent of Europe, which we are accustomed to regard with such horror, are a little more careful of the people's pockets than this; and with all our boasted self-government we are no better than a prey to political and mercantile swindlers."

This condition of affairs upon which the country has unfortunately fallen, is partly due to the want of foresight in the framing of charters; but chiefly to the ease with which legislative bodies can be manipulated by vast monied interests. The history of the gas investigation last winter at Albany, proves that no ordinary means will avail to compel honesty in the dealings of incorporated companies, when they are rich enough to spend money freely. The attempt was made to fix a standard quality for gas, and to enact that when less than fourteen candle gas was delivered, a drawback shoul t be allowed to the consumer. It is well understood how that bill was killed in the Senate, and how by a liberal use of money, and judicious distribution of shares, the gas companies procured its defeat.

How to now curtail the power of such monopolies is a question of the utmost difficulty. Every attempt to do it has thus far signally failed. We confess that we can at present see no adequate means by which the people at large can combat the power so imprudently vested in unscrupulous corporations. But this we can see; that this power is becoming a danger to the commonwealth, which it is blindness to ignore, and the consideration of which it is folly to defer.

THE PRESERVATION OF MEATS WITHOUT SALT.

There are two reasons why the use of salt for preserving meats is objectionable. The first and most important is that meats thus preserved lose important nutritive qualities, and therefore, if used constantly, give rise to scorbutic diseases, of which impaired nutrition is undoubtedly a cause.

Second, salt meats are for the most part less palatable than fresh.

It is true that in temperate climates where a great variety of food—vegetable, as well as animal—is used, salted meats are largely used without seriously bad effects, their defects being compensated for by other kinds of food; but even with the most abundant supply of vegetable food, fresh meats are preferred when obtainable, and they constitute a large proportion of the food supply of all large cities in civilized countries.

Such being the case, all attempts at preserving meats fresh during their transportation through long distances, from localities where meat is cheap and abundant, are of the highest importance, especially to the poor who find it difficult to obtain a proper supply of fresh meat.

It has been recently announced, that an eating house in London has been able to furnish a good nourishing bowl of meat soup to the poor, at the low price of two cents, and a plate of well-cooked, wholesome, fresh meat at the same price. It is also stated that a similar establishment has also commenced operations in Paris. These meats have been brought from New Zealand and Australia, and are said to arrive in excellent condition.

We have from time to time discussed various meat-preserving processes invented in this country and in Europe, and we will in this article give some particulars of more recent methods.

One of these is a method employed by M M. Tellier and Lecoq, at Monte Video. The apparatus used was a freezing machine, invented by M. Tellier. The fullest account of this apparatus we have met with is contained in the *Leader*, a journal published in Melbourne, Australia:

M. Tellier, as his means of freezing, uses the volatile gas of ammonia, or methylic ether. Under the influence of the heat contained by the liquid or the air to be cooled, the vaporization of the gases takes place; a force-pump compresses the vapors thus formed, which are condensed in a worm or or series of small tubes, surrounded by cold water, where, being again liquefied, they return to the evaporator, and reproduce the same effects. M. Tellier prefers methylic ether, as under his system he obtains from it the same results in cold, by a pressure not exceeding 50 lb. to the square inch, as he can with the pure gas of ammonia under a pressure from 120 lbs. to 200 lbs., according to the temperature of the atmosphere.

As all forms of ether, from the liability of ignition, are objected to on board ships, M. Tellier was compelled to employ the pure ammoniacal gas as his freezing agent. The meats to be preserved were suspended in a small room between decks, carefully protected by thick non-conductors. Air cooled in the machine down to 32 degrees Fahrenheit was, from time to time, circulated round the meats, the object being not to freeze them.

These gentlemen placed on board a steam packet running to London, about half a tun of fresh beef, mutton, poultry, game, and fish, inclosed in a temperature reduced to 32° by means of one of M. Tellier's freezing machines.

It seems that the machine was too complicated, and that by the time the ship reached the equator, the pump worked with difficulty, and a large escape of gas ensued. From the seventeenth to the nineteenth day out, the temperature rose from 32° to 36° Fah, and when the pump ceased to act, the meats decomposed before repairs could be effected.

An important defect in this experiment appears to have been in not freezing the meat at the outset, as in a frozen state it would have doubtless kept until the pump could have been repaired. The pump works under a pressure of two hundred pounds per square inch, and it must be therefore a matter of some difficulty to keep it from leaking during an entire voyage. On shore, as an ice-making machine, the apparatus is said to work well. One of them is at work at Marseilles in France, producing, it is stated, ten tuns of ice per tun of coal consumed.

The use of flat boxes for packing frozen meat, is said to have proved very good for the purpose, the broad sides being of sheet iron to form a freezing surface, and the narrow sides of deal to form a non-conducting surface. The boxes are about a yard square, and from five to ten inches in depth; and Mr. Julius Jeffreys, the originator of this plan, proposes to place them together in one solid mass, and to keep a double current of chilled air in constant circulation over the whole surface of the mass. Blowers or fanners will draw the currents from the chilling chamber surrounding the ether or ammonia vessel, as the case may be, and containing a series of sheet metal chilling tubes. The air will be driven along air passages traversing lengthways an air casing, surrounding everywhere the block of boxes.

An ammonia ice-making machine, invented by Mr. Rees Reece, is highly spoken of by the Australian press, and our readers will bear in mind that in no part of the world has more attention been paid to this subject than in Australia, where cold is regarded as the only means by which her vast surplusage of mutton can find a market. The details of this machine are not given; but the *Leader* states that its special superiority consists in its construction and arrangement for effecting the continuous distillation and rectification of dilute solution of ammonia upon what is known as the separative principle. By its use, it is stated, twenty-five to thirty tuns of ice can be made with a consumption of one tun of coal, and even more than this is claimed, but it is evident that these results are over-stated.

The tendency of opinion seems to be at present setting more and more strongly to freezing processes as a means for preserving meats, and we think there is more hope that success will be reached "on this line" than in any other way.

CANAL THROUGH THE ISTHMUS OF DARIEN.

There are probably few thinking men who do not foresee that, sooner or later, a ship canal must connect the Atlantic and Pacific waters. Which of the routes hitherto surveyed and discussed will be ultimately selected as most favorable to success in a work of this kind, time will show; but at present there is really too little knowledge of possible routes to form a correct and final judgment. An error in choice, easily avoided by a proper exploration at the outset, may involve unnecessary and enormous expense in construction.

Three routes have been much mooted, and our general knowledge of them obtained by former surveys is enough to give a tolerable idea of their feasibility. The Panama route involves only twenty-eight miles of construction, but there are difficulties which, although not insurmountable are of great magnitude. The Nicaragua route *via* the river San Juan and Lake Nicaragua involves only sixteen miles of construction, but it involves the improvement of the river navigation, and, without doubt, also that of the lake. The third route discussed, called the Tehuantepec route, is one hundred and thirty miles in length, and there is probably less accurate knowledge in regard to it than either of the others.

The matter standing thus the Government has acted wisely in dispatching a steamer to Aspinwall to make surveys and gain further light.

Meanwhile, and in anticipation of the presentation of the subject to Congress for definite action, the press, which will undoubtedly almost unanimously favor the project, can do much to create a popular opinion in its favor.

That the immediate construction of such a canal would result in great and lasting benefit to the commerce of the United States seems to us as scarcely admitting of dispute. The most casual inspection of the map of the world will show that many of the richest and most productive portions of the globe would be brought so near to our Atlantic ports that no nation would be able to successfully compete with us in securing their traffic. The East Indies, China, Japan, and the whole Pacific coast of South America, would naturally pour their vast products into our warehouses and freight our merchant vessels with profitable cargoes. And last, but not least, the dangerous passage of Cape Horn, hitherto the dread of navigators and the scene of untold disasters, would be abandoned forever as an avenue of commerce.

NEW FACTS ABOUT THE PRESERVATION OF TIMBER.

Mr. Charles Coisne, from Belgium, in a report on the prepared timber exhibited in Paris, in 1867, remarks, that at present only two methods for the preservation of railway sleepers seem to be in use, to wit: The saturation with sulphate of copper, and the one with oil from gas tar. Only the latter is considered as really practical and effective. The Southern French Railway Company exhibited pine sleepers that had been impregnated with sulphate of copper; but, albeit, they had been only from seven to ten years in use, some of the specimens, on examination, were found to be more or less rotten. Specimens of Dorsett and Blythe, in Bordeaux, appeared well preserved; but no date as to the time of their being in use could be ascertained. The creosotized fir sleepers from Bethell, in London, were perfectly unaltered after having been in the ground from sixteen to twenty years. Creosotized beech and oak sleepers of Dorsett and Blythe showed also no marks of rot; but they lacked data as to the time they had been in service. The first wood-creosotizing establishment, according to Mr. Coisne, was founded in Antwerp, in 1858, the second in Ostende, in 1859, and a third in Ghent a year later. 1,682,880 railway sleepers were impregnated in these establishments during the last decade, besides a great deal of timber for Belgian sea-ports. Two thirds of all the sleepers in Belgium have undergone the process of creosotizing. It might, therefore, be supposed that the cost of maintenance for ties on these lines would soon be reduced to almost nothing. However, this will probably not be the case, for some of the ties that are injected with oil from gas tar exhibit, after the first few years, marks of a more or less advanced decomposition. This cannot be attributed to the ineffectiveness of the creosote, but must be ascribed to the fact that the impregnation had not been complete. It has been taken for granted that 150 liters of creosote are sufficient for one cubic meter, but this quantity is hardly sufficient to saturate the sap-wood; the denser heart wood becomes rarely saturated. This accounts for the fact that the latter is most subject to rot. Mr. Coisne, in 1864, recommended to perforate the level part of the sleepers where the heart wood lies exposed, and also the surfaces of support of the chair. It is satisfactory to state that this process has been employed with good results by the chief civil engineer of the Department de la Vendée, France. When improper timber is selected, or when the timber is treated on wet or cold days, or when inferior creosote is employed, one may be almost certain that the hopes anticipated as to the endurance of the material will not be fulfilled. The results which Bethell obtained in England have been confirmed in Belgium. Thirty per cent of creosotized fir sleepers were found to be still unaltered, after eighteen years' service. As to the amount of creosote absorbed by them, it was ascertained to be twenty liters, which quantity was obtained in deducting the average weight of non-prepared sleepers from that of prepared sleepers. The creosote did not contain any carbolic acid, but considerable portions of napthaline; it was distilled at a high temperature, dissolving in naphtha to which it imparted a green color.

In 1862, 1,297 telegraph poles were creosotized in Ghent, Belgium; in 1863, 3,553 pieces. On the other hand, 600 were treated in 1864, in closed vessels with sulphate of copper, and 3,010 in 1865. The last mentioned process must be considered far superior to the method of Boucherie, for which the trees must be felled in the most unfavorable season. If not well executed, the impregnation of telegraph poles with creosote oil, will likewise not yield satisfactory results.

Coisne finally recommends to comply with the following requirements: 1. The injection should be carried to complete saturation, 250 liters of creosote being necessary for one cubic meter of wood. For oak, of which only the sapwood need to be saturated, 100 liters are considered sufficient. 2. The creosote employed should be distilled at a high heat. Two thirds should be gathered at a temperature exceeding 480 Fahrenheit, while one-third at most should not be collected below 390 Fahrenheit. The oil should be of a greenish color, and not contain over thirty per cent of napthaline. 3. The heart-wood, wherever it lies exposed, should be well perforated with a proper instrument so that the preservative may pass everywhere. 4. The wood should be exposed to the air for eight or ten months, before treating, and the saturation must be effected first in the vacuum and subsequently under pressure.

MADDER EXTRACTS AND THEIR APPLICATION IN TOPICAL DYEING.

In spite of the discovery of the aniline pigments, madder has retained its prominent position in topical dyeing, or calico printing. This is easily explained when we take into consideration the beautiful shades produced by means of alumina and iron mordants, and also their wonderful stability.

Since the beginning of this century great strides have been made in the preparation of extracts of madder; partly on account of the introduction of cylinder printing machines, partly because of the rapid increase of the knowledge of the chemicals employed in this art.

Let us glance over the various modes for preparing madder root. Formerly this latter was simply dried and ground, but in more recent times, great care has been bestowed upon the removal of the foreign ingredients with which madder is associated; and this eventually led to the preparation of the madder flowers, garaneine, and alizarine. But as these dyestuffs are admixed with a considerable proportion of fibrous substances, their coloring power is only seven or eight times greater than that of the root, and, besides, they can serve for dyeing only, not for printing, at least not according to the old methods.

Various attempts have consequently been made for some time past to fix the madder dyes on the cloth by printing. Experiments in this direction were undertaken by Robiquet, Colin, Lagier, and Persoz in 1827; ten years later, Gastard, in Colmar, discovered a process which was improved upon in 1855 by Hartmann, and introduced into some print works of small extent. These methods were similar to each other in that the cloth was uniformly mordanted, then printed with a solution of madder extract in ammonia, soda, or soap, and finally exposed to steam. However, it was soon discovered that uniform mordanting is not practical, unless perfectly pure alumina bases are at hand, and, besides, the madder extracts at that time brought into market were too impure to yield constant results, or to allow the simultaneous fixation of mordant and pigment.

These extracts were mostly prepared by exhausting madder flowers or garanceine with wood spirits or alcohol, their coloring power was fifty times greater than that of the dye root, but they contained about sixty per cent of ineffective resinous matter.

As a very excellent product for its time may be mentioned the "colorin" of Lagier and Thomas, which, however, did not come into very extensive use; the times not being favorable for the employment of madder extracts. E. Kopp first indicated a method, admitting of practical use, by which the two principal pigments of the madder, alizarine and purpurine, could be separated. The purpurine of Kopp has found but a limited sale, but the yellow alizarine, as obtained from the green alizarine by the use of mineral oils, has become generally employed.

The difficult problem to print alizarine on unmordanted goods was solved about the same time. The conditions for the success of this operation may be enumerated as follows: 1. A very concentrated and pure extract of madder. 2. Employment of a perfectly pure acetate of alumina. 3. A proper acid solvent for the pigment. Crystallized acetic acid is generally used. 4. The use of certain substances, as tin salts, fatty acids, or lime salts, in order to impart to the dye a hygroscopic consistency and to modify its shade. The thus composed and properly thickened dye is printed on simultaneously with the other dyes; the printed goods are now hung up for some time in a warm and moist room, then steamed, and finally passed through soap-water, if required.

For violet, the acetate of alumina must be replaced by acetate of iron. As to the white spots which occur after the application of the color on immature cotton; they do not appear in this process.

Pure alizarine yields a very beautiful violet, but a red of a violet tint. A good red can only be obtained with extracts that contain both alizarine and purpurine, and a part of the yellow coloring matter in proper proportions. Such extracts, however, yield a dull violet. The colors with which red is most successfully employed are aniline-black, chrome-orange, and the genuine albumine colors.

According to our present state of knowledge, it is probable that the madder pigments pre-exist in the root in the form of soluble, readily decomposable glucosides, or sugar-yielding elements. However, there remains no doubt about the existence of the following elements: 1. The alizarine, discovered by Robiquet and Colin. 2. The purpurine, examined by Persoz, Runge, Debus, Wolff and Strecker, and Schutzenberger. 3. The pseudo-purpurine. 4. An orange color. Both of these latter were found in the purpurine of Kopp. 5. Purpuroxanthin, a yellow pigment that has also been isolated by Schutzenberger from commercial purpurine. These pigments are crystallizable, and differ from each other by their physical properties, their solubility in different neutral and alkaline solvents, their composition, and finally by their deportment in dyeing, as shown by the following:

ALIZARINE yields stable colors that resist soap and aqua regia; yields a red with a violet hue, but a very pure violet.

PURPURINE AND ORANGE COLOR are both stable dyes, resisting soap and aqua regia tolerably well; produce very bright reds, but dull and grayish violets.

PSEUDO-PURPURINE.—This color is completely decomposed by nitro muriatic acid (aqua regia); it yields a brick red and pale violet.

PURPUROXANTHIN produces shades of little stability; gives orange yellow with alumina and a pale gray with iron mordants.

This shows that the different madder colors differ considerably. Only the purpurine and the orange color, which is a hydrate of the purpurine, do not differ with regard to their dyeing properties, but the greater solubility of the latter in alcohol leaves no doubt that they are different bodies. The stability of the shades furnished by their dyes seems to be in reverse proportion to the amount of hydrogen present. The greater the percentage of oxygen the more the colors pass from violet red into a pure red, and from a pure violet into a spotted and gray violet.

In noting these differences, the manufacturer will be enabled to mix the various dyes in the proper proportions, they also account for the unequal qualities of madders of different origin. The fastness of the madder from Alsace is, for instance, not only attributable to its freedom from chalk, but particularly to a great percentage of pseudo-purpurine, which is lacking in the Avignon madder. Garancine furnishes also less enduring shades than the madder flowers. The reason for this has been searched for in the presence of traces of sulphuric acid that adhere to the fiber in spite of constant washing; but it is more probable that the coloring matter, which in the madder flowers is combined with lime, belongs to the purpurine group, and that in isolating it with an acid the color is intensified, but it is so at the expense of stability. The purpurine possesses more affinity for bases than alizarine.

AERIAL NAVIGATION.

A paper read by JOHN WISE, Aeronaut, before the Franklin Institute, Dec. 15, 1869.

Dr. James Bell Pettigrew, in a discourse before the Royal Institute, of Great Britain, on the subject of Aeronautics, said, among other things: "In order to construct a successful flying machine, it is not necessary to imitate the filmy wing of the insect, the silken pinion of the bat, or the complicated and highly differentiated wing of the bird, where every feather may be said to have a peculiar function assigned to it; neither is it necessary to reproduce the intricacy of that machinery by which the power in the bat, insect, and bird is moved; all that is required is to distinguish the power and extent of the surfaces, and the manner of their application, and this has, in a great measure, been already done. When Vivian and Trevithick constructed the Locomotive, and Symington and Bell the Steam Boat, they did not seek to reproduce a quadruped, or a fish—they simply aimed at producing motion adapted to the land and water, in accordance with natural laws, and in the presence of living models. Their success is to be measured by an involved labyrinth of railroad, which extends to every part of the civilized world, and by navies, whose vessels are dispatched, without the slightest trepidation, to navigate the most boisterous seas, at the most inclement seasons.

"The aeronaut has the same task before him, in a different direction, and, in attempting to produce a flying machine, is not necessarily attempting an impossible thing. The countless swarms of flying things testify as to the practicability of the scheme, and nature at once supplies him with models and materials. If artificial flight were not attainable, the insects and birds would afford the only examples of animals whose movements could not be reproduced. The outgoings and incomings of the quadrupeds and the fish are, however, already successfully imitated, and the fowls of the air, though clamorous and shy, are not necessarily beyond our reach. Much has been said and done in clearing the forest and fertilizing the prairie—can nothing be done in reclaiming the boundless regions of the air?"

Certainly there can, if we begin right! As the first sea-ships were not made to be propelled by steam and paddle-wheels, but to be drifted leisurely on the water before the winds, I propose to inaugurate a system of aerial navigation on the like unpretentious principle; namely, drifting in the currents of the trade winds to such points and places as are within the known province of the resources of aeronauts. We have, in this Northern Hemisphere, a system of trade-wind currents, at present so well authenticated and understood as to be acknowledged by the leading scientific institutions of the world as established meteorological facts, of daily recurrence; and I have practically explored them time and again for thirty years past. In the temperate zone these currents blow from the southwest and the northwest, overlapping each other and producing, between them, a compound or eddy current, blowing eastward.

In the spring and in the autumn these two great currents form conjunctions, and produce, for some days, those violent gales termed equinoctial storms, continuing until the balance is restored between the going and the coming of the trade winds, circulating between the equatorial and polar regions. The lower portion of the lower stratum of these currents—that is, the one from the northwest, is all the time, more or less, sliding off toward the south, and gradually curving round until it reaches the intertropical regions, where it is recognized by mariners as the northeast trade wind; and here, meeting the more rapid motion of the earth's surface from west to east, as well as the equatorial heat, it is whirled westward and upward, and pressed outward, as it ascends, producing the great upper current from the southwest; and thus the northwest current has become the southwest current.

On the other hand, our southwest current is all the time passing off a portion of its upper surface to the north, until it reaches the frigid zone, where it sinks down and becomes the northwest trade-wind current, underlapping the upper current, and, by its friction against the latter, producing what I term the eddy current, blowing nearly direct toward the east.

Thus, we have, within the practical capability of the ordinary air ship, the means of reaching any place east, northeast, or southeast from the place of departure in our latitude.

It is an easy matter to sail from Philadelphia, New York, Boston, or Baltimore, to St. Petersburg, London, Paris, Madrid, Lisbon, or Gibraltar, or to any point within that range of latitude, as it becomes simply a matter of constructing an aerocraft that is capable of floating in these currents of the atmosphere for a few days, and we know that air ships can be constructed that will retain a sufficient buoyancy for many days. Napoleon the First had one constructed and used, that ascended with its practicing army pupils thirty days after its inflation—time sufficient to circumnavigate the globe with an air-ship.

The change of dimension of the bulk of the inclosed gas by change of temperature between day and night, is to be compensated by a balance rope. When the sun increases the levitating power of the air float, it will soon find its equipoise in lifting from the surface of the sea, or the land its equivalent of the balance rope, and its loss by the coolness of the night by giving back to the land or water its equivalent of weight.

I have practiced this current sailing for over thirty years, more or less, made over 400 voyages—from 100 to 1,000 miles in length—and never failed to find these trade-wind currents when an altitude of 5,000 to 12,000 feet was attained although at these times currents from opposite directions frequently prevailed on the surface of the earth. An air vessel of 100 feet diameter, two thirds filled with coal gas, would have a net carrying power of 9,000 pounds, and would be all sufficient for a practicing machine with a view to sound these currents across the ocean and to test the practicability of establishing an air line of mail and passenger conveyance from this country to Europe. Pleasure seekers and invalids would find it a swift and easy voyage from America to Europe—no sea-sickness and less than three days to make the voyage.

This is certainly a feasible plan for the inauguration of trial trips, and is seriously worthy the attention and application of the enterprise and genius of the present day and in our own nation. A little barometrical practice in the scheme would soon teach us how to lay our lines for a successful system of trans-Atlantic aerial navigation.

The First Californian Beet Sugar.

A lot of Californian beet sugar has been made, and the business may be regarded as established, with every prospect of speedy and large development. We have heretofore spoken of the experimental factory near Sacramento, intended to test the practicability of making sugar from beets grown in the State of California. There was a doubt about the soil. It was feared that the prevalence of alkali gnerally made it almost certain that, even where not apparent to the eye, there would be enough to prevent the crystallization of the sirup into sugar.

It has already been shown by analysis that our sugar beets are sufficiently rich in saccharine matter. The only question, therefore, being on the crystallizing of the sirup, very rude works were put up, which were considered sufficient to prove the point in controversy. With rusty iron boilers, and rivets covered with oil, the sugar was expected to be dark enough. "But," said the shareholders, "let it be as black as your hat, only so it is crystallized sugar, and the money is ready to put up the right kind of work."

On the 10th of December, 1869, all questions of doubt were set at rest by the production of 150 pounds of crystallized sugar from white Silesian beets grown on the borders of the American river—leaving an unexpectedly small portion of molasses. The experiment was conducted by W. Wadsworth, Esq., who studied in European sugar works, and who is well practiced in the various processes known in France and Germany. The process used in the experiment is very simple. A revolving cylinder washes the beets; then revolving knives cut them into very thin ribbons, which are macerated for a short time in cold water, and which extracts every portion of saccharine matter. Some lime is used to extract the bitter principle, and carbonic acid gas removes the lime by precipitation. Steam pipes and evaporating pans follow; boiler, animal charcoal, and settling vessels complete the process. The success of this first experiment will soon lead to the multiplication of sugar mills, and in a few years California may be independent of foreign supplies. The next thing the Sacramento Company will prove will be the percentage of sugar in our beets—which will be determined next week.—*Alta California.*

Immensity and Violence of the Solar Forces, as Exhibited in Recent Photographs.

The astronomer of the *Spectator* is still finding wonders in the sun. He has now been examining some photographs by Dr. Zoller, of the "colored prominences" in the solar atmosphere, and is justly amazed at the immensity and violence of the forces whose action is indicated by them.

"Here," he says, "is a vast cone-shaped flame, with a mushroom-shaped head of enormous proportions, the whole object standing 16,000 or 17,000 miles from the sun's surface. In the cone figure we see the uprush of lately imprisoned gases; in the outspreading head the sudden diminution of pressure, as the gases reach the rarer and upper atmosphere. But turn from this object to a series of six pictures placed beside it, and we see the solar forces in action. First, there is a vast flame, some 18,600 miles high, bowed toward the right, as though some fierce wind were blowing upon it. It extends in this direction some four or five thousand miles. The next picture presents the same object some ten minutes later. The figure of the prominence has wholly changed. It is now a globe shaped mass, standing on a narrow stalk of light above a row of flame hillocks. It is bowed toward the left, so that in those short minutes the whole mass of the flame has swept thousands of miles away from its former position. Only two minutes later and again an entire change of appearance. The stalk and the flame-hillocks have vanished, and the globe-shaped mass has become elongated. Three minutes later, the shape of the prominence has altered so completely that one can hardly recognize it for the same. The stalk is again visible, but the upper mass is bowed down on the right so that the whole figure resembles a gigantic A, without the cross-bar, and with the down stroke abnormally thick. This great A is some 20,000 miles in hight, and the whole mass of earth might be bowled between its legs without touching them! Four minutes past, and again the figure has changed. The flame hillocks reappear, the down-stroke of the A begins to raise itself from the sun's surface. Lastly, after yet another interval of four minutes, the figure of the prominence has lost all resemblance to an A, and may now be likened to a camel's head looking towards the right. The whole series of changes has occupied but 23 minutes, yet the flames exceeded our earth in volume tenfold at least."

The same writer begs those who consider this subject to bear in mind the enormous size of the sun; so great, that if it were represented by a globe two feet in diameter, the earth would appear no larger than a cherry stone. He says:

"We recognize in our hurricane the action of nature in her fiercest moods, but the solar hurricanes would, in an instant, destroy the whole globe on which we live. We wonder at the volcano which lays a whole city in ashes, but our earth would be swept like a mote before the rush of a solar volcano. We see, lastly, in the earthquake, which upheaves a continent, the most energetic of all the forces at work upon our earth, but the least of the throes which convulse the solar surface would toss a globe like ours as waves of the ocean toss the lightest sea drift."

A NATURAL CURIOSITY.—P. C. Mixter, of West Sandlake, New York, has kindly sent us a remarkable root of a fir tree, cut from the interior of a well. The root is a curiosity. He writes us that the tree is about nine inches in diameter, and stands about eight feet from the well. The root entered the well about three feet from the top, and ran down the wall until it reached the water. After descending about nine feet, it divides into three branches which subsequently subdivide until the extremities form a bunch resembling much the tail of a horse. The entire length of the root is not much less than eighteen feet. This power of the roots of plants to search for the water they need almost looks like instinct.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4 00 a year.

Money to invest in some new article of real merit. Address W. P. Spence, Box 79, Stapleton, N. Y.

Cisterns prevented from overflowing and bursting by Muss' Patent Water Leader. Agents wanted. For particulars inquire of J. Muss, Box 736, Quincy, Ill., or J. R. Mitchell, Salem, Columbiana Co., Ohio.

Recipe Wanted—To enamel, japan, or varnish rusty galvanized Iron Wire Nets, which are used for drying glue on. Must be cheap and easily applied. Peter R. Lamb & Co., Toronto, Canada.

Send for circular of Oldham's Excelsior Clothes Dryer, a rare chance to make money. Address Geo. Oldham, Jr., Cuba, N. Y.

Manufacturers of Shingle Machinery please send circulars and price lists to M. A. McAfee, Talbotton, Ga.

Wanted—A situation as Sup't in a Foundery & Machine Shop. Well posted in pattern making, etc. Address C. P. W., 25 Pearl st., N. Y.

G. W. Lord's Boiler Powder for the removal of scale in steam boilers is good and reliable. We sell on condition. Send for circulars to G. W. Lord, 107 West Girard Avenue, Philadelphia, Pa.

Pyrites wanted—Containing Gold, Silver, or Copper. Address A. G. Hunter, Jackson, Mich.

Patent Rights bought and sold by R. T. Bradley & Co., 131 Fourth st., Cincinnati, Ohio.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Every wheelwright and blacksmith should have one of Dinsmore's Tire Shrinkers. Send for circular to R. H. Allen & Co., Postoffice Box 376, New York.

Aneroid Barometers made to order, repaired, rated, for sale and exchange, by C. Grieshaber, 107 Clinton st., New York.

Foundery and Machine Business.—Experience, with some capital, wants an engagement. South or West preferred. Address Box E. E., Catskill, N. Y.

Foreman in a Machine Shop—A person having ten years experience in that capacity is desirous of forming a new engagement. Address, with particulars, Postoffice Box 119, La Crosse, Wis.

Back Nos., Vols., and Sets of Scientific American for sale. Address Theo. Tusch, No. 37 Park Row, New York.

Mineral Collections—50 selected specimens, including gold and silver ores, $15. Orders executed on receipt of the amount. L. & J Feuchtwanger, Chemists, 55 Cedar st., New York.

The Babcock & Wilcox Steam Engine received the First Premium for the Most Perfect Automatic Expansion Valve Gear, at the late Exhibition of the American Institute. Babcock, Wilcox & Co., 44 Cortlandt st., New York.

For best quality Gray Iron Small Castings, plain and fancy Apply to the Whitneyville Foundery, near New Haven, Conn.

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves

Foot Lathes—E. P. Ryder's improved—220 Center st., N. Y.

Those wanting latest improved Hub and Spoke Machinery, address Kettenring, Strong & Lauster, Defiance, Ohio.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Brooklyn, N. Y.

Mill-stone dressing diamond machine, simple, effective, durable. Also, Glazier's diamonds. John Dickinson, 64 Nassau st., New York.

Send 3-cent stamp for a circular on the uses of Soluble Glass, or Silicates of Soda and Potash. Manufactured by L. & J. W. Feuchtwanger, Chemists and Drug Importers, 55 Cedar st., New York.

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of the Parker Power Presses.

Diamond carbon, formed into wedge or other shapes for pointing and edging tools or cutters for drilling and working stone, etc. Send stamp for circular. John Dickinson, 64 Nassau st., New York.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 17c. a line.

Winans' boiler powder, 11 Wall st., N. Y., removes Incrustations without injury or foaming; 12 years in use. Beware of Imitations

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

All reference to back numbers should be by volume and page.

W. H. K. & Co., of Pa.—You can run a boiler with salt feed water without more than the ordinary injury to it until the salt deposits upon its surface. Before this takes place, the surplus salt in the concentrated water should be got rid of by what is called "blowing off," which carries off the supersalted water. The length of time you can run without blowing off depends entirely upon the amount of evaporation and the saltness of the water. We advise you to get "Bourne's Catechism of the Steam Engine," from which you can get the fullest information on this subject.

G. B., of Vt.—Your first query is answered in an article recently published in our columns, on the injurious effects of plants in sleeping apartments. You ask further, "Is there any danger of carbonic acid descending from a flue above an open fireplace, when it is discharged into a chimney through the fireplace into the room where the fireplace is placed?" We think there would be, unless a strong draft were maintained in the chimney by a fire in the lower fireplace.

L. & Co., of Pa.—Theoretically there should be no difference in in the economy of running a one cylinder engine of eighty-horse power or a of two cylinder one of the same power.

R. S., of N. C.—Heat escapes in three ways, by convection, conduction, and radiation. Only the last two are concerned in the escape of heat from the outer surface of an inclosed tube, but both must be guarded against. Air is a bad conductor but does not resist radiation. Charcoal pulverized of course holds air in its interstices, and it has been found by experience to be excellent as an imprisoning agent for heat in hot water pipes, etc., and as a filling for refrigerators.

J. R. M., of Ohio.—It is not true that water enters a vacuum as rapidly under atmospheric pressure as when its surface is subjected to greater pressure. Of course the higher a column is carried in a pipe before reaching the vacuum chamber, the more counter resistance from the weight of the column will be experienced.

W. D. F., of Cal.—The plan of elevating the streets at crossings and allowing them to descend to the middle of the intervening blocks, has already been suggested and decided impracticable. Not impracticable in construction, but it is thought the people will not tolerate it.

S. J. T., of Ga.—The metallic appearance of the mineral you send is due to the presence of iron in the shape of pyrites. The mineral is of no value unless it also contains precious metals, which is not probable and would require analysis to determine.

E. S., of N. Y.—We think you have misunderstood the import of the article on balance wheels of watches referred to. If you wish to bring your proposition before the public, you should advertise it in our "Business and Personal" column. Your communication is respectfully declined.

F. L. C., of Ohio.—The New York Belting and Packing Co., 39 Park Row, New York, make an extra stout hose which we regard as the best flexible steam pipe to be had. It costs about fifty per cent more than the common hose.

M. S., of Mo.—We do not know positively what effect the chlorine would have upon the glue which holds ivory to wood, but we think ivory might be bleached while glued to wood without damage. You can by a slight experiment determine this for yourself.

A. M., of Vt.—It will take no more power to drive a machine at the end of a shaft remote from the main driving pulley than at any other part of the shaft, provided the shaft is perfectly lined. If out of line the case is different, and as absolute perfection is unattainable, it is probable that practically a little more is generally required to drive machinery remote from the main pulley than near to it.

D. P. C., of Md.—We do not believe in discharging exhaust steam into a brick chimney. It is liable to disintegrate the mortar and destroy the chimney. The proper way to secure a good draft is to correct the proportions of the chimney. This will also prove the most economical in the long run.

C. H., of Me., and others.—A hollow cylinder of metal of any kind is stronger than a solid cylinder of the same weight and length. Although a hollow cylinder might be, in some instances, as strong or stronger than a solid one, the same diameter and length, it would not do to make such a proposition general.

C. D. M., of Oregon.—To find the proper weight for a safety valve, multiply the number of pounds pressure per square inch you wish to carry in the boiler, into the area of the inner side of the valve in square inches; then multiply this product by the distance from the center of the valve stem to the fulcrum of the lever, and divide the product thus obtained by the distance the weight is to be suspended from the fulcrum; the result will be the weight in pounds.

J. H. S., of Ohio.—Your views are, in our opinion, altogether wrong; but whether correct or not, they do not affect the question of the relative ease of draft between wooden and iron axletrees. The position taken in this matter was that all the circumstances should be equal or similar. You consider them as dissimilar.

A. S. R., of Texas.—You can change cider to vinegar quite rapidly by leaching it slowly through beech shavings, birch twigs, or corn cobs. a proper temperature, 90° to 92° Fah., being maintained. We can not answer your second query about horseshoes. We find none advertised in our paper.

T. D. H., of N. Y.—The throat of your fan wheel should have sectional area equal to that of one third the diameter of the fan. It may be somewhat larger without injuring its working qualities.

S. H. W., of Oregon.—It requires a hot fire to melt the glazing for pottery. Furnaces capable of producing intense heat are usually employed. There is no difference chemically between the terms "sea salt" and "common salt." Both mean chloride of sodium.

E. P. L., of Wis.—One stick of timber used as a stringer eight inches by twelve is better and stronger, in our opinion, than two eight by six, with keys eight feet apart and bolted at each key, provided the timber used is of equally good quality in both cases.

W. B. G., of Mass.—The gyroscope was noticed in our journal many years ago. We refer you to the back volumes. We do not wish to resume the discussion of this subject at the present time.

W. J. A., of N. Y.—A round bar of wrought iron one inch in diameter is stronger than a wire rope of the same size.

A. M., of Ky.—If by your query you wish to ascertain whether we think it economy to work steam expansively, we answer—Yes.

A. E. G., of Wis.—An engine of 5-horse power over and above friction, will raise 182 gallons of water 20 feet per minute.

Recent American and Foreign Patents.

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

Steam Governor.—C. D. Allen, New York city.—This invention relates to a new and useful improvement in governors for steam engines whereby such governors are made more useful than they have hitherto been.

Anti-Friction Journal Bearings for Hoisting Machines and other Purposes.—Robert G. Hatfield, New York city.—This invention relates to a new and useful improvement in machines for raising weights and moving bodies in any direction, and consists in mechanism for diminishing friction on the journals.

Propelling Boats.—Daniel J. Ross, Havre de Grace, Md.—This invention relates to a new and useful improvement in the mode of propelling boats through the water, more especially designed to be applied to small boats, or those which are usually propelled by oars.

Tube Cutter.—John Peace, Camden, N. J.—The object of this invention is to provide a tool for cutting tubes of all diameters by hand and with great facility.

Spring-Bed Bottom.—Andrew Cole, Mishawaka, Ind.—The object of this invention is to provide a durable, simple, and highly elastic bottom for beds.

Axle Gage.—Gottlieb Luedke, Princeton, Wis.—The object of this invention is to provide improved gages for easily determining the pitch for the arms of the wood axles, by which to be guided in dressing down the said arms for the reception of the skeins, so that when the wheels are placed therein the spokes of dished wheels will, when at the under side of the hubs, stand perpendicular.

Screw Clamp for Shipwrights.—Wm. H. Phillips, Bridgetown, N. J.—The object of this invention is to furnish a simple and effective screw clamp for shipwrights' use. It is to be employed in planking the hulls of vessels, in which operation each successive plank must be forced down firmly against the upper edge of the preceding one, before it is fastened with treenails, bolts, or spikes. This forcing of the two planks together requires an apparatus capable of developing great power, owing to the edgewise curve or "snye," so-called, which the form of the hull requires of the planks.

Vapor Candle.—L. Chandor, St. Petersburgh, Russia.—This invention relates to new and useful improvements in vapor candles.

Sleeve Button.—John Kenmuir, Leavenworth, Kansas.—This invention relates to improvements in fastening devices for sleeve buttons, and consists in the application to the back of the button of a hinged hook and spring catch, the said hook being bent into the proper form to be passed through small holes in each part of the sleeve, and then through a hole in the back of the button, for engagement with the spring catch.

Skate.—Charles T. Day, Newark, N. J.—This invention consists in pivoting the clamping levers which carry the jaws together, and in forming a curved nut on each pair of such levers, so that the right and left hand adjusting screw can be fitted through both the said nuts in a diagonal position.

Sun Dial.—Ludwig Ignatius Trueg, St. Vincents, Pa.—This invention relates to a new sun dial which is so constructed that it can be correctly set in accordance with the several degrees of latitude, and to be in conformity with the actual time of correct clocks. The invention consists chiefly in the employment of a graduated arc which is pivoted at its ends and which receives the shadow from the indicator plate.

Reversible Chair.—William H. Joeckel, New York city.—This invention has for its object to provide a simple device whereby, on such chairs which have reversible backs, the seat, will be inclined backward whenever the position of the back is changed. The invention consists in the application of a cam to the pivot of the back, working between forked ears that project from the pivoted seat. Whenever the back is turned over the cam will be turned over with it to change the position of the seat.

Button.—A. P. Critchlow, Northampton, Mass.—This invention has for its object to so construct buttons of all kinds, that the same can be readily fastened to garments or other articles, and that they may be constructed at a small cost.

Water Wheel.—R. W. Trude, Clearfield Bridge, Pa.—This invention has for its object to furnish an improved water wheel, simple in construction, effective in operation, and which will not be impeded in its operation by back water.

Cultivator.—Jesse A. Wilson, Hamburgh, Iowa.—This invention has for its object to furnish an improved cultivator, which shall be strong, simple in construction, and effective in use, being so constructed that the frame work of the cultivator will readily pass over the rows of plants without injuring them.

Seed Planter.—J. L. Strait, Cooksville, Mich.—This invention has for its object to furnish a simple, convenient, effective, and inexpensive machine for planting cotton seed, corn, peas, etc., which shall be so constructed as to be conveniently adjusted to plant the seeds in hills or drills and in greater or less quantities, as may be desired.

Harrow.—Charles R. Macy, Bedminster, N. J.—This invention has for its object to furnish an improved harrow, which, while operating as an ordinary harrow to stir up, loosen, and pulverize the soil, will, at the same time, crush and break up the clods and lumps, and scatter the parts and fragments of said clods and lumps over and mix them with the loose soil.

Hame Fastener.—William W. Tillou, LeRoy, N. Y.—This invention has for its object to furnish an improved fastener, by means of which the ends of the hames may be conveniently drawn into place and securely held and locked.

Hair Cutter.—George A. Harley, New York city.—This invention has for its object to improve the construction of an improved hair cutter, patented by the same inventor, September 14, 1869, and numbered 94,820, so as to make it more convenient in use by adapting the slotted comb to be used with an ordinary razor blade.

Trace Fastening.—William W. Mallery and Charles H. Sage, Copenhagen, N. Y.—This invention relates to a new and useful improvement in a fastening for the traces of harness, and consists in applying a spring slide to the end of the trace, by which slide the trace is held to the whiffletree.

Pulley Block.—C. H. Knapp, Lawrenceville, Pa.—This invention relates to improvements in pulley blocks, and consists in an improved construction of divided blocks, for being automatically opened by blocks on the rope for discharging the same, when the weight is raised to the required hight, for allowing the latter to fall in a lateral direction, as in elevating hay and delivering over the mow, or on the top of the stack.

Propelling Apparatus.—E. Averill, Sacramento, Cal.—This invention relates to improvements in feathering paddles for boats, and operating devices for the same, having for its its object to provide an improved arrangement of means for feathering the paddles, and for operating a pair for one side of a boat alternately; also for reversing them for propelling in either direction.

Piston.—O. Collier, Sacramento, Cal.—This invention consists in an arrangement of the piston, of two end disks and a grooved central ring, one of the disks having a tubular extension, to which the other is fitted, and through which the piston rod passes, receiving a nut at the end, screwing the one disk on the extension of the other, and against the central ring; also screwing the whole against a collar on the rod. The invention also comprises a mode of packing by which the piston may be centered.

Table.—Heber F. Learnard, Mazo-Manie, Wis.—This invention relates to improvements in the construction of tables for house, office, and other uses, and consists in an improved mode of joining the side rails of the frame to the posts by dovetail or beveled rebates, and detachable metallic clamps, to provide a more durable construction, and an arrangement whereby the legs and frame may be readily detached for packing and transportation. The tops and leaves are also detachably connected to the side rails of the frame. The invention also consists in an improved arrangement with the leaf supporting arms of fall leaf tables, of springs to throw the arms out when the leaves are raised.

Brake for Vehicles and Machinery.—Benj. F. Leet, Dayton, Nevada.—This invention relates to new and useful improvements in brakes for car, wagon, and other revolving wheels, and consists of brake shoes suspended in advance of the wheels upon arms jointed to supports above the horizontal axis of the wheels, and arranged to be let down by strong suspending devices against the faces of the wheels, the friction of which on the said brake shoes, will cause the shoes self-actingly to arrest the motion of the said wheels, the said brake shoes being so suspended that in swinging downward in the plane of the wheels, their course will cross that of the periphery of the wheels. The invention also comprises a mode of suspending and operating the brake shoes, or the arms on which they swing, by knuckle-jointed links, to the middle joint of which a sliding bar is attached and operated, either by a toothed pinion and hand shaft, or by an oscillating shaft, hand lever, and eccentrics, for imparting the reciprocating motion for working the said knuckle-jointed links; the said links, as also the jointed arms by which the brace shoes are suspended, are arranged for adjustment for varying the position of the shoes relatively to the periphery of the wheels.

Spur.—Seth Craig, Philadelphia, Pa.—This invention relates to a new manner of securing spurs to the heels of boots, and has for its object to provide a simple and reliable fastening, which need not have any catch provided in the heel, and which allows the ready removal of the spur.

Detachable Head Rest for Chairs, etc.—D. R. V. Goetchins, Little Falls, N. Y.—This invention has for its object to provide a head rest which can conveniently be secured to the backs of railroad chairs, common chairs, sofas, etc., and which can as conveniently be detached.

HORSE HAY FORK.—James Dampman, Lebanon, Pa.—This invention relates to improvements in locking devices for horse hay forks, and consists in a sliding block on the elevating rope, having a fixed and a pivoted jaw for engaging and holding the upper end of the tine not connected to the hoisting rope; the said upper end being provided with an eye which, when brought up to the locking position, will receive the hooked end of the pivoted jaw, which is then closed up against the fixed jaw by pressing the shank into the space between the sides of the movable block, where it is secured by a spring catch having a trip cord connected to its free end, and passing out laterally through a hole in one of the sides of the block, so that when pulled it will disengage the spring catch, and trip the holding jaw, to permit the opening of the tines of the fork for discharging.

AUXILIARY PROPULSION OF VESSELS.—John Bourne, London, England.—The object of this invention is to provide a propelling mechanism for sailing ships in calms or light winds, which mechanism, while of average efficiency, shall be capable of being readily put into or out of operation, so that it will, when not used, leave the ship in all other respects the same as if it had not been applied.

HOLLOW GRATE BAR.—George E. Turner, Chicago, Ill.—This invention has for its object to so construct the hollow grate bars which conduct air from below the fire to the products of combustion, that the unequal temperature to which it is subjected at different hights may not injuriously affect the same.

LAMP EXTINGUISHER.—S. W. Perkins, Geneso, Ill.—This invention consists of a case capable of being slipped on over any ordinary lamp tube, and bearing two jaws, each provided with a weight and having a tendency to fold together upon the wick, so as to completely cover it when turned down, and thus extinguishes the flame; said jaws being readily separable by the wick as it is turned up by the ratchet wheel to be lighted.

STEAM ENGINE.—C. C. Waggoner, St. Johns, Ohio.—This invention consists in a novel and peculiar mechanism for shifting the valves, whereby the operation may be performed in one sixteenth of the time of the stroke.

PNEUMATIC CENTRIFUGAL POWER REGULATOR.—Charles A. Sullivan, Starkville, Miss.—This invention relates to means for regulating the evolution of a spring driver, and to preventing a useless and too rapid expenditure of its power. The invention consists in certain combinations and arrangements of auxiliary mechanism to restrain the actuating power, which, together, constitute the pneumatic centrifugal power regulator.

CARRIAGE SPRING.—Daniel Shockey, Waynesborough, Pa.—This invention relates to a spring apparatus in which the cross bars on which the carriage immediately rests, move on vertical guide bars projecting from the axles, and springs are interposed to check the downward movements of such cross bars. The invention consists in interposing springs to check the upward movements of such guide bars.

KNITTING MACHINE.—John Kent, New York city.—This invention relates to a new and useful improvement in machines for knitting cotton, linen, and woolen goods or garments; and consists in attaching to the ordinary knitting machine certain mechanisms whereby the goods or garments manufactured on such machines are made to present the appearance of being seamed or sewed together, while, in fact, the goods are formed entire, and with unbroken thread.

COMBINED SEEDER AND CULTIVATOR.—Clark Alvord, Westford, Wis.—This invention relates to a seeder, and consists of a seeder wheel placed in front or rear, and, for the most part, outside the seed box, but entering partially within the same, and receiving in its circumferential V-shaped groove a portion of the seed, which portion it carries under and out, and discharges; the circumferential groove being provided with transverse partitions, so constructed as to carry the seed before them until the proper moment, and then discharge it over the stop.

MODE OF CURING CHEESE AND PRESERVING THE SAME WHEN CUTTING.—Artemas Holbredge, West Burlington, N. Y.—This invention relates to an improved mode of putting up, curing, packing, and preserving cheese, whereby it is designed to improve the quality of the cheese, render it capable of preservation a greater length of time, economize in space in packing, storing, and shipping, and to economize and preserve it in cutting for use. The invention also comprises an improved mode of ascertaining and cutting off the exact amount required.

SASH AND BLIND MARKER.—George W. Burton, Bordentown, N. J.—This invention relates to a new machine for marking the bars of sashes and blinds, to indicate the proper places for mortising the same. The invention consists in the general combination of an adjustable fixed marker with a movable marker, and with a spring lever for moving the same; and also in the method of holding the markers in place so that it can readily be displaced for the several jobs.

WHEEL FOR VEHICLES.—Horatio Keys, Terre Haute, Ind.—This invention relates to a new manner of securing the spokes in the hub of a wheel, with an object of obtaining a firm hold and of facilitating repair in case one or more of the spokes should be broken.

RAILROAD CHAIR.—Loyst J. Smith, Whitehall, N. Y.—This invention relates to a new suspension railroad chair, which is so constructed that it will constitute a durable and reliable connection of railroads and a noiseless support of the same.

NEW BOOKS AND PUBLICATIONS.

CIVIL ARCHITECTURE. Being a Complete Theoretical and and Practical System of Building, containing the Fundamental Principles of the Art. By Edward Shaw, Architect, to which is added a Treatise on Gothic Architecture, etc., by Thomas W. Silloway and George M. Harding, Architects. The whole Illustrated by One Hundred and Two Plates, finely engraved on copper. Eleventh edition. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street. Price, by mail, free of postage to any part of the United States, $10·00.

A work of this character which can reach eleven editions scarcely needs other evidence of its worth. As its title imports, it is not a mere collection of designs of little value to any but the finished designer, but a complete elementary treatise, beginning at the foundation of the science; and after taking its reader by pleasant and easy gradations through the first principles, teaching him how to apply them in actual work.

The present edition is enriched by the substitution of twenty new plates for those less in keeping with modern improvements, four of which are by Pugin, one of the best English authors on architecture. The whole work has been thoroughly and carefully revised, and, as it now stands, forms the best American work on the science of architecture extant.

ILLUSTRATED REGISTER OF RURAL AFFAIRS.

This annual, published by Luther Tucker & Son, Albany, N. Y., contains 150 illustrations and a valuable assortment of useful hints and information for farmers and housewives. The price is only 30 cents.

FLORAL GUIDE.

James Vick, of Rochester, N. Y., has issued a very beautiful illustrated catalogue of flowers. The engravings are exquisitely done.

THE *Phrenological Journal*, for January, is received, with the usual number of graphic sketches of character, portraits of distinguished men, and other entertaining features, which render it one of the most readable of American publications. The present number is peculiarly rich, and by the courtesy of its publishers, it furnished us last week with a fine portrait of M. Lesseps, and a sketch of his life, which is, at this time, of especial interest in connection with the recent construction of the great Suez Canal.

THE INSURANCE MONITOR, C. C. Hine editor and proprietor, 176 Broadway, New York, is one of the ablest monthlies devoted to a specialty published. To all interested in insurance matters, directly or indirectly, it is a *sine qua non*, and its miscellany cannot but prove acceptable to the intelligent general reader.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING DEC. 28, 1869.

Reported Officially for the Scientific American

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97,970.—BASE-BURNING FIREPLACE HEATER.—Samuel B. Sexton, Baltimore, Md. Dated December 14, 1869; antedated November 23, 1869.
98,216.—STEAM ENGINE GOVERNOR.—C. D. Allen, New York city. Antedated Dec. 24, 1869.
98,217.—PROPELLING APPARATUS.—E. Averill, Sacramento, Cal.
98,218.—WATER ELEVATOR.—Jabez K. Babcock, Shortsville, N. Y.
98,219.—BOOTJACK.—S. P. Babcock, Adrian, Mich.
98,220.—HARVESTER.—L. M. Batty, Canton, Ohio.
98,221.—CHURN DASHER.—F. Bosom (assignor to himself and J. W. Tackabury), St. Louis, Mich.
98,222.—PROPELLING APPARATUS.—John Bourne, No. 1 Northumberland Terrace, Regent's Park Road, England.
98,223.—WATER WHEEL.—McK. A. Brooks, La Porte, Ind.
98,224.—FINISHING CASE FOR RAILWAY BARS.—John Burt, Detroit, Mich.
98,225.—MACHINE FOR LAYING OUT SASH AND BLIND.—G. W. Burton, Bordentown, N. J.
98,226.—APPARATUS FOR MIXING AND AGEING LIQUORS.—S. C. Bruce, New York city. Antedated Dec. 21, 1869.
98,227.—RAILWAY CAR.—Joseph Busser, Troy, Ohio.
98,228.—VAPOR BURNER.—L. Chandor, St. Petersburg, Russia, assignor to C. M. Clay.
98,229.—SELF-ADJUSTING CART-SADDLE.—Matthew Clinton, New York city.
98,230.—SPRING-BED BOTTOM.—Andrew Cole, Mishawaka, Ind.
98,231.—PLANING MACHINE.—G. W. Cole, Canton, Ill.
98,232.—PISTON AND PISTON PACKING.—O. Collier, Sacramento, Cal.
98,233.—SIGNAL FOR RAILWAYS.—James P. Coulter, Bloomington, Ill.
98,234.—BALL-AND-SOCKET JOINT.—R. R. Craig and J. Craig, Nevada, Cal.
98,235.—SPUR.—Seth Craig, Philadelphia, Pa.
98,236.—HAY FORK.—Jas. Dampman (assignor to W. A. Moyer), Lebanon, Pa.
98,237.—SKATE.—C. T. Day, Newark, N. J.
98,238.—STEAM-BOILER FURNACE.—R. S. Dillon (assignor to himself and G. H. Russell), Detroit, Mich.
98,239.—CHARCOAL FURNACE.—W. T. Downs, St. Louis, Mo. Antedated Dec. 11, 1869.
98,240.—HOOP-CUTTING AND DRESSING MACHINE.—F. Ellis (assignor to himself and J. S. Ellis), Sylvania, Ohio.
98,241.—STEERING APPARATUS.—Edward Fox (assignor to himself and J. J. Walton), New York city.
98,242.—TRUSS FOR VESSELS.—Charles Furbish, Bucksport, Me.
98,243.—STOVE LEG.—John Gibson, Jr., Albany, N. Y. Antedated Dec. 11, 1869.
98,244.—COFFEEPOT, PITCHER, ETC.—John Gibson, Jr., Albany, N. Y. Antedated Dec. 11, 1869.
98,245.—DEVICE FOR TILTING PITCHERS, COFFEEPOTS, ETC.—John Gibson, Jr., Albany, N. Y. Antedated Dec. 1, 1869.
98,246.—REIN HOLDER.—John Gibson, Jr., Albany, N. Y. Antedated Dec. 17, 1869.
98,247.—HITCHING POST.—John Gibson, Jr., Albany, N. Y. Antedated Dec. 18, 1869.
98,248.—RAILROAD-CAR HEATER.—John Gibson, Jr., Albany, N. Y.
98,249.—SECURING LEGS TO STOVES.—John Gibson, Jr., Albany, N. Y.
98,250.—HEAD REST.—D. R. V. Goetchins, Little Falls, N. Y.
98,251.—SHOVEL PLOW.—Frank Goss, Wexford, Pa.
98,252.—COMBINED SEED SOWER AND HARROW.—A. D. Gray, Chariton, Iowa.
98,253.—PAPER FEEDER.—J. H. Gray and W. B. Turner, St. Anthony, Minn.
98,254.—REGISTER FOR SPINNING JACK.—Henry Greenwood, Gilbertsville, Mass.
98,255.—APPARATUS FOR RAISING AND LOWERING CHANDELIERS AND LAMPS.—H. S. Hall, Boston, Mass.
98,256.—HAIR CUTTER.—G. A. Harley, New York city.
98,257.—HYDRAULIC NOZZLE.—Aaron Harris, Laporte, Cal.
98,258.—HORSE HAY FORK.—Elam Harter, Dowagiac, Mich.
98,259.—GRAPPLING HOOK.—Elam Harter, Dowagiac, Mich.
98,260.—ANTI-FRICTION JOURNAL BEARING FOR HOISTING MACHINES, ETC.—H. G. Hatfield, New York city.
98,261.—CURTAIN FIXTURE.—Rufus E. Hitchcock, Waterbury, Conn.
98,262.—CURING CHEESE.—Artemas Holbredge, West Burlington, N. Y.
98,263.—DRIED-BEEF CUTTER.—C. J. Holmes and D. C. Holmes, Stafford Springs, Conn.
98,264.—LAMP.—John Horton (assignor to B. B. Schneider), New York city.
98,265.—BORING AND MORTISING MACHINE.—John Humphrey, Ravenna, Ohio.
98,266.—GRAIN SMUTTER, SCOURER, AND SEPARATOR.—J. C. Hunt, Terre Haute, Ind., and W. W. Ingraham, Chicago, Ill.
98,267.—REVERSIBLE CHAIR.—William H. Joeckel, New York city.
98,268.—PROPELLER WHEEL.—J. A. Joyner, New York city. Antedated Dec. 18, 1869.
98,269.—ROTARY TABLE WAITER.—A. N. Kellogg, Chicago, Ill.
98,270.—MACHINE FOR GRINDING GLASS JARS.—A. W. Kelly and J. B. Samuel, Philadelphia, Pa.
98,271.—BUTTON.—John Kenmuir, Leavenworth, Kansas.
98,272.—KNITTING MACHINE.—John Kent, New York city.
98,273.—CARRIAGE WHEEL.—Horatio Keys, Terre Haute, Ind.
98,274.—BOB SLED.—John Killefer, West Richfield, Ohio.
98,275.—PULLEY BLOCK.—C. H. Knapp, Lawrenceville, Pa.
98,276.—TABLE.—H. F. Learnard, Mazo Manie, Wis.
98,277.—BRAKE FOR CARRIAGES.—Benjamin F. Leet, Dayton, Nevada.
98,278.—METALLIC CARTRIDGE.—Chas. D. Leet, Vienna, Austria, and B. B. Hotchkiss, New York city. Antedated December 15, 1869.
98,279.—STEAM PUMP.—J. A. Lidback (assignor to himself and Henry Baker), Portland, Me.
98,280.—AXLE GAGE.—Gottlieb Luedke, Princeton, Wis.
98,281.—HARROW.—C. R. Macy, Bedminster, N. J.
98,282.—CHARCOAL COOKING FURNACE.—Angelina Madison, Cincinnati, Ohio. Antedated Dec. 15, 1869.
98,283.—TRACE FASTENING.—W. W. Mallery and C. H. Sage, Copenhagen, N. Y.
98,284.—HARVESTER RAKE.—F. H. Manny, Rockford, Ill.
98,285.—APPARATUS FOR BLEACHING AND DEFECATING CANE JUICE.—J. C. Marsh (assignor to G. R. Marsh), Alexandria, La.
98,286.—WELT KNIFE.—Elezer May, Natick, Mass.
98,287.—STREET BOX FOR GAS PIPES.—Emerson McMillin, Ironton, Ohio.
98,288.—CHURN.—A. H. McWaine, Shickshinny, Pa.
98,289.—WATCHMAN'S TIME DETECTOR.—A. Meyer, Stuttgart, Germany, assignor to Theodor Hahn.
98,290.—BAR OF HORSESHOE BLANKS.—James Montgomery, Sing Sing, N. Y.
98,291.—SPIDER.—Elias Nashold, Rockford, Ill.
98,292.—HAY SPREADER.—Eben W. Nichols, Worcester, Mass.
98,293.—DRAFT AND SPARK EXTINGUISHING DEVICE FOR STEAM GENERATORS.—J. S. Patric and Lewis Patric, Rochester, N. Y. Antedated Dec. 24, 1869.
98,294.—TUBE CUTTER.—John Peace, Camden, N. J.
98,295.—SHIPWRIGHTS' CLAMP.—Wm. H. Phillips, Bridgetown, N. J.
98,296.—ELECTRICAL ANNUNCIATOR FOR HOTELS.—Henry B. Porter, Chicago, Ill.
98,297.—PULVERIZING CHASER.—Theophilus Pugh, Chicago, Ill. Antedated Aug. 7, 1869.
98,298.—SOFA AND TABLE.—Wm. Reichenbach and Frietrich Roschdiantzky, Chicago, Ill.
98,299.—LOCK FOR SATCHELS AND CARPET BAGS.—William Roemer, Newark, N. J.
98,300.—BUTTON AND PIN FOR CARPET BAGS, ETC.—Wm. Roemer, Newark, N. J.
98,301.—BASE-BURNING STOVE.—J. J. Roeper, Philadelphia, Pa.
98,302.—PROPELLING BOATS.—D. J. Ross, Havre de Grace, Md.
98,303.—HARVESTER CUTTER.—Jacob Schneider, Canton, Ohio.
98,304.—CHEWING GUM.—Wm. F. Semple, Mount Vernon, Ohio.
98,305.—PLANE FOR SHAVING WHALEBONE.—J. A. Sevey, Boston, Mass.
98,306.—PERPETUAL BRICK BURNER.—Zachariah Shaw, Ypsilanti, Mich.
98,307.—CURTAIN FIXTURE.—John Shorey and F. H. Butler (assignors to said Shorey and John Griffith), Lowell, Mass. Antedated Dec. 13, 1869.
98,308.—MACHINE FOR FOLDING CLOTH.—Augustus Simpson (assignor to Woonsocket Iron Foundery), Woonsocket, R. I.
98,309.—SPINDLE FOR SPINNING SILK.—George Singleton, (assignor to himself, J. F. Preston and J. N. Leonard), Rockville, Conn., Robert Singleton and E. K. Rose, Paterson, N. J., and Leonard & Lockhart, Chicago, Ill.
98,310.—APPARATUS FOR PACKING STUFFING BOX.—D. L. Smith, Montana, Iowa.
98,311.—HAMES AND COLLARS.—J. G. Smith, Oregon, Wis., assignor to himself and F. A. Vickery, Mason City, Ill.
98,312.—RAILWAY RAIL CHAIR.—L. J. Smith (assignor to himself and E. H. Gardiner), Whitehall, N. Y.
98,313.—SEED PLANTER.—J. L. Strait, Cooksville, Miss.
98,314.—PNEUMATIC CENTRIFUGAL POWER REGULATOR.—C. A. Sullivan, Starkville, Miss.
98,315.—HAMES FASTENER.—W. H. Tillou, Le Roy, N. Y.
98,316.—BREECH-LOADING ORDNANCE.—E. H. Tobey, Chicago, Ill.
98,317.—MACHINE FOR QUARRYING AND DRESSING STONE.—Frederick Townsend, Albany, N. Y.
98,318.—MEAT CUTTER.—G. P. Treulieb, Baltimore, Md.
98,319.—WATER WHEEL.—R. W. Trude, Clearfield Bridge, Pa.
98,320.—SUN DIAL.—Ludwig Ignatius Trueg, St. Vincents, Pa.
98,321.—HOLLOW GRATE BAR FRAME.—G. E. Turner, Chicago, Ill.
98,322.—GOVERNOR VALVE.—Thomas Warren, Flint, Mich.
98,323.—HORSESHOE.—Thos. Waterhouse, West Gorham, and C. F. McKenney, Saco, Me.
98,324.—WHEELBARROW.—J. G. Weir, Pittsburgh, Pa.
98,325.—BED LOUNGE.—B. C. Wilkins, Elgin, Ill.
98,326.—CULTIVATOR.—J. A. Wilson, Hamburg, Iowa.
98,327.—CARD HOLDER.—S. E. Adamson, Philadelphia, Pa.
98,328.—EAVES TROUGH.—Wm. Adel, Rockton, Ill.
98,329.—STONE SEPARATOR.—Henry Aiken, Philadelphia, Pa.
98,330.—TURBINE WATER WHEEL.—O. N. Angell and A. J. Angell, Providence, R. I.
98,331.—MACHINE FOR THE MANUFACTURE OF SPOKED WHEELS.—E. A. Archibald, Methuen, Mass.
98,332.—OIL CAN.—A. N. N. Aubin, Montreal, Canada.
98,333.—PEAT MACHINE.—Amie N. N. Aubin, Montreal, Canada.
98,334.—SHINGLE MACHINE.—Joseph Baker, Sheridan, assignor to himself and R. C. Hathaway, Ionia, Mich. Antedated Dec. 9, 1869.
98,335.—COMBINED HARROW AND SEED SOWER.—E. A. Barton, Boonville, Ind.
98,336.—ENAMELING IRON AND STEEL.—Benj. Baugh, Chadwick, near Bronsgrove, England.
98,337.—HAND CULTIVATOR.—Luman L. Beach, Mount Upton, N. Y.
98,338.—BUTTONS.—C. Becker and Morris Wise, New York city.
98,339.—SPRING BED BOTTOM.—C. H. Berry, East Somerville, Mass.
98,340.—TOBACCO CUTTER.—Seymour A. Bostwick, Laconia, N. H.
98,341.—COMBINED COTTON SCRAPER AND CULTIVATOR.—B. F. Bowling, Holly Springs, Miss.
98,342.—CROSSING SIGNALS FOR RAILWAYS.—C. M. Bowman, Washington, D. C.
98,343.—APPARATUS FOR FILTERING VOLATILE LIQUIDS.—Washington Boyce, Tuscola, Ill. Antedated Dec. 17, 1869.
98,344.—KING BOLT FOR RAILWAY CAR TRUCKS.—James M. Bucklin, St. Louis, Mo.
98,345.—REED ORGAN.—Riley Burdett, Chicago, Ill.
98,346.—GRAIN SEPARATOR.—Henry K. Burkholder, Clear Spring, Pa.
98,347.—AUTOMATIC FAN.—C. F. Burleigh, Tuftonborough, N. H.
98,348.—LAWN MOWER.—Luke Chapman (assignor to himself and the Collins Company), Collinsville, Conn.
98,349.—BUTTONHOLE CUTTER.—D. G. Chase, Boston, Mass.
98,350.—CORN MARKER.—J. T. Corbitt, Des Moines, Iowa.
98,351.—CHILDREN'S CARRIAGE.—B. P. Crandall, New York city.
98,352.—SIGNAL BOX MECHANISM FOR FIRE ALARM TELEGRAPH.—M. G. Crane, Newton, Mass., assignor to J. M. Gardiner, St Louis, Mo.
98,353.—PISTON LIQUID METER.—Robert Creuzbaur, Brooklyn, N. Y.
98,354.—PLATING IRON FOR THE MANUFACTURE OF HINGES, ETC.—J. J. Crooke, Southfield, N. Y., and Lewis Crooke, New York city.
98,355.—STUMP EXTRACTOR.—C. W. Dawson, Paynesville, Mo.
98,356.—APPARATUS FOR FLOATING SHIPS OVER SAND BARS.—E. M. Decy, New York city.
98,357.—TOBACCO PRESS.—S. P. Dick and D. R. Musselman Louisville, Ky.
98,358.—CHOKE-BLOCK FOR RAILWAYS.—John Donaldson, George Reavely, and James Francis, Galashiels, Scotland.
98,359.—BEDSTEAD AND LOUNGE.—Jacob Dourson, Columbus Ohio.
98,360.—EXTENSION TABLE ROLLER SLIDE.—Jacob Dourson, Columbus, Ohio.
98,361.—QUILTING FRAME.—A. E. Ellis, Friendsville, Ill.
98,362.—WAITER.—Obed Fahnestock, Lebanon, Ind.
98,363.—MACHINE FOR MILLING KNIFE-EDGES OF SCALE-BEAMS.—Henry Fairbanks, St. Johnsbury, Vt.
98,364.—MANUFACTURE OF SHEET-IRON.—William Fields, Wilmington, Del.
98,365.—SASH CORD GUIDE BLOCK.—J. M. Ford, Brooklyn, N. Y.
98,366.—PUMP.—Isaac N. Forrester, Bridgeport, Conn.
98,367.—PUMP.—Isaac N. Forrester, Bridgeport, Conn.

98,368.—PUMP.—Isaac N. Forrester, Bridgeport, Conn.
98,369.—HANDLE FOR CUTLERY.—J. D. Frary, New Britain, Conn.
98,370.—GANG PLOW.—E. E. Gore, Phœnix, Ind.
98,371.—STEAM STEERING APPARATUS.—John McFarlane Gray, Liverpool, England.
98,372.—VENTILATOR.—B. R. Hawley, Normal, Ill.
98,373.—CONCRETE BLOCKS FOR BUILDING AND OTHER PURPOSES.—Thomas Hesp, St. Joseph, Mo.
98,374.—GRAIN DRYER.—H. B. Hebert, New York city.
98,375.—PHOTOGRAPHIC PAPER.—H. M. Hedden, Worcester, Mass.
98,376.—METHOD OF FORMING THE HEADS OF CARRIAGE SPRINGS.—B. T. Henry, New Haven, Conn.
98,377.—CAR COUPLING.—T. R. Herd, Allegheny, Pa.
98,378.—RAILWAY CAR TRUCK.—George Herrick, Waverly, N. Y.
98,379.—CARRIAGE JACK.—Francis Hovey, New York city.
98,380.—SASH HOLDER.—R. B. Hugunin, Cleveland, Ohio.
98,381.—RENDERING SAFES, VAULTS, AND CHESTS FIREPROOF.—Theodore Hyatt, New York city.
98,382.—NITRO GLYCERIN COMPOUND FOR BLASTING.—John Horsley, Cheltenham, England.
98,383.—LANTERN.—John Hughes, Buchanan, Pa.
98,384.—CURTAIN FIXTURE.—M. G. Imback, Bethlehem, Pa. Antedated Dec. 18, 1869.
98,385.—MECHANICAL MOVEMENT FOR ACTUATING PRESSES.—P. C. Ingersoll (assignor to himself and H. F. Dougherty), Green Point, N. Y.
98,386.—QUILTING FRAME AND CLOTHES DRYER.—John G. Ishler, Martinsville, Ill.
98,387.—BLEACHING COTTON AND WOOLEN FABRICS.—John Jeaning, Plainville, Conn., assignor to himself and R. B. Prindle, Washington, D. C.
98,388.—HOISTING MACHINE.—George Johnson, Cincinnati, Ohio. Antedated Dec. 17, 1869.
98,389.—RUFFLING ATTACHMENT FOR SEWING MACHINES.—A. C. Kasson, Milwaukee, Wis.
98,390.—SEWING MACHINE.—Thomas Lamb, Philadelphia, Pa.
98,391.—LADIES' BOOT.—William Love, McConnellsville, Ohio.
98,392.—WATER-WHEEL.—Thomas Lowden (assignor to himself, George Stout, and R. J. Lowden), Boston, Mass.
98,393.—ADJUSTABLE WRENCH.—James Magee, (assignor to himself and S. A. Alpin), Usquepaugh, R. I.
98,394.—HARVESTER.—L. J. McCormick, Lambert Erpelding, and W. R. Baker (assignors to C. H. McCormick & Brother), Chicago, Ill.
98,395.—WASHING MACHINE.—W. T. McKean, East Palestine, Ohio.
98,396.—CUTTER HEAD.—R. N. Meriam, Worcester, Mass.
98,397.—HORSE HAY FORK.—J. A. Miller, Shippensburg, Pa. Antedated Dec. 18, 1869.
98,398.—CLOTHES DRYER.—R. M. Miller, Port Andrew, Wis.
98,399.—VENTILATOR.—C. J. Neger, Philadelphia, Pa.
98,400.—SALVE.—W. W. Oglesbey, Benton county, Oregon.
98,401.—BED BOTTOM.—O. S. Osgood, Burlington, Iowa.
98,402.—DEVICE FOR LUBRICATING JOURNALS.—Addison Overbagh, Scranton, Pa.
98,403.—WINDOW BLIND.—Lindon Park, Brady, Pa.
98,404.—SOLAR CAMERA.—Isaiah Paxson and Charles Paxson, New York city.
98,405.—EXTINGUISHER.—S. W. Perkins, Geneseo, Ill.
98,406.—LOCK.—N. Petre, New York city.
98,407.—SEED AND GRAIN SEPARATOR.—J. F. Pool, Monroe, Wis.
98,408.—NOZZLE FOR OIL CANS.—Chas. Pratt, New York city.
98,409.—THREAD CONTROLLER FOR SEWING MACHINE.—G. M. Pratt and L. E. Maynard (assignors to the Finkle and Lyon Manufacturing Company), Middletown, Conn.
98,410.—KNITTING MACHINE. — A. B. Prouty, Worcester Mass., assignor to Samuel V. Essick, Mansfield, Conn.
98,411.—HYDRANT.—D. J. Pruner, Bellefonte, Pa.
98,412.—HOPPER BOY RAKE.—Aaron C. Pry, Keedysville, Md.
98,413.—SEED SOWER.—Amos Raffensparger and D. G. S. Gochnauer, Mulberry, Pa.
98,414.—FEED CUTTER.—J. P. Randolph, Marietta, Ohio.
98,415.—FOLDING CHAIR.—E. C. Ranks, Boston, Mass.
98,416.—BASE-BURNING STOVE. — S. H. Ransom, Albany, N. Y.
98,417.—ROAD SCRAPER.—George N. Rex, Butler, Ind.
98,418.—SPRING COUPLING.—L. Rodenhausen, Philadelphia, Pa.
98,419.—SHIP PUMP.—Benj. K. Rogers, Jonesport, Me.
98,420.—HEAD-REST FOR CAR SEATS.—H. W. Safford, New York city.
98,421.—CURING AND PRESERVING BUTTER.—Jacob F. Saiger, Shelby, Ohio.
98,422.—PUMP.—Jacob Scott, Earlville, Iowa.
98,423.—LATHE.—William Sellers, Philadelphia, Pa.
98,424.—BASKET MACHINE.—Merville Shaffer (assignor to Ford Tanner), Lafayette, Ind.
98,425.—MANUFACTURE OF NITRO GLYCERIN.—Taliaferro P. Shaffner, Louisville, Ky.
98,426.—PROCESS OF PRESERVING NITROLEUM AND OTHER EXPLOSIVE LIQUIDS.—Taliaferro P. Shaffner, Louisville, Ky.
98,427.—EXPLOSIVE COMPOUND. — Taliaferro P. Shaffner, Louisville, Ky.
98,428.—BLASTING FUSE.—Taliaferro P. Shaffner, Louisville, Ky.
98,429.—WELL TUBE.—James T. Shattuck, Natick, Mass. Antedated November 27, 1869.
98,430.—MACHINE FOR PRESSING CLAY PIPES. — Thomas Shaw, Philadelphia, Pa.
98,431.—KNIFE REST.—Daniel Sherwood, Lowell, Mass., assignor to Woods, Sherwood & Co.
98,432.—TABLE CASTER.—Daniel Sherwood, Lowell, Mass., assignor to Woods, Sherwood & Co.
98,433.—CARRIAGE SPRINGS. — Daniel Shockey, Waynesborough, Pa.
98,434.—TOBACCO, HAY, AND COTTON PRESS.—Valentine J. Shryock, Folsomville, Ind.
98,435.—WATER WHEEL.—William Slade, Sen., Gum Creek, Ga.
98,436.—CARRIAGE AXLE.—Alfred E. Smith, Bronxville, N. Y.
98,437.—SKATES.—Augustus B. Smith, Philadelphia, Pa.
98,438.—PICTURE NAIL.—Friend W. Smith, Jr., Bridgeport, Conn.
98,439.—METALLIC CARTRIDGE.—Wm. H. Smith, Charlestown, Mass.
98,440.—CHAIR FRAME.—Wm. M. Smith, Columbus, Ohio.
98,441.—TAG FOR MAIL BAGS.—C. A. Snyder, Richmond, Va.
98,442.—APPARATUS FOR PRODUCING AND CARBURETING HYDROGEN GAS.—John H. Steiner (assignor to himself and Christian Sharps), Philadelphia, Pa.
98,443.—CARRIAGE.—Lewis Theobald, Bremen, Ind.
98,444.—MACHINE FOR MAKING RAILROAD SPIKES.—Leopold Thomas, Pittsburgh, Pa.
98,445.—SODA WATER APPARATUS.—James W. Tufts, Medford, Mass.
98,446.—WALL FOR BUILDINGS.—M. P. Turner, Des Moines, Iowa.
98,447.—GAGE FOR FILING SAWS.—Oliver Tyson, Otho, Iowa.
98,448.—TICKET HOLDER.—George M. Van Buren, New York city.
98,449.—STEAM ENGINE.—Charles C. Waggoner, St. Johns, Ohio.
98,450.—MANUFACTURE OF PARTLY GILT FRAMES.—Washington Wallick (assignor, by mesne assignments, to Wallick & Assay), Philadelphia, Pa. Antedated December 22, 1869.
98,451.—APPARATUS FOR FILLING VIALS.—John P. Whipple, Woonsocket, R. I.
98,452.—FEEDING MECHANISM FOR SEWING MACHINES.—James H. Whitney, Brooklyn, N. Y.
98,453.—STATIONERY FURNITURE.—Charles H. Wight, Baltimore, Md.
98,454.—MACHINERY FOR OPERATING CHURNS.—C. S. Williamson, Covert, N. Y.
98,455.—MACHINE FOR BORING BLIND STILES.—Albert M. Winn, Jefferson Kindleberger, and William Augustus Arnold (assignors to "The Inventor's Association"), San Francisco, Cal.
98,456.—HARVESTER CUTTER.—Frederick Wittram, San Francisco, Cal.
98,457.—APPLE CORING AND SLICING MACHINE.—Moses B. Wright, West Meriden, Conn.
98,458.—MOUNTING WRITING SLATE.—George F. Bowman, Cleveland, Ohio.
98,459.—CLAMPS FOR ELEVATING WELL TUBES AND RODS.—Adam Good, Jr., Titusville, Pa.

REISSUES.

96,866.—SEWING MACHINE.—Dated November 16, 1869; reissue 3,776.—P. J. Clever, Gollard, Texas.
77,304.—PREPARING COMPOUNDS CONTAINING COLLODION.—Dated April 28, 1868; reissue 3,777.—Division A.—John A. McClelland, Louisville, Ky.
77,304.—MATERIAL FOR FORMING DENTAL PLATES.—Dated April 28, 1868; reissue 3,778.—Division B.—John A. McClelland, Louisville, Ky.
73,900.—CARBURETING AIR FOR THE PRODUCTION OF LIGHT AND HEAT.—Dated January 28, 1868; reissue 3,779.—Blakey Pilkington, Oakland, Cal., assignee, by mesne assignments, of James D. Jenkins.
94,248.—FRUIT JAR.—Dated August 31, 1869; reissue 3,780.—Henry E. Shaffer, Rochester, N. Y.
55,581.—FRUIT JAR.—Dated June 12, 1866; reissue 3,781.—Thomas B. Whitney and S. A. Whitney, Glassborough, N. J., assignees of John Focer.
12,627.—PLOW.—Dated April 3, 1855; extended seven years; reissue 3,782.—Thomas J. Hall, Bryan, Texas, for himself and Henry P. Stockton and Robert P. Lane, Rockford, Ill., assignees of Thomas J. Hall.
80,865.—PRINTING PRESS.—Dated August 11, 1868; reissue 3,783.—J. M. Jones, Henry Johnson, and George M. Bowman, Palmyra, N. Y., assignees of J. M. Jones.

DESIGNS.

3,807.—BADGE.—Abraham Demarest, New York city.
3,808.—KEY.—Emery Parker, New Britain, Conn.
3,809.—STRIKER-PLATE FOR A LOCK.—Emery Parker (assignor to Russell and Erwin Manufacturing Company), New Britain, Conn.

EXTENSIONS.

TREATING OILS.—Philo Marsh, South Adams, Mass.—Letters Patent No. 14,042, dated January 1, 1856.
METHOD OF OPERATING AND LUBRICATING SLIDE VALVES.—James Cochrane, New York city.—Letters Patent No. 14,010, dated January 1, 1856.

APPLICATIONS FOR EXTENSION OF PATENTS.

ORE WASHER.—William L. Carter, Marietta, Pa., has petitioned for the extension of the above patent. Day of hearing, Feb. 23, 1870.

MACHINE FOR CUTTING LOAF SUGAR.—Adolph Brown and Felix Brown, New York city, has applied for an extension of the above patent. Day of hearing March 9, 1870.

FIREPLACE.—Alice Dodge, of Pittsburgh, Pa., administratrix of Calvin Dodge, deceased, has applied for an extension of the above patent. Day of hearing March 2, 1870.

SURFACE CONDENSERS FOR STEAM ENGINES.—D. D. Foley, Washington D. C., assignee, by mesne assignments, of James M. Miller, has petitioned for an extensionof the above patent. Day of hearing May 4, 1870.

METHOD OF COOLING AND VENTILATING ROOMS, ETC.—Azel S. Lyman, New York city, has applied for an extension of the above patent. Day of hearing March 9, 1870.

GRAIN SEPARATOR.—Cyrus Roberts, Three Rivers, Mich., and John Cox, Newhope, Pa., have petitioned for an extension of the above patent. Day of hearing March 9, 1870.

HERMETICALLY SEALING PRESERVE CANS.—Charles Branwhite, New York city, has petitioned for the above patent. Day of hearing March 9, 1870.

MACHINE FOR MAKING CARPET LINING.—John R. Harrington, Brooklyn N. Y., has applied for an extension of the above patent. Day of hearing March 16, 1870.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,411.—ROCK-BORING MACHINERY.—Charles Burleigh, Fitchburg, Mass. November 25, 1869.

3,461.—BEDSTEADS AND GUARDS.—C. H. Hudson, New York city. Nov. 30, 1869.

3,462.—ELLIPTIC SPRINGS ANR APPARATUS THEREFOR.—B. T. Henry, New Haven, Conn. November 30, 1869.

3,477.—CURING SPONGE.—W. H. Spencer, New York city. December 1, 1869.

3,515.—FLUID LENSES.—D. A. Woodward, Baltimore, Md. December 4, 1869.

3,527.—GRAIN HULLER.—J. T. Prince, Boston, Mass. December 6, 1869.

3,379.—SAW, SAW TEETH, AND MACHINERY THEREFOR.—S. G. Arnold Providence, R. I. November 23, 1869.

3,386.—APPARATUS FOR GRINDING SAWS.—H. Disston, Philadelphia, Pa. November 23, 1869.

3,396.—APPARATUS FOR LIGHTING AND EXTINGUISHING GAS BY ELECTRICITY.—New England Electric Gas Lighting Company, Boston, Mass. November, 24, 1869.

3,411.—SEWING MACHINE.—L. Melone, Mount Gilead, Ohio. November 27, 1869.

3,456.—JOURNAL BEARING.—I. P. Wendell and S. P. M. Tasker, Philadelphia, Pa. November 29, 1869.

Advertisements.

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COMPETITIVE TEST OF ENGINES

American Institute Fair

NEW YORK.

TABLE OF TESTS AND RESULTS BEtween the Babcock & Wilcox Engine, and the Corliss Steam Engine built by

Wm. A. Harris, of Providence, R. I.,

at the National Fair of the American Institute, held in New York city, October, 1869, with steam furnished by the Harrison Safety Boiler:

	Babcock & Wilcox.	Corliss.
Diameter of cylinder, inches	16	16·13
Stroke of piston, inches	42	42
Duration of experiment, hours	8	8
Average pressure of steam, per gage	81·803	80·445
Total revolutions of Engines	28,958·88	28,932·96
Average revolutions of Engines per minute	60·331	60·277
Total weight of coal used during experiments, lbs	2,500	1,957·5
*Indicated horse-power	78·793	76·579
Average pounds coal per indicated horse power per hour	3·966	3·195
**Dynamometer horse-power	65·981	69·952
Difference between Indicated horse-power and Dynamometer horse-power, showing horse-power required to drive each Engine, by itself, and piece of heavy shafting between Dynamometers—say 75 feet—which, if deducted in both cases, would increase the ratio of the difference of power required to drive the engines alone	12·811	6·627
Proportion of coal consumed for dynamometer horse-power	2093·44	1787·944
Proportion of coal to drive engine and first piece of shafting	406·56	169·556
Percentage of difference of coal necessary to drive engines, in favor of Harris		58 p.ct.
Average pounds of coal per dynamometer horse-power per hour	4·736	3·498
Percentage of difference of coal per dynamometer horse-power per hour, in favor of Harris		26 p.ct.
***Total cubic feet water during experiments	256·09	255·29
***Total water used, as per meter, during the experiments in lbs	16061·94	15956·13
†Average dynamometer horse-power per last three indications	69·453	71·791
Temperature of feed water, deg	47	47
Temperature of engine room, deg	72·6	66·5
Temperature of fire room, deg	42·7	49·7
Barometer, inches	30·95	30·29

*The power exerted on Piston of Engine, is termed INDICATED HORSE-POWER, and *includes* the power required to drive the Engine itself, as well as the load.

**The power exerted beyond Engine, is termed DYNAMOMETER HORSE-POWER, or actual load, and *excludes* the the power required to drive the Engine.

This shows which Engine runs with the least friction, and which has the best valves, and the best mechanism for working them, termed Valve Gearing.

***See Water Meter test.

†See Regulating test.

WATER METER TEST.

BY MR. EMERY (Sup't).

*Test proving the inaccuracy of Water Meter after trial of Engines.

State of Meter	Cubic feet	Weighed.	Should weigh.
4181·1			
4185·1	4	229·	250·
4189·1	4	249·25	250·
4194·1	5	279·25	312·5
4199·1	5	308·	312·5
4204·1	5	290·75	312·5
4208·1	4	230·	250·
4213·1	5	315·	312·5
4218·1	5	315·	312·5
4223·1	5	304·	312·5
4228·1	5	301·75	312·5
4231·1	4	251·	250·
4237·1	5	306·	312·5

*This table shows that the water passed through the meter did not weigh as the dial indicated it should.

Test of Regulator and Valve Gear Combination,

as shown with full load on Engine, 2½ dynamometer horse-power more load carried during the regulating test by Corliss Engine. Furnace doors open and fires banked. Indications of steam gage and counter taken each minute. This shows which Engine runs with the least friction, and which has the best valves, and the best mechanism for working them, termed Valve Gearing; also, the best Regulator and Valve Gear Combination.

Babcock & Wilcox Engine.			Corliss Engine.		
Steam gage.	Counter.	Revo. per minute.	Steam gage.	Counter.	Revo. per minute.
65·	126.468		65·	10.071	
62·	529	61	63·5	131	60
58·	588	59	59·	190	59
54·	646	58	56·	249	59
50·	704	58	52·5	308	59
45·	762	58	48·5	366	58
40·	818	56	45·	424	58
37·5	.871	53	42·	482	58
34·5	920	49	38·	540	58
Loss of 30·5 pounds steam. Loss of 12 revolutions. Average loss of one revolution to each 2·54 pounds steam.			Loss 27 pounds steam. Loss 2 revolutions. Average loss one revolution to each 13·5 pounds steam.		

From these Tables, those interested, and the public generally, can obtain facts long withheld from them, and from which they can draw their own conclusions.

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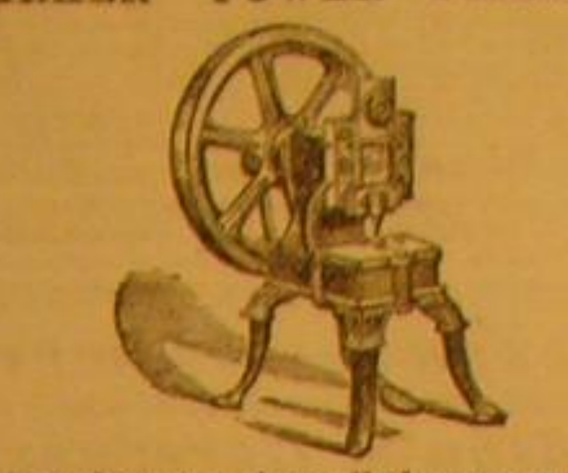

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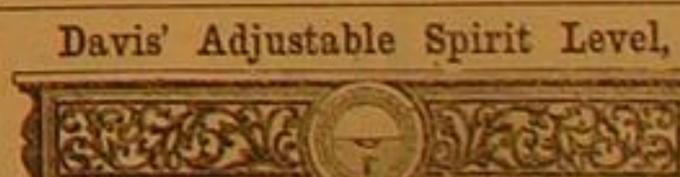

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