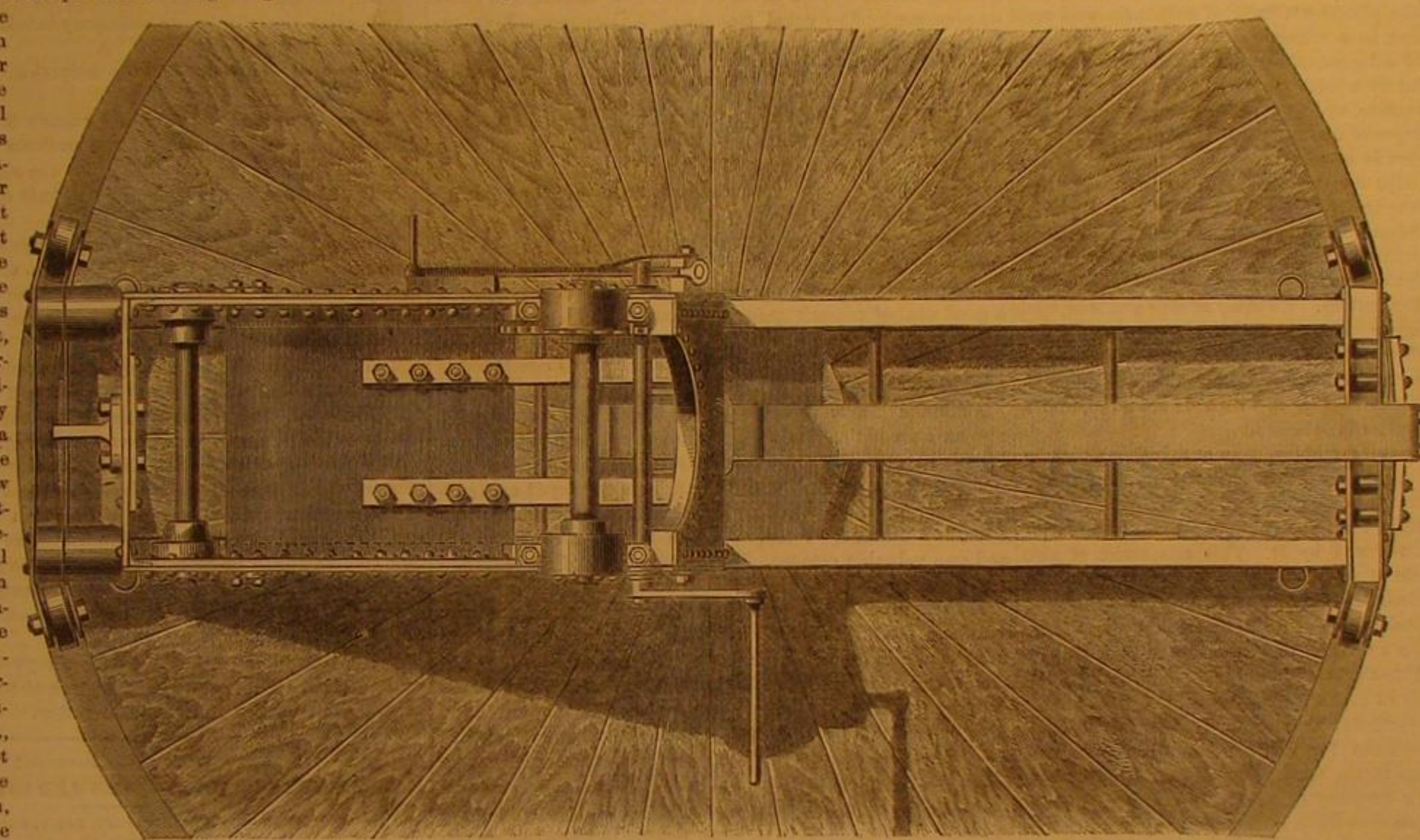
SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXII.—No. 8. [NEW SERIES.] | NEW YORK, FEBRUARY 19, 1870. | $3 per Annum. [IN ADVANCE.]

CARRIAGES AND SLIDES OF THE SPANISH GUNBOATS DESIGNED BY CAPTAIN ERICSSON.

The carriages and slides of the gunboats recently built in this city for the Spanish Government, may be regarded as among the most important improvements connected with naval gunnery which have been introduced since the close of the war.



CAPTAIN ERICSSON'S GUN CARRIAGE.

The solution of the problem of firing the gun over the bow, in a direct line with the keel, in such a manner that it may be trained in all directions, has engaged the naval artillerist for a long time. It is evident that unless the slide on which the gun carriage is run in and out, can be so arranged as to admit of a rotary motion round a central pivot, the object in view cannot be attained. On reflection it will be found that an apparently insurmountable difficulty renders such an arrangement impracticable, viz., the central pivot round which the slide is to turn, will be far in the rear of the trunnion of the gun when run out ready for firing. Experts well understand that the result of this will be, that at the first instant of the recoil of the gun, it will be lifted upwards with great violence. The reason is obvious. The line drawn from the center of the trunnions to the pivot round which the slide revolves, is a diagonal of about 45° of inclination ; hence, as the point of resistance is in the rear of, and far below the point of pressure—the center of the trunnion—an upward movement of the gun must take place. Owing to this difficulty naval artillerists have resorted to the expedient of "pivoting" the gun slide, which means, to secure the same by a vertical "fighting bolt" passing through its forward end into certain sockets inserted in the deck. Apart from the trouble and delay of having to move the slide from side to side of the vessel, and changing the fighting bolt from one socket to another, the confined space on the deck near the bow of a small gun boat, does not admit of the large sweep necessary on the pivoting system. The slide represented by our engravings has been constructed to overcome these difficulties. It will be seen that the deck ring or circular rail which supports the friction rollers of the slide, is firmly bolted to the deck beams, and that it projects above the deck all round ; the object of this projection being that of giving lateral support to a bent plate, which corresponds with the curvature, and extends below the surface of the ring, and which is attached to the forward end of the slide. It should be observed that the central pivot of the slide, secured to the deck by means of a casting firmly bolted to the deck beams, fits so loosely in the bearing that when the gun recoils the strain imparted to the slide is received wholly by the deck ring through the bent plate, which accordingly takes the place of the ordinary fighting bolt. This bent plate, which hooks the deck ring, may therefore be considered as a continuous fighting bolt, which, in whatever direction the gun is fired, sustains the force of the recoil of the gun.

By referring to the engravings it will be seen that even when the gun is run full out, the center of the trunnion will be in the rear of the bent plate which hooks the deck ring ; and that a diagonal line drawn from the point of contact between the said plate and the ring to the center of the trunnion, will have a backward inclination. Consequently, the tendency of the force of the recoil will be that of pressing the gun downwards in place of lifting it up, as when the strain is brought against the central pivot of the slide.

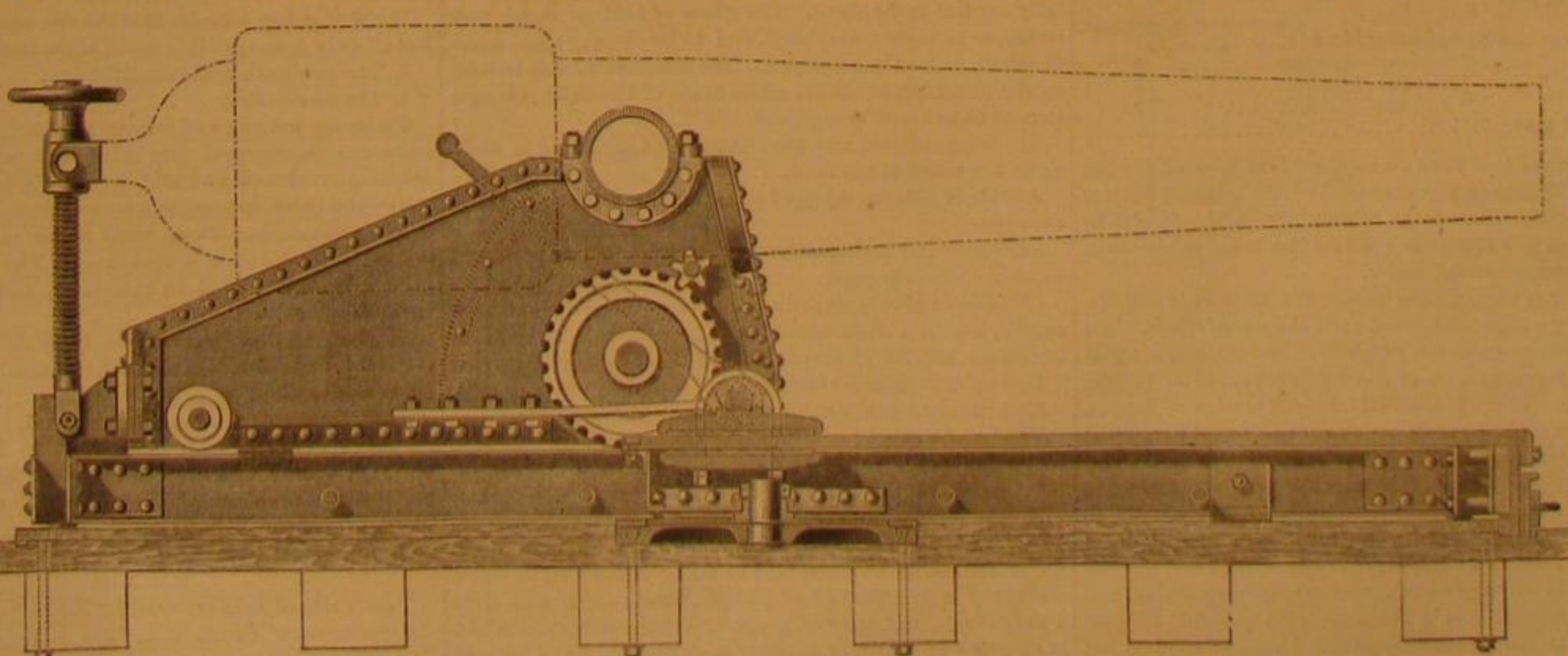
Most of our readers are aware that the modern practice is that of checking the recoil by means of friction instead of employing breeching, as formerly. This modern improvement is, however, attended with serious inconveniences ; namely, that when the friction gear is slackened, in a sea way, the gun becomes unmanageable, and that much time is lost in screwing up and unscrewing the friction gear for each discharge.

It may be mentioned that the slow fire of the heavy guns in our monitor turrets, during the war, was owing to the time thus lost in tightening and relieving the friction apparatus. The new carriage removes these difficulties entirely by the device shown in the engravings. A flat bar of metal, termed the friction bar, 6 inches wide and 1½ inch thick, is firmly secured to the forward end of the slide ; the other end of the bar being supported by a cross piece extending between the two sides of the slide frame. Wrought iron clamps lined with wood, secured to the carriage by means of horizontal links, are made to pinch the friction bar by means of an oval shaft actuated by a lever, as will readily be understood by inspecting the engravings. That the clamps may be made to pinch the friction bar, and thereby any desirable degree of friction may be produced, by simply forcing said lever downward, is self evident ; likewise, that by lifting the lever upward the friction may be relieved in an instant. The gun is ordinarily run out by means of the crank handle, pinion, and cog wheel, shown in the engravings. Recent trials with the new carriage have proved that in a sea-way, the friction may be safely relieved at any time, and that the gun may be run in and out by the rolling of the vessel with out employing the hand gear.

The following extract from the report of Captain Simpson, U. S. Navy, to the Chief of the Bureau of Ordnance, dated Dec. 13, 1869, will be read with interest.

"During the firing thus tabulated, the running out gear was but seldom used, the carriage being allowed to move obedient to the roll of the vessel, and its motion was found to be perfectly under the control of one man at the compression lever, who could check it at any point.

"The most prominent advantage, in fact the essential characteristic of this carriage, is its system of compression which is complete and instantaneous."



[For the Scientific American.]

ON THE USES OF ZINC.

BY PROFESSOR CHARLES A. JOY.

We have previously given the history, occurrence, and properties of zinc, we now propose to speak of its applications. The uses of the metal are so rapidly extending that what we say of it to-day will hardly hold good to-morrow, and we can only aspire to record a small number of its many applications. We shall not confine ourselves to the metal, but shall include its salts in the enumeration.

Zinc powder, mixed with oil, is employed as a varnish to protect iron from rust, but its chief application for this purpose is known as galvanizing iron. It was discovered by Proust and afterwards more fully illustrated by De la Rive, that the presence of a little iron in zinc produces a galvanic current, and rapidly promotes the decomposition of water. Reasoning from this it was proposed to employ zinc to prevent the oxidation of metals, and hence the name of galvanizing was applied to the process.

Galvanized iron, which is now so much used for corrugated roofing, boats, buildings, spoutings, ships' sheathing, buckets, tanks, wires, and many other purposes, is prepared by first cleaning the plate by a bath of sulphuric acid and water, then washing in a concentrated solution of chloride of ammonium, and subsequently plunging it into the molten zinc. The zinc dissolves some of the iron, and forms a perfect alloy on the surface, and by repeating the immersion the thickness of the layer of zinc may be increased at pleasure. In this process there is considerable loss by the formation of a refuse alloy of zinc and iron, amounting in the United States to several hundred tuns per annum. Mr. William H. Chandler, of the Columbia College School of Mines, proposes to economize this refuse by heating it in an iron kettle nearly to the point of volatilization of the zinc and allowing it to cool slowly from the bottom. An alloy of zinc and iron, containing a much larger percentage of iron than the original refuse, gradually forms, falls to the bottom of the kettle, and is removed by a perforated ladle. The operation is repeated in separate kettles until all of the dross is removed, and a good commercial spelter is obtained.

Zinc is now extensively employed as a reducing agent in the preparation of aluminum, calcium, silicium, boron, and other rare elements. It is found to act more powerfully upon chlorides and fluorides than upon oxides, although the latter are many of them reduced by it. This adaptation of zinc opens up a new field of research, and will doubtless lead to important applications in the future.

We have previously alluded to the fact that phosphorus can be expelled from a mixture of bone ash and fluor spar by means of zinc, and that this method is proposed as a substitute for the old way of making phosphorus.

The solvent properties of zinc for gold and silver at once suggest its employment for the reduction of the ores of these metals in place of the amalgamation process so long in use. The reducing property of zinc is so powerful that it forms detonating powders when mixed with any nitrates and chlorates, and if it were cheaper could be used in the manufacture of blasting powder, the same as it has been employed for pyrotechnical fuses.

Zinc has long been employed for the decomposition of water in the preparation of hydrogen gas. It was at first supposed that the purer the metal the better would be the results; but practice soon proved the contrary, and the presence of foreign metals was discovered to greatly promote the evolution of the gas. The following table shows the relative amount of gas given off in the same interval of time, by pure zinc and its alloys, according to accurate observations made by De la Rive:

	Gas obtained in same time.
Nine parts of zinc and one of iron	100
" " " one of copper	43
" " " one of lead	15
" " " one of tin	12
Distilled zinc	5

It was also found that the acid mixture best adapted for the evolution of hydrogen was composed of one hundred parts of water and thirty-three parts of sulphuric acid. It will be apparent from this that pure distilled zinc is not at all adapted to the decomposition of water.

Zinc powder is employed to reduce the nitrates to nitrites, thus affording a cheaper method than the use of silver. It is also found to decompose the sulphide of barium, and to afford a way for the preparation of the hydrated oxide of barium instead of the old method which involved the use of copper. As the soluble salts of baryta are now largely used to prevent boiler incrustations, any cheaper methods for their production will be appreciated by our engineers. The first attempts to employ zinc white as a substitute for white lead appear to have been made by Courtois in 1782, but it was not until 1845 that the effort to introduce it met with much success. The cost of the material and the necessity for a special oil and dryer were impediments in the way of its general introduction. Even at the present time our house-painters do not appear to be as familiar with it as they ought to be. It is sometimes found to chip off; but this can be prevented by filling the pores of the wood with linseed oil, previous to to applying the zinc white. Sorel prefers to use the chloride of zinc as a paint, and for this purpose prepares the following mixture:

Chloride of zinc (solution 50° B.)	30 parts.
Cream of tartar	1 "
Hydrochloric acid	1 "
Potato starch	4 "
Water	64 "
	100

Stir in zinc white and chalk to proper consistency, and to give glance add a little linseed oil. To obtain a plastic mass like whalebone, take 50 parts potato starch, 5 parts oxide of zinc, and stir them into a mixture composed of 50 parts chloride of zinc (of 55° B.), 1 part cream of tartar, and 1 part hydrochloric acid.

The advantages claimed for zinc paint are as follows: It does not require to be rubbed to give good luster; is more durable than lead paint; withstands moisture; has no smell; protects wood from decay; renders the wood incombustible; is not a poison; does not turn black in bad gases.

The Bartlett white lead is essentially oxide of zinc with lead, and is an article lately introduced to the trade and highly commended by such high authorities as Chandler and Muspratt.

An amalgam of zinc, tin, and mercury has long been employed on the cushions of electrical machines, and is still a favorite. The late Professor Schonbein, of Basle, Switzerland, discovered a remarkable property of zinc amalgam to decompose water and to convert a portion of it into peroxide of hydrogen. It is only necessary to shake vigorously some zinc amalgam in a flask of water, to which a few drops of sulphuric acid have been added, to produce an appreciable quantity of the higher oxide of hydrogen, sufficient to show its presence by the usual reactions. As the peroxide of hydrogen has valuable bleaching and medicinal properties, this method of its preparation by means of zinc amalgam may be worthy of further investigation.

The chloride of zinc has numerous applications in the arts besides those already alluded to. In the form of a solution it is found to have a constant boiling point, and hence it is used in the laboratory to afford a bath of higher temperature than 212° Fah.

The chloride dissolves silk and is used to separate that fiber from wool and vegetable. It is extensively used to impregnate timber to protect from decay, and at one time occasioned a good deal of remark under the name of the kyanizing process. Under the trade name of Sir William Burnett's Disinfecting Liquor, the chloride of zinc has acquired considerable celebrity.

As butter of zinc the chloride has been used as a styptic, also as an emetic. Its application for soldering steel, iron, brass, and copper by means of tin, is well known to plumbers.

The chloride of zinc, with the oxide, is employed as a substitute for gypsum in taking plastic casts, in making statuettes, as a filling for teeth, as a lute in gas manufacturing, and as a valuable cement. The applications of the chloride are so numerous that it is proposed to manufacture it by expelling hydrochloric acid from carnallite and making it pass over zinc dust or roasted ore. The object would be to use waste material in both branches of the manufacture. It has been found that zinc will alloy with magnesium, and where no more than five to twenty per cent zinc is employed the alloy is malleable and ductile. Such a mixture of metal in the form of fine filings has been used as a source of light for photographic purposes; but the great amount of smoke produced by the zinc and magnesium offers an insuperable obstacle to the employment of such a lamp in churches, caves, and confined localities. It is interesting, however, as a scientific experiment—and may be used to add to the brilliancy of fire works.

The hypochlorite of zinc can be recommended as a powerful bleaching agent. To chloride of lime, instead of sulphuric acid, add sulphate of zinc. Sulphate of lime and oxide of zinc will be precipitated and hypochlorous acid set free. It acts powerfully in the purification of whisky; also for bleaching paper, yarn, and other goods.

Newton's patent for the substitution of oxide of zinc for oxide of lead in the manufacture of glass has been successfully applied in England. The glass is said to stand heat better, to be more translucent, and to be cheaper than when the oxide of lead is employed. The oxide of nickel is used as the bleaching agent for glass made of the oxide of zinc instead of oxide of manganese.

The compounds of zinc have extensive application in medicine; the metal is not used.

Acetate of zinc is employed as external remedy or wash for the eyes.

Carbonate of zinc is preferred as a cerate to the powdered calamine formerly used.

Chloride of zinc is prescribed in cases of cancer and as a caustic, also as a disinfectant for ships, hospitals, and dissecting rooms, and for preservation of anatomical specimens.

Zinc oxide is used for ointments.

Zinc sulphate as a tonic, astringent, and emetic.

Valerianate of zinc as an anti-spasmodic.

Cyanide of zinc as a substitute for hydrocyanic acid.

Iodide of zinc as a tonic and astringent.

Nitrate and lactate are also sometimes employed; and recently a very important medicine has made its appearance under the name of phosphide of zinc. It is given in cases where the administration of phosphorous is indicated. It is a gray crystallized body of perfectly definite composition and is prepared by passing the vapor of phosphorous in a current of dry hydrogen through melted zinc. It can be more easily prepared by heating gently one part of finely divided zinc and two parts of amorphous phosphorous in a crucible provided with a perforated cover for the passage of hydrogen gas. Phosphide of zinc is produced with a slight explosion.

Aside from its medicinal qualities this interesting compound can be employed when heated with sulphuric acid to evolve spontaneously combustible phosphureted hydrogen gas.

Galvano-plastic figures can be readily plated if they are first brushed over with a solution of nitrate of silver in alcohol, and are afterwards suspended in an atmosphere of phosphureted hydrogen evolved from the phosphide of zinc or made in the usual way.

The employment of zinc in the manufacture of colors is daily extending. We have a beautiful green and a yellow paint that ought to be more largely employed.

Rinmann's green can be made of various shades according to the proportions of the materials employed, and ought to be substituted for the highly poisonous and dangerous arsenical (Scheele's) green so popular with our paper hangers: Five parts oxide of zinc and one part sulphate of cobalt give dark green; ten parts oxide of zinc and one part sulphate of cobalt give grass green; twenty parts of oxide of zinc and one part sulphate of cobalt give light grass green. By varying the mixture of iron, nickel, and cobalt oxides with the zinc, we can obtain red, yellow, and white colors. The beautiful zinc yellow is the chromate.

The use of cast zinc as a substitute for bronze has become a very extensive one in France. It is said that as many as 200,000 zinc clocks are annually made in France, and the number of statuettes, figures, and gas fixtures of all kinds can hardly be computed.

The property of zinc to throw down nearly all other metals from their solutions, is made use of to obtain the rare metal indium, and also to separate cadmium from refuse solutions. The similar precipitation of antimony is taken advantage of to coat zinc with a fine black color.

Zinc is used in dyeing, for the reduction of indigo and in preparation of indigo vat.

The oxide of zinc is preferred by many to jeweler's rouge as a polishing powder. One of the methods proposed for the manufacture of oxygen is to employ the oxide of zinc with nitrate of soda, also to reduce the sulphate of zinc according to Deville's plan.

To remove stains caused by photographic chemicals, it has been proposed to wash the hands with a concentrated solution of either sulphate or chloride of zinc, to which some acid is added at the same time. It is also well to rub the blackest stains with metallic zinc.

Zinc for fastening iron railings into stone is preferable to lead. Iron cemented with lead is consumed by rust and rapidly destroyed. The zinc sustains the chemical action in preference to the iron, and thus prevents rusting.

The part played by zinc in all of the researches and inventions of electricity and galvanism is so great that any notice of the metal would be deficient without an allusion to this use. We could also give an extended notice of the value of zinc compounds in promoting the study of organic chemistry, especially the interesting researches conducted by aid of zinc ethyl, but all this would be theoretical and foreign to the objects of this journal.

We have made no allusion to the alloys of zinc with the other metals. These are so numerous and important that we must leave them for future consideration.

[For the Scientific American.]

MANUFACTURE OF COTTON SEED AND COTTON SEED OIL.

BY C. WIDEMANN, CHEMIST, PARIS, FRANCE.

No. IV.

In England cotton seed oil is not used as it is in this country; the oil is treated for its stearine and oleine—the stearine being used by soap and candle manufacturers, and oleine for greasing wools or forming a soft, printers' soap. The stearine is obtained by a chemical process and not by chilling the oil, as it is done here. The manufacturers of the oil South are now obliged to send their oil North to have it winter pressed, and I cannot understand yet why they do not manufacture their own stearine by the very simple English process.

Without going very far into the description of the process, I shall only state that it is based upon two operations:

1. The sulphuric acid saponification.
2. The distillation.

Under the influence of concentrated sulphuric acid the fat acids are transformed into glyceroles which separate into sulpho-glyceric acid and acid fats, the latter combining with the mineral acid, forming sulpho-stearic, sulpho-margaric, and sulpho-oleic acids. These acids being treated with boiling water the combination is broken up. The sulphuric acid set at liberty is dissolved in the water, and the fat acids are isolated.

In England they consume yearly by this process over 50,000,000 pounds of cotton seed oil, the stearine produced being made into candles.

As the soap is made from the crude oil, I shall first describe the manufacture of soap from it. Two kinds of soap are made—a white and a dark brown—the first made from the crude oil with an addition of palm oil or tallow, and the second from the foot oil resulting from the operation of clarification and resin.

THE LYE.

Two kinds of soda are used for the preparation of the lye; the "soft soda" (black ash), that is soda without salt, is first used for the pasting, and is thus prepared:

FIRST LYE.—Soda at from 33° to 36° Baumé, 1,000 pounds; lime newly burned, 200 pounds.

SECOND LYE.—For cooking the following lye is employed, which completes the saponification:

Soda, from 33° to 38°, Baumé's alkalimeter, 1,500 lbs.; sal soda at from 18° to 20° by the alkalimeter, 500 lbs.; lime freshly calcined, 400 lbs. Suppose we add 10,000 lbs. of crude cotton seed oil, 2,000 lbs. of resin, 1,000 lbs. of palm oil or tallow. Total, 13,000 lbs. yielding 150 per cent of soap.

We should first use about 12,000 lbs. of the first lye at from 10° to 12° by the alkalimeter and bring this lye to a boiling point, the oils and resin are then introduced, stirring continually, for one hour. The fire is stopped as soon as the ebullition takes place; then 2,400 lbs. of lye at from 15° to 18° are added, and the boiling is continued for 5 hours, after this another addition of lye at 25° is added (about 2,400 lbs.), and as soon as the whole mass has assumed a certain consistency another quantity of lye is added at from 20° to 30° by the alkalimeter. The lye separates from the soap formed, and the mass is then ready for the cooking; the lye is drawn off and a new quantity of soft lye at from 20° to 25° Baumé is added (about 7,000 lbs.), no fire is needed as the whole mass is warm enough to maintain its fluidity; it is stirred for an hour and then drawn off; 8,000 to 9,000 lbs. of the lye No. 2 are then added at 25° alkalimeter, and the whole is boiled, and kept boiling from 4 to 5 hours, the soap is then made, and the surplus lye drawn off.

CALCULATION ON SOAP NO. I.

Cotton seed oil, crude, 10,000 lbs. at 7½c. per lb......	$750·00
Resin, 2,000 lbs. at 1c. per lb..........	20·00
Lye..........	250·00
Palm oil 1,000 lbs. at 12c. per lb..........	120·00
Fuel..........	15·00
Labor..........	40·00
Taxes, interest, etc..........	25·00
Total..........	$1,220·00

Yield 13,000 × 150 per cent = 19,500 lbs. of soap.

SOAP NO. II. IN QUALITY.

(Cotton seed oil) foot oil resulting from the operation of refining, 10,000 lbs. at 4c..........	$400·00
Resin, 4,000 lbs. at 1c..........	40·00
Lye..........	250·00
Fuel..........	15·00
Labor..........	40·00
Insurance, taxes, etc..........	25·00
Total..........	$770·00

Yield 14,000 × 125 per cent = 17,500 lbs. for 4 days' work with 3 kettles.

A very good soap is made in Europe from the oil obtained in treating the cakes with sulphide of carbon. Mr. Driess, of Pantin, near Paris, tells me that the cakes coming from the United States contain from 15 to 20 per cent of their weight of oil. When these cakes are used for feeding cattle this oil is not lost, but when the cakes are used as manure this fat is more injurious than profitable to the soil. It is extracted by sulphide of carbon. At Marseilles alone the daily yield from 200,000 kilogrammes of cakes is 20,000 kilogrammes of oil, or for a year of 300 days 6,000,000 of kilogrammes of oil. The sulphide of carbon is re-collected by distillation.

CLARIFICATION.

The clarification of oils is done by a half saponification transforming nearly all the stearine into a soft soap, and precipitating the coloring matter of the oil along with this soap. The lyes used for that purpose are of a strength of from 18° to 22° Baumé and at a temperature of 90° Centigrade, the quantity varies from 8 to 15 per cent.

WINTER PRESSED OIL.

The winter pressed oil is manufactured in a very simple way in this country. The refined oil is exposed in winter in large flat vats to the cold air, and very soon the mass becomes solid, resembling tallow. It is then placed in bags and pressed under wooden presses, the oleine runs out, and, deprived of its stearine and margarine, has the property of remaining fluid at a very low temperature. This is used for lubricating purposes. The stearine remaining in the bags is sold at a pretty good price in England.

For the Scientific American.

ANILINE GREEN FOR WOOL.

BY M. REIMANN

The recent labors of A. W. Hofmann have in some measure solved the question respecting the composition of aniline green.

I shall only take the chief results of these great researches, and then proceed to discuss a new branch of tinctorial industry produced by aniline green.

As is well known, there are two sorts of aniline green. The first is prepared with aldehyd; the second, discovered only three or four years ago by M. Cherpis, a French chemist, is obtained from the so called Dahlia violet. The mode of manufacturing this color is as follows:

Magenta is heated in a sealed apparatus, with a mixture of alcohol and iodide of methyl.

The violet color is as Professor Hofmann has already shown, a salt of the base trimethylia aniline, combined with iodide of methyl, that is to say, iodide of methyl trimethylia aniline.

As there is an excess of iodide of methyl in the apparatus, it is not to be wondered at, that very often two equivalents of the iodide of methyl combine with the base, instead of one, so that the bimethyliodide of trimethylia-aniline, or iodine green salt, is formed.

The fact that the second equivalent of iodide of methyl is not so firmly combined with the base as the first, explains an observation made some time ago, viz: that a solution of the green salt is changed to violet by heating it at the boiling temperature. One equivalent of iodide of methyl is removed, and the violet salt is formed.

This very circumstance has prevented the employment of aniline green in the dyeing of wool. The wool when dyed in the dyer's bath requires a temperature of 212° F., a temperature which is destructive to the iodine green. Therefore, it was for a long time impossible to dye woolen materials with this green, although silk and cotton goods were dyed by it in the most beautiful shades.

In recent times, however, we have learned how to employ the iodine green, even in the dyeing of wool.

The mordant used for this purpose is the silicate of soda, and it must be noted that in the dying operation, the temperature should not exceed 144° to 167° F.

The process is carried out as follows:

The thick solution of silicate of soda, as it is produced in chemical works, is diluted with six times its weight of clear warm water, and well mixed with it.

The wool is well washed, and then introduced into the tepid bath, where it is allowed to remain some hours.

The wool is next taken out of the mordant, and well wrung out, and dried without previous washing.

Meantime the dyeing baths must be prepared. A solution of iodine green, as it is sold by the manufacturers, is poured into a sufficient quantity of water. The bath is then heated to the temperature of 144° F.

The dried wool is moistened with warm water until it has become thoroughly saturated, and is then introduced into the dyeing bath.

It is allowed to remain here one hour, during which time it must be well stirred about.

The wool readily abstracts the coloring matter from the bath, so that after an hour it presents a fine green color, which is visible in the evening as well as by day-light.

If it is desirable to produce a yellow shade, the wool, after it has been immersed in the green bath, must be further immersed in a bath of picric acid, when the bluish-green tint is transformed into a yellowish one.

Lastly, the dyed wool is passed through a weak solution of sulphuric acid and water, and finally washed in a small quantity of clean water.

It must further be observed that the solution of silicate of soda has a concentration of 40° B. This must be diluted with six times its weight of water.

[For the Scientific American.]

ON OX GALL.

BY C. WIDEMANN.

In the SCIENTIFIC AMERICAN of the 5th of February, I called the attention of readers to albumen. I shall now treat of a product of no less importance in the arts, and which has the same fate as the blood—I mean the ox gall. With the little exception of what is sold to the dyers and curriers, and to a small concern manufacturing a kind of soap to cleanse woolen fabrics from grease, I consider that there is an immense quantity of this article lost.

Ox gall has received abroad a great many useful applications. First let us see of what it is composed, and how its different properties have been applied to industry.

The gall is a greenish liquid secreted by the liver, possessing an alkaline reaction, and producing froth with water, similar in that respect to soap. It has a bitter taste, and is composed mostly of water, a colorless fluid similar to turpentine called "Picromel," margaric acid, a resinous substance, soda, and a few other salts. The margaric acid, the resinous substance, and the soda combine together to form with the picromel a soap, having the property of dissolving fats. Acids render it cloudy; alkalies destroy its gummy appearance. It dissolves freely in water and alcohol. Left to itself it corrupts slowly without emitting the usual putrid odor generated by the corruption of animal substances.

The ox gall varies in color, appearance, and composition, as we said above. The usual color is greenish, but it is also sometimes deep green or light yellow. Its consistency is sometimes sirupy, sometimes very limpid, sometimes cloudy by the presence of a peculiar yellow coloring matter called "cholesterine," easily separated by water.

Taking 800 parts we find the composition to be about:

Water..........	700	
Picromel..........	69	
Resinous matter..........	15	
Yellow coloring matter..........	4	at an average.
Soda..........	4	
Phosphate of soda..........	2	
Chlorides of sodium and..........		
Chlorides of potassium..........	3·5	
Sulphate of Soda..........	0·8	
Phosphate of lime..........	1·2	

Or in another experiment on 100 parts:

Carbon..........	63·7
Hydrogen..........	8·9
Azote..........	3·9
Oxygen..........	23·5
	100

It combines with all colors for painting purposes, imparting tenacity and fixing them with intensity, giving them fluidity, but acting also on very light colors to give them a dirty shade when not properly purified.

If a great quantity of gall is collected it can be evaporated to the consistency of an extract, and can be dissolved in an alkaline water when it is to be used. The concentrated gall will keep for years.

To clarify the ox gall and have a perfectly pure product, we recommend the following method:

The ox gall is first boiled and carefully skimmed. To every pint add one ounce finely-powdered alum, boil until the mixture is perfect, then let it cool. Then take the same quantity of ox gall boiled, and skimmed as above, and add one ounce per pint of common salt. It is then left to settle for two or three weeks, decanted, and the two preparations mixed together, which precipitates the cholesterine. It can then be used in painting for the finest miniatures and water colors.

The ox gall possesses also other properties; it fixes the colors on the paper if this paper is passed through its solution, giving more brilliancy and durability to ultramarine, carmine, green, and all fine colors; combined with gum-arabic it thickens colors without giving them a disagreeable luster, prevents peeling and cracking, and allows other shades to be applied without mixing with that previously applied.

Mixed with lamp-black and gum tragacanth it gives an ink similar in every respect to Indian ink, and can be scented with a little musk or any other perfume.

Passed over pencil, or crayon, or chalk drawings, they may be afterward painted over without difficulty; by passing it over the ivory plates, miniature painters remove the natural oil from the surface and fit them for the reception of the colors. Ox gall can be used for transparent window blinds or screens, as when it is passed over oiled or varnished surfaced colors can then be applied, which colors resist all influences tending to remove them.

The scourers use it by itself to remove fatty matters from wool fabrics, or in combination with spirits of turpentine, alcohol, honey, the yolk of eggs, clay, etc., to cleanse silk fabrics.

The following recipe is the composition of the ox gall soap usually sold:

Six part white soap; one part ox gall; one part potassa; one part alum.

Ambrosine—A New Organic Mineral Substance.

A correspondent of the *Rural Carolinian*, Mr. Charles U. Shepard, Sen., Charleston, writes to that paper as follows:

An irregular oval-shaped mass of a mineral, closely resembling amber, has been brought to my notice by Major Edward Willis, of this city; and is here noticed in the hope that an additional supply of the same curious substance may be obtained by our phosphatic explorers. The present mass was originally of the size of a man's fist. It is of a yellowish-brown color externally, but within is clove-brown. It breaks with about the same facility as amber; has a conchoidal fracture, and a resinous luster. It is feebly translucent. Its specific gravity is but slightly above that of water. Indeed, small fragments of it when thrown into water float for a short time, until they part with adhering air, when they slowly descend through the liquid. It is strongly electric by friction. It melts into a clear, yellowish liquid at about 460° Fah.; though it softens at a much lower temperature.

It gives off considerable succinic acid long before it melts. On fusion a dense yellow oil is volatilized, attended with an agreeable balsamic odor, wholly unlike that from the resins of our pines. A dark brown, non-volatile fluid remains behind so long as the melting heat is kept up.

As it differs from any of the oxygenated hydrocarbons known, I have called it Ambrosine—a term compounded from the two words amber and resin; to both of which substances it bears a resemblance. It is very combustible—burning with a bright, yellowish white light, a pleasant odor, and without leaving any carbon, or even the slightest ash behind. It is largely soluble in oil of turpentine, alcohol, ether, and chloroform, as well as in a solution of potash; and is feebly taken up by the strong acids, without suffering decomposition.

It probably originated in some of the coniferous trees that existed during the pleiocene epoch in geology, when our phosphatic formation was in progress of deposition.

A Case of Spontaneous Combustion.

A Newbern, Va., correspondent of the Boston *Journal of Chemistry* writes:

"A merchant in this place received a box from Baltimore containing, among other things, ordinary bat cotton, and a can of Japan lacquer, or varnish. In transportation the can was broken, and the contents ran out, saturating one or two bats of the cotton. The box was received in the evening, and put in the store at night. When opened the next morning and exposed to the air, the cotton was found to be hot and smoking. The merchant took the precaution to lay it out at the door, when it ignited and blazed up. The cotton might have been taken out of the box the evening it was received, and carelessly laid aside, or it might have ignited before the box was opened; in either event the whole stock of goods would have been destroyed, and several houses in addition. The origin of the fire would, of course, have been attributed to an incendiary. The packing of Japan varnish with combustible articles, I suppose, is frequently done; and is it not well that the public should know the dangerous results that might ensue? I was ignorant of the fact myself, and I suppose others are also, as the box was put up by a reliable house engaged in the drug trade in Baltimore. There was nothing else in the box that could have had any agency in the combustion."

ACTION OF COMPRESSED AIR IN FRONT OF PROJECTILES.—Some papers on this subject have recently come before the French Academy; and on the occasion of M. Delaunay remarking on bolides and aerolites, General Morin observed that artillerists found that in firing over a level near the ground, the dust was raised right and left by the compressed air acted upon by the ball. Ancient cannoneers, he said, spoke of valleys as attracting balls, because in such situations the compressed air afforded the greatest obstacle to their passage. In firing along a horizontal wall, and near it, balls deviated, so that if the wall was at the right, the balls went to the left, and *vice versa*.

TO THE POINT.—Mr. Geo. W. Woodward, the well-known publisher of architectural works, whose advertisement appears in its proper place, in a recent note to us says: "*AFTER an expenditure of over twenty-six thousand dollars in advertising, the proof is ample that the* SCIENTIFIC AMERICAN *is the most profitable medium I have yet employed.*"

PRESERVATION OF ICE.

We condense from the *American Builder* an article on the above subject, and reproduce an engraving of an ice house designed to be most effective and serviceable.

The practical rules to be observed in the harvesting, storing, and preservation of ice, may be briefly summed up as follows:

1. Secure the purest and most solid ice. It should, particularly, be free from organic substances.

2. Get the ice when it is coldest. It is decidedly beneficial to store it with a temperature considerably below the melting point.

3. Put it up in a compact and solid body, so that the least amount of surface may be exposed to extraneous influences.

4. Do not directly surround or cover it with organic substances, such as straw, shavings, and sawdust.

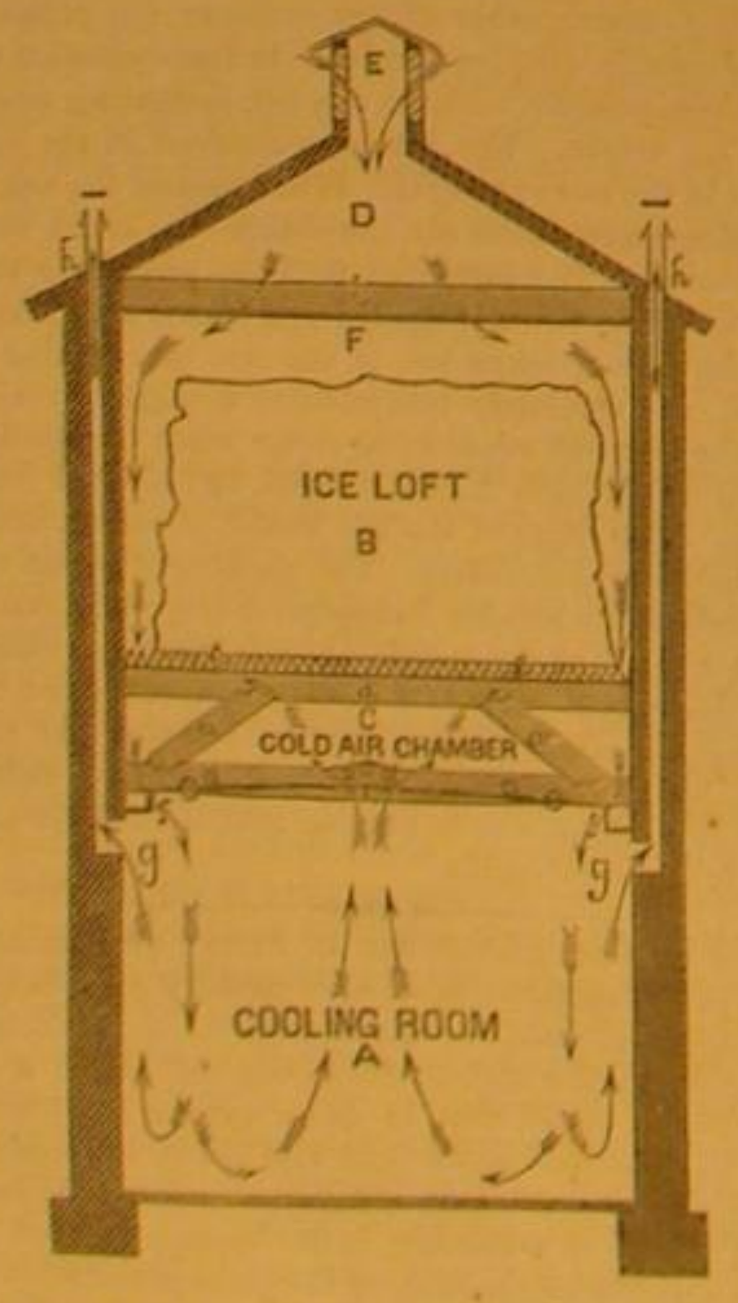
5. Preserve considerable space about the body of the ice, and ventilate the same; that no water should be allowed to stand around or below it, is a matter of course.

6. Keep the organic substances forming the non-conducting material in the walls and roof of the ice house dry, in order to prevent any evolution of heat from decay or rot.

A knowledge of the fact that heated air rises and the cold air remains on the lowest plane of a room, led to the expedient of placing the ice over a room intended to be cooled. But next rose the question regarding the most economical and efficient method of transmitting the cooling effect of the ice through the ceiling into the room below. Wood was first used, but this allowed little of the coolness of the ice to be transmitted into the room below. Then the ice was so packed as to have flues, with holes through the ceiling, below them, where the air coming in contact with the ice was cooled, and this lowered the temperature of the room beneath. By this arrangement, however, the ice wasted rapidly, and the flues soon became so large as to prove of no benefit just at the season when the cooling effects of the ice were most desirable. Lastly, some one conceived the idea of making the ceiling of iron, which would most directly cool the uppermost air in the room and cause it to descend, making room for other air to be cooled and descend in like manner. These ceilings were most eagerly taken hold of and praised as perfection. But their use has developed many great defects. The galvanizing scales off, allowing rapid corrosions of the metal; the seams become broken, allowing the water to run through; the room below is not properly ventilated; the condensing of the vapor in the room upon the surface of the iron causes a constant shower; besides, they are very expensive.

To overcome these objections, and reduce the amount of the first outlay to a minimum, an ice house is proposed, the construction and arrangement of which are as shown in the annexed diagram.

The accompanying engraving shows an upright cross section of an ice house, with cooling room, A. *a a* are trussed timbers placed about four feet apart, for the support of slat floor, B, upon which the ice is placed, allowing the air beneath to have direct contact with it. Space, C, is a cold air chamber, with water-tight bottom, C, which is inclined, in order to collect the ice water in troughs following the sides of the structure. Space, F, over the ice, should be about two feet, and the ceiling should be covered on the under side of the joist with common boards, and be filled from eight to ten inches thick with loose shavings, the object being to allow



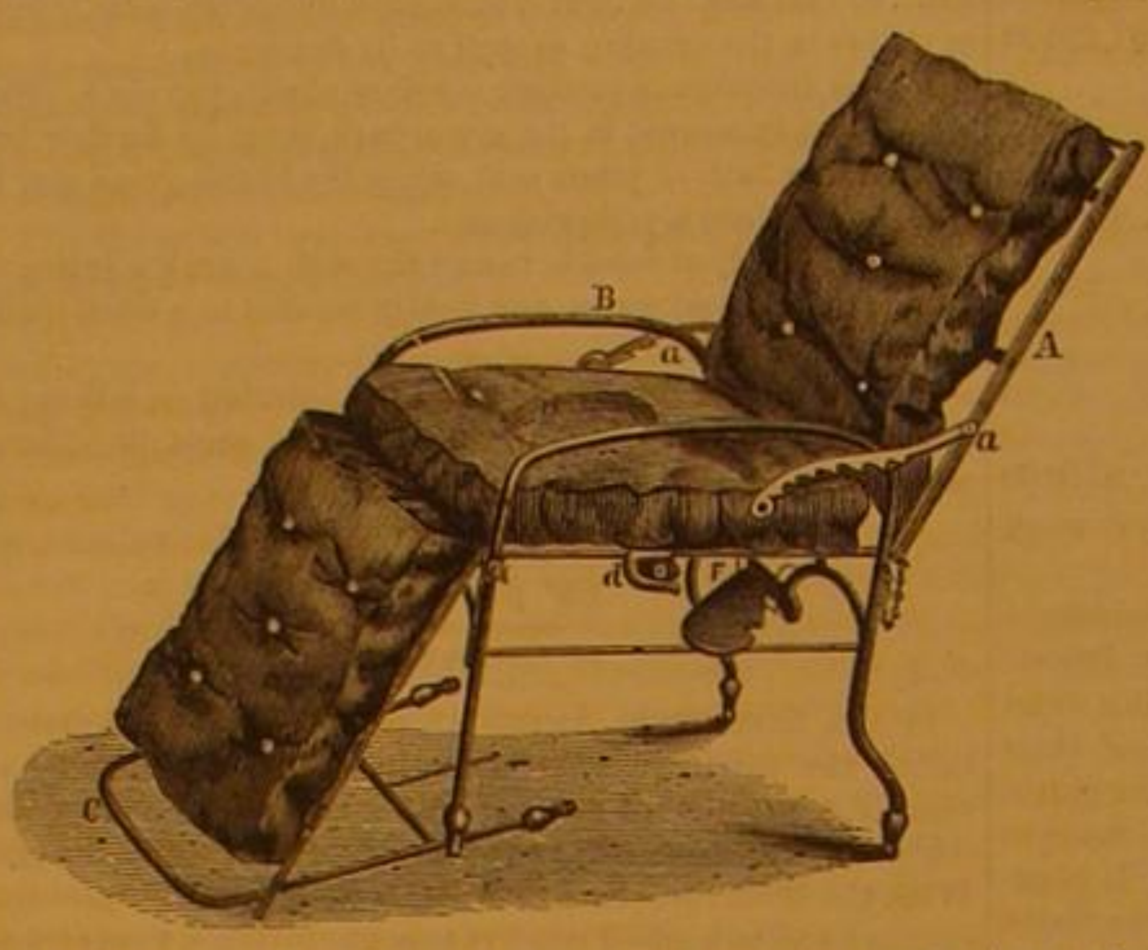
the air to pass in finely-divided currents from space D into F. On the top of the roof is the injecting ventilator, E, and in the walls are flues terminating into ejecting ventilators, *h*. The movements of the air will naturally be as indicated by the arrows. The warmer air in A will rise, and ascend through apertures, *d*, into chamber, C, touch the ice, become cooled, and fall back into A through aperture, *f*. The atmospheric air will enter space, D, and divide itself through ceiling, *i*, into space, F, pass over the exposed surface of the ice, and descend along its four sides through the slat floor, B, into chamber, C, and thence into room, A, for use. An equal quantity of foul air must needs be allowed to escape through openings *g*, and ejecting ventilators, *h*.

The advantages of this arrangement may be briefly enumerated as follows:

1. It is cheap.
2. It is durable.
3. It is in strict accordance with physical laws.
4. It accomplishes the necessary ventilation of the ice in two ways: It sends the cool air from above and around the ice, which would otherwise be totally lost, into the room, A; and since the air is continually supplied from the atmosphere, preserves the purity of the air in room, A.
5. The cold air in chamber, C, is peculiarly advantageous, since it allows the transmission of cool air into rooms located by the side of cooling room, A.

IMPROVED BEDSTEAD AND MATTRESS FOR INVALIDS.

Sickness and suffering are the common lot of mankind, and the great number of appliances calculated to ameliorate the condition of invalids is justly regarded as a marked feature of our present high civilization.



Our engraving illustrates a bedstead and mattress calculated to minister greatly to the comfort of bed-ridden people. The bedstead is constructed of wrought iron, and is made in three segments, hinged and combined in such a manner as to be readily adjusted to suit for reclining at any desired angle, or for sitting upright, so that it may be used either as a chair, lounge, or bed. This invention not only enables the patient to repose or rest in a comfortable position, but is equally convenient for the surgeon and attendant in all surgical, obstetrical, and chronic cases.

The manner in which the mattress is opened, as shown in the engraving, and the vessel drawn under or removed by the device, F, is so simple and easy that the most helpless patient can be relieved of the necessities of nature without moving, or inconvenience. The whole is mounted on casters, and its cost is not materially greater than that of an ordinary bedstead and mattress.

For further particulars address the patentee and manufacturer, Anthony Iske, 22 Prince street, Lancaster Pa.

THE PRESERVATION OF MEAT.

THE LONDON TIMES' ACCOUNT OF THE IMPROVED GAMGEE PROCESS.

About four years ago, in consequence of the increasing price and scarcity of meat, and of the danger incidental to bringing live animals, possibly affected with contagious diseases, to the roads and pastures of England, Professor Gamgee, formerly head of the new Veterinary College at Edinburgh, commenced a series of experiments with a view to determine the best method of preserving the flesh of animals for food. His early attempts, although attended with enough success to justify endeavors to improve the process first employed, were not altogether satisfactory. The intervening time has been devoted to the careful consideration of the several steps that had been taken, and to a steady continuance of practical researches in America. At last, however, Professor Gamgee has returned to England the possessor of a method of preservation that he is prepared to expose to all reasonable tests, and by which he expects at once to remove butchers' meat from the number of perishable commodities.

In the introduction of a purely chemical process to the general fraternity of butchers, Professor Gamgee has been materially aided by the Messrs. Bonser, of Newgate market, who had the sagacity to perceive that imperishable meat would be of at least as much value in the ordinary course of the retail trade at home as to the business of the importer from abroad. By the help of Messrs. Bonser, a certain number of "preserved" carcasses were offered to the butchers for sale, and these were eagerly purchased, at a somewhat enhanced price. It may be presumed that customers made no complaint, for the butcher-purchasers unanimously "asked for more;" and since then a continuous supply has been thrown into the market, and has been sold with readiness.

As far as regards color and appearance there is very little, and as regards flavor and texture there is nothing, by which the preserved meat can be distinguished from that which has been slaughtered in the ordinary way; and the chief or only difference between them is that the former will keep good for periods varying from three to twelve months, according to the length of time during which it has been exposed to the gases employed. The necessary plant has been set up in the vicinity of Columbia market, and the carcasses supplied by Messrs. Bonser are in the continuous process of treatment, so that colonists and others commercially interested may see all that is done, and may learn how to carry the method into practice elsewhere.

This week an Australian stock-breeder has taken away with him some preserved sheep, in order so try how they bear the packing and shaking incidental to ship transit, and to exhibit to his fellow colonists the results that have been attained. If these carcasses reach Australia in good condition, it is not too much to hope that the problem of a meat supply thence will be solved, and that colonial breeders will next turn their attention to the quality of their stock, and will endeavor to produce animals equal in condition and flavor to those that now form the staple food of the better classes in England. The transit test is a severe one, and at present has been only applied for the much shorter voyage between England and America. On this trip no injury has been sustained, and it is fairly probable that careful packing will enable the meat to bear the Australian voyage, and to arrive not only undamaged but tempting in appearance. As far as can be foreseen at present, there is nothing in the condition of a ship's hold that will be likely to interfere with the preservative action of the process.

The chief agent employed is sulphurous acid; but in order to prevent this from flavoring the meat, there is a preliminary exposure to carbonic oxide, by which the coloring matter of the blood and tissues is rendered able to resist the reducing or decomposing action of the acid. In the first place the animals are killed by being made to breathe carbonic oxide, that is, by a process analogous to the administration of chloroform. Insensibility is quickly produced and then the animal is bled, and the carcass dressed in the ordinary way.

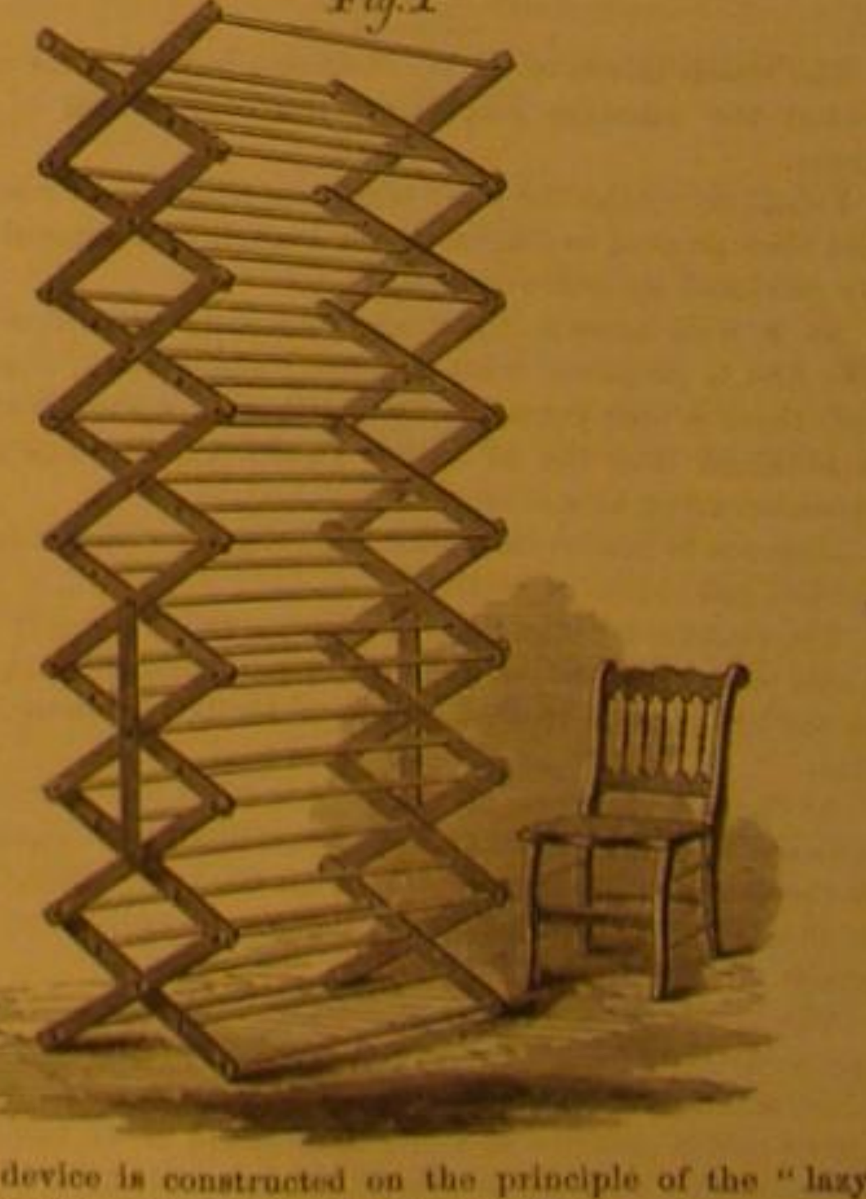
In a temperate climate it is left to cool and set spontaneously; but in a hot climate an artificial process of refrigeration is required. By this the carcass is reduced to about 50 degrees Fahrenheit; and it is then placed in an air-tight chamber, into which an atmosphere of mixed carbonic oxide and nitrogen is driven by a blower. In this chamber there is also a wooden case, containing charcoal, charged with sulphurous acid; and after the carcasses have been for a certain period exposed to the carbonic oxide and nitrogen alone, the lid of the case is drawn off by a thong passing through a stuffing box, and the charcoal gradually gives off its acid to the meat. The chamber is left undisturbed for seven or eight days in the case of sheep, ten days for pigs, and eighteen or twenty for bullocks. After this the door is opened, and the meat is taken out ready to be stored or packed. In hot climates not only do the carcasses require to be cooled at first, but a stream of cold brine from a refrigerator is kept flowing over the chambers during the whole of the process.

The expense of the plant and method is inconsiderable. In addition to the butchers required to kill and dress the animals, the largest establishment would only need one man to drive the refrigerating machine and blower, and one to attend to the charging of the charcoal. In England the cost of preserving amounts to two or three pence for a sheep and to about a shilling for a bullock.

IMPROVED CLOTHES DRYER.

Our engraving illustrates an improved form of clothes-bars, so constructed that they may either be fixed to the side of a room, or placed on the floor in the ordinary way

Fig. 1



The device is constructed on the principle of the "lazy-tongs" and is extensible and self-supporting.

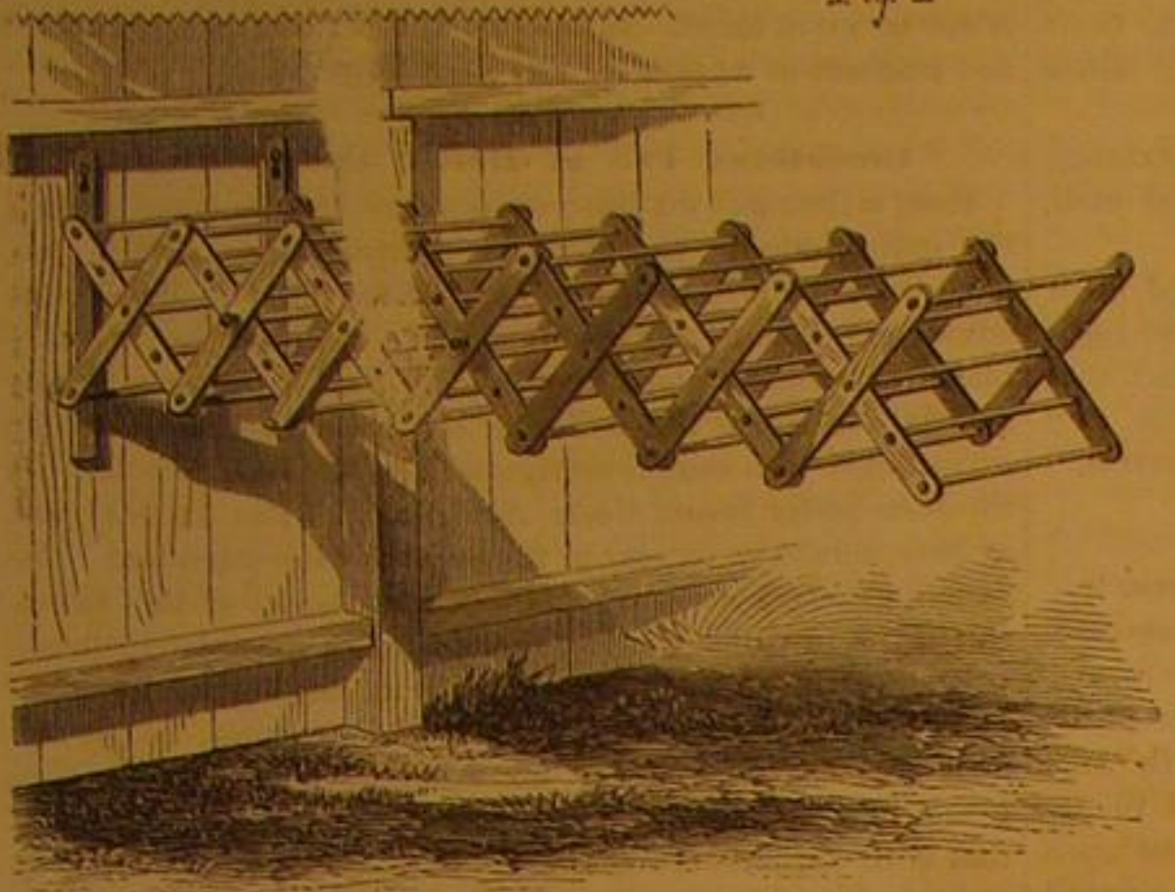
When standing on the floor it is kept extended by rectangular bars engaging with the transverse bars of the device. This form of the invention is shown in Fig. 1.

When extended from the wall it needs no special appliance to keep it extended, as when it is placed on the floor. The upper and inner transverse bar engages merely with hooks or brackets on the wall, and the lower ends of the inner bars of the "lazy-tongs" rest against the wall as shown in Fig. 2

Fig. 3 shows the same closed up when not in use.

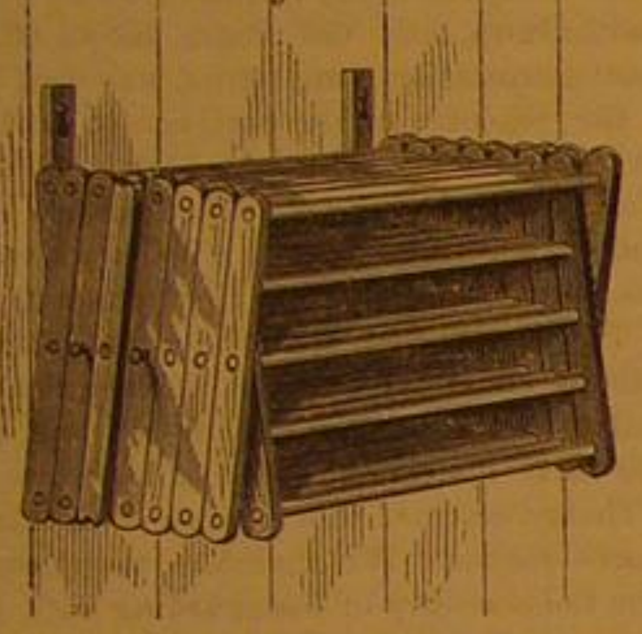
This apparatus is intended to take the place of all other clothes-dryers, lines, or bars, for in-door or out-door use. It can be made complete in any ordinary shop where wood is worked; and it can be made of any size, from forty-five, to two hundred feet of rounds. The engraving, Fig. 1 represents

Fig. 2



an apparatus with one hundred and five feet of rounds, or clothes space.

Fig. 3



This convenient and useful household appurtenance was patented through the Scientific American Patent Agency, Oct 19, 1869, by J. C. Longshore, of Mansfield, Ohio. State and county rights will be sold. Address Bent. Goodnow, & Co., 119 Milk street, Boston, or Longshore & Brother, Mansfield, Ohio.

Correspondence.

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

Use of Small Turbines.

MESSRS. EDITORS:—I notice on page 76, current volume, SCIENTIFIC AMERICAN, an elaborate description of a very interesting and successful experiment in the use of high falls of water and small turbine wheels.

This is what the country needs to see more of, and we heartily congratulate the enterprising owner on the success of his undertaking. We are greatly indebted to the writer for his very interesting description of the same, and hope it may be the means of inciting other mill-owners and manufacturers to go and do likewise.

I think, however, your worthy correspondent cannot be up with the times as regards the achievements of modern engineering science, or he would hardly place so much stress on the "world-wide value" of this so-called experiment; for, while it is true that such applications of water power are rare, the wonder with scientific men, when they look upon the vast amount of useless power flowing down our mountain slopes from Maine to Mexico, is not that such powers can be made available, but that they are allowed to run idly to waste, while expensive and troublesome steam is used instead.

The practicability of such applications of power has long since ceased to be a matter of doubt; in fact, mere experiments of this kind may be classed with your correspondent's overshot wheels, as "matters of a by-gone age." I would further say to your correspondent that, considering the hight of head used (ninety-five feet), what he is pleased to term the "insignificant little wheel, only eleven and a half inches in diameter," is in reality a pretty large one to do the work stated, for had some kinds been used, one of seven or eight inches in diameter would have been sufficient.

Joseph Glynn, in his treatise on the power of water, gives a description of a turbine constructed by M. Fourneyron, at St. Blaise, in the Black Forest of Baden, about the year 1837, which worked under a head of three hundred and fifty-four feet; its diameter was thirteen inches, the face of the wheel, or depth of buckets was ·225, or less than a quarter of an inch; it made from 2,200 to 2,300 revolutions per minute. This turbine drove a cotton mill of 8,000 spindles with all the accessories.

The water was filtered before it entered the conduit pipes.

There have been a number of small turbines used on high falls in this country. Mr. J. E. Stevenson built one of only seven inches diameter, for a fall of about ninety feet, which was highly successful, and he has a number of ten or twelve inches in diameter, working under falls of from sixty to one hundred feet. Messrs. James Leffel & Co. build wheels as small as five and three quarter inches diameter, which, under a fall of ninety-five feet, are said to give nineteen horses power.

In some recent experiments of my own, with reference to obtaining a cheap application to light manufacturing purposes of the usually high falls of city supplies, I used a wheel only three inches in diameter, having twenty-four issues, each measuring one tenth of an inch square.

This wheel under a fall of thirty-five feet, drove a heavy English foot-lathe with sufficient power to turn a hickory block four inches in diameter; the water was conveyed to it through over one hundred feet of one and one quarter inch pipe, having a number of sharp angles and curves. The wheel running unloaded made 2,288 revolutions per minute, ascertained by actual count by means of a worm and wheel.

This is the smallest wheel I have any knowledge of, doing active service.

From the above statements your correspondent and the public will see that the application of high falls of water, by means of small turbines, has long since ceased to be an experiment.

We hope, Messrs. Editors, that ere long, by means of the recent improvements in hydraulic motors, and the introduction of the transmission of power by wire ropes, to see every idle streamlet harnessed and made to contribute its mite to the reduction of man's labor, and the saving of our coal beds.

CHAS. E. FOWLER, C.E.

Peekskill, N. Y.

Muzzle vs. Breech-Loading Guns for Sporting Use.

MESSRS. EDITORS:—I live on the northern frontier of the great forest known in your part of the State as the great north woods. I am a practical gun-maker, making a specialty of top and bottom double-barreled muzzle-loaders. In fact, quite a respectable percentage of the venison which appears in New York markets, is killed with rifles made at my hands. I am a constant reader of the time-honored SCIENTIFIC AMERICAN, and have been a silent and watchful spectator of the contest for supremacy going on during the last few years between breech- and muzzle-loaders. Now when we take into account the many desirable points in hunting and sporting guns, it must be admitted that each system is possessed of some points of merit over the other, and that neither has gained a signal victory, leaving military weapons out of the question. In our locality, for instance, the hunting of deer during the autumnal season amounts to quite a business, and, of course, a rifle best adapted to the purpose is the first thing needful.

Thus far breech-loaders, even from the best factories in the country, have failed as a class, to come to the degree of accuracy so indispensable to hunters. Several well directed attempts have been made to introduce them here, but every one has died of its own weakness, and to-day the double-barreled muzzle-loader reigns supreme.

Still there are cases (I have made them myself, and have met them in my experience) where breech-loaders were hard to beat.

I have seen out of a dozen from a noted factory only two that would perform in any degree worthy the name of rifle, and still no gages, or instruments, knowledge or theory known to me could detect the reason why some others, at least, should not perform as well. I have seen, too, a splendid barrel, to all appearance, produce quite poor results when loaded at the breech with the most approved ammunition, and under the most favorable circumstances; and then, when charged from the muzzle, from the same powder and lead, adding only the patch, and starting the bullets with a common ramrod, the result was four hundred per cent improved. Again, I have seen out of a dozen double muzzle-loaders made at one time and under no particular requirements, one or two which would beat the others a little, but the poorest was better than any of the breech-loaders before named. It is not my purpose to enter into theoretical speculation; we have enough of that already, unless it can better withstand the stern arguments of practice.

Neither must I be understood as prejudiced against the breech-loading system. Indeed, I yet hope to see guns of this kind true in every case. Untold fame and fortune awaits the inventor of such a gun, if it be not cumbrous, inconvenient, or expensive. I do not make these remarks unmindful of the unprecedented talent and study already devoted to the business; but this talent has been directed more to minor facilities than to uniform accuracy of performance, and it seems to me in the former particular as largely overdone. We are often told that a deer is a large target at short range in the woods, and perfect accuracy is unimportant. To such we say, "Try it." Not once in five times does the hunter have a whole deer for a target. It often happens that only a leg, a neck, a nose, or even a horn must be struck, in order to secure a second and final shot. Of this deer-hunting I may speak again at some future time, if this prove of interest. It is a science and an art peculiar to woodsmen and amateurs alone, and is the only one I think of, not treated of in your journal. The above facts are the result of careful study and twenty years' experience. There are to-day, thousands of your readers who, like myself, have remained silent during all this discussion on the inferiority of breech-loading, who will heartily indorse what is here recorded; and among them are to be found a large majority of the best hunters and riflemen in the country.

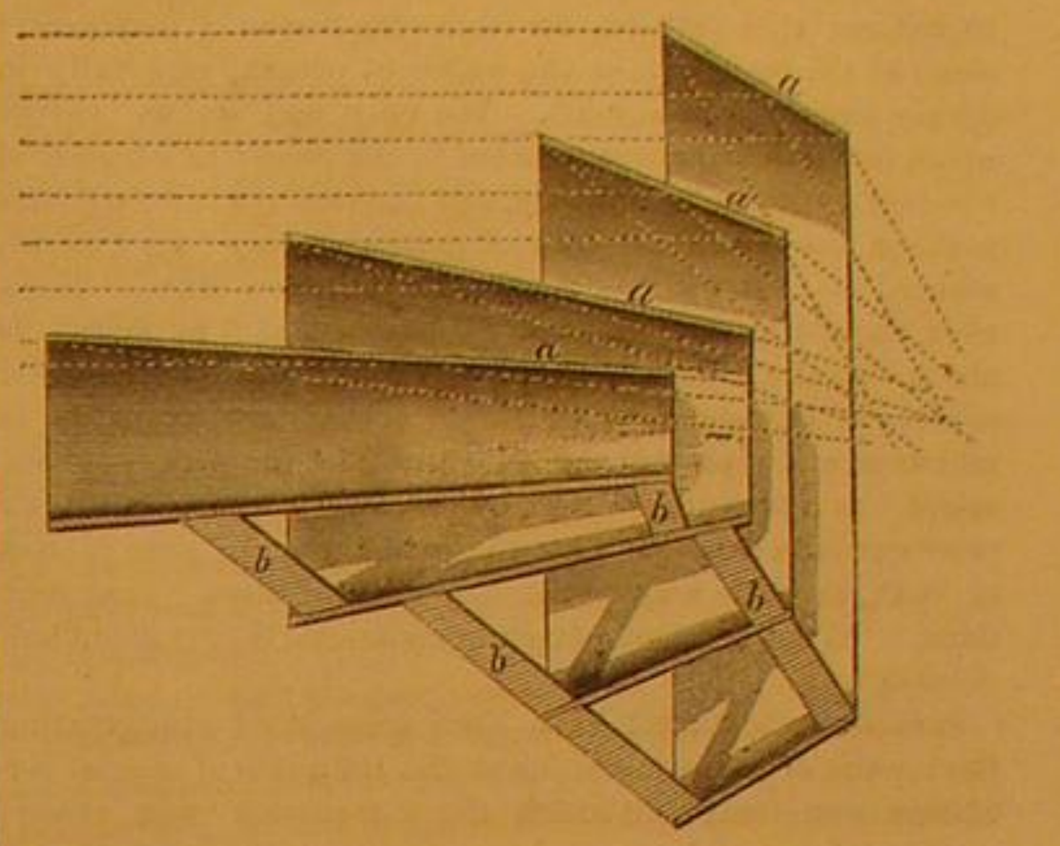
L. L. HEPBURN.

Colton, N. Y.

Concentration of Solar Heat for Motive Power.

MESSRS. EDITORS:—Some twelve or fifteen years since I made some experiments in concentrating the rays of the sun for the purpose of heat and light, and of late the name of Ericsson has been associated with a solar engine. I have been somewhat anxious to see an account of his plan of concentration. Some one has suggested a long tube, but I do not see how that can be made to act.

I inclose a diagram of the plan I adopted, and which certainly made a powerful reflection.



a a are sections of conical tubes or rings; *b b* are thin, flat stays or braces, holding the rings in their proper positions. The parallel dotted lines represent direct rays of the sun. The rings are so placed relative to each other that the rays falling immediately outside of a ring will be caught on the inside of the next outside ring. The insides of the rings are reflectors, and the angles are so arranged that the reflected rays are all concentrated to one point—care being had that no reflected rays be obstructed by falling upon the outside of the rings. Such a reflector has even some advantages over a lens, as it can be made to concentrate as closely, and is always achromatic.

I printed life-size photographs from small negatives with such a reflector.

It had not occurred to me that the rays of the sun could be used as a power for a motor, but since the 9th of March, 1862, I have entertained so high an opinion of Ericsson that I take an interest in whatever he may be engaged in.

Philadelphia, Pa. D. S.

Two Driving Wheels vs. One for Harvesters.

MESSRS. EDITORS:—I hoped to see the article under the above heading, that appeared in a January number of your paper, answered by an able hand. But as it is a subject in which I feel an interest, expecting to buy a machine next summer, I am pleased to see this subject examined.

I must say I think it is practically and philosophically true that two driving wheels for harvesters are better than one. With two drivers there is a quicker motion given to the pitman when cutting on a curve turning from the land; because the driver that runs the machinery runs closer to the grass, and consequently on a larger circle, and we lose no motion when circling round a corner in the opposite direction. We think a mowing machine should be so geared that it will have a capacity for cutting at least three-eighths faster on hard ground. Then it advances with almost the entire weight of the cutter-bar resting on the driver, with a good fly-wheel at the wrist in the pitman, the inertia of which will counteract the inertia of the pitmen and sickle in stopping and starting. With the lively motion as here indicated the side draft is not great. We presume it is impossible to so construct a machine that there will not be more or less side draft at times. The weight of the machine cannot be so well balanced on one driver as it can on two drivers.

When running over stones and knolls the machine with two drivers has the advantage, because the weight is changed from one wheel to the other, and the wheel that is on the level will keep up a regular motion, which cannot be done with a single driver. One of the main objections to a machine with but one driver is that it drops suddenly into ditches and cavities, and takes a much heavier pull to lift it out, than if the weight were divided on two wheels; and such a machine runs much harder over uneven ground, and does not carry up the cutter-bar so well, and is therefore harder to turn at the corners. Mr. Hull's argument in reference to the vibrations of the draft-pole will apply with greater force to a machine with one driver, if the side draft is balanced for ordinary grass; the reason is that there is more weight on the cutter-bar, consequently the uneven surface of the ground will effect it more.

The argument in reference to the knives stopping when the driving power changes from wheel to wheel is not good. For if the team does not stop, the drivers do not stop; and if one driver is doing the driving, it will continue to do so, like a one-wheel machine, until the other wheel has an occasion to run faster than the first, in that case the first wheel is not released until the cogs and bearing of the second wheel are all tight and braced for action. It is impossible for the knives to stop under any circumstances where they would not stop under the same circumstances with one driver. Yet, on the other hand, the knives of a machine run by one driver may stop when the driver strikes a tussock or drops in a cavity, when the knives of a two-wheeled machine would not stop.

The reason farmers prefer the two-wheeled machines is, they work easier and better. If the side draft is so balanced that it disappears while cutting in heavy grass, it will not be so equally balanced when we run into the grass, and *vice versa*. T. N. Burnell.

Reynolds, Ind.

Chemical Fertilizers.

Messrs. Editors:—The last report of the Commissioner of Agriculture is said to be "the best that has appeared from that Department." Although disposed (on many accounts) to indorse this opinion, for this very reason I may except some of the estimates of the value of potash, especially in Jersey and Delaware marl. We only find on an *average* about one half the amount stated in the report in cargoes of the best varieties from Jersey, and the manufacturer who has perhaps the largest "salts of potash factory" in America assured me that was his result several years since. Moreover, the commercial value of "*soluble* potash," as stated, is about half the price at which it is offered from the cheapest source at Stassfurt, in those salts that are available as manures, and represent the *full* value of "the potash of commerce" as a manure—which, by the way, is quoted in all our price currents at about half the actual cost of pure potassa or K O., and this may be the secret of all these "exaggerations." What is called potash in commerce is only about half potassa.

It is probable that I have been accused of exaggerating the results of crops raised under the influence of special fertilizers sometimes, although the comparison was always made fairly with the normal or natural product under similar circumstances, and as precisely as possible. For instance, the average product of corn per acre in our State will not exceed about fifteen bushels; yet two bushels of ears per shock (at 3½ feet) indicates fifty-six bushels of shelled corn per acre, and double that may easily be produced with a good fertilizer on any acre of land of average quality. Moreover, I am assured by good authority that double that crop has been actually produced in Ohio on an acre (but not at 3½ feet.)

So also in my wheat experiments that have been published from year to year. A few feet of a drill row, *uniformly filled with wheat plants at harvest*, were always selected so as to avoid the numberless accidents to which the crop was subjected through the long period of nine months, including all of the winter; this was always considered by me a fair zero or standard for comparison for a precisely similar area under the influence of a spring top dressing of some concentrated fertilizers.

The average crop of wheat in our State never exceeds twelve bushels, but such results exhibit thirty-six to forty bushels *without any manure*, and nearly one hundred bushels per acre on manured land. Calculations based on the seed sown are more remarkable exaggerations, yet they are *relatively* correct when the normal product is *fairly* stated. For instance, one grain will produce thirty-four grains in one head of wheat; but often (by stooling) a number, say three heads or one hundred grains. Consequently, if two bushels per acre are drilled, two hundred bushels *may* be produced; and this does not exhibit the half of the truth with regard to the prolific character of wheat, that *every* practical farmer will admit, while he is disposed to discredit all statements that demonstrate his failures in comparison with the natural products of the soil he cultivates, and much more so when the product of his labor is doubled by the aid of science.

Port Penn, Del. David Stewart, M. D.

Causes of Strikes.

Messrs. Editors:—On page 60, present volume, a "Mechanic" says he "considers the lax manner in which apprentices are taken into shops as the primary cause of strikes."

Had he said the lax manner in which apprentices conduct themselves after being taken in, he would have hit the nail on the head. And if he had said the culminating point of the trouble lay in the insane attempt of good mechanics, and probably well-meaning, but certainly misguided men, to achieve excellence and fair wages while bent nearly double under a load of self-made abortions called union brothers, he would have driven the nail home and clenched it.

Let trades unions and masters' combinations be abolished, and, as says Mrs. Partington, "let every man stand on his own bottom," apply himself diligently to the interests of his employer—not take two "cuts" where one should do—and strikes will vanish with their cause.

Common sense asserts, and co-operation proves this to be eminently true.

Good men would be paid according to their value; botches, reduced to their legitimate level, would realize that they had mistaken their calling, and partake themselves to pursuits more within reach of their limited capacity or more congenial to their tastes.

To make a good mechanic, something more than a stated period of apprenticeship is requisite. A young man of twenty, with a good common-school education and a liking for the trade he has chosen, may make a fair mechanic in two years; whereas his fellow-apprentice, without the aforesaid valuable preliminary, and with strong proclivities for skating rinks or velocipede schools, might find himself only a very indifferent workman after three, five, or even ten years' irksome service. A law dictating the term of service to any trade would be quite as absurd as an enactment compelling equal proficiency in each and every case.

It is in the interest of employers to treat their men fairly, which they will generally do; but when every good workman lugs into the shop a back load of bunglers, and insists upon their being employed at the same price as himself just because they have their 'prentice papers in their pockets, the master will probably attempt to strike an average; which attempt—according to your correspondent's own showing—would more than likely succeed.

Over twenty years' service and observation in the machinists' trade in the United States, Canada, and Great Britain, have led me to the following conclusions:

1st. That no one should enter the trade without a fair education, especially mathematics and philosophy, and an unmistakable aptitude, and an almost irresistible liking for it.

2d. Those workmen get on best who have an eye to their masters' interests and go straight on, leaving side issues alone.

3d. That "unions" offer no incentive to more than average achievements; and, so far from benefiting really good men, "cost more than they come to." And

4th. That combinations of capital on one side and labor unions on the other side are kindred blunders to be set right by a more enlightened understanding of the great fact that capital and labor are in the same boat, and must pull together with capital as stroke oar. B. F. Wilson.

Syracuse, N. Y.

Green Wood as Fuel for Steam Engines.

Messrs. Editors:—I am engaged in running a steam portable saw-mill, and in my business have made some observations which may be of some value. The form of most portable engines and boilers is such that steam can only be kept up by the use of dry wood. I am, however, obliged to use green wood—frozen white-pine slabs with ice and snow upon them as they come from the saw; and, as your readers well know, it is about the poorest fuel that ever tried the soul and patience of man. I have to keep up 80 lbs. of steam, in a twenty-horse power boiler. I have tried various means to increase draft, from jet steam blowers to suction blowers. I however, have at last hit upon the right thing. I have narrowed my grate down so as to make the natural draft fiercer. The size of the fire-box before alteration was 36 inches by 36 inches, and 26 inches in hight. I dropped the grate 18 inches and put in a brick arch on the grate 10 by 18 inches, gradually enlarging till it passed the ring in the bottom of the fire-box. The spaces between grate bars are six in number, one fourth of an inch in width and 18 inches long. This makes a total area of 27 square inches, for admission of air. The smoke-stack is 15 inches in diameter and 45 feet high. I find I can now get up steam to 80 lbs. from cold water in 35 minutes. The number of tubes is 46, and they are 2½ inches in diameter by 6½ feet in length. If any of your readers can beat that I would like to know it.

A boiler for green wood could be made with a special view to bricking up in the way I have described. I used fire bricks at first but common bricks will last out one job, and do not cost one twelfth as much.

Will some of your readers inform me whether, if I keep the boiler free from deposits, the fire will injure the rivets any more than at the ring at the door? There seem to be two opinions. Boiler makers say that I must not let the fire touch the rivets at all; others say it will do no harm.

I have sawed 10,000 feet of lumber in nine and one half hours, and 48,000 feet in five and one-half days, with a 46-inch saw at 3-inch feed. C. E. Grandy.

Union, Conn.

Invention Wanted.

Messrs. Editors:—I ask your indulgence to call upon your numerous readers and inventors to bring out a machine for soiling cattle—that is, cutting green feed for them. It should require only the labor of one man and team. The machine should be carried on two or four wheels, with a large box placed upon it to carry the cut grass. The sickle bar should be jointed, and extend on either side, with a platform supporting an endless apron to elevate the cut grass into the box above mentioned. When sufficient is cut for the day, or a load, the machine ought to be capable of being thrown out of gear, the sickle bar and horizontal apron should in some way be elevated against the elevating apron which stands at the side of the load so that the machine can be driven into the barn or yard where the stock is to be fed. A little reflection will enable any one to see that such a machine is much needed on every farm where stock is kept, and could be as easily managed as a common mower, and driven anywhere a two-horse wagon could go. The same machine could be used for heading grain and putting it in ventilated stacks, also to cut grass after the dew is off, and put it in stacks well ventilated. John T. Smith.

Cedar Rapids, Iowa.

Girdling Fruit Trees.

Everybody has heard, says the Boston *Journal of Chemistry*, of the rascally act of certain miscreants in Michigan, who girdled fifteen hundred fruit trees belonging to a man against whom they had a grudge; and likewise how the neighbors turned out *en masse*, and bandaged the trees with cloth strips dipped in great kettles of heated sealing-wax. The outrage was repeated, and again the friendly surgery of the neighbors came to the aid of the mutilated trees, though, as was stated at the time, with small hope of saving them. The sequel of the history does not appear to have become so generally known. Strange to say, the trees all lived and bore such fruitage as had never before been seen in that region. The marvel has made a great sensation in the vicinity, and the theory has been promulgated that fruit trees can be made to bear more abundandantly by girdling them. This would seem to be rather a hasty generalization from the facts in the case, and we advise our orchardists not to try the experiment upon too many of their trees at once. Some have suggested that, though the interception of the sap in the girdled trees has caused fruit to grow instead of wood this season, the real trial of the trees will come next year. Time will show; and, as we have had occasion to tell farmers more than once, they must wait until time *does* show results that can be *depended upon*, before they are in haste to jump at conclusions. An experiment in farming is seldom worth a copper if it has not continued for five years at least. *Sequence* is very likely to be confounded with *consequence* (the *post hoc* with the *propter hoc*, as the logicians would say), if this rule is not borne in mind. It is a pity that writers on agriculture and teachers of agriculture so often forget it.

Incautious Use of Boiler Compositions.

Many a time and oft have we cautioned steam users against the indiscriminate use of boiler compositions. Often, too, have we pointed out the folly of following the dangerous advice so frequently given, that when compositions are used blowing out should be discontinued. Such a course is simply suicidal, as far as the boiler is concerned, as has just been exemplified in a case investigated by Mr. L. E. Fletcher for the Manchester Steam Users' Association. The suicidal policy may, however, extend to the owner or the attendant. The case in question occurred to a first class boiler of the Lancashire type, in which the two furnace tubes were strengthened at each of the ring seams of rivets from one end of the boiler to the other with T-iron hoops. One morning, as the fireman was about to charge his fires—the steam at the time being at a pressure of 55 lbs. per square inch—he noticed that both furnace crowns were bulging down at a little on one side of the center line, though, on looking at his water gage, he found that he had a depth of between 8-in. or 9-in. of water over the furnace crowns. The engineer also tested the glass water gage, and found it as just stated, but, on account of the condition of the furnace crowns, he had the fires at once withdrawn, and the steam blown off. It appears that an anti-incrustation composition was used in this boiler, and that the patentee of the composition had given directions that the boiler should not be blown out until cleaning time. Therefore it had been worked on, all bottled up, for three hundred and forty hours. The water with which the boiler was fed was drawn from the river, and left a sludgy deposit. This, combining with the composition—which was of a glutinous character—formed, in the absence of blowing out, a coating on the furnace crowns of about an inch thick, and hence their distortion. It was fortunate that the engineer in charge detected this in time, or rupture might very shortly have ensued. We therefore once more point out to our readers the necessity of disregarding such absurd recommendations as those sometimes given with boiler compositions to cease blowing out. To cease to blow out will in all probability be to commence to blow up; therefore of two evils there can be no question as to which is the less—having to blow-out or having a blow-up.—*Mechanics' Magazine.*

The Beton Agglomere.

This new building material, which has been used extensively in Paris in the construction of foundations, sewers, and aqueducts, originated with Mr. Coignet, a French engineer, who began his experiments about ten years ago. It is composed of about five parts sand to one of lime, and where a rapid setting is desired a small amount of cement is added—say about one quarter the quantity of lime. The mixture is ground and worked as nearly dry as possible. It is not molded simply like ordinary artificial stone, but it is placed in the molds in thin layers and subjected to the action of heavy rammers. When a layer has been long enough under the rammer, its surface is scratched, similar to a wall when being prepared for the second coat of plastering, and the next layer is turned on and subjected to similar treatment. It is claimed that by this process an excess of water is eliminated which acts unfavorably in the setting of mortar, and that as the bulk is diminished there is developed a marvelous increase of strength. That the material when properly prepared possesses strength can scarcely be doubted. The span of the basement arches of the Paris barrack is 18·3 feet; the floor at the corner of the arch being about nine inches thick. One month after the completion of one of these arches it bore a weight of forty-eight tuns upon a compass of ten or twelve feet.

Although the *beton* has been used to a very considerable extent in Paris for the construction of sewers, and there are instances where a house, and even a church, have been built of it, still it is hardly to be expected that it can come into general use for such purposes. The material might be much cheaper than stone, but a great variety of patterns and of machinery would be required so that nothing would be saved. But the *beton* is certain to prove of value in the construction of monolithic foundations, and for this it is peculiarly adapted to the wants of our western builders.—*American Builder's Journal.*

India-Rubber Nursing Tubes a Cause of Sore Mouth.—A correspondent writes us that he has found the india-rubber tube, so generally used upon nursing bottles, to be a cause of sore mouth in children, and describes a case where rapid recovery from a long and severe attack of sore mouth and throat in a nursing child resulted from the removal of the rubber tubes. He also calls attention to an extract from an English paper, which corroborates the opinion that such tubes are a source of sore mouth and throat in nursing children.

The Superintendent of the Brooklyn Bridge Company thinks that it will take five years to complete the bridge. The machinery for the construction of the towers will cost $150,000.

MORE ABOUT NIIN.

The Maya word niin applies not solely to the grease described in a former article, but also to the insect from which it is obtained. As far as observations go, the latter entomologically belongs to the lower species of *Hemiptera*, genus *Coccus*, where we find it associated with the well-known cochineal (*Coccus cochinillifer*), and also with the South Asiatic *Coccus lacca*. With this it seems to have still closer affinities, for this lac insect principally lives on an euphorbiaceous plant (*Aleurites laccifera*, or *triloba*), and also on the banyan tree (*Ficus Indica*), upon which it produces the gum lacca of commerce. The life of the niin, on the other hand, seems to be exclusively wedded to the anacardiaceous genus, *Spondias* (which embraces the mango fruit tree, the hog plum of the West Indies, etc.), of which one or two species are extensively cultivated all over the tropical regions of this continent, and the adjacent archipelago of the West Indies. Thus both insects, the one of Asia and the other of America, besides producing somewhat similar articles of commerce, offer in common the advantage of living on plants which are otherwise useful, and cultivated for the sake of their fruits; a circumstance which invites more readily the propagation of an almost unlimited number of these respective foster plants. The cultivation of the *Spondias*, called by the Spanish *ciruelo*, and by the Mayas *abal*, and probably referable to the species *Mombin*, is by nature made so easy that even thick cuttings germinate quickly in almost any soil. The gum, exuding spontaneously from the stem and branches of the *ciruelo*, is often used in Yucatan as an equivalent for gum-arabic, while, by the instrumentality of the niin insect (*i. e.*, by animalization), it becomes a resinous drying oil, insoluble in water or alcohol, hot or cold.

The gathering of the niin insect and obtaining its grease presents no difficulty whatever, as children even can be intrusted with it. The grease is obtained by broiling or boiling the insects, during which process it can be readily taken off. Dr. Schott says:

"My acquaintance with the niin insect having been but cursory, does not permit me to give a scientific description of it. No winged specimens have come under my notice, and I suppose, therefore, that only females were observed. These are about one inch long, with a cross diameter of about one fourth of an inch. Their color varies from a somewhat pellucid chrome yellow to a rich orange, though subdued by a closely adhering coat of fine, silky, white web, in which they are thickly enshrouded, and which appears to serve as a soft protecting cocoon, much like that of a cochineal insect. The aspect of a niin colony on the twigs and top branches of the *ciruelo* has, therefore, much similarity to that which I have often observed of certain species of *opuntia* (prickly pear), on which cochineal insects were living. The plants, especially their upper parts, look as if covered by a heavy deposit of mildew.

"The principal crop of the niin insect falls in the rainy season, *i. e.*, between the months of April and September, during which time its principal growth and development are derived from the foster plant.

"As to the uses for which the niin grease might be employed in art and science a wide field for speculation may be opened, as Mr. Bloede, in his analysis, has already indicated. The Indians and Mestizos of the peninsula, especially the inhabitants of one or two villages in the vicinity of Yzmel, have heretofore almost exclusively used it to mix the paints employed in adorning small articles of household use, such as bowls and drinking-cups made from the halves of the globular fruit of the calabash tree (*Crescentia cujete*), and in preparing a varnish for those and other articles. This use of the niin grease, however, seems not to be confined alone to Yucatan, but is met with in other parts of tropical America. I was told that the Indians and half-breed population in the vicinity of Vera Cruz excel the Mayas in the skill and taste they exhibit in the use of this article in adorning drinking-cups and other trinkets, both inside and out. From these modest articles of Indian finery it would be a short step only to the manufacture of crockery, made of papier mâché, similar to the admirable tea-cups, bowls, and other dishes of the Japanese, employing the niin varnish, which endures for any length of time the effects of hot or cold water and of alcohol, to give a protecting and preserving finish and beauty.

"Besides the uses of the niin already mentioned, it is also kept as a drug in the apothecary shops of Yucatan, where it is held for surgical purposes and general external use instead of other drying oils, like that of linseed for preparing vulnerary plasters and cerates in general.

"There is hardly room for doubt that the niin could be procured in sufficient quantity for commercial demands. The breeding of the insect producing the article depends entirely on the multiplication of a fruit tree which is already under extensive cultivation all over the tropics of this continent and adjacent islands; localities the greater part of which is easily accessible to maritime commerce. Within the space of a few years a steady enterprise would establish a fixed market price for the niin, so that women and children, and in fact the whole population, would contribute in the collection of the insect or the oil itself, as soon as they could rely upon a just exchangeable return for their labor."—*Report of the Commissioner of Agriculture.*

THE question whether the mere selling of articles made by a patented machine amounted to an infringement of the patentee's right, has been argued in the English Court of Exchequer. The judges held that the patent laws protected not only machinery, but articles made by it, and that the purchase and sale of such articles were to be considered as an infringement of the rights of the patentee.

Linseed Oil, and its Preparation for Painters' Use.

Linseed oil is extensively employed as a vehicle for the harder resins, to which it imparts softness and toughness, but causes the varnish to dry slowly; and unless the oil is of the purest and palest quality, well clarified, and carefully combined with the resin, without excess of heat, it materially darkens the color of the varnish when first made, and it is also liable to become darker by age after it is applied. Linseed oil intended for the best varnishes is clarified by gradually heating it in a copper pot, so as to bring it nearly to the boiling point in about two hours; it is then skimmed and simmered for about three hours longer, when dried magnesia, in the proportion of about one quarter of an ounce to every gallon of oil, is gradually introduced by stirring; the oil is then boiled for about another hour, and afterwards suffered to cool very gradually. It is then removed into leaden or tin cisterns and allowed to stand for at least three months, during which the magnesia combines with the impurities of the oil and carries them to the bottom, and the clarified oil is taken from the top of the cistern as it is required without disturbing the lower portion, and the settlings are reserved for black paint. A pale drying oil may also be made as above, by substituting for the magnesia white copperas and sugar of lead, in the proportions of two ounces of each to every gallon of oil.

Linseed oil when rendered drying, by boiling and the addition of litharge and red lead, is sometimes used alone as a cheap extempore varnish. In boiling linseed-oil, it is heated gradually to bring it to the boiling point in about two hours; it is then skimmed, and well-dried litharge and red lead, in the proportion of about three ounces of each to every gallon of oil, are slowly sprinkled in, and the whole is boiled and gently stirred for about three hours, or until it ceases to throw up any scum, or emit much smoke. It is then frequently tested by dipping the end of a feather into it, and when the end of the feather is burned off, or curls up briskly, the oil is considered to be sufficiently boiled, and is allowed to cool very slowly, during which the principal portion of the dryers settle to the bottom. The oil is afterwards deposited in leaden cisterns screened from the sun and air. When the oil is required to be as pale as possible, dried white lead, sugar of lead, and white copperas are employed instead of the litharge and red lead.—*Byrne's Handbook for the Artisan.*

Observations on Sound in the Lake Tunnel at Chicago.

The eighth Annual Report of the Board of Public Works, of the city of Chicago, in giving a history of the lake tunnel, says that observations on sound were frequently made during the progress of the work. The first distinct notice of anything of this kind was when the tunnel had been made one hundred yards from the land shaft. Just above the tunnel is the breakwater inclosing the inlet basin. The outside of the breakwater consists of round piles, laced one to two feet apart. The waves could be distinctly heard in the tunnel below, striking those piles through 60 feet of earth. The next observation was the passing of propellers and tugs, when the tunnel reached half a mile or more out.

The different noises made by a vessel or engine passing overhead could be heard as distinctly through thirty to forty feet of earth as on the surface of the water. It was considered a matter of much interest to determine how far sound could be heard through the clay. The miners thought it could not be more than 150 to 200 feet. In order to be certain, observations were made when the faces were 800 feet apart, and sounds of blows of iron on stone or iron in the clay, but not on the clay itself, could be heard with great distinctness. Whether the sounds passed through 800 feet of clay, or first through 30 feet of clay, then through 800 feet of water and then through 30 feet of clay, is a question—probably the latter.

Oiling Brown Stone.

The *Architectural Review and American Builders' Journal* objects to the method of oiling brown stone fronts as recommended by Mr. T. H. Riley, in our issue of January 1st. He says:

"We have two objections to this mode of treatment—the one is that oiling is expensive, and the other is that the oil is drawn out by the action of the sun, after a short time, and therefore requires renewal.

"The preparation of silicate of soda (soluble glass), as well as its application, may meet the requirements of facility of use, and permanency of prevention. As to economy, we would say that it is involved in these latter.

"Coating the backs of the brown stone slabs used for facing with cement, is an easy as well as economic practice. It prevents the absorbed moisture on the front passing much further than the surface, and therefore gives a fair opportunity for the quickly drying out of the stone by exhalation."

SIDEWALKS.—A correspondent recommends the following as an excellent composition for sidewalks, and says it is not patented: Sand five parts, coal ashes two parts, slaked lime one part, fine gravel two parts. Mix cold, and add coal tar, cold or hot, until the mass becomes just sticky with it. Make the walk by ramming down, or rolling hard six inches of gravel. Then put on a three-inch layer of the mixture, and roll or pound very hard.

SOME French bankers and a dozen American capitalists have organized a company in Paris to construct a canal across the Isthmus of Darien, and it is said that the capital has been subscribed. The company await the report of the United States exploring expedition.

THE HYDROSTATIC TEST FOR STEAM BOILERS.

The *Locomotive* expresses doubts upon the propriety of what is known as the hydrostatic test for boilers, and its remarks upon this subject are well worthy consideration. It says:

"The application of hydrostatic pressure to steam boilers, with a view to determining their fitness for use under steam, is so universal a practice with builders and inspectors, that to question its utility and propriety, is to inspire doubts as to the thoroughness of one's engineering education, and invoke severe criticism; and yet, it cannot be denied that much damage results from the system as practiced. It is usual to delegate the duty of "testing" to persons totally unacquanted with the strength of iron or the damaging effect of sudden increments of pressure upon sheets already heavily strained; or, at least, they are not selected because of any particular fitness; and, in consequence, injudicious strains are placed on boilers, and the tensile strength of the iron seriously impaired thereby. We have frequently been told by steam users when discussing the relative merits of various systems of inspection, that they felt perfectly secure, because their boilers were built under special contract, and were subjected by the maker to 200 lbs. cold pressure, meaning to have us infer, that after such usage, they must surely not fail under 100 lbs. of steam; but we have made it our business to probe these parties further, and discover that seams were strained, braces broken, bolts sheared off, or insufficiently stayed surfaces distorted. These are the apparent results—that which they don't see is the most injurious, and cannot be remedied as are the others.

"They remind us, too, that the ultimate tensile strength of good iron is 50,000 to 60,000 lbs.; forgetting that all the material used in construction—indeed, most of it will not bear more than half that amount, and further, that experience demonstrates the necessity of recognizing but about one sixth of this figure available in constant use.

"Let these persons, so confident of the ability of their boilers to withstand such severe and frequent tests, estimate the accumulated pressure of 100 lbs. per square inch, or a single inch of the boiler's length, measured, we mean, in the direction of its axis, and stand aghast at the tremendous force constantly struggling to free itself from its iron prison; or, will they prefer to listen to the result of an experiment, made during the past summer, at the Fort Pitt Iron Works Pittsburgh, Pa., with a cylindrical boiler, constructed of steel plates ¼ in. in thickness, by that establishment, for the Government, with a view to testing its adaptability to such use, relatively with the iron. The trial was made in presence of the proprietors of the works, the Government engineer officer—under whose supervision it was built—the eminent constructing and mechanical engineer, Thatcher Perkins, and others. Measurement of the "girt" of the boiler was made—with a steel tape—before and during the process of pumping in cold water, and when the pressure reached 780 lbs., a permanent enlargement of 3½ in. was found to exist, in the direction of the circumference of the boiler—*though no leaks were visible*—and at 820 lbs., rupture occurred. It were well here, not to overlook the influence of the successive strokes of the pump, acting as a "water ram" on the pregnant boiler.

"There is no doubt that boilers are very often severely and permanently injured, by the hydrostatic pressures to which they are subjected, in order to prove that they are strongly built. Each successive test weakens them, until they fail to respond to the requirement to longer bear the burden, and rupture, as did one recently at Mobile, while under the manipulation by this intelligent process of the United States Government Inspector.

"But there is another feature. So popular has this method become, that implicit confidence is placed in it by many, who frankly deny that any further test of a boiler's capacity for sustaining steam pressure is necessary. Not a month since we were informed by a deputy State Inspector—who, by the way, was an executive, and controlled subordinate deputies, that he *had* and could again *pass* boilers without having seen them. So expert had he become, that he cared simply to see the gage (affixed to the pump in an adjoining apartment), and to note that it held the maximum pressure for two minutes. This was sufficient. What to him were blistered and burned plates, incrusted surfaces, corroded sheets, slack or broken braces, unskillful workmanship or faulty design? The iron had once more submitted to the demand of its annual inquisitor, regretting that he was not likely to be in charge when the exhaustion of its waning strength culminated in disaster.

"We have recently been solicited to write on a boiler, whose fire sheet is so badly burned and blistered as to be positively dangerous; the firm is constantly changing engineers in their endeavor to get one who will stolidly risk his life and reputation, and the lives and property of others, without entering his protest; and upon what do the owners base their presumptuous, perhaps criminal conduct, in refusing to make needed repairs? Upon the certificate of the State Inspector that their 'boiler has withstood a hydrostatic pressure of 135 lbs., and is safe to carry 90 lbs. of steam.' For how long is this already dangerous condition to continue? For twelve months—ten yet to elapse! May we not reasonably look for some damage in this direction, ere long? And when it does occur, at whose door shall the censure be laid?"

P. A. PEER, of Kalamazoo, Mich., says: The premium engraving you sent me was safely received some days since. I think it the nicest work of the kind I ever saw. Accept my thanks, and rest assured that I shall always take pleasure in extending the circulation of the SCIENTIFIC AMERICAN."

IMPROVEMENT IN KEY-HOLE GUARDS.

The object of this invention is to provide a convenient, simple, and inexpensive guard for a key-hole, and to make the same reversible so that it may be used on either side of the lock.

Our engraving gives a good idea of the improvement. In it, A represents the lock, B the key-hole, and C the sliding reversible guard. The lock is provided with a reversible sliding catch, D, which holds the key-hole guard in place whether it be placed over the key-hole or withdrawn.

Fig. I

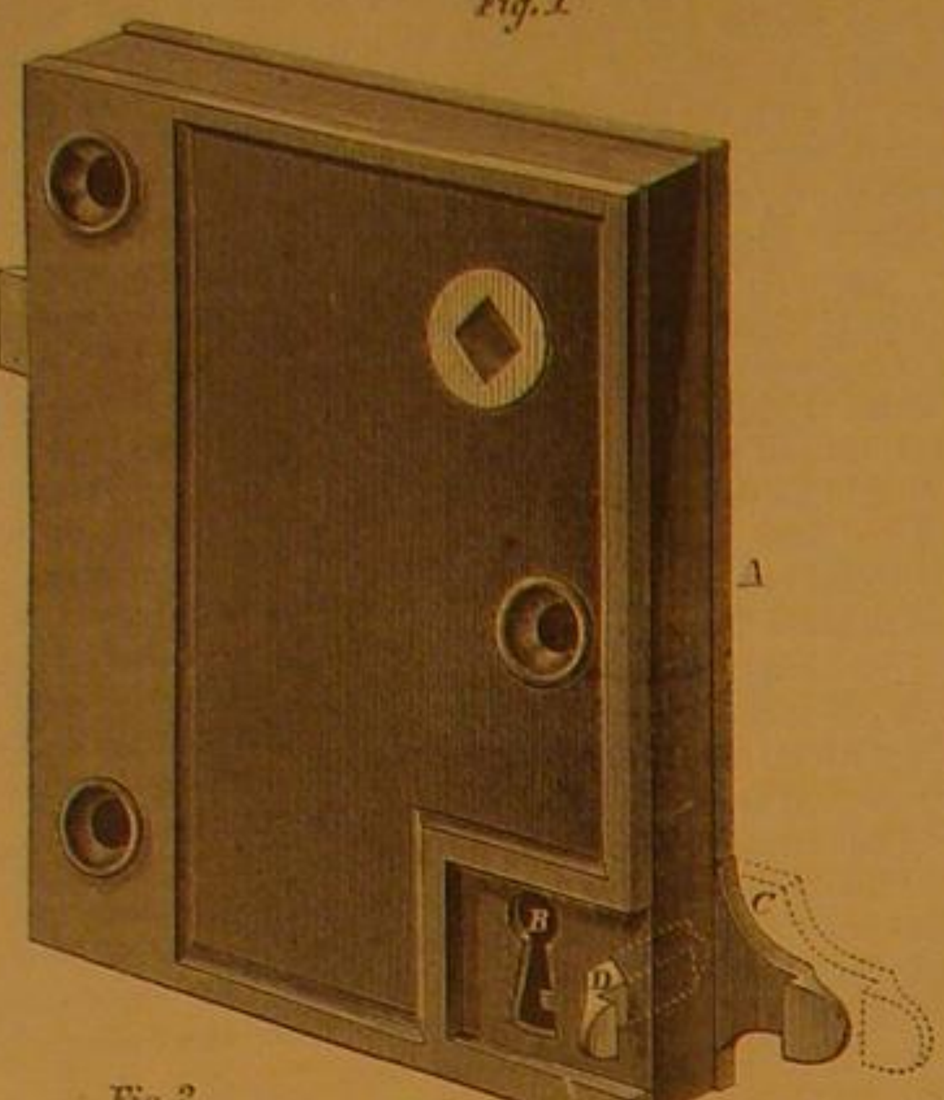


Fig. 2

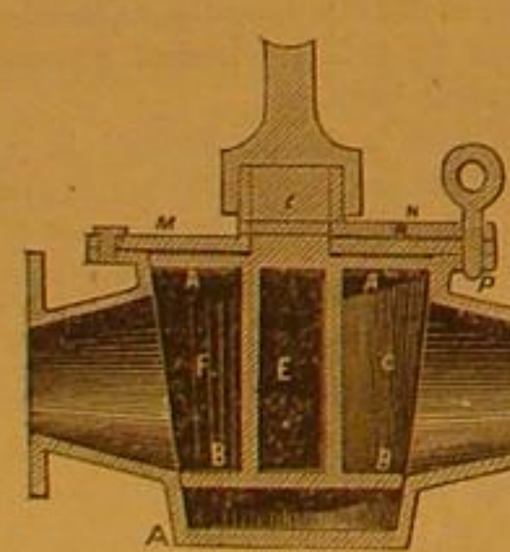
On each side of the lock a recess is made which incloses the key-hole, and is sufficiently deep to receive the full thickness of the guard. The sliding reversible catch plays in a dovetailed recess or channel, made across the edge of the lock from one recess to the opposite one as shown. The point of the catch engages in one or other of the recesses, F, in the key-hole guard shown in detail in the engraving, Fig. 2. The recess nearest the thumb-piece is the one held by the catch when the guard covers the key-hole, the other is held when the guard is withdrawn.

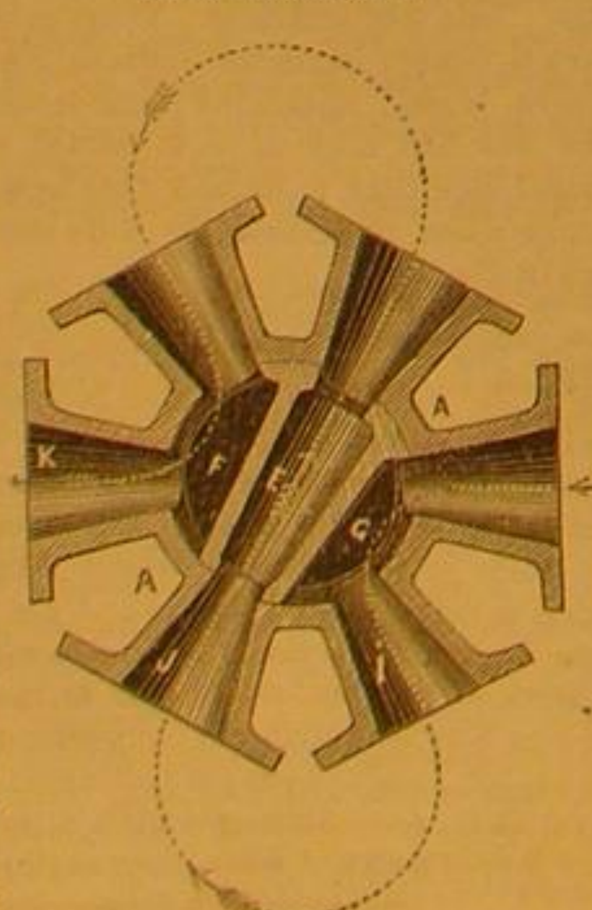
By these means all tampering with the lock from the outside is effectually prevented.

Patented through the Scientific American Patent Agency, January 18, 1870, by John L. Russell, of Prairie City, Iowa, who may be addressed for a portion or the entire right for the United States, or for the right to manufacture on royalty.

SIX-WAY TAP FOR GAS AND WATER.

Our engravings give a sectional and plan view of a new six-waycock for gas or water, representing it as applied to gas purifiers, for which it has special advantages. It is an English invention. The barrel in which the plug is placed is formed of six branches, two of which form the inlet and the outlet passages, the other four being for guiding the gas, when used in gas works, into and out of the purifiers. The plug is composed of top and bottom disks, connected by thin division plates; one side of each of the plates has other plates at right angles thereto, which fill the spaces between any two of the openings at which they may be placed, and form bearing surfaces for the plug to work upon and to make the same gas-tight. It is intended to employ only one tap for every two purifiers, and any one, two, three, or all four purifiers of a set can be shut off for the purposes of cleaning or for repairs.



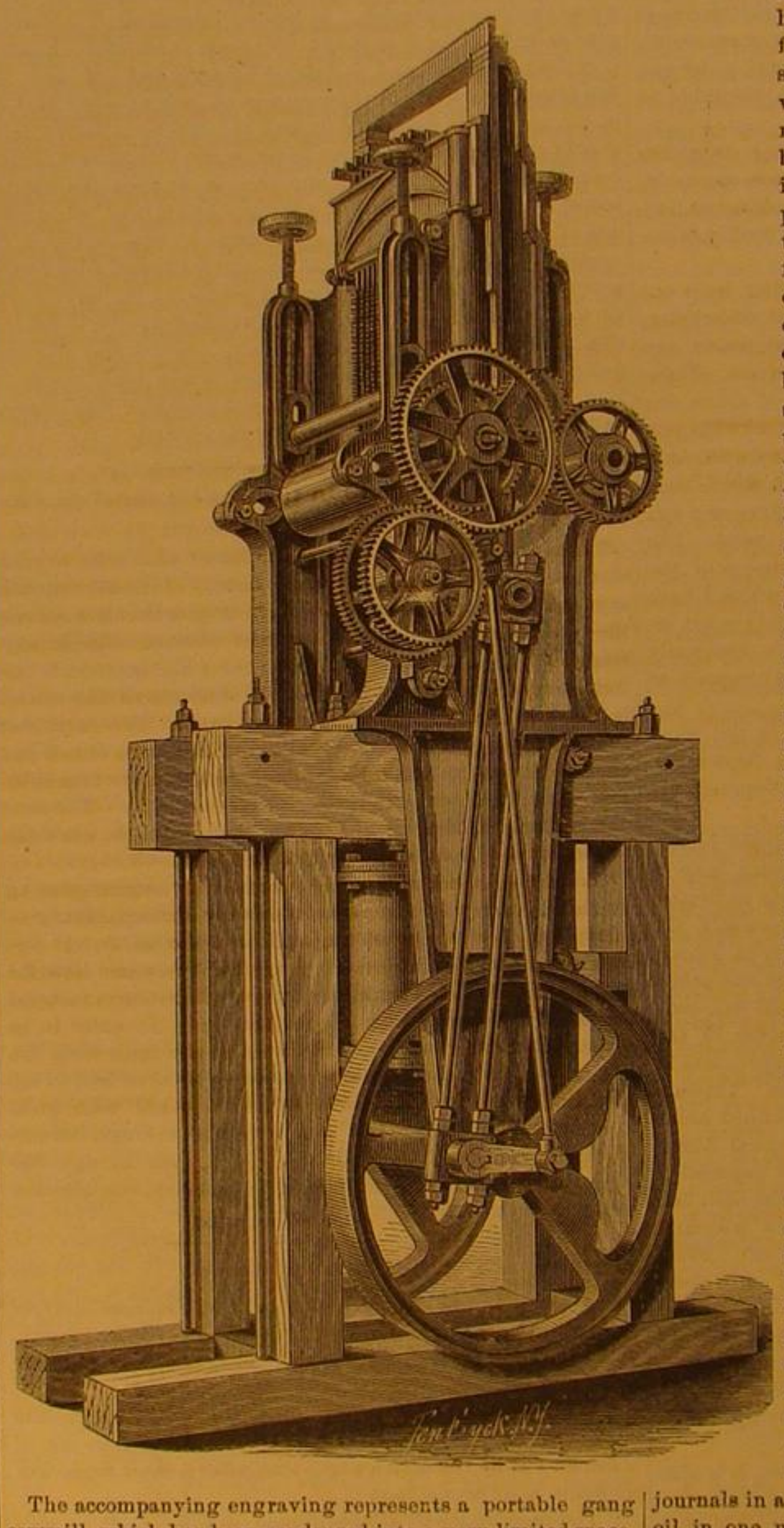


The plug is composed of top and bottom disks or plates, as before mentioned, which are connected by vertical division plates to form, as it were, three passages when the plug is in the barrel, one of the passages being between the plates so as to lead the gas direct through the body, while the other passages are formed between the outsides of the vertical plates and the inside wall of the barrel. The edges of one end of the vertical plates are of the same thickness as the body of the plates, or they may be a little thicker, to obtain a little more bearing surface, if desired, but the edges on the other ends have plates or pieces projecting from both faces as shown in Fig. 2. A guide pin serves as a stop to an arm connected with the plug; this pin being placed in one of six holes in the edge of the upper flange, enables the cock to be accurately turned the required distance.

This description with an inspection of the engravings will give a complete idea of the device.

PENNY'S IMPROVED GANG SAWMILL.

It is a generally admitted fact that our forests are being rapidly cut away, and as a matter of course the value of lumber is increasing in the same ratio as the supply diminishes. A saving of the stock wasted in sawing has therefore become a pressing necessity. While the old gang of reciprocating saws had all the essential requisites for producing the best article of lumber with the smallest amount of work, the elaborate mill houses and foundations, together with the great cost of the machinery have kept them from coming into more general use.



The accompanying engraving represents a portable gang sawmill, which has been condensed into a very limited space. Simplicity being of the utmost importance, each piece, where possible, has been made to perform a number of functions. The two upright frames carry the shaft, which gives motion to the slide valve of the steam cylinder and the arm that moves the feed rollers which carry the log, and they also sustain the steam cylinder that moves the saws; and upon these uprights are cast the brackets that support the entire machine. The stands that sustain the rollers for carrying the timber to be cut, are a part of the same brackets, while the upper portion acts as guides for the sash or sawgate, which also does the double duty of acting as a cross head for the piston rod. Upon the steam cylinder are cast large flanges which are planed up and securely bolted to the two uprights; also doing the double duty of supporting the cylinder which drives the saws, and rigidly bracing the whole framing. The feed is the old intermitting one of the pawl and ratchet; its amount being regulated by covering the the teeth of the ratchet wheel which would be otherwise engaged by the pawl. To do this a narrow tongue of metal is placed in a grooved stand, and slid up or down by means of a lever, which is held fast by a set screw when the proper adjustment is made.

The operation consists of feeding the log or timber between the top and bottom rollers, while the end is sustained either by a little car, or else by idle rollers, at option.

It is claimed that this machine is not only much cheaper than the stationary gang saw-mills, but that it excels them in the important particulars of simplicity, strength, and compactness. It may also be readily and easily put up or taken down. Only a comparatively small outlay is necessary for house and foundations.

The principal part of the weight being below the center serves to keep steady and balance the machine. It is composed of very few pieces, and therefore, in addition to the consequent reduction of cost at the outset, there is reduction in the wear and tear of the machine while in use.

In addition to these advantages, it possesses all the advantages of the reciprocating saw-mill over circular saws in economizing lumber.

This invention was patented Nov. 23d, 1869, through the Scientific American Patent Agency, by William Penny, of Milton, Fla., to whom, or to Wood and Mann, Utica, N. Y., orders for the machine or letters requesting additional information may be addressed.

Bichromatism.

This is an easy and cheap process, carried out as follows: Fasten a piece of stout, transparent, tracing paper by gumming the four corners to a piece of thick, flat, level glass on which the design on thin paper has been pasted. If you cannot draw or get a friend to draw for you, many good and effective subjects may be found among old prints and woodcuts, and by taking a careful tracing of the necessary parts, a very good design and skillful bit of "cribbage" obtained. When the design is satisfactorily pencilled out on the tracing paper it must be gone over with a quill pen and thick ticket writers' ink; when dry, turn it, fasten down, and go over the other side. About one pennyworth of bichromate of potassa is to be coarsely pounded and put into about two ounces of hot water; strain this when cold, and then brush over one side of any pieces of paper or silk that it may be desired to print upon when they are dry. The printing is done by the usual photo paper printing frame, substituting the design on tracing paper for the glass negative. They print quick and deep if exposed to direct sunlight; one or more trials will easily give the right amount of time, and fixing is done by washing and soaking for a short time in clean water, next the drying and pressing with a warm flat iron. Pure white centers may be left in any kind of border by stopping out in the printing with a piece of thin card or blackened paper. Ornamental devices, or ornaments, can be printed on pieces of white silk or ribbon by marking out a pattern and laying on the bichromate solution with a camel hair brush inside the pattern; when dry, iron slightly, in order that the ribbon may lie flat to the tracing pattern. Some highly effective ornamentation may be produced in this way. White centers may be left on ribbon and paper, and mottoes, verses, etc., printed with type. Pleasing and artistic blendings of type-printing and ornament may be produced by such means with a very small outlay of time or money.

Wickersham's American Oil Feeders.

These feeders have been in use on the machinery used in the *Public Ledger* establishment for a period of two years, long enough to demonstrate their great usefulness and superiority They are reliable, filter the oil before delivering it on the journals, detect, and make a greater saving of oil than any other method tried in this establishment. The economy in the saving of oil is very large. One of the greatest advantages of this oil feeder consists in the nicety with which it can be adjusted, so as to deliver the largest or smallest quantity of oil on the journals in a given space of time, varying from an ounce of oil in one minute to an ounce in a year. It does its work evenly, certainly, effectively, and economically, and, as a real improvement in the lubrication of machinery, deserves this public notice.

Mr. J. B. Wickersham's (the inventor) address is 152 South Fourth street, Philadelphia.—*Philadelphia Public Ledger*, November 19, 1869.

OKRA PAPER.—We are in receipt of the Tuscaloosa *Observer*, which—as also the Mobile *Register*—is printed on Okra paper, a plant that grows abundantly throughout the South. The paper seems of good quality and though thin, possesses much more strength than ordinary paper of the same weight. It is now stated that through the patient perseverance of the inventor, Dr. Read, and the enterprise of the president and directors of the Chickasabogue Paper Company, the above manufacture may now be considered as fixed on a firm basis. The New York office of this company is at No. 48 Pine St., Room No. 7, where any additional information may be obtained.

THE trigonometrical survey of England and Wales, on the scale of one inch to the mile, was finished on the first week of the present year. It was commenced in the year 1791.

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN. S. H. WALES. A. E. BEACH.

VOL. XXII., No. 8 . . . [NEW SERIES.] . . *Twenty-fifth Year.*

NEW YORK, SATURDAY, FEBRUARY, 19, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

PROPOSED MODIFICATION OF THE PATENT LAWS--AN ATTEMPT TO BREAK DOWN THE RIGHT OF APPEAL.

The Report of the Commissioner of Patents, published in full in our last number, is a document of unusual interest and importance. It contains many useful recommendations, and displays a lively interest in the welfare of inventors, though it is probable that the zeal shown in that direction may not command their full approbation.

After supplying the usual statistical tables showing the gradual progress of invention in our country, the Commissioner calls attention to the rapid increase of documents, drawings, models, etc. He seems to have applied the measuring line to all the contents of the office, ascertaining, for example, that five thousand square feet of models, seventy-two cubic feet of drawings, four hundred cubic feet of printed drawings, four hundred and twenty-five cubic feet of printed specifications, four hundred cubic feet of files, and two hundred and sixty lineal feet of books, are annually added to the records of the Office. To mitigate the cost of this increasing accumulation, the Commissioner advises that all models be dispensed with, except when, in the discretion of the Office, such mode of illustration is absolutely necessary to a clear understanding of the invention. This measure would certainly relieve inventors from considerable delay and expense in completing their applications, and at the same time the Patent Office would be relieved of much useless lumber.

The Patent Office building, one of the most extensive structures in the country, is now nearly filled with models accumulated during the past twenty-five years, and if this system is to continue much longer the present building will not be large enough. We should be glad to see this recommendation carried into effect.

The report calls attention to the present practice of using rejected applications as references to defeat new applications, and recommends its abolishment. Many cases have been rejected because the devices claimed were either useless, frivolous, or wanting in novelty, and certainly they add nothing of value to the public records. Still, the Examiners are required to make careful search among all this useless material before they can pass upon a new application for issue.

In an able review and defense of our patent system, the Commissioner calls attention to the thorough manner in which the business of the Office is transacted, and to the care with which the claims of inventors are considered and modified, so that the public may not be deceived as to the scope and bearing of a patent granted. He admits, however, that many useless inventions are patented, and attaches the chief blame therefor to unscrupulous solicitors, who are naturally more solicitous about the number than the quality of the patents which they obtain. This tendency, he goes on to say, is aggravated by those who solicit upon *contingent* fees, or who, without special training or qualifications, adopt this business as an appendage to a pension or claim agency, and press for patents as they press for back pay and pensions. The Commissioner knows well enough that the majority of patents, sought and obtained for the purpose of recovering a contingent fee, are not worth the vellum upon which they are engrossed. The Commissioner being himself an able expert in patent law and practice, is so much impressed by this new species of "no cure, no pay" that he courageously deals with it in his annual report, hoping thereby to modify it before it works out the final ruin of our patent system.

Commissioner Fisher takes a very decided stand against the continuance of the present system of appeal from his decision to justices of the Supreme Court of the District of Columbia.

The report treats this matter at considerable length, and sets forth that the appeal from the Commissioner is unnecessary, not only because that officer is less likely to err than the justice who is not supposed to possess mechanical knowledge, but also because the law provides for an appeal by filing a bill in equity in any circuit court of the United States. We share, to some extent, the conviction of the Commissioner that the present provision for appeals from his decisions is not altogether satisfactory; but on the whole we regard this *privilege* as one of the most precious now conferred upon applicants, and to allow it to be repealed, without providing something better, appears to us to be fraught with great mischief to the rights of applicants.

The appeal from the Commissioner by filing a bill in equity in the Circuit Court is a process much more complicated and tedious than the direct appeal as at present provided. Such appeal implies a completed act of the Commissioner—an an alleged injury wrought by his decision; whereas heretofore his decision was not final in itself so long as notice of intention to appeal was filed. In cases where the possession of a limited number of machines is almost equivalent to the possession of the patent itself, the injury wrought by an unjust but final decision is irrevocable. Not only in the annual report but also in the proposed simplification of the patent law, now pending before the patent committee of the Senate, the proposition of the Commissioner to abolish the appeal to the supreme court of the district is ingrafted; also a clause giving to the Commissioner a right to make rules for regulating proceedings before the Office, without any qualification or limitation whatever.

This provision, as well as that abolishing the right of appeal might receive our approbation if we could be assured that the office of Commissioner of Patents was to be kept, as now, in the hands of an able man, but the office at the present moment is a political one, and liable whenever a vacancy exists to be filled by a politician wholly incompetent to grapple with the nice and intricate questions that arise in the daily practice of the duties of the Commissionership.

Hence we contend that the right of appeal from the Commissioner's decision should be sacredly preserved, and with such additional safeguards thrown around it as will reassure inventors that they have an impartial, inexpensive tribunal outside the Patent Office to which they can apply for redress.

The mischief that might be wrought by such uncontrollable power in the hands of one incompetent Commissioner would far outweigh all the annoyances to which the Patent Office is now subjected by the adverse decisions of district judges.

The further recommendations of the Commissioner as to the printing of drawings and specifications, limitation of time within which action may be brought for the infringement of letters patent, are valuable and worthy of careful consideration.

The proposition to have copyrights registered in the Patent Office agrees exactly with our views on this subject. In the bill now pending before the Senate no mention is made of design patents. We presume, however, that this matter must have been included a similar modification of the copyright law. We do not suppose that the Commissioner or Congress proposes to do away with patents for designs, but we cannot comprehend why a completed bill to revise the patent laws should be silent on this important subject.

THE PNEUMATIC TUNNEL UNDER BROADWAY, NEW YORK.

Something of a fragmentary and, in most respects, unreliable character has found its way into the daily papers relative to the important work now in progress under Broadway in this city, known as the Pneumatic Tunnel. So far as the accounts of some legal proceedings to which the work has given rise, and its present extent are concerned, the statements made by the journals are, in the main, correct; but the real scope of this important experiment, and the benefits which its successful completion are destined to confer upon the city itself, seem either not to be fully understood, or to be looked upon with incredulity.

We have said this is an important experiment. So far as the working of such a tube is concerned, it is not an experiment, but a well demonstrated fact. It is only an experiment in a financial and business point of view. That upon the completion of the tunnel and its opening to public transit a gratifying result will reward its projectors, we entertain no doubt whatever.

Although the President of the Beach Pneumatic Transit Company is one of the proprietors of the SCIENTIFIC AMERICAN, the writer of the present article visited the tunnel for the first time on the 8th of February. The day was stormy and the snow fell fast and heavy. Cars were with difficulty kept on the tracks in the streets. Umbrellas were in vain. The wind made no more of turning them inside out, than of shaking dead leaves from the trees in the park. It was a favorable time to contrast the miseries and annoyances of street car travel with the comfort of tunnel transit.

Entering at the south-west corner of Warren street and Broadway, we were soon initiated into the mysteries of which so much has been made by the newspaper reporters. The simplicity of the principle of this mode of transit is not fully appreciated until one sees the thing itself.

Let the reader imagine a cylindrical tube eight feet in the clear, bricked up and white-washed, neat, clean, dry, and quiet. Along the bottom of this tube is laid a railway track, and on this track runs a spacious car, richly upholstered, well lighted, with plenty of space for entrance and exit. The whole arrangement is as comfortable and cozy as the front basement dining-room of a first-class city residence. The tunnel has not only the positive comforts described, but it is absolutely free from the discomforts of surface car-travel. The track is smooth and level, and, not being subjected to incessant battering from heavy trucks, is easily kept in first rate condition. It is not cold in winter. It will be delightfully cool in summer. The air will be constantly changed in it by the action of the blowing engine. The filthy, health-destroying, patience-killing, street dust, of which up-town residents get not only their fill, but more than their fill,—so that it runs over and collects on their hats and clothes; fills their hair, beards, and eyes, and floats in their breaths like the vapor on a frosty morning,—will never be found in the tunnel. Add to these advantages that of cheap, rapid, and uninterrupted transit, free from the dangers of collision with loaded trucks, and we have a pretty fair showing in favor of the tunnel over street railways.

When the tunnel is opened to the public it will be no dirty hole in the ground the people will be invited to enter, but a handsome subterranean avenue, through which they may be rapidly transported to their homes up town.

This system is in our opinion vastly superior to subterranean steam transit under Broadway, as has been proposed. Its first cost is very much less. It is free from the smoke nuisance and from the dust of locomotives. There can be no accumulation of carbonic acid gas in it, an evil which may be estimated from the fact that for every pound of coal burned, three and one third pounds, or twenty-nine and one half cubic feet of carbonic acid will be generated. Granted that this gas will find free exit from the area ways, at the side of the street so that people can breathe and live below, it will float off into the stores alongside, descend into the cellars and become a general nuisance.

In the Pneumatic system, the cars will be impelled by compressed air only. This air will be uncontaminated by gas or dust, the track will not be crushed and damaged by heavy locomotives, and all the discomforts of steam travel through tunnels will be eliminated.

The present apparatus in the basement of the building at the corner of Warren street and Broadway, comprises a stationary engine of one hundred-horse power, with boiler, and a Root's Pressure Blowing engine, capable of delivering to the tunnel one hundred thousand cubic feet of air per minute. We may on a future occasion give a more detailed account of this apparatus.

There is no doubt that this method of transit might be made not only the means of easy and rapid communication between the upper and lower parts of the island, but also between New York and Long Island, and New York and New Jersey, through tubes underneath the North and East rivers. The relief which this would give to surface travel and the convenience it would afford to suburban residents, would increase the value of real estate, and greatly add to the comfort and luxury of metropolitan life.

OFFICIAL REPORT OF PROFESSOR CHANDLER TO THE BOARD OF HEALTH ON THE NEW YORK GAS COMPANIES.

The report of Professor Chandler to the New York Board of Health, is an able *resume* of a somewhat extensive investigation into the various methods of purifying gas now in use in Europe and America, and particularly those employed in the works of the three great companies which supply this city with illuminating gas.

The methods stated to be in general use are the wet lime, the dry lime, the Laming process, and the iron ore process.

The wet lime process consists in passing the gas through milk of lime, which removes both the sulphur compounds and the carbonic acid. The objection to this process is, notwithstanding it is very effective, and is the oldest process known, that the foul milk of lime or "blue billy," which contains the impurities eliminated from the gas, is very difficult to dispose of, and becomes an intolerable nuisance when left exposed to infect the atmosphere.

In the dry lime process the gas is passed through dry lime instead of milk of lime. The foul lime is much easier disposed of than the foul milk of lime. When, however, it is left exposed to the air it also emits peculiar and very offensive odors, from the generation of sulphide of ammonium and other noxious gases. The Manhattan Gas Company use an invention which prevents the escape of these foul gases, and obviates the offensive character of this process as formerly conducted.

The Laming process—so named after its inventor—consists in the use of the hydrated sesquioxide of iron mixed with sulphate of lime, sawdust, and sometimes hydrate of lime. Of this process, Professor Chandler says, in his report:

> This material is very effective in removing the sulphur compounds from the gas. There is, however, some difference of opinion as to the completeness with which the carbonic acid is removed, due perhaps to variations in the proportions of the ingredients. Two important advantages attend the use of this mixture; first, when fouled it does not evolve offensive odors on exposure to the air; second, by exposure to air the sesquioxide of iron, which has been changed to sulphide of iron in the purifier, is regenerated, the sulphur being liberated, and sesquioxide of iron again formed. The mixture may, therefore, be used again and again till it becomes so clogged with the sulphur liberated that it does not act promptly on the gas. It is then found to contain from forty to sixty per cent of sulphur, and may be used for the manufacture of sulphuric acid. I have seen mixtures which had been in use twelve months.

The iron ore process is a substitute for the Laming process, bog iron ore being employed instead of the artificial sesquioxide employed in the Laming process. This ore is a natural hydrated sesquioxide of iron. The process is due to Mr. J. M. Hills, and a modification of it is now used by the New York Gas Light Company.

Professor Chandler remarks of the mixture employed by the latter company that

it was invented by Messrs. St. John and Cartwright, and has been in use nearly two years, giving entire satisfaction. As the bog iron ores of this neighborhood are not sufficiently pulverulent to act promptly on the gas, Messrs. St. John and Cartwright add to the ore a quantity of iron borings or turnings, which they then convert into an artificial hydrated sesquioxide of iron by moistening the whole with ammoniacal liquor and exposing it to the air. The resulting mixture of natural and artificial oxide receives an addition of coarsely pulverized charcoal. This mixture is always sprinkled with ammoniacal water before it is placed in the purifier.

The material now in daily use at the works of the New York Gas Light Company was introduced in April, 1868. Occasional additions of iron borings have been made to it; otherwise the material is the same. When last tested it contained thirty per cent of sulphur. In Germany several varieties of sesquioxide of iron are now in use, prominent among which are "the Oberuseler mixture," an iron ore containing some oxide of manganese; the "Manheim oxide," and "Deicke's oxide," very pure artificial oxides of iron.

The wet-lime process is only used so far as is known in a single establishment in Ireland, where it is preceded by another process which, removing the ammonia, renders the lime, when taken from the purifiers, quite inoffensive. The dry-lime process has also been almost universally abandoned in Europe, the iron processes having been found to be not only cheaper, but free from the offensiveness of the lime processes. The iron process has also gained a foothold in America, being used not only by the New York Gas Light Company, but by two or three companies in Massachusetts.

We have not space to follow Professor Chandler through his discussion of the relative merits of the methods enumerated. He, however, effectually disposes of the objections raised against the iron process, and emphatically indorses it as being far superior to any other process of purification known to gas engineers.

The report next reviews the history of the complaints made against the several gas light works of New York, on account of the offensive gases emanating from them, and the proceedings of the Board of Health in the matter. On the 30th April, 1866, a meeting of the Sanitary committee, and a committee of the Citizens' Association was held to consider means for abating the nuisance, the gas companies being also represented. The result of the conference was the prompt institution of experiments on the part of the Manhattan and New York companies, which have resulted in the less objectionable processes above specified, and a great improvement in the purity of the air in their vicinity was at once noticed. On the contrary, the Metropolitan Company refused to heed the demands of the citizens, and obstinately held out against them.

The Board of Health at sundry times attempted to compel this company to adopt a less objectionable process of purification. But while the company refused to accede to the requirements of the Board, they expressed their willingness to adopt a better process than the one employed, if shown that it was better and that it could be advantageously adopted. The conduct of the company has, however, shown that they were indisposed to make any change calculated to improve the sanitary condition of the atmosphere of the neighborhood about their works. Professor Chandler sums up the case against this company in the subjoined extract, which must complete our notice of his able report. Our readers will see that it places the refractory corporation in not a very enviable light in reference to their respect for the rights of citizens, the more so as it is also shown in another part of the report, that the changes necessary to adapt their works to an improved process of purification would be very slight, and inexpensive.

This company has probably spent nearly $10,000 for expert fees, counsel fees, sending to Europe the man whose evidence was suppressed and whose advice was not followed, time of employees, printing 200 pages of evidence, etc., all apparently with the design, not of suppressing the nuisance, but of defeating the honest efforts of the Board of Health in behalf of the citizens of New York. Suppose the officers of this company were really acting in good faith, with a sincere desire to obviate the nuisance, they could at once introduce a better process of purification, a cheaper process, by which they could save $10,000 per annum, or they could retain their present process and ventilate the foul lime. Let them follow the example of either of the neighboring companies, use the iron process of the New York Company or the ventilating process of the Manhattan Company, or they may select any one of the improved iron processes now used in Europe. All that is asked of them is that they manifest the same willingness to direct their efforts to the management of their business in a manner most conducive to the health and comfort of the city, as was so promptly manifested by the other companies.

BENT, STAINED, AND ORNAMENTAL WINDOW GLASS.

Though a great deal of ornamental window glass is used in this country, and the demand is slowly but steadily growing, there are only a few establishments in the country where all kinds of ornamental glass for windows is produced. The largest and most constant demand at the present time is stained glass for churches. As work of this kind can be cheaply done, and as it obviates the necessity for blinds or shades, the cost in the end is but little more than the expense of plain glass.

In going through an establishment where ornamental window glass is produced, one of the first operations to be noticed is the production of what is known to the trade as "plain obscure," or plain ground glass. This is ordinarily done by placing the sheets of glass on the bottom of a large box, fastening them down, and then covering them with sand, gravel, and water to the depth of from one half inch to two inches. The box has a vibrating motion given to it by means of a crank and connecting rod. In about two hours the sand and gravel have cut the face of the glass to the required degree of obscurity. The breakage in this operation varies from five per cent, upward, as the glass is thin and crooked or straight and thick. The effect of obscure may be obtained by covering the glass with a thin coat of white enamel.

"Laying a ground" is one of the most essential of all the operations in producing ornamental glass. It is simply covering the glass with an even coat of the color. The color, which is ground up in proper vehicles like a thin paint, is first spread upon the glass with a broad soft brush; while the color dries, which is at once, it is smoothed and spread about with blenders until perfectly even and uniform. This is a trade by itself, and requires great steadiness of the hand and care in manipulation. The white enamels require the most care, as they are usually in situations at no great distance from the eye, and any imperfection in them shows more plainly than in any other color. The beauty of stained work depends in a great measure upon the care and skill with which the grounds are laid. If the glass is to have no pattern upon it, it goes at once from this room to the kiln where the enamel is burnt in. Usually, however, it passes to a room where the "brushing out" is done. The color is upon the glass—an even coat over the whole surface—the figures are produced by brushing away all the color except where the figures are to be. This is done by putting a stencil plate upon the glass and brushing the color out through it, which of course leaves a figure upon the glass of exactly the same shape as the plate. The stencil plates used for this kind of work are the finest that are made. As they are reversed from those in which the paint or ink is brushed through them, they have the advantage that the lines do not have to be broken but only supported by cross lines or lace work, as it is called. When a design is to be shaded by transparent lines like those used on vestibule doors, the stencil plate has only the leading lines and outline. The details are put in afterward with a fine point that removes the ground; this is called stippling. Almost all patterns on enameled glass are produced by stencil plates or some modification of them. In most elaborate designs the artist has much to do after the glass has been under the stencil plate, the details and shading have to be put in, and, it may be, lines to be erased that were put into the pattern simply to give support to the metal.

The glass is now ready for the fire; for, in its present state, the color is easily rubbed off. The enamels must be melted upon its surface in order to make them stick. When they are once subjected to the action of the fire they become so incorporated with the substance of the glass that they cannot be removed except by grinding.

The kilns in which the colors are burned in, are arranged so that the flame from the fire plays upon the surface of the glass. As soon as the colors are melted, the bottom of the kiln upon which the glass rests is pushed back to a cooler part where another furnace prevents too rapid cooling. The glass is then removed from the slab forming the floor and set up on the edge till the kiln is ready to cool.

For some kinds of work what is known as a box kiln is used. This is a cast iron box, measuring some two and a half feet each way. It is set in fire brick so that the heat from a furnace beneath may play all around it. This is chiefly for small work, such as the borders for church windows, etc. After the box is filled with glass the front is closed except a small hole through which the inside is observed. The fire is then started and the whole brought to nearly a bright red heat after which it is allowed to cool slowly.

The patterns of which mention has been made are an interesting study by themselves. For the more important kinds of work where there are many copies to be made they are of thin sheet brass. Others less often used are of zinc or block tin, while for single orders paper is used. Some of the designs for white enamel for office windows, etc., are so delicate as to seem like lace or woven work rather than a design punched from a sheet of metal. Their number and variety seem almost infinite. Men are constantly employed in producing new ones, and so high a reputation have American designs attained that European manufacturers are constantly copying them as they appear.

The glazing room is one of the most important points in a large establishment of this kind. A church window may consist of hundreds of small bits of glass. These are brought to the glazing room and united by leads when they are ready to be put into the sashes. The cross section of one of these leads is like a letter ⌶ laid upon its side. They are inserted between each bit of glass, in fact each piece, no matter how small, is surrounded by them, and in that way joined to the rest of the window.

The colors and their preparation require more scientific knowledge and skill than any other department of the business. The colors themselves are, as a rule, metallic oxides that remain unchanged by a red heat, or else some preparation which, at a red heat, takes on the proper color.

Iron, cobalt, copper, chromium, silver, gold, and platinum, are the chief sources of color; the more costly metals furnishing the most brilliant tints. These substances will not by themselves, adhere to the glass, it is therefore necessary to mix them with a "flux," that is something which shall act as a cement. In many cases these oxides are so refractory that they will not melt at a red heat; then some substance must be found that will reduce the melting point without changing the color—no very easy thing to do in some instances. Usually the action of the fire produces a change in the enamels; thus black, when it is put upon the glass, is of a dark olive green, the heat turning it to the proper tint. In glass bearing figures in transparent colors, as ruby, blue, green, etc., the glass used is colored, and all but the figure is covered with an opaque enamel.

There is another kind of glass used for vestibule doors, and ornamental work in general, which is very beautiful and extremely costly, namely, etched glass. The glass is covered with a varnish that resists acid, the pattern is then cut through the varnish to the glass. Hydrofluoric acid is then employed to "bite" the design in. Usually, in this kind of work, the ground is obscured so at to leave the figures transparent. The process is dangerous to the workman, and, at the same time, demands a great deal of skill and artistic talent.

Bent glass for windows, carriage fronts, and corner panels is coming more and more in vogue, and, where there is a great number of pieces required to have the same curve, is not very expensive. A piece of boiler plate or heavy sheet iron is bent to the required curve. This is called the mold, and the chief expense is in making it. The glass is laid on this mold, which is rubbed over with calcined plaster to prevent the glass from sticking when it becomes soft. Mold and glass are then put into the kiln. The heat softens the glass till it sinks down and takes the shape of the mold.

One other variety of ornamental glass in general use is that having white figures on a colored ground. This is really cut glass. The colored portion of the glass being very thin, it is only necessary to cut through it to leave a white or transparent mark. The cutting is done with small wheels and stones of various kinds. An examination of a piece of work of this kind will show at once the marks of the wheels and explain the peculiarities of the patterns used.

WHAT IS CHEMISTRY!

If we open a dictionary, an encyclopedia, or a school book, we shall find a definition of chemistry, tracing the word back to the Arabs and utterly confounding us with the profound knowledge of the learned pundits who have endeavored to enlighten the world on the subject. Somehow, after reading all their wisdom we are about as much in the dark as we were before. We therefore propose to let the Arabs alone this time, and also to say nothing about Albertus Magnus, Paracelsus, and the rest of them, but to speak of chemistry as it appears to us in this year of grace 1870. It is a very different science from what it was fifty years ago; it is not the same thing it was ten years ago; and, if it keeps on growing at the same rate for the next fifty years, it appears destined to absorb a host of other sciences and to become master of the situation. The popular notion is that creating a few unsavory smells, producing loud explosions, effecting marvelous changes in color, and amusing small children, is what we call chemistry. Hence in the minds of such people it is unworthy a place in a school of public instruction. It is about time that more correct information on the subject should be promulgated, and on this account we have selected it as a text for a few editorial remarks.

We used to say that it was the business of the chemist to investigate everything under the sun; but this statement no longer holds good, as the sun itself and all of the heavenly bodies, have been brought down to earth by means of the spectroscope and are made objects of study in the chemical laboratory.

We must now amend the saying by stating that everything in the universe is a fair object for the study of the chemist. This would appear to afford ample occupation for the most ambitious person, and it would seem at first glance to be a hopeless task. It is not, however, so difficult as it appears upon first presentation. The number of compounds in the world is large, but the number of simple elements composing them is small. There are a great many words in our language, but these are made up of twenty-five letters. If we are instructed how to handle these letters we know how to spell, and as soon as we can spell we try to attach the words together to make sentences, and if we are skillful in forming sentences we may write a book.

The world, to the chemist, is a big book made up of sentences and words written in sixty-five characters which he calls elements. As soon as we are able to recognize these characters on all occasions, we can read the work of nature and understand it. We shall find that certain elements are rarely used—that, in fact, the number of letters in nature's alphabet is not greater than we constantly employ in ours. This view of the case materially lessens our task and we can go courageously to work to study the composition of the globe. What is, therefore, chemistry?

It is the science of forces that act at insensible distances between the atoms of different kinds of matter. All of the forces of chemistry act in contact and the result is a new body. In physics the forces operate at great distances, often without any permanent change in the body acted upon. For instance, a current of electricity around a piece of soft iron converts that iron into a magnet; but the iron weighs no more, nor is it any longer or broader than before; and as soon as the electricity ceases to pass, the iron is no longer a magnet. This is called a physical operation, but if the same bar of iron be heated in contact with sulphur, it unites with the sulphur and produces a body very different from either of its constituents, this is called chemical action. The chemist studies contact forces. He splits up everything into its elements, and then observes the behavior of these elements when they are brought in contact with each other. By exchanging one element for another, a new and different compound is formed, just as moving letters about will give us different words and sentences.

It is only by experiment that we can derive any knowledge of the kind of compound the bringing together of elements will produce, and hence chemistry is an experimental science. The more we study the behavior of elementary bodies, the more we are struck with the fact that nearly all of the phe nomena of nature can be traced to chemical forces. When atoms are brought in contact we always have heat, frequently light, and probably generally electricity, and thus the forces we call physical really belong to chemistry. This is what we meant when we said that chemistry was destined to absorb many other sciences.

It is a common habit to speak of mathematics as an exact science, or to intimate that chemistry has no claims to a similar honor, but recent investigations have gone far to place chemistry among the exact sciences. The forces acting in it are well understood, the results are constant, the laws capable of precise statement—and of late years higher mathematics have been made to play a conspicuous part in chemical investigations. The faculties of the mind are admirably trained by a science that requires the closest observation, quick perception, accurate reasoning, and sound judgment. These faculties were less cultivated by the ancients, and hence the small number of discoveries made by them.

As the laws of chemistry become better known, we are enabled to explain many geological phenomena and to understand the constitution of minerals. Medicine and physiology and all the laws of life are better interpreted since chemistry has taken a part in their study. It is somewhat remarkable that a science which affords us nearly all the comforts we enjoy in our households, that has given us our glass, our paper, our food, our wealth, and, in fact, our civilization, should play such a small part in the instruction in our schools. But notwithstanding the disadvantage of such neglect, it makes a path for itself by its importance to the progress of society. The remark is often made that the child of the present age is the same as the child of two thousand years ago; and those who assert it mean that the school-boy now-a-days must begin as low down in the scale of knowledge as the Roman lad of the Augustan age. There is great fallacy in such a statement. When we meet a boy of the present time wending his way to school, with his books strapped into a bundle, if we stop him and examine his pack, we shall find in the most elementary treatise he carries, scientific information that was only known to the most learned philosophers among the Greeks or Romans. What was then acquired as the highest degree of knowledge, is now in every school-book, and thus our boys begin where Plato and Aristotle left off, and Pliny is only quoted for the droll mistakes he makes in his natural history. The new rector of the University of Vienna recently called attention, in an address, to the backwardness of the ancients in the sciences. This backwardness he ascribes, firstly, to an actual want of the power of accurate observation; and, secondly, to a restless spirit of speculation. He illustrates his remarks by referring to the observations of the ancients on the stars. The highest number recorded by them as visible to the naked eye was 1,600, whereas our school-boys can easily point out 3,000; and there is the same extraordinary discrepancy in the enumeration of the nebulæ, and the number of stars in the constellations.

It is an interesting question how far we inherit a schooled eye from ancestors trained in the observation of external objects, and how early science may be taught to children. A writer in *Nature* takes the ground that it is proper to begin at 8 or 9 years. On this point he speaks as follows:

"An ordinarily intelligent boy or girl of 8 or 9 years is perfectly capable of understanding the broad differences between the animal, vegetable, and mineral kingdoms; that there are more gases than one in the world; that some of them are colorless, while others are brown or green; that some burn, and others do not; that some plants grow from the inside, while others grow from the outside; that some animals have jointed back bones, that others have their bones outside their bodies, while others have none at all. Facts such as these are perfectly comprehensible to children even younger than those I have named. During the first two years of a child's school life, after he has learned to read and write, he should be carried through the whole range of physical science in a systematic manner. The fundamental truths of chemistry and physics should be first taught him; all theoretical considerations being left aside. As few definitions as possible should be given; the whole task of the teacher at the commencement being to cultivate the child's powers of observation to the utmost. Gradually the powers of induction and deduction may be developed; facts and phenomena should be compared, and conclusions drawn from them. There is nothing a child likes so much as investigation, or 'finding out all about things,' as he himself would phrase it. The boy in the nursery rhyme, who cut the bellows open to see where the wind came from, is a type of his class."

More mistakes are made by inventors, mechanics, and practical men, from a want of a knowledge of the elementary principles of chemistry and physics, which ought to have been taught them in childhood, than from ignorance of the higher principles of science. Chemistry is really a very easy and simple study. It only requires that the pupil shall have eyes and use them—and where a boy can see and won't see, he ought to be made to see.

It is a great mistake to try to commit to memory the names of everything in creation; the true plan is, tq acquire a knowledge of the principles on which the combinations are founded, and let details take care of themselves; and the time to acquire this knowledge is in childhood, when the memory is fresh and the intellect quick to grasp information, and the eye readily observes what is passing in the world around us.

Chemistry is at the foundation of our prosperity; let us have more of it taught in our schools.

IT is intended to introduce steel rails on the Grand Trunk (Canada) railroad. Some 15,000 tuns will be laid this year.

CURIOUS ICE FORMATIONS.

Our readers have doubtless read with much interest the communications upon this subject recently published in this journal, with illustrations of singular ice-spurs shooting from the surface of water frozen in ordinary open vessels, as also the accounts given of sudden formations of ice in dams and rivers. The study of these formations has an eminently practical bearing, and as we have received a somewhat extensive correspondence upon the subject, we will in the present article sum up such additional facts as have been communicated.

The theory of Mr. Wiegand has received a striking confirmation from a St. Louis correspondent, who writes us that in December, 1868, remaining in his office until very late at night, and the fire having gone out, so that the room became very cold, his attention was attracted by a singular crackling sound which he found to originate in the freezing of some water standing in a cold room adjoining.

Upon examination he found that an irregular hole had formed in the top of the layer of ice which rested upon the surface of the water, and that water was welling up through the hole. The water which issued from this embryo crater, spread about to a short distance, and almost instantly changed to ice. His curiosity having become excited, our correspondent continued to watch the phenomenon at intervals, until finally the walls of the crater had attained a considrable hight. The following morning he found it to be two and a half inches high, and three inches in diameter at the base, external measurement.

A correspondent from Lexington, Va., has made a mathematical calculation of the amount of water displaced during the freezing of a stratum of water one inch thick, in a pail ten inches in diameter, and finds that the displacement is not less than 7·85 cubic inches, or sufficient to form a cylindrical column more than six inches high, and one and one fourth inches in diameter. This correspondent, who is evidently a gentleman of much information upon this and similar subjects, indorses in substance the theory of Mr. Wiegand, in regard to the formation of ice in the dam at Week's Mills, Me., described by the Rev. W. H. Littlefield, in the correspondence above referred to. Its adherence to the wheel and gate, he ascribes to what is known as "regelation," a subject most ably discussed in Tyndall's lectures on heat. This term—regelation—may be defined as the adherence of fragments of ice to other fragments, when they are brought in contact with moistened surfaces, and also the freezing of ice to certain solids, such as wool, flannel, hair, cotton, etc., which freeze to ice even in a warm atmosphere. No adequate explanation of this phenomenon has yet been made, and it is spoken of by Miller as needing further elucidation.

Mr. Stanley G. Wight, formerly a member of the Board of Water Commissioners of the city of Detroit, has put us in possession of some interesting facts in regard to the formation and accumulation of ice in the strainer over the inlet pipe to the pump well in that city.

This strainer is nine feet in diameter, and is placed over and around the mouth end of the inlet pipe to the pump well. The inlet pipe extends into the river one hundred and fifty feet from the wharf, and its entire length is two hundred and twenty feet. On the river end of the pipe there is a bell-shaped mouth-elbow, covered by the strainer, and this was formerly surrounded by piles, driven to protect it from injury from the anchors of vessels.

Both pipe and strainer are made of half-inch boiler plate. Above the end of the pipe the strainer is perforated with half-inch holes, one hundred and forty-four to the square foot; and surrounding the mouth of the pipe, inside the strainer, there is a diaphragm plate similarly perforated. Below the diaphragm plate the strainer is perforated with four-inch holes, to allow the escape of sand. The piles surrounding the strainer are thirty in number, and the pipe is similarly protected by piles driven along its sides with masonry intervening.

The sixteenth annual report of the Water Commissioners sets forth that "under certain circumstances, during extreme cold weather, it is with difficulty a supply of water can be obtained, in consequence of the accumulation of ice on the strainer, frequently requiring the speed of the engine to be reduced, and at times to stop it for several hours together, no water passing through the pipe into the well, notwithstanding the bottom of the well is twelve feet below the surface of the river. The size of the well is about forty feet long, eighteen feet wide, and twelve feet deep. The circumstances under which the difficulty occurs are, when the weather is cold and ice is forming in the lake above and on the shores of the river, and the river is free from ice over the strainer. But when the river is covered with ice over the strainer, the difficulty does not occur at any degree of cold. The greatest difficulty occurs when the thermometer ranges from seven or eight degrees to eighteen or twenty degrees above zero, but when the mercury rises above twenty degrees the difficulty soon ceases. The greatest number of detentions, it has been observed, occur at night, and when the sun is obscured by clouds; but when the sun is unclouded, no difficulty is ever experienced. This peculiar stoppage to the flow of water to the pump well has been encountered for many years—first on the strainer of the inlet pipe laid in 1840, again on the one laid in 1850; both of which were located so near the wharf that the ice which formed on them was removed by means of long poles kept at hand for the purpose."

The report further sets forth, in substance, that with the pipe laid in 1858, which extends out further into the river than the former ones, the ice could not be removed as above stated, and all that was done up to 1866, was to wait for the ice to loosen without artificial appliances. The Board of Commissioners meanwhile were subjected to great anxiety, and at last it was referred to the Committee on the Supply of Water, consisting of Mr. S. G. Wight and Mr. J. Owen, who set about investigations into the causes of the difficulty, and the application, if possible, of some adequate remedy.

Every possible means was tried to gain information. A voluminous correspondence with scientific men and scientific associations failed to discover any complete remedy. With a view to test whether the trouble arose from anchor ice, as commonly supposed, a self-acting door was placed on the down-stream side of the strainer, which under similar circumstances had formerly afforded a limited supply of water. Certain unforseen causes forced the abandonment of this door.

It having been observed that no trouble arose when the river was covered with ice, booms were so placed that a sheet of ice should form over, and extend to some distance from the strainer, when the rest of the river was not so covered; this plan entirely failed. A platform of plank submerged immediately over the strainer on the supposition that it would act as a non-radiator, only increased the difficulty, the ice forming at higher temperatures than before.

On the 29th of December, 1867, while only a small amount of water was supplied to the pump well, a diver was sent down, who found the strainer one mass of ice, the particles being collected into a mound ten feet high and fifteen feet in diameter, and rapidly growing by the accumulation of minute ice crystals. Specimens of this ice brought to the surface showed it to be "*in sheets and particles as thin as paper, translucent, with sharp pointed edges.*" Further, it was found that all the water entering the pipe was through the down-stream side of the strainer.

It was now supposed that to inclose the strainer with a canvas screen on all sides of the surrounding piles except the down-stream side, would remedy the difficulty. This was only just accomplished when the weather became colder, and before daylight the next morning the engine stopped altogether. At 11½ o'clock the same morning, another descent was made by the diver, and it was ascertained that "with the temperature of atmosphere at *twenty-nine degrees*, the water at the surface was *thirty-three degrees*, while at the bottom of the river it was *thirty-five degrees*. At this descent much less ice was found on the strainer and its surroundings than the first time. The lower side was clear, but on the upper side the action of the current had worn the ice into elongated cones, pointing up stream. At this time the pump was receiving a full supply of water."

The observations of the committee have established the fact that the ice particles described are constantly present in the river under certain circumstances, and that they collect upon any obstruction they meet with in their passage.

These facts are of great practical interest, and the conclusion is legitimate that much in regard to the formation of ice under peculiar circumstances remains yet to be explained. The subject is one on which a great deal can be said, and many curious facts can be elicited; and it is to be hoped that some scientist competent to grapple with it, will ere long penetrate deeper into the mysteries of ice formations than any one has yet done.

AWARD OF OUR CASH PRIZES.

We announced in our annual prospectus, for 1870, that we would distribute $1,500 in cash prizes in competition for the fifteen largest lists of subscribers sent in on or before the 10th of February. We also announced the offering of a splendid steel engraving, as a certain reward for clubs of ten names and upward, obtained at our published rates. The interest manifested in the engraving has been spirited and satisfactory. Already hundreds of copies have been sent to those entitled to receive them, and many recipients have written to us in praise of the picture as a work of artistic merit.

This has been a pleasant, and, on the whole, a very agreeable feature of our programme; but in reference to the matter of the cash prizes, which to many, doubtless, appeared to be more difficult to obtain, only eight persons announced themselves as competitors, and as a matter of course each has won a prize. The result is not so agreeable to us in a financial point of view as the prize picture. Still we shall cheerfully respond to and honor the drafts drawn upon us by the following named gentlemen for the sums set opposite to their names, and at the same time we congratulate each of them upon his success.

To J. W. Briggs, West Macedon, N. Y.	$300
" M. Moody, Dennison, Ohio	250
" James C. Wells, Warren, Pa.	200
" W. A. Knight, East St. Louis, Ill.	150
" G. F. Merriam, Fitchburg, Mass.	100
" P. H. Wait, Sandy Hill, N. Y.	90
" G. W. Rose, New Bloomington, Ohio	80
" W. C. Rusheneker, Atchison, Kansas	70

With the above result before us, we announce our retirement from the cash prize business, but shall continue to award the engraving as a premium to clubs, as per our published rates. As a work of art it has received unqualified praise.

M. GAUDIN has lately exhibited some excellent imitations of precious stones, the basis of which is alumina fused with silica by means of the oxy-hydrogen blowpipe. He uses metallic oxide to give them the proper color. It is also stated that a pupil of Liebig has made some discoveries in the same direction; but as yet his method is not definitely given.

THE Superintendent of the Brooklyn Bridge Company thinks it will take five years to complete the bridge. The machinery for the construction of the towers will cost $150,000.

Food for Trout in Fish Ponds.

From the Third Report of the Commissioner of Fisheries of the State of Maine, we extract the following in reference to food for trout:

"Rearing fish in small private ponds, where they must be altogether fed by hand, will answer very well when confined to the maintenance of the young, through the early stages of growth, when they would be most liable to destruction if turned loose, or to the growing of a limited number of breeding trout or fresh-water salmon. But when it comes to raising fish for the table, such management does not promise to produce cheap food for man unless there be found some source of food for the fishes that shall be cheaper than any that has yet been proved. It may be as easy to raise trout as to raise chickens or pigs; but in order to furnish them as cheaply to the market, they must be grown on food as cheap as that which grows chickens and pigs. Now trout are carnivorous—so are all other fishes with whose habits we are acquainted. To be sure, many kinds will eat vegetable substances, bread, corn, rice, and so on, and it is quite probable that these matters contribute to their nourishment; but whether there be any species that is mainly a vegetarian is a matter of doubt. Even gold-fish are found to grow sickly if deprived for a long time of animal food. But animal food is expensive, at least that which is to be had in the markets; and as to butcher's refuse, the necessity of obtaining during warm weather a fresh supply almost daily would greatly increase the expense. Besides, a tolerable approach to economy in the use of meats, which is sure to take place with the increase of population, and the consequent demand would so far utilize many parts of slaughtered animals that now go to waste, that the residue would hardly be equal to any great demand from fish growers. The food that has generally been used for trout is liver. Some calculations regarding the profitableness of raising trout have been based on the supposition that liver can be obtained at three or four cents a pound, and at this price it may be that trout can be reared and marketed at a profit, but they certainly would not be *cheap*, and probably would be only luxuries. Yet parties engaged in trout-growing in Massachusetts have been paying, during the past season, for beef's liver, to feed their young fry, *ten cents a pound*, a price, which, if the liver were fed to the larger fish, 'would be ruinous.' Curdled milk has been used by some with favorable results; and should this be found on full trial to meet all the wants of the fish, it must take the place of liver and such meats. One company, located at West Barnstable, Mass., feeds the large trout on salt water shrimps, gathered in the marshes in the immediate vicinity, and costing one dollar per bushel. Should all these plans fail, it is yet believed that some way will be discovered of utilizing the insects that devour our crops, or the flies that breed in offal and about stables and manure heaps.

"A bare statement of the number of persons engaged in this industry will show that it is no longer regarded in the light of an experiment. In New England and the Middle States, there are probably thirty or forty establishments for the cultivation of fish, principally trout, with a view to profit. One firm in Western New York hatches several hundred thousand trout annually, and has realized as much as $10,000 profit in a single year. These profits, however, be it bore in mind, are mainly from the sale of young fish and fecundated eggs."

NEW BOOKS AND PUBLICATIONS.

HAND-BOOK FOR THE ARTISAN, MECHANIC, AND ENGINEER. Comprising the Grinding and Sharpening of Cutting Tools, Abrasive Processes, Lapidary Work, Gem and Glass Engraving, Varnishing and Lacquering, Apparatus, Materials, and Processes for Grinding and Polishing, etc., etc. By Oliver Byrne, Civil, Military, and Mechanical Engineer, author of "The Practical Metal Worker's Assistant," "The Practical Model Calculator," "Elements of Mechanics," etc., etc. Illustrated by one hundred and eighty-five Wood Engravings. Philadelphia: Henry Carey Baird, Industrial Publisher, No. 406 Walnut street. Price, by mail, free of postage, $5·00.

While this work is a guide to the accomplished and finished artisan, the descriptions of processes and directions for procedure in the various departments of handiwork, of which the work specially treats, are of the plainest and most practical character. The author states in his preface, that the intention has been to make these directions so profuse and minute, that any mechanic or amateur following them strictly may succeed at the first attempt in performing any operation described. As will be seen by the title the work covers a large field, much of it a *terra incognita* to the majority of American mechanics. Among subjects little understood in this country, and upon which the work treats at large, are lapidary work and the performance of such ornamental work, now mostly done in Europe, as is perfected by the use of abrasive materials. Particular attention is paid to the finishing of various kinds of work, and the general information given is so diffuse and profuse, that scarcely any workman in any branch of industry will not find the book eminently serviceable to him. The author is already widely and favorably known through his previous works, it is praise enough of the present work to say that to the practical mechanic, it exceeds in value anything Mr. Byrne has yet written.

A HAND-BOOK OF PRACTICAL TELEGRAPHY. By R. S. Culley, Engineer to the Electric and International Telegraph Company. Published with the sanction of the Chairman and Directors of the Electric and International Telegraph Company, and Adopted by the Department of Telegraphs for India. Fourth Edition, Revised and Enlarged. New York: D. Van Nostrand, Publisher, 23 Murray street, and 27 Warren street.

The contents of this work are included in the following classification: The Electrical Laws upon which the System depends; the Methods of Discovering Faults; the Practical Management of Apparatus; the Construction of a Line; and the Leading Principles of Submarine Telegraphy. The author has had the assistance and co-operation of some of the most able English electricians in obtaining information, and the work contains full descriptions of the latest improvements. The first thing which impresses us in an examination of this work is the great skill with which, without burdening the text with technical terms, the author has been able to make his discussions complete and reliable, and at the same time attractive, from their terseness and perspicuity. The style is admirable; and it would seem that even the most unscientific ought to be able to read the work with ease and satisfaction. The scientific reader will, however find, that while the work is eminently practical, it has a foundation of sound theory, and its pages contain enough to make it a valuable addition to any library of technical works. We will, in a future issue, make an extract or two from the work, from which our readers may judge the better of the author's style and method.

IRON TRUSS BRIDGES FOR RAILROADS. Methods of Calculating Strains, with a Comparison of the most prominent Truss Bridges, and New Formulas for Bridge Computations. Also, the Economical Angles for Struts and Ties By Brevet-Colonel William E. Merrill, U. S. A., Major Corps of Engineers. New York: D. Van Nostrand, 23 Murray street and 27 Warren street.

Bridges are the most costly, and, as a rule, the worst constructed features of American railroads. While there are splendid and honorable exceptions to this rule, all the more brilliant from contrast with the rude and ill-composed structures which so often shock the artistic sense of those who possess taste, and expose their lives to great risks in common with those who have no taste, the fact remains that the majority of railroad bridges erected in this country are—to draw it exceedingly mild—little credit to American engineering. The work before us is an attempt to give a basis for sound reform in this feature of railroad engineering by throwing "additional light upon the method of calculating the maxima strains that can come upon any part of a bridge truss, and upon the manner of proportioning each part, so that it shall be as strong relatively to its own strains as any other part, and so that the entire bridge may be strong enough to sustain several times as great strains as the greatest that come upon it in actual use." The various trusses examined are the Fink, Bollman, Jones or Howe, Murphy-Whipple or reversed Howe, Post, Triangular, and the Linville or Pratt. It is premised that safe bridges can be built on any one of these plans, but that some require more metal than others in order to secure the requisite strength. These various forms are discussed at length, and a large number of valuable new formulas are deduced from those of Hodgkinson, calculated to be of great service to engineers in the solution of the various problems relating to bridge construction. The work is published in excellent style and in quarto form, and seems to have been carefully edited. It is illustrated by plain and colored diagrams.

MCKILLOP, SPRAGUE & CO.'S COMMERCIAL REGISTER FOR 1870.

The above well-known leading commercial agency, formerly of 37 Park Row, has issued from its new and capacious buildings, 109 and 111 Worth street, one door east of Broadway, New York, its Commercial Register for 1870. During the past year changes have been much more numerous than in previous years, and the list of names has reached to the astonishing number of some five hundred thousand. The business history and antecedents of the individuals included in this list have been obtained with great care, and must have necessitated a very large expenditure. The reputation of this agency for accuracy is an enviable one, and we find that in consulting it for the business standing of persons in various parts of the country whose business standing we personally know, the ratings are verified by our knowledge of their character. The Southern States are reported much more fully than last year. Another indication of the increasing prosperity of that section. Changes and new firms will be noticed as they occur in a weekly circular issued to subscribers. Messrs. McKillop Sprague & Co. are constantly extending their facilities, and will continue to extend them as may be required to protect the interests of their patrons. No business firm who extends credit to their customers can afford to be without this annual register. Manufacturers can get the names and address of nearly every person in the United States using the articles they make. See advertisement on back page of this paper.

THE February number of the "Aldine Press," published by Sutton Bowne & Co., 23 Liberty street, New York city, is the most beautiful specimen of typographical perfection we have ever seen in a periodical. It is printed on beautiful cream laid paper, and contains, besides a choice literary repast from the pens of various popular authors, two magnificent engravings from Doré and five others from artists of distinction. This unsurpassed "Typographical Art Journal" is published monthly at the low rate of $2·00 per annum.

WE are in receipt of "Self-Instructing Drawing Lessons for Little Folks," published by John D. T. Brooks, 20 Washington street, Boston, Mass. The studies are judiciously selected, and are arranged in progressive order. We recommend the work as being well adapted for the intended purpose. It might be continued in numbers with profit to the little folks.

THE PHOTOGRAPHER'S ALMANAC, for 1870, edited by A. H. Wall, and published at the office of the "Illustrated Photographer," London, is one of the most beautiful and comprehensive annuals relating to the heliographic art that has come under our notice. It contains a large amount of interesting and valuable information, embracing all the best recipes and new processes in photography that have been made public during the year.

THE ARCHITECTURAL REVIEW AND AMERICAN BUILDERS' JOURNAL, for February, is one of the best numbers we have yet seen of that excellent periodical.

Recent American and Foreign Patents.

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

WASHER AND WRINGER.—D'Alembert T. Gale, Poughkeepsie, N. Y.—The object of this invention is to construct a convenient apparatus which can be used both for washing and wringing garments, and which is of very simple arrangement, and easily manipulated.

KEYS FOR LOCKS.—Joseph Linder, Seneca Falls, N. Y.—This invention relates to a new key for door and other locks, and consists in the application to the key of a pivoted plate, carrying a concealed bit, which allows the key to be introduced through a circular keyhole, the bit being forced out for action by the introduction of the key into the lock.

PAY BOX.—W. W. Wormood, Dubuque, Iowa.—The invention consists in an improved arrangement for discharging the fares from the first receptacle and depositing and securing them in the space below, as is required to keep the said first receptacle clear for the better inspection of the fares as they are deposited, and to permit access thereto by the conductor.

VELOCIPEDE.—G. D. Emerson, Calumet, Mich.—This invention relates to improvements i velocipedes, and has for its object to provide a propelling arrangement whereby the operator may apply the whole force of his weight to the work ordinarily, and, at times, an additional force by adding the force of his arms to the effect of his weight.

SHEET MUSIC HOLDER AND TURNER.—F. J. Herpers and M. M. Sommer, Newark, N. J.—This invention relates to improvements in an apparatus to facilitate the holding and turning of the music sheets by the performer so as not to interrupt the playing, and it consists in the application, to any music sheet-holder, of spring-actuated turning arms, arranged to be held by a button and to throw the sheet over when let go, and provided with a ratchet and spring pawl, by which the operator may instantly disconnect one arm at a time by a touch of the pawl. The invention also comprises an improved spring clamping attachment for connecting the holder to the stand.

JOURNAL BOX.—James T. Robinett, Petersburg, Va.—The improvement relates to the manner in which the bearing piece and its lining are united together, referring to that class of journal boxes which are made in two parts.

KNITTING MACHINE.—Henry V. Hartz and Julius Feiss, Cleveland, Ohio.—The object of this invention is to simplify and improve the operation of the knitting machine, making it more convenient and easy to control while it operates more rapidly, accurately, and effectually, and with less breakage of the yarn, and makes better work.

BUCK SAW FRAME.—Thomas H. Rollins, Detroit, Me.—The object of this invention is to provide means for straining wood or buck saws in thin frames by lever purchase, and to so connect the cross bar with the stands that the stands shall not be weakened by cutting mortises therein.

SUSPENSION BRIDGE.—Jarvis Royal, White Rock, Ill.—This invention relates to new and useful improvements in suspension bridges, whereby the construction of that class of bridges is greatly simplified, and the invention consists in making the suspension cable in sections and in the method of fastening the same, and also in the method of forming and supporting the road bed.

GAS-BURNING SAD IRONS.—Robert Drake, Newark, N. J.—This invention relates to new and useful improvements in sad irons, which are heated by the combustion of gas therein, and consists in the peculiar mode of introducing the gas into the interior, and in the formation of the interior of the bottom or face of the sad iron, and in the devices in combination therewith for insuring a perfect flow and combustion of the gas.

HORSE POWER.—C. H. Gifford, Potsdam Junction, N. Y.—This invention relates to a new and useful improvement in horse-powers for driving thrashing machines and other machinery, and for all purposes to which it is applicable.

ANTI-FRICTION JOURNAL BEARING.—H. G. Hatfield, New York city.—This invention relates to a new and useful improvement in journal bearings, whereby the journal is relieved of frictional or rubbing contact, and revolves on a moving surface; and the invention consists in a revolving ring (upon which the journal rests) supported by a series of friction rolls in a revolving frame.

VEHICLE SPRINGS.—John Goller, Los Angeles, Cal.—This invention relates to improvements in springs for thorough brace vehicles, and consists in the construction of bow springs for attachment to the ends of the bars of the reach frame and the straps or bows of alternate leaves of steel and wood, and in bending the outer steel leaf around the upper end of the other leaves, forming, in connection with a band or metal socket, a recess in which the ends of the wood and inner metal leaves are allowed to work, to compensate for the expansion and contraction due to the springing section, the said space being filled with an india-rubber spring against which the ends of the said inner leaves work.

GANG PLOW.—John Cox and Solomon Cox, Eugene City, Oregon.—This invention relates to a new gang plow which is adjustable in every direction, and of simple and desirable construction. The invention consists in the general arrangement of the adjusting devices and of various details of construction.

FLOORING FOR HOUSES.—Wm. Baum, Hoboken, N. J.—This invention has for its object to construct a wooden floor for rooms, halls, etc., which can be made of broad boards and without the use of nails, and which will not be liable to warp or expand. The invention consists in the use of grooved and tongued rails attached respectively to the beams and to the undersides of the boards. These rails lock the boards at several places firmly to the beams and prevent effectually every displacement of the same.

TRUNK LOCK AND HASP.—Edward L. Gaylord, Terryville, Conn.—This invention has for its object to improve the construction of hasp locks and hasps, so as to make them stronger, more convenient, and more ornamental than when constructed in the ordinary manner.

ADDING MACHINE.—Gilbert W. Chapin, Brooklyn, N. Y.—This invention has for its object to furnish a simple and convenient adding machine, designed more particularly for bookkeepers' use, and which will enable the user to add columns of figures with quickness and accuracy.

WATER VELOCIPEDE.—Oliver A. Davis, Brooklyn, N. Y.—This invention has for its object to combine with a small and light boat an arrangement of mechanism by means of which the boat may be easily and rapidly propelled through the water by a convenient application of foot power.

GRATE.—G. H. McElevey, New Castle, Pa.—This invention has for its object to improve the construction grates for fireplaces and stoves, so that a draft may be introduced into the rear side of the fire, and introduced in such a way that it may be controlled as may be desired.

COMBINED CLOTHES WASHER AND DRYER.—Edwin Rees, Stoddartville, Pa.—This invention has for its object to furnish a simple, convenient, and effective machine for heating the water, washing, rinsing, and drying the clothes, and which shall, at the same time, be very compact, taking up but little room.

HOISTING APPARATUS.—Matthew Lynch, New York city.—This invention has for its object to furnish a simple, convenient, reliable, and safe hoisting apparatus, designed more particularly for use upon the outside of school and other building, but also applicable for use in other situations, and which shall be so constructed that it may be stopped and will remain stationary at any desired elevation.

ADJUSTABLE DRAFT BAR.—L. S. Clarke, Bethel, Conn.—The object of this invention is to provide for a difficulty which has always been experienced in arranging thills to one horse sleighs or cutters, and other one-horse vehicles, so that the horse may travel either in the middle of the road track or upon one side, at the pleasure of the driver.

NEEDLE WRAPPER.—Alfred Shrimpton, Redditch, England.—This invention consists in fitting the needles to be prepared through the folded edges of a compound piece or strip of paper and fabric, and attaching the edges of the paper of the said compound piece or strip to the paper wrapper.

PIN FOR ARTIFICIAL TEETH.—H. M. Raynor, New York city.—This invention relates to a new manner of constructing the pins by which the teeth are fastened to the rubber or base, and consists of making these pins of wire, doubled up in such manner as to form loops at the projecting part, the ends of the wire being imbedded in the teeth.

ROTARY PROVISION SAFE.—Austin Sly and Samuel S. Ford, Lebanon, N. H.—This invention has for its object to construct an airy, convenient provision safe which cannot be entered by rats, mice, or insects, and which will at all times remain clean and in good order.

FEED WATER HEATER.—Enos B. Johnson, Chicago, Ill.—This invention relates to a new apparatus for heating the feed water of steam boilers by means of the exhaust steam for the purpose of utilizing the heat of the exhaust. The invention consists in the general arrangement in a water chest of detaining shelves and serpentine steam pipes, all combined in such manner that the water ascending in the box will by the shelves be caused take a circuitous course following the windings of the steam pipe, while the steam entering from above passes through the water and gives off its heat to the same.

DENTIST'S ARTICULATOR.—G. F. Schaffer, New York city.—The object of this invention is to provide a convenient "joint" for dentist's articulators, which will prevent the two parts of the same from being brought closer together than is necessary.

CARRIAGE TOP.—William Schoch, Plumsteadville, Pa.—This invention consists in the application to a carriage top, of a removable jointed fly or "shoot" which can, when not used, be taken off, the top folded together and packed away under a seat or in any other desired place.

CAR COUPLING.—Robt. Green, Boonton, N. J.—This invention relates to improvements in self-coupling car couplings, and consists in the combination with a hollow funnel-mouthed draw-head, provided with a broad, longitudinal opening through the top to the hollow space, and a shoulder or ledge at the neck of the funnel-shaped mouth, of a swinging catch-plate arranged in the said opening through the top, to swing up and down on the rear end engaging with the rear wall of the draw-head; the under side of the said plate being provided with a shoulder or ledge to act in conjunction with the shoulder at the neck of the draw-head, to hold the head of the shackle or connecting link, which, when orced in, will raise the swinging plate and pass beyond the shoulders, when the plate will fall and hold the shackle.

SPLITTING ROCK.—John Robb, New York city.—This invention consists in filling or nearly filling the holes drilled in the same way as for blasting, with water, or other liquids, and then inserting plungers fitted to work as tightly as possible, above the water, and subjecting the said plungers to the action of great weights, hammers, or other devices let fall upon them, or otherwise imparting great concussive force, which is, through the medium of the water, expended upon the side walls of the holes in the pi rection best calculated for separating the rocks.

OPERA CHAIR.—Bernhard Koechling, New York city.—This invention relates to a new manner of fastening the backs to the side frames of those chairs which are used in theaters, opera houses, public halls, etc., and has for its object to do away with the straps and other fastening devices which were heretofore required to connect the side pieces and to lock the backs thereto.

MALTING GRAIN.—Rudolph d'Heureuse, New York city.—This improvement is devised to better control the time in steeping grain for malt and other purposes, preparatory to the process of germinating the grain, and thus to economize in time and apparatus, and to keep the whole process of steeping and germinating under more perfect control than can be done in the usual rude manner.

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.

J. M. E., of ——. It makes no difference in the amount of driving power of an overshot wheel, whether the pinion is on the water side of the wheel or on the other side. In speeding up from a prime motor, if you enlarge all wheels proportionally within certain limits, you will reduce friction thereby, but you will always lose power by speeding down and then speeding up again to get the required speed. This, if we understand you, is what you propose in the second case you mention, and it is therefore not so economical as the first proposition here the speed is maintained as high as possible from the outset.

J. W. H., of Iowa.—The conducting power of copper being 2·5 greater than that of iron, the heat of the products of combustion would be more likely to be transmitted to water in a boiler of copper with a contracted fire surface, than in an iron boiler with too small fire surface. But with ample fire surface all the available heat ought to be transmitted in either case, and it is the heat of combustion that produces steam, not the material of which boilers are made. The strength of copper is not materially weakened at 320 degrees. Indeed, it has been asserted, we think, that its strength will increase up to a certain temperature, but we can find no authority for the statement.

J. B., of Fla.—You do not give data sufficient to determine whether the induction pipe of your engine is large enough or not. You should state whether the steam is used expansively or not, and if it is so used, to what extent. Assuming, however, that it is large enough, if you carry it eighty feet farther than at present, you would, we think, need to enlarge it one third its present diameter, provided it be none too large now and quite short. We should prefer to transmit the power through a two-inch shaft rather than to move the engine so far from the boiler. We think it would be more economical.

C. K., of Conn.—For large vessels, the screw has a decided economical advantage over side wheels. The screw, with one third less coal, will yield the same speed as the wheels. It is not new to place two pairs, or four wheels, on steam vessels. The experiment has been tried without economical success. Whether you use four wheels, or two which contain the same paddle surface, makes, theoretically, no difference. But practically the two wheels are best. If four are used the water reaches the aft, or second pair of wheels in a state of motion, and slip or loss of power is the result.

D. D., of N. Y.—It is not new to force air through grain bins to prevent or arrest fermentation, weevils, etc. It is common now to erect grain storehouses with special position for the ventilation of the grain. Perforated air pipes pass through the bins, and air is forced through the grain by steam power.

D. S., of Del.—A siphon acts only by air pressure, the same as an atmospheric pump. The principle of its action does not at all resemble that of the water ram. There is no doubt a pond might be drained by a siphon constructed of tiles, but your explanation of the working of such a siphon is altogether astray.

A. H. B., of Kansas.—The substance called "whiting" in commerce, is nothing more than a very pure and fine powder of the carbonate of lime. It is made by grinding chalk and washing to separate the fine light particles from the coarser.

W. H. B., of Texas.—There are many conflicting opinions on the setting of circular saws and mill saws. "Worssam's Mechanical Saws." Published by Henry Carey Baird, 406 Walnut street, Philadelphia, Pa., will give you full and reliable information both on this and the other points of which you wish to know.

G. F. S., of Mass.—There is no doubt that heat would be transmitted through the walls of three quarter inch brass tubes into water provided you could keep the water in them, which we regard as rather doubtful. The priming in such a boiler would be somewhat remarkable.

W. W. McK., of Md.—We judge from your description that the suppply pipe to your pump is too small for the pump at high speed. This is a too common fault. If this is not the case we can see no reason why the pump should not fill properly as you state the fitting is perfect.

G. A. H., of Mich.—Pills are coated with sugar by means of a confectioners' pan, over a fire, in the same manner that seeds, spices, nuts, etc., are coated. The pills are rolled in sugar flour, placed in the pan, treated with the coating sirup, and rolled in the pan over the fire.

S. B. H., of R. I.—It has been maintained by some that electrical discharges in thunder storms are always from the earth to the clouds. Our own opinion is that the reverse is most frequently the case, but that discharges from the earth to the clouds no doubt frequently occur.

H. N. S., of Mass.—The difference in the distance of the earth from the sun at different parts of its orbit, has probably an inappreciable effect on the climate of the earth or upon variations of weather in any season.

A. H. M., of Mich.—To blow off a tubular boiler at so high a pressure as sixty pounds, would be apt to loosen the tubes. Thirty pounds ought to clean it of all loose material that can be blown out.

J. C., of W. Va.—We do not think your plan for a surface condenser a feasible one, and therefore respectfully decline your communication.

S. R. B., of Ohio.—You will find your inquiries in regard to cotton presses answered in a communication published in another column of the present number.

B. F. J., of Pa.—The incised lines on furniture are gilded in the ordinary way with Mosaic gold. Furniture thus ornamented has no special name.

H. B., of Pa.—Your definition of a horse power, and the remarks thereon, will not bear scrutiny. We respectfully decline your communication.

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.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING FEB. 8, 1870.

Reported Officially for the Scientific American.

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99,518.—CUT-OFF VALVE-GEAR.—A. W. Almqvist and F. W. Ofeldt, New York city.
99,519.—THRASHING MACHINE.—Benj. Ayars, Greenwich, N. Y.
99,520.—HAY CRANE OR CARRIER.—B. P. Barackman, Linesville, Pa.
99,521.—PUMP.—J. S. Barden, Providence, R. I.
99,522.—FLOORING.—Wm. Baum, Hoboken, N. J.
99,523.—WINDOW STOP.—W. L. Beckwith, Olmstead, Ohio.
99,524.—NECK-YOKE TUG.—Geo. Bennett, New Pennington, Ind.
99,525.—BASE BURNING FIRE-PLACE HEATER.—B. C. Bibb and Philip Klotz, Baltimore, Md., assignors to B. C. Bibb.
99,526.—SIPHON.—J. A. Bostwick, New York city.
99,527.—SEDIMENT CHAMBER FOR LAMP POSTS.—G. C. Bovey, Cincinnati, Ohio.
99,528.—METALLIC CARTRIDGE.—F. E. Boyd, Boston, Mass.
99,529.—WATER RESERVOIR FOR COOKING STOVES.—Esek Bussey, Troy, N. Y
99,530.—PUNCTURING AND TUBULAR STOPPER FOR SEALED CANS.—Alexander Campbell, Charlestown, Mass.
99,531.—RAILWAY.—Hiram Carpenter, New York city.
99,532.—WATER-WHEEL.—Ira Carter, Champlain, N. Y.
99,533.—ADDING MACHINE.—G. W. Chapin, Brooklyn, N. Y.
99,534.—STEP AND BOLSTER FOR COTTON SPINDLES.—C. H. Chapman, Shirley, Mass.
99,535.—SHIFTING CUTTER THILL.—L.S. Clark, Bethel, Conn., assignor to himself, G. S. Peck, and G. W. Lyon.
99,536.—SEED DRILL.—J. B. Clemans, Kansas, Ill.
99,537.—TRAP.—Daniel Cole, Scott township, Pa.
99,538.—GANG PLOW.—John Cox and Solomon Cox, Eugene City, Oregon.
99,539.—RAILWAY CAR BRAKE.—J. M. Crosby, Marathon, and Wm. Ballard, Caroline, N. Y.
99,540.—FLOATING VELOCIPEDE.—O. A. Davis, Brooklyn, N.Y.
99,541.—MALTING GRAIN.—Rudolph d'Heureuse, New York city.
99,542.—SADIRON HEATER.—Robert Drake, Newark, N. J.
99,543.—HAND CULTIVATOR.—Lewis Duvall, Big Spring, Ky
99,544.—MACHINE FOR EMBOSSING HATS.—Rudolph Eickemeyer, Yonkers, N. Y.
99,545.—RAILWAY CAR BRAKE.—D. M. Elder, Monmouth, Ill.
99,546.—VELOCIPEDE.—G. D. Emerson, Calumet, Mich.
99,547.—RAILWAY CAR WHEEL.—John N. Farrar, Pepperell, Mass., assignor to himself and G. E. Brown, South River, N. J.
99,548.—TURBINE WATER-WHEEL.—J. J. Faulkner, McMinnville, Tenn.
99,549.—WASHING MACHINE.—B. F. Fellman, Sellersville, Pa.
99,550.—FRUIT JAR.—A. E. Fife, Rochester, N. Y.
99,551.—PRINTING PRESS.—Merritt Gally (assignor to Allen Carpenter), Rochester, N. Y.
99,552.—WASHER AND WRINGER.—D'Alembert T. Gale, Poughkeepsie, N. Y.
99,553.—TRUNK LOCK.—E. L. Gaylord, Terryville, Conn.
99,554.—GAS-PRODUCING FURNACE.—Wm. Gerhardt, New York city, assignor to himself, Thos. Daffin, and Thos. Banes, Philadelphia, Pa.
99,555.—HORSE POWER.—C. H. Gifford, Potsdam Junction, N. Y.
99,556.—FASTENING STOVE-DOOR LINING.—Henry G. Giles, Troy, N. Y. Antedated Feb. 5, 1870.
99,557.—GUN WIPER.—C. F. Gillette, Sparta, Wis.
99,558.—VEHICLE SPRING.—John Goller, Los Angelos, Cal.
99,559.—NOSE-RING FOR HOGS.—O. P. Goodman, Chillicothe, Ohio.
99,560.—CORN-STALK CUTTING KNIFE.—Geo. D. Goodsell and N. E. Babcock, Rockford, Ill.
99,561.—SCIENTIFIC PLAYING CARDS.—Caleb Goodwin, Chicago, Ill.
99,562.—RAILWAY CAR COUPLING.—Robt. Green, Boonton, N.J.
99,563.—MODE OF CONNECTING PITMEN TO CUTTER BARS.—Wm. Green, Ashland, Ohio.
99,564.—VENTILATING MILLSTONES.—Amos Grube, West Hempfield township, Pa.
99,565.—DOOR FOR CANNON STOVE.—Conrad Harris and Paul W. Zoiner, Cincinnati, Ohio.
99,566.—ANTI-FRICTION JOURNAL BEARING.—R. G. Hatfield. New York city.
99,567.—VELOCIPEDE.—G. L. Haussknecht, Brooklyn, N. Y Antedated Aug. 27, 1869.
99,568.—SHEET-MUSIC TURNER AND HOLDER.—F. J. Herpers and M. M. Sommer, Newark, N. J.
99,569.—WATER-WHEEL.—G. A. Houston, Beloit, Wis.
99,570.—FURNACE.—Joseph B. Hoyt, Stamford, Conn.
99,571.—APPARATUS FOR SEPARATING GOLD AND SILVER FROM PULVERIZED QUARTZ.—E. A. Hyde, Ann Arbor, Mich.
99,572.—METHOD OF ATTACHING FLOAT AND SINKER TO FISHING LINES.—James Ingram, Troy, N. Y.
99,573.—FEED-WATER HEATER FOR STEAM GENERATORS.—E. B. Johnson, Chicago, Ill.
99,574.—WORKING SCRAP AND OTHER IRON.—G. W. Jones, Ormsby, Pa.
99,575.—POTATO DIGGER.—G. W. Knight, Camden, N. J.
99,576.—OPERA CHAIR.—Bernhard Koechling, New York city.
99,577.—KEY.—Joseph Linder, Seneca Falls, N. Y.
99,578.—HOISTING MACHINE.—Matthew Lynch, New York city.
99,579.—FENDER FOR FIREPLACE STOVE.—John Martino, Philadelphia, Pa.
99,580.—FENDER FOR FIREPLACE STOVE.—John Martino, Philadelphia, Pa.
99,581.—FIREPLACE GRATE.—G. H. McElevey, New Castle, Pa.
99,582.—GRATE BAR.—Wm. McMonnies, Brooklyn, N. Y.
99,583.—MEDICINE FOR CURE OF FEVER AND AGUE.—Jacob Hamton Morris, Eaton, Ohio.
99,584.—GRATE.—Howell Mulford, Philadelphia, Pa.
99,585.—HOT-AIR FURNACE.—Edmund D. Norcross, Augusta, Me.
99,586.—LOOM.—John R. Norfolk, Salem, Mass.
99,587.—RAILWAY RAIL FASTENING.—William Palliser, of the Army and Navy Club, Pall Mall, England, assignor to Joseph Valentine Smedley.
99,588.—MANUFACTURE OF IRON AND GRANULATING THE SAME.—Wm. H. Perry, Sharon, Pa.
99,589.—HAY GATHERER.—W. E. Phelps, Elmwood, Ill.
99,590.—BASE-BURNING STOVE.—J. A. Price, Scranton, Pa.
99,591.—HORSE POWER.—James M. Rand, Chicago, Ill.
99,592.—GROOVING MACHINE FOR SHEET-METAL.—Charles H. Raymond, Southington, Conn.
99,593.—PIN FOR ARTIFICIAL TEETH.—Hiram M. Raynor, New York city.
99,594.—CLOTHES WASHER AND DRYER.—Edwin Rees, Stoddartville, Pa.
99,595.—MODE OF SPLITTING ROCK.—John Robb, New York city.
99,596.—SAW FRAME.—Thomas H. Rollins, Detroit, Me.
99,597.—SUSPENSION BRIDGE.—Jarvis Royal, White Rock, Ill.
99,598.—DENTAL ARTICULATOR.—George F. Schaffer, New York city.
99,599.—PLANING MACHINE.—John B. Schenck, Matteawan, N. Y.
99,600.—SAWING MACHINE.—J. B. Schenck, Matteawan, N.Y.
99,601.—CARRIAGE STOP.—William Schoch, Plumsteadville, Pa.
99,602.—STEAM ENGINE.—Peter Shellenback, Middletown, Ohio, and John Harton, Seymour, Ind.
99,603.—MOP AND SCRUBBER HEAD.—E. H. Shoemaker and Samuel McCleery, Franklin county, Ohio.
99,604.—BOOT PATTERN.—Elias Shopbell, Ashland, Ohio.
99,605.—NEEDLE WRAPPER.—Alfred Shrimpton, Redditch, England.
99,606.—ROTARY PROVISION SAFE.—Austin Sly and Samuel S. Ford, Lebanon, N. H.
99,607.—CARRIAGE AXLE BOX.—Alfred E. Smith, Bronxville, N. Y.
99,608.—LAUNDRY BENCH.—Albert H. Spencer, Providence, R. I.
99,609.—SADIRON HEATER.—Ferdinand Stadler, Philadelphia, Pa.
99,610.—COMPOSITION OR FILLING FOR COACH PAINTERS.—John W. Tully, Delano, Pa.
99,611.—MECHANICAL MOVEMENT.—James C. Vancleave, Hamburg, Arkansas.
99,612.—CHURN.—Richard P. Wells (assignor to himself and John P. Comly), Dayton, Ohio.
99,613.—COOKING STOVE.—Alexander White (assignor to himself, Alexander H. Hammond, and Isaac D. Ruggles), Geneseo, Ill.
99,614.—CURRENT WHEEL.—Eugene A. White, Boston, Mass.
99,615.—MANUFACTURE OF YEAST FOR DISTILLERS.—Joseph Wolff, Lexington, Ky.
99,616.—FARE BOX FOR STREET CARS.—W. W. Wormood (assignor to himself and C. Hathaway), Dubuque, Iowa.
99,617.—GRAIN PLATFORM FOR HARVESTERS.—John P. Adriance and Thomas S. Brown, Poughkeepsie, N. Y.
99,618.—COMPOSITION FOR PREPARING WOOD FOR PAINTING.—John Babcock, Cambridgeport, Mass.

99,619.—Necktie.—John Bachelder, Norwich, Conn.
99,620.—Hasp Fastening for Fruit Crates.—Francis R. Baird, Norfolk, Va.
99,621.—Step Ladder.—John H. Balsley, Dayton, Ohio.
99,622.—Bracket Hinge for Ladders.—John H. Balsley, Dayton, Ohio.
99,623.—Chain Shackle. — Elijah Bangs, Provincetown, Mass.
99,624.—Manufacture of Steel.—Julius Baur, New York city.
99,625.—Cultivator.—Daniel G. Benner, Holmesville, Ohio.
99,626.—Vise Clamp.—Bror Folke Bergh, Boston, Mass.
99,627.—Packing for Steam Engines, Pumps, etc.—Wm. Beschke, Philadelphia, Pa.
99,628.—Preserving Fruits, Vegetables, etc.—Lyman Bradley and Thomas D. Phillips (assignors to themselves, and A. D. Denny), Buffalo, N. Y.
99,629.—Aerial Ship.—Martin Baun, Cape Vincent, N. Y.
99,630.—Amalgamator.—John C. Brewster, New York city.
99,631.—Base for Summer Piece and Grate Frame.—Andrew Brown and Wm. Patterson, Brooklyn, E. D., N. Y.
99,632.—Railway Car Coupling.—Leopold F. Buschmann, New York city.
99,633.—Corset Fastening.—Wm. B. Cargill, Waterbury, Conn.
99,634.—Belt Tightener.—M. C. Chamberlin and A. Clawson, Plain View, Minn. Antedated January 29, 1870.
99,635.—Fountain Pen.—Richard H. Chinn, Washington, D. C.
99,636.—Bed Bottom.—I. A. Clippinger and Samuel S. Pratt, Newton, Iowa. Antedated January 28, 1870.
99,637.—Treating Argillaceous Limestones to Obtain Hydraulic Cement, etc.—François Coignet, Paris, France, assignor to "Coignet Agglomerate Company of United States," New York city.
99,638.—Machine for Bending Rake Teeth.—Columbus Coleman, Allegheny City, Pa.
99,639.—Rudder for Vessels. — Stephen G. Coleman, Providence, R. I.
99,640.—Grate Bar.—Henry Collinson, Dorchester, assignor to himself and N. M. Hasen, Andover, Mass.
99,641.—Machine for Combing Cotton, etc.—Hezekiah Conant, Providence county, R. I.
99,642.—Furnace Grate Bar.—Jonathan Cone and William K. Kelly, Bristol, Pa.
99,643.—Horse Hay Rake.—John H. Cook (assignor to Hagerstown Agricultural Implement Manufacturing Company), Hagerstown, Md.
99,644.—Toy.—C. L. Combs, Washington, D. C.
99,645.—Oven.—Alexander Crumbie, Jersey City, N. J.
99,646.—Fire Plug.—Jas. Curran, Baltimore, Md.
99,647.—Knitting-machine Needle.—J. F. Daniels, Lake Village, N. H.
99,648.—Mop and Rubber Scrubber.—B. C. Davis (assignor of one third to W. M. De Long, and one third to W. F. Mills), Binghamton, N. Y.
99,649.—Bib Cock.—J. H. Davis, Allegheny City, Pa.
99,650.—Angle-valve Cock.—J. H. Davis, Allegheny City, Pa.
99,651.—Globe-valve Cock.—J. H. Davis, Allegheny City, Pa.
99,652.—Check-valve Cock.—J. H. Davis, Allegheny City, Pa.
99,653.—Valve Cocks made of Cast Iron and Subsequently Annealed.—J. H. Davis, Allegheny City, Pa.
99,654.—Machine for Making Paper Twine.—R. V. De Guinon, South Bergen, N. J.
99,655.—Piano.—A. F. Dessau, Washington, D. C.
99,656.—Sheet-metal Roofing.—Joseph Diehl, Clayton, Pa.
99,657.—Shaft Coupling.—C. F. Du Vall, Milwaukee, Wis. Antedated Feb. 5, 1870.
99,658.—Brick Machine.—Thomas Ellis and W. A. Ellis, Philadelphia, Pa.
99,659.—Sectional Fly Wheel.—H. L. Farr (assignor to C. A. Greenleaf, J. L. Mothershead and Edwin J. Peck), Indianapolis, Ind.
99,660.—Machine for measuring Horses for Collars.—W. H. Flynn, Somerville, Mass., assignor to himself, T. J. McCormick, and E. P. Edstrom, Jr.
99,661.—Writing Slate.—J. H. French, Albany, N. Y.
99,662.—Fruit Jar.—Wm. Galloway, Philadelphia, Pa.
99,663.—Atmospheric Transportation. — R. H. Gilbert, Washington, D. C.
99,664.—Corset.—T. S. Gilbert, Birmingham, Conn.
99,665.—Exploding Compressed Powder.—Edwin Gomez, New York city.
99,666.—Metallic Cartridge.—Edwin Gomez, New York city.
99,667.—Turntable.—Clemments A. Greenleaf, Indianapolis, Ind.
99,668.—Towel Dryer.—Selim Elijah Grout, West Concord, Vt.
99,669.—Spring Power.—A. C. Hallam and J. W. McKee, Brooklyn, E. D., N. Y.
99,670.—Knitting Machine.—H. V. Hartz and Julius Feiss, Cleveland, Ohio.
99,671.—Shipping and Unshipping Hooks.—Noah Havermale, Canton, Ill.
99,672.—Writing Desk. — William Hoter, New Haven, Conn.
99,673.—Apparatus for Drying Fish and other Substances.—William J. Hooper, Theodore Hooper, and Orazio Lugo, Baltimore, Md.
99,674.—Twisting Tube for Spinning.—C. D. House, Lake Village, assignor to O. G. Neal, Laconia, and J. F. Adams, Manchester, N. H.
99,675.—Extensible Advertising Frame.—D. G. Howell, Danby, N. Y.
99,676.—Washboard.—J. H. Hubbell, West Salem, Ohio.
99,677.—Smelting and Refining Iron.—W. W. Hubbell, Philadelphia, Pa.
99,678.—Railway Car Brake.—E. N. Huntsman (assignor to himself, W. M. Clancy, L. L. Miller, and J. T. Blair), Allegheny, Pa. Antedated Jan. 31, 1870.
99,679.—Elevated Railway.—W. Hyde (assignor to himself and W. Townsend), New York city.
99,680.—Double-acting Pump.—William H. Ivens, Trenton, N. J.
99,681.—Double-cylinder Force Pump.—Wm. H. Ivens, Trenton, N. J.
99,682.—Machine for Molding, Rounding, Channeling, and Stamping Soles of Boots and Shoes.—Albert Jeffers, Lynn, Mass.
99,683.—Method of Forming Teeth on Rollers.—Asa Johnson, Brooklyn, N. Y.
99,684.—Machinery for Corrugating and Molding Sheet Metal.—Asa Johnson, Brooklyn, N. Y., assignor to himself and W. H. Johnson, New York city.
99,685.—Power Washing Machine.—Jose Johnson, New York city, assignor to himself and Joseph W. Oakman, Brooklyn, N. Y.
99,686.—Cross-head Shifter.—Charles R. Joyce, Alexandria, Va.
99,687.—Machine for Spreading Tobacco Leaves.—M. M. Kinck (assignor to himself and Herman Glafcke), Hartford, Conn.
99,688.—Vapor Burner.—J. C. Love, Philadelphia, Pa.
99,689.—Vapor Burner.—J. C. Love, Philadelphia, Pa.
99,690.—Cartridge Shell Extractor.—J. M. Marlin, Hartford, Conn.
99,691.—Carriage Wheel.—R. W. McClelland, Springfield, Ill.
99,692.—Register Air Flue.—Wm. L. McDowel, Philadelphia, Pa.
99,693.—Revolving Fire-arms.—John C. Miller, Danville, Ky.
99,694.—Oven.—Daniel Moore, Davenport, Iowa.
99,695.—Harvester Cutter.—C. K. Myers, Pekin, assignor for one-half to Horace Terrell, Tazewell county, Ill.
99,696.—Wood-turning Lathe.—N. Norris, C. S. Black, and R. S. Black, Buchanan, Mich.
99,697.—Stove Leg.—W. R. Oatley, Rochester, N. Y.
99,698.—Caliper.—T. C. Page and G. W. Hadley, Chicopee, Mass.
99,699.—Machine for Picking Cotton and other Waste.—G. F. Palmer, Rochester, N. H.
99,700.—Hat-sizing Machine.—Augustus Pelisse and Francis Degan, Newark, N. J.
99,701.—Knife Guard.—Dan Perry, North Providence, R. I.
99,702.—Device for Securing Shovels and Plowshares to Standards.—Joshua Pierpont (assignor to himself and S. S. Tuttle), La Harpe, Ill.
99,703.—Truss.—Daniel Pomeroy, New York city, and Wm. Pomeroy, Brooklyn, N. Y.
99,704.—Sewing Machine.—Alonzo Porter (assignor to himself, E. O. Marshall, and S. R. Young), Rochester, N. Y.
99,705.—Hammer.—J. P. Radley, Albany, N. Y.
99,706.—Scaffold and Ladder.—J. E. Ranch, Selin's Grove, Pa.
99,707.—Flanging Apparatus.—Edward Regan, Indianapolis, Ind.
99,708.—Stringing and Tuning Pianofortes.—William J. Richards, Ferdinand M. Sofge, and Joseph H. Richards, La Fayette, Ind.
99,709.—Splint for Fracture of Clavicle, etc.—Haynes L. Richardson (assignor to Wm. Pomeroy, Daniel Pomeroy, and J. R. Pomeroy), New York city.
99,710.—Machine for Tarring Paper for Roofing, etc. —John Roberts, Waltham, Mass., assignor to himself, C. Hart Smith, Baltimore, Md., and Levi Wilcutt, Boston, Mass.
99,711.—Journal Box.—J. T. Robinett (assignor to himself, Wm. Mahone, and J. P. Minetree), Petersburgh, Va.
99,712.—Casting Augur Gate Hinge.—Benoit Roux (assignor to M. Greenwood & Co.), Cincinnati, Ohio.
99,713.—Fish Net.—P. G. Sabins, Westport, assignor to himself and W. H. Pierce, Fall River, Mass.
99,714.—Stop Cock.—Joseph Seeberger, Troy, N. Y.
99,715.—Hose Coupling.—George Sewell, Brooklyn, N. Y.
99,716.—Molding Cutter.—T. J. Shannon (assignor to himself and J. L. Haven & Co.), Lawrenceburg, Ind.
99,717.—Lifting Jack.—Amenzo Shaver, Warnerville, N. Y.
99,718.—Toast Rack.—Daniel Sherwood (assignor to Woods, Sherwood & Co.), Lowell, Mass.
99,719.—Harrow.—Henry Shirk and Cyrus Shirk, Lebanon, Pa.
99,720.—Churn.—J. W. X. Smith, Independence, Iowa.
99,721.—Cartridge.—W. H. Smith, Charlestown, Mass.
99,722.—Device for Ventilating, Cooling or Warming Beds.—D. E. Somes, Washington, D. C.
99,723.—Locomotive Tender Loader.—A. H. Spencer, Providence, R. I.
99,724.—Button Fastener for Shoes.—C. F. Spencer, Rochester, N. Y.
99,725.—Water Cooler.—J. H. Stone, Philadelphia, Pa.
99,726.—Fender for Fireplace Heaters.—David Stuart and Lewis Bridge (assignors to Stuart, Peterson & Co.), Philadelphia, Pa. Antedated Aug. 9, 1869.
99,727.—Automatic Water Cut-off.—D. F. Sweet (assignor to himself and L. A. Leighton), Osetgo, Mich.
99,728.—Process of Treating Petroleum.—J. A. Tatro, Hartford, Conn.
99,729.—Nut for Screw Bolts.—N. Thompson, Brooklyn, N. Y.
99,730.—Draft Bar for Horse Cars.—Joseph Trent, Millerton, N. Y.
99,731.—Clip for Harness.—Charles M. Tripp, Pittsburgh, Pa.
99,732.—Street Railway Car.—M. P. Turner, Des Moines, Iowa.
99,733.—Expelling Volatile Matter from Peat and other Materials.—T. G. Walker, New York city.
99,734.—Water Elevator.—B. Wieland, Oneco, Ill., and D. S. Young, Monroe, Wis.
99,735.—Cleansing Paper when Reduced to Pulp from Coloring Matters.—S. W. Wilder, Lawrence, Mass.
99,736.—Safety Box for Bank Porters.—Wm. Wiler (assignor to himself and Lucien Moss), Philadelphia, Pa.
99,737.—Apparatus for Transmitting Power.—Blasius Williams, Jefferson, Texas.
99,738.—Artificial Fuel.—Henry Wurtz (assignor to J. L. Graham), New York city.
99,739.—Composition for Molding Picture Frames, etc. —Henry Wurtz (assignor to himself and James L. Graham), New York city.
99,740.—Preparing Anhydrous Grahamite.—H. Wurtz (assignor to J. L. Graham), New York city.
99,741.—Chemical Product called Fused or Anhydrous Grahamite.—Henry Wurtz (assignor to J. L. Graham), New York city.
99,742.—Universal Joint.— Anton Zwiebel, Burlington, Wis.
99,743.—Sewing Machine.—W. T. Smith, West Zanesville, Ohio, assignor to himself and W. T. Maher.

REISSUES.

3,821.—Corn Popper.—J. H. Bigelow, Worcester, Mass.—Patent No. 93,271, dated Aug. 3, 1869.
3,822.—Horseshoe.—G. T. Chapman, New York city.—Patent No. 74,892, dated Feb. 25, 1868.
3,823.—Stop Valve.—J. H. Davis, Allegheny City, Pa.—Patent No. 85,288, dated Dec. 29, 1868.
3,824.—Cement Water Pipe.—Edwin Dayton, Meriden, Conn.—Patent No. 77,465, dated May 5, 1868.
3,825.—Sewing Machine.—G. L. Dulaney, Mechanicsburg, Pa.—Patent No. 37,617, dated Feb. 10, 1863.
3,826.—Reflector.—Division A.—I. P. Frink, New York city. Patent No. 1,249, dated April 17, 1860.
3,827.—Reflector.—Division B.—I. P. Frink, New York city. —Patent No. 1,249, dated April 17, 1860.
3,828.—Pneumatic Pump.—W. H. Guild, Williamsburg, N. Y.—Patent No. 51,175, dated Nov. 28, 1865.
3,829.—Branch Stop Cock for Mains.—R. A. Hill, Washington, D. C., for himself and H. C. Lane, assignee of R. A. Hill.—Patent No. 90,541, dated May 25, 1869.
3,830.—Machine for Grinding and Pressing Apples, Grapes, etc.—C. B. Hutchinson, Auburn, N. Y.—Patent No. 37,679, dated Feb. 3, 1863.
3,831.—Cotton-Seed Hullers.—Pierre P. J. Martin, Paris, France.—Patent No. 29,393, dated July 31, 1860.
3,832.—Dentists' Tool Rack.—I. A. Salmon, Boston, Mass. —Patent No. 62,368, dated Feb. 26, 1867.
3,833.—Metallic Cartridge.—Rollin White, Lowell, Mass. —Patent No. 33,805, dated Nov. 26, 1861.

DESIGNS.

3,837 and 3,838.—Carpet Patterns.—Jonathan Crabtree (assignor to Wm. Hogg, Jr.), Philadelphia, Pa. Two Patents.
3,839.—Metal Can.—Horace Everett, Philadelphia, Pa.
3,840.—Bread Toaster.—Samuel Fawcett and H. R. Corkhill, Rochester, N. Y.
3,841.—Equestrian Statuette. — Nicholas Muller, New York city.
3,842.—Baptismal Font.—Daniel C. Ripley, Birmingham, Pa.
3,843.—Group of Statuary. — John Rogers, New York city.
3,844.—Pair of Gate Hinges.—Benoit Roux (assignor to M. Greenwood & Co.), Cincinnati, Ohio.
3,845.—Satchel Fastening.—George Sieben (assignor to J. H. White), Newark, N. J.

APPLICATIONS FOR EXTENSION OF PATENTS.

Sheep Shears.—Robert M. Wilder, of Coldwater, Mich., has applied for an extension of the above patent. Day of hearing April 20, 1870.

Construction of Artificial Legs.—William Selpho, New York city, has petitioned for an extension of the above patent. Day of hearing April 20, 1870.

Hand Saws.—Jackson Gorham, Bairdstown, Georgia, has petitioned for the extension of the above patent. Day of hearing April 27, 1870.

Making Brass Kettles. — Frederick J. Seymour, Jr., Wolcottville, Conn., has applied for an extension of the above patent. Day of hearing April 27, 1870.

Method of Securing Types on Rotary Beds.—Richard M. Hoe, New York city, has petitioned for an extension of the above patent. Day of hearing July 20, 1870.

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