SCIENTIFIC AMERICAN

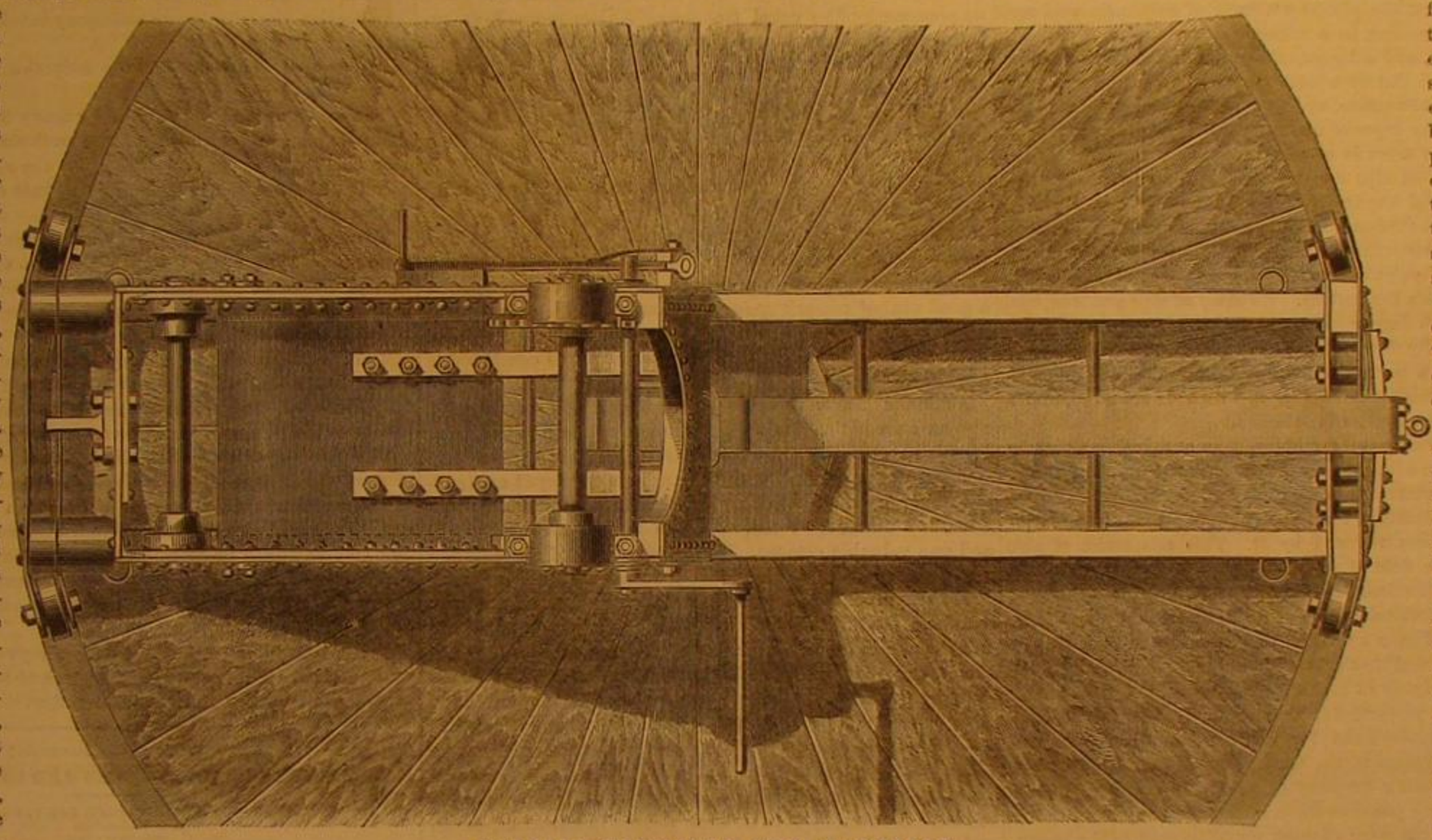
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

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.

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.



CAPTAIN ERICSSON'S GUN CARRIAGE.

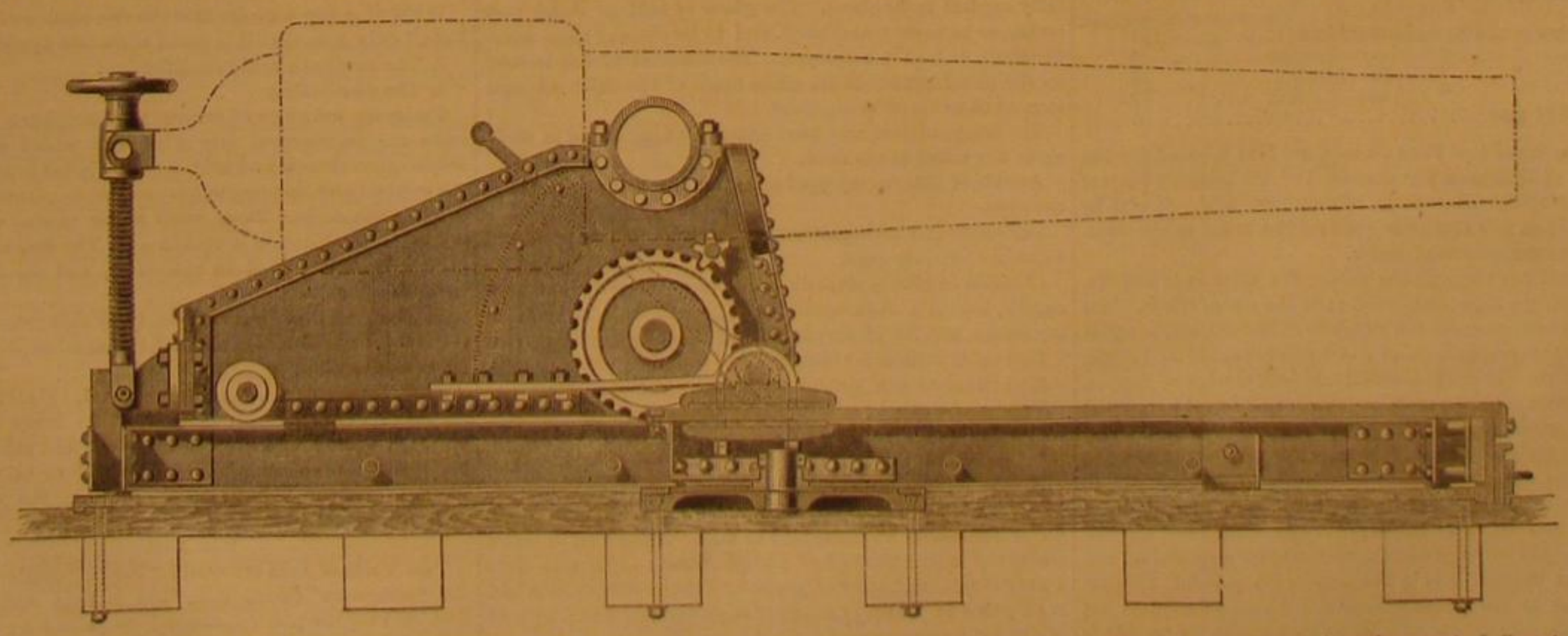
By referring to the engravings it will be seen that even when the gun is run full out, the center of the trunnion will be in the rear of the bent plate which hooks the deck ring; and that a diagonal line drawn from the point of contact between the said plate and the ring to the center of the trunnion, 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 brecching, 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 1¼ 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 without 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 galvanising 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 at 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 dying 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.

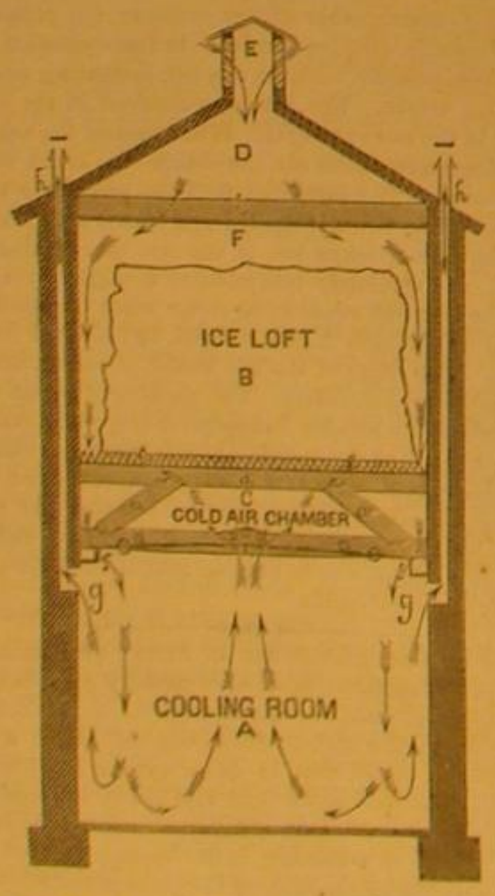
5. Preserve considerable space about the body of the ice, and ventilate the same; that no water should be allowed to stand around or below it, is a matter of course.

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



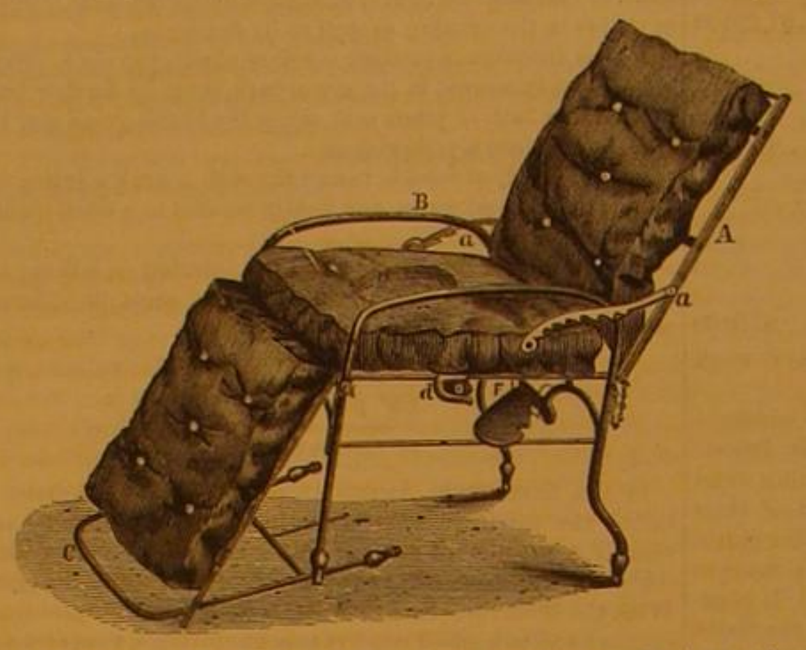
the air to pass in finely-divided currents from space D into F. On the top of the roof is the injecting ventilator, E, and in the walls are flues terminating into ejecting ventilators, *h*. The movements of the air will naturally be as indicated by the arrows. The warmer air in A will rise, and ascend 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.

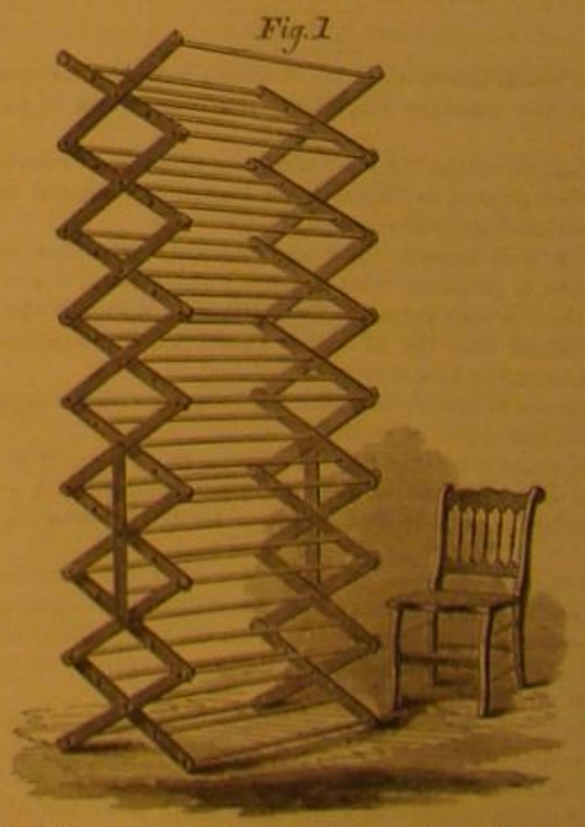
In a temperate climate it is left to cool and set spontaneously; but in a hot climate an artificial process of refrigeration is required. By this the carcass is reduced to about 50 degrees Fahrenheit; and it is then placed in an air-tight chamber, into which an atmosphere of mixed carbonic oxide and 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.

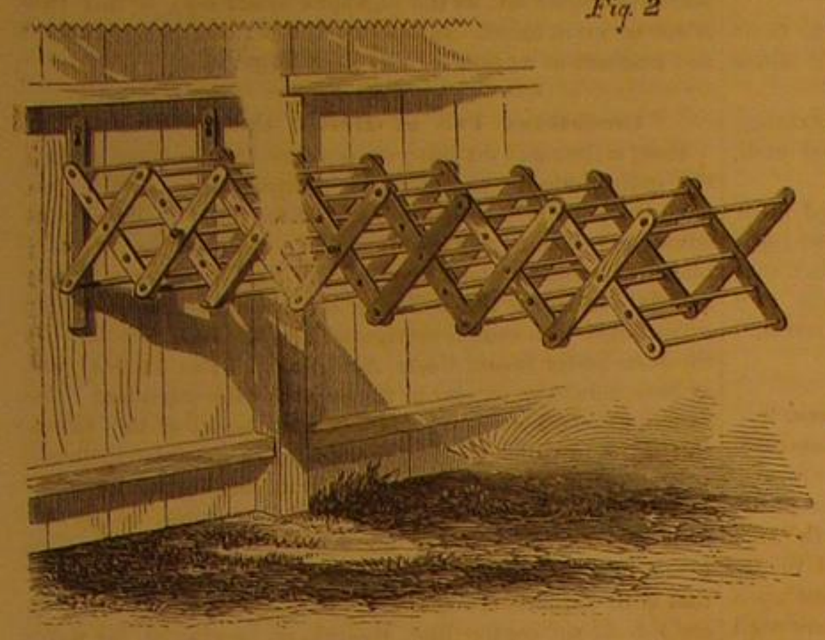
When standing on the floor it is kept extended by rectangular bars engaging with the transverse bars of the device. This form of the invention is shown in Fig. 1.

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.

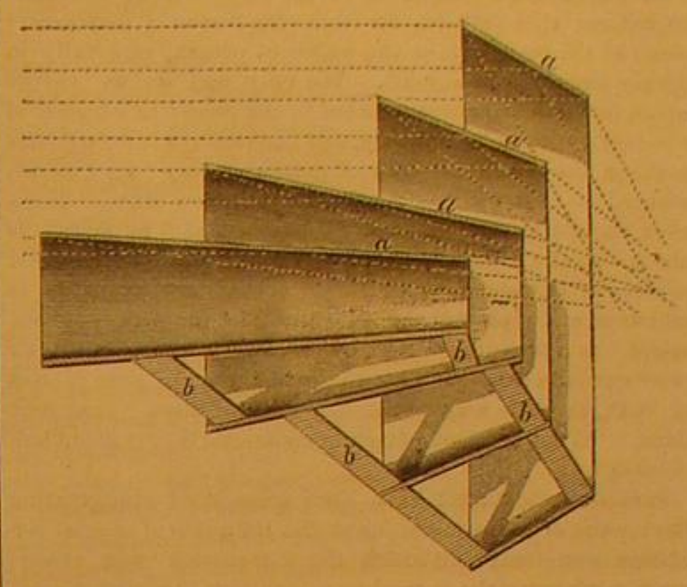
L. L. HEPBURN.

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 philosphically 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 pass ing 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 3¾ 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 chang ng 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. 1

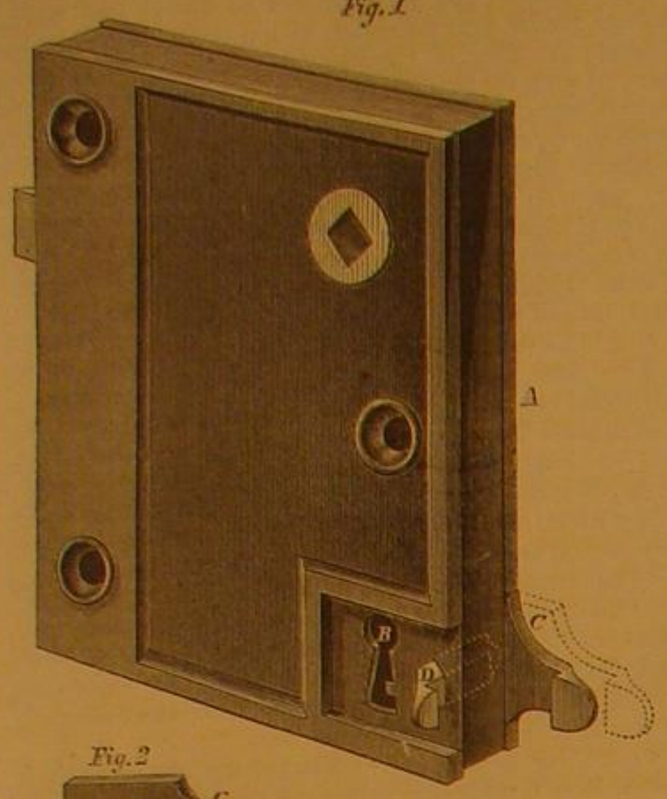


Fig. 2

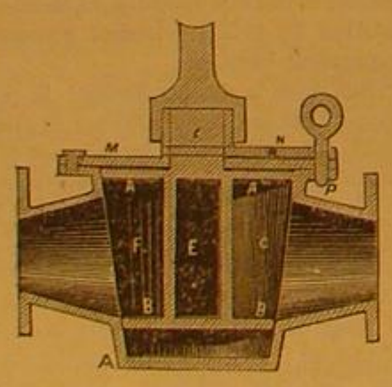
On each side of the lock a recess is made which incloses the key-hole, and is sufficiently deep to receive the full thickness of the guard. The sliding reversible catch plays in a dovetailed recess or channel, made across the edge of the lock from one recess to the opposite one as shown. The point of 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.

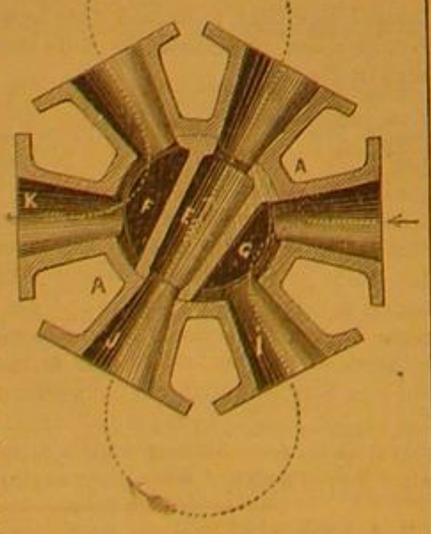
By these means all tampering with the lock from the outside is effectually prevented.

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.



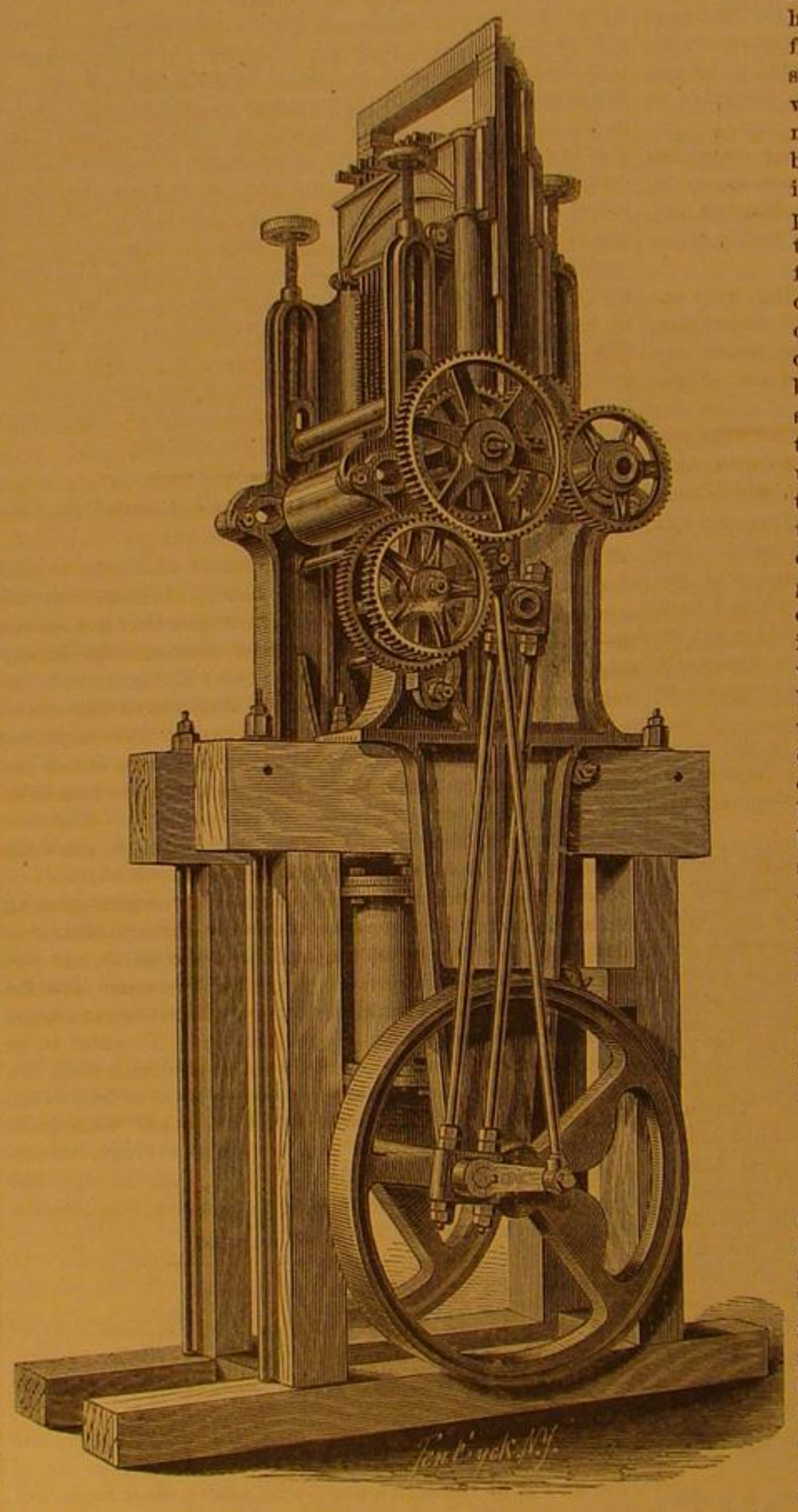


The plug is composed of top and bottom disks or plates, as before mentioned, which are connected by vertical division plates to form, as it were, three passages when the plug is in the barrel, one of the passages being between the plates so as to lead the gas direct through the body, while the other 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.

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

☞ "The American News Company," Agents, 121 Nassau street, New York.

☞ "The New York News Company," 8 Spruce street.

☞ Messrs. Sampson, Low, Son & Marston, Crown Building 188 Fleet st., Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.

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

NEW YORK, SATURDAY, FEBRUARY, 19, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

Carriages and Slides of the Spanish Gunboats designed by Capt Ericsson.....119
On the Uses of Zinc.....120
Manufacture of Cotton Seed and Cotton Seed Oil.....120
Aniline Green for Wool.....121
A Case of Spontaneous Combustion.....121
On Ox Gall.....121
Ambrosine—A New Organic Mineral Substance.....121
*Preservation of Ice.....122
*Improved Bedstead and Mattrass for Invalids.....122
The Preservation of Meat.....122
*Improved Clothes Dryer.....123
Use of Small Turbines.....123
Muzzle vs. Breech-Loading Guns for Sporting Use.....123
Concentration of Solar Heat for Motive Power.....123
Two Driving Wheels vs. one for Harvesters.....123
Chemical Fertilizers.....124
Cause of Strikes.....124
Green Wood as Fuel for Steam Engines.....124
Invention Wanted.....124
Girding Fruit Trees.....124
Incautious Use of Boiler Compositions.....124
More about Nitu.....125
Linseed Oil and its Preparation for Printers' use.....125
Observations on Sound in the Lake Tunnel at Chicago.....125
Oiling Brown Stone.....125
The Hydrostatic Test for Steam Boilers.....125
*The Beton Agglomere.....
*Improvement in Key-Hole Guards.....126
Six way Tap for Gas and Water..
*Perry's Improved Gang Saw-Mill.....126
Rheumatism.....126
Wickersham's American Oil Feeders.....126
Proposed Modification of the Patent Laws—An attempt to Break down the Right of Appeal.....127
Pneumatic Tunnel under Broadway, New York.....127
Official Report of Prof. Chandler to the Board of Health on the New York Gas Cos.....127
Bent, Stained, and Ornamental Window Glass.....128
What is Chemistry?.....128
Curious Ice Formations.....129
Award of Cash Prizes.....129
Food for Trout in Fish Ponds.....130
New Books and Publications.....130
Recent American and Foreign Patents.....130
Answers to Correspondents.....131
List of Patents.....131
Applications for the Extension of Patents.....131

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, to 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 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 carniverous—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 Angelos, 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 action, 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 ARTICTLATOR.—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 oreed 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 direction 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 advertisemets 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 25 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 further 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.

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

American Boiler Powder—A safe, sure, and cheap remedy for scale. Send for circular to Am. B. P. Co., P. O., Box 315, Pittsburgh, Pa.

Steam Crane Cars, or Derrick Cars, wanted by Baltimore Bridge Co., 49 Lexington st., Baltimore, Md.

For fire brick, fire clay, furnace tile, glass pots, stove linings, sewer pipe, drain tile, garden vases, pedestals, hydraulic cement, plaster of Paris, etc. Address D. R. Ecker, No. 18 Smithfield st., Pittsburgh, Pa.

Spools of all kinds, and spiral shade tassel molds made by H. H. Frary, Jonesville, Vt.

Automatic 10-spindle drill, 5,000 to 20,000 holes per day in castors, etc. Tin Presses and Dies for cans. Ferracute Machine Works, Bridgeton, N. J.

A young man who has studied surveying, wants employment, by a surveying or engineering party. Address J.C. Burruss, Carrollton, Ill.

Notice to bridge, car, and ship builders.—For sale at a great sacrifice, a Daniels Planer, will plane 60 feet. Address M. F. Ackley, No. 1,303 S. 13th st., Philadelphia, Pa.

Design for steam plow, 50c. Address Geo. Ray, Philadelphia.

For first-class 15-in. swing screw-cutting engine lathes, drill lathes, etc., address Star Tool Co., Providence, R. I.

Tempering steel—new and imp'd process—for springs, cutlery, etc. Saves labor and produces a better article. Address J. F. Dubber, 72 Beekman st., New York.

See advertisement of Thomas' Lathes in another column.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

Right for Sale.—Best thing out. Self-governing action and re-action water wheel. Will vent large or small volume of water. Address Wm. E. Hill, Erie, Pa.

80 acres, having a 50-horse water-power in one of the best counties of Iowa, for sale by D. C. Baker, Ottawa, Ill.

For Hub-mortising Machines, address Exeter Machine Works, Exeter, N. H.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

G. W. Lord's Boiler Powder, 107 W. Girard ave. Phila, Pa., for the removal of scale in steam boilers is reliable. We sell on condition.

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

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

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

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

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

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

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

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

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

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

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

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING FEB. 8, 1870.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1

The full Specification of any patent issued since Nov. 30, 1866, at which time the Patent Office commenced printing them ..... $1·25

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York

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, Mc.

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, Plumstead-ville, Pa.

99,602.—STEAM ENGINE.—Peter Shellenback, Middletown, Ohio, and John Barton, 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. Raggles), 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. Hazen, 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 Hofer, 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 to himself, W. M. Claney, I. 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. Klack (assignor to himself and Herman Glafeke), 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 Tarrell, Tazewell county, Ill.
99,696.—WOOD-TURNING LATHE.—N. Norris, C. S. Black, and H. 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. G. 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 Willcut, 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. 33,895, 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.

U. S. Patent Office.

How to Obtain Letters Patent
FOR
NEW INVENTIONS.

Information about Caveats, Extensions, Interferences, Designs, Trade Marks; also, Foreign Patents.

For a period of nearly twenty-five years, MUNN & CO. have occupied the position of leading Solicitors of American and European Patents, and during this extended experience of nearly a quarter of a century, they have examined not less than fifty thousand alleged new inventions, and have prosecuted upward of thirty thousand applications for patents, and, in addition to this, they have made, at the Patent Office, over twenty thousand preliminary examinations into the novelty of inventions, with a careful report on the same.

The important advantages of MUNN & CO.'S Agency are, that their practice has been ten-fold greater than that of any other Agency in existence, with the additional advantage of having the assistance of the best professional skill in every department, and a Branch Office at Washington, which watches and supervises, when necessary, cases as they pass through official examination.

CONSULTATIONS AND OPINIONS FREE.

Those who have made inventions and desire a consultation are cordially invited to advise with MUNN & CO. who will be happy to see them in person at the office, or to advise them by letter. In all cases, they may expect an HONEST OPINION. For such consultations, opinion, and advice, NO CHARGE is made. A pen-and-ink sketch and a description of the invention should be sent.

TO APPLY FOR A PATENT,

A model must be furnished, not over a foot in any dimension. Send model to MUNN & CO., 37 Park Row, New York, by express, charges paid, also, a description of the improvement, and remit $16 to cover first Government fee, and revenue and postage stamps.

The model should be neatly made, of any suitable materials, strongly fastened, without glue, and neatly painted. The name of the inventor should be engraved or painted upon it. When the invention consists of an improvement upon some other machine, a full working model of the whole machine will not be necessary. But the model must be sufficiently perfect to show with clearness the nature and operation of the improvement.

PRELIMINARY EXAMINATION

Is made into the patentability of an invention by persons search at the Patent Office, among the models of the patents pertaining to the class to which the improvement relates. For this special search, and a report in writing, a fee of $5 is charged. This search is made by a corps of examiners of long experience.

Inventors who employ us are not required to incur the cost of a preliminary examination. But it is advised in doubtful cases.

COST OF APPLICATIONS.

When the model is received, and first Government fee paid, the drawings and specification are carefully prepared and forwarded to the applicant for his signature and oath, at which time the agency fee is called for. This fee is generally not over $25. The cases are exceptionally complex if a higher fee than $25 is called for, and, upon the return of the papers, they are filed at the Patent Office to await Official examination. If the case should be rejected for any cause, or objections made to a claim, the reasons are inquired into and communicated to the applicant, with sketches and explanations of the references; and should it appear that the reasons given are insufficient, the claims are prosecuted immediately, and the rejection set aside, and usually

Without Extra Charge to the Applicant.

MUNN & CO. are determined to place within the reach of those who confide to them their business, the best facilities and the highest professional skill and experience.

The only cases of this character, in which MUNN & CO. expect an extra fee, are those wherein appeals are taken from the decision of the Examiner after a second rejection; and MUNN & CO. wish to state very distinctly, that they have but few cases which can not be settled without the necessity of an appeal; and before an appeal is taken, in any case, the applicant is fully advised of all facts and charges, and no proceedings are had without his sanction; so that all inventors who employ MUNN & CO. know in advance what their applications and patents are to cost.

MUNN & CO. make no charge for prosecuting the rejected claims of their own clients before the Examiners and when their patents are granted, the invention is noticed editorially in the SCIENTIFIC AMERICAN.

REJECTED CASES.

MUNN & CO. give very special attention to the examination and prosecution of rejected cases filed by inventors and other attorneys. In such cases a fee of $5 is required for special examination and report, and in case of probable success by further prosecution, and the papers are found tolerably well prepared, MUNN & CO. will take up the case and endeavor to get it through for a reasonable fee, to be agreed upon in advance of prosecution

CAVEATS

Are desirable if an inventor is not fully prepared to apply for a Patent. A Caveat affords protection, for one year, against the issue of a patent to another for the same invention. Caveat papers should be carefully prepared.

The Government fee on filing a Caveat is $10, and MUNN & CO.'S charges for preparing the necessary papers are usually from $10 to $12.

REISSUES.

A patent when discovered to be defective, may be reissued by the surrender of the original patent, and the filing of amended papers. This proceeding should be taken with great care.

DESIGNS, TRADE MARKS, AND COMPOSITIONS

Can be patented for a term of years, also, new medicines or medical compounds, and useful mixtures of all kinds. When the invention consists of a medicine or compound, or a new article of manufacture, or a new composition, samples of the article must be furnished, neatly put up. Also, send a full statement of the ingredients, proportions, mode of preparation, uses, and merits.

PATENTS CAN BE EXTENDED.

All patents issued prior to 1861, and now in force, may be extended for a period of seven years upon the presentation of proper testimony. The extended term of a patent is frequently of much greater value than the first term; but an application for an extension, to be successful, must be carefully prepared. MUNN & CO. have had a large experience in obtaining extensions, and are prepared to give reliable advice.

INTERFERENCES

Between pending applications before the Commissioners are managed and testimony taken; also, Assignments, Agreements, and Licenses prepared. In fact, there is no branch of the Patent Business which MUNN & CO. are not fully prepared to undertake and manage with fidelity and dispatch.

FOREIGN PATENTS.

American inventors should bear in mind that five Patents—American, English, French, Belgian, and Prussian—will secure an inventor exclusive monopoly to his discovery among ONE HUNDRED AND THIRTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such, that patents can be obtained abroad by our citizens almost as easily as at home. MUNN & CO. have prepared and taken a larger number of European Patents than any other American Agency. They have Agents of great experience in London, Paris, Berlin, and other Capitals.

A Pamphlet, containing a synopsis of the Foreign Patent Laws, sent free.

Address MUNN & CO., 37 Park Row, New York.

THE SCIENTIFIC AMERICAN *FOR 1870.*

A SPLENDID PREMIUM.

This Illustrated Weekly Journal of Practical Information, Art, Science, Mechanics, Invention, Chemistry, and Manufactures---Entered its Twenty-fifth Year on the 1st of January.

The SCIENTIFIC AMERICAN at the head of the Industrial Journals of the wor point of Circulation and Influence.

Every number has Sixteen [illegible]rial pages, embellished with Engravings of New [illegible]ntions, Machinery, Tools for the Workshop, House and Farm, also Public Buildings, Dwelling Houses, and Engineering Works.

The Illustrated Department of the SCIENTIFIC AMERICAN is a very striking feature, and has elicited the praise of the Press; and all articles appearing in its columns are written in a popular and instructive style.

Any one sending

10 Names for 1 year, and $20, will receive one picture
20 " " 50, " " "
30 " " 75, " two pictures.
40 " " 100, " three "
50 " " 125, " four "

Competitors for the above prizes can send in names at any time and from any postoffice. For full particulars and sample copies of the SCIENTIFIC AMERICAN, address the Publishers.

Terms of the SCIENTIFIC AMERICAN: Single copies one year, $2·00; six months, $1·50; and one dollar for four months. To Clubs of ten and upward, $2·50 each per annum.

MUNN & CO.,
37 Park Row New York.

Advertisements.

RATES OF ADVERTISING.

Back Page - - - - $1·00 a line.
Inside Page - - - - - 75 cents a line.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

BECK'S New, 1st-premium Vises, see Challenge, P. 175, Vol. XXI. 3d Pat. pending. Eng. soon.

WANTED—CIRCULARS AND INFORmation of Improved Wood-work Machinery, Engines, and Foundery Fixtures, for a new establishment. Address GEORGE MUNGER, East River, Conn.

FOR THE BEST STEAM JACKET KETtles, made without Bolting or Packing for High Pressure Steam, address E. WHITELEY, Patentee, 57, 59, 61, 63 Charlestown st., Boston, Mass.

Philadelphia Machinery Agency.

KELLY, HOWELL & LUDWIG,
917 Market st., Philadelphia, Pa.

$2500 TO $3000 PER YEAR.—An agent is wanted in every town in the Union to make and sell an article of daily consumption in every family. It is entirely new. Sale permanent as flour. Address LOUIS COBLENTZ,
Middletown, Md.

"I Caught a splendid mess, the rest caught none." He used the celebrated "fish bait," which is only one of many secrets on hunting and fishing contained in the "Hunters' Guide and Trappers' Companion. It tells all about hunting, trapping, fishing, how to make canoes, traps, etc. etc. How to tan furs many ways, fishing secrets, etc., etc. 29,000 sold already. Sells 100 every day. You can get it for 25c., and it is worth $10 to any man or boy. Send on your "quarter" to the Sole Publishers, HUNTER & CO., Hinsdale, N. H.

TO AMATEURS.—For Sale—One of Holtzappfel's Best Lathes, with a great variety of Chucks and Cutters, for Ornamental Turning. Also, Apparatus for Curvilinear and Spiral Turning. Sliding Mandrel, with screw guides, over-head motion, slide rest, and over 100 tools for metal and wood turning, ornamental drills, etc., etc. Price $1000—less than one half original cost. Apply to
JNO. E. HYDES' SONS,
23 Maiden Lane, New York.

LOOK AT
The Bright Side.

It is a paper of sixteen illustrated quarto pages, published monthly at 50 cents a year, "for all children." The very best writers. Large premiums for clubs. Three months on trial for 10 cents. Send for it and say where you saw this advertisement. Specimen copy FREE.
ALDEN & TRUE, Publishers,
Chicago, Ill.

LAMB KNITTING MACHINE

WITH MARSHALL'S, RIST'S, AND CRANDELL'S IMPROVEMENTS added: The most complete and BEST KNITTER IN THE WORLD. We mean what we say, and will forfeit one thousand dollars if what we claim isn't true. For circular and sample stocking, address, inclosing stamp,
J. D. ORNE & CO.,
1 and 3 Market st., Rochester, N. Y.

TO INVENTORS
Patent Right Men, etc.,
WOOD'S MUSEUM MECHANICS' FAIR.

NOTICE.—The Engine, Machinery, Shafting, and all apparatus requisite for the Exhibition of Machinery and Working Models in the grand hall of the
PERPETUAL MECHANICS' FAIR
being now ready, Exhibitors and Inventors are hereby notified that they can secure space and motive power by immediate application to GEO. WOOD,
Manager of Wood's Museum. Upward of 3000 persons, from every part of the Union, visit the Museum every day.

$10 Saved.—"I had it all in a letter, sealed, and as I put it in the P. O., our P. M. showed me the "Star Spangled Banner." I read its exposures.—That $10 didn't go. I subscribed for the "Banner" and have $9·25 left." So writes a new subscriber. Now, reader, did you never get bit? Has no bogus jewelry, sewing machine, watch, or some other swindler caught you? Then you are lucky indeed. Do you care to keep posted on all the tricks and traps of swindledom? Read the "Banner." Every attempt at swindling is "shown up" in its columns. It employs a special detective in N. Y. City to unearth rascality. See the January number, see the February number, see the March number, just out. It is a large, 40-column, 8-page, Ledger-size, illustrated paper, crammed full of real, genuine wit, humor, fun, and money-saving exposures of rascality. Thousand after thousand of the superb steel plate "Evangeline" have gone to thousands of gratified readers all over the Union. Do you not want Longfellow's beautiful heroine "Evangeline?" It is 14½ by 2 feet in size, on elegant plate paper. We will mount it carefully on a roller and send it to you prepaid. Will give you the "Banner" for a whole year for only 75 cents, not one half the price of the plate alone. Specimens 6 cents. Send your address and only 75 cents to "STAR SPANGLED BANNER," Hinsdale, N. H.

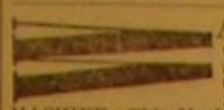
THE CHALMERS-SPENCE
Patent Non-Conductor

For covering Boilers, Pipes, etc. Saves fuel, is non-combustible, never deteriorates. Head Office foot of Ninth st., E. R., New York. Branch at St. Louis, Mo. Agencies Boston, Philadelphia, and New Orleans.

The Albany Iron Man-
UFACTURING CO. OFFER FOR RENT

On very moderate terms, the whole or a part of their large and splendid new building, just completed, together with the steam power belonging thereto. The building is 200x50 feet, four stories high; the engine of 150-horse power. Address S. V. TALCOTT, Sec.,
Albany, N.Y.

SECOND-HAND Iron and Wood-working Machinery, of all kinds at CHARLES PLACE & CO.'S, 60 Vesey st., New York.



WANTED — AGENTS — $75 to $200 per month, everywhere, male and female, to introduce the GENUINE IMPROVED COMMONSENSE FAMILY SEWING MACHINE. This Machine will stitch, hem, fell, tuck, quilt, cord, bind, braid, and embroider in a most superior manner. Price only $18. Fully warranted for five years. We will pay $1000 for any machine that will sew a stronger, more beautiful, or more elastic seam than ours. It makes the "Elastic Lock Stitch." Every second stitch can be cut and still the cloth cannot be pulled apart without tearing it. We pay Agents from $75 to $200 per month and expenses, or a commission from which twice that amount can be made. Address SECOMB & CO.,
Pittsburgh, Pa., Boston, Mass., or St. Louis, Mo.

CAUTION.—Beware of all Agents selling Machines under the same name as ours, unless they can show a Certificate of agency signed by us. We shall not hold ourselves responsible for worthless Machines sold by other parties, and shall prosecute all parties either selling or using Machines under this name to the full extent of the law, unless such Machines were obtained from us or our Agents. Do not be imposed upon by parties who copy our advertisement and circulars, and offer worthless Machines at a less price.

INVENTORS, AGENTS, MERCHANTS, and all Dealers in Patents or Patented Goods, should subscribe for the PATENT STAR, devoted to their Interests. Terms 50c. per year. Send stamp for sample to BENT, GOODNOW & CO., Boston, Mass.

Write to or call on **BUCK** who makes a machine that no one but has a right to make; and be assured by that it is the only one that will Mortise or Bore Blind Stiles for fixed or rolling Slats in all kinds of Wood, regardless of knots, in both stiles at once, at the rate of 50 mortises per minute; discarding chisels and substituting cutters that leave the mortise clear of chips. M. BUCK, Ag't, Lebanon, N. H.

Chas. E. Emery,
CIVIL AND MECHANICAL ENGINEER,
No. 7 Warren st., New York.

Drawings and Specifications furnished. Steam Machinery practically tested. Inventions examined for Capitalists. Refers, by permission, to Horatio Allen, Esq., Capt. John Ericsson, C. H. Delamater, Esq., Hecker & Bro., and other eminent engineers and manufacturers

STEAM ENGINES AND BOILERS, NEW and Second-hand, 2 to 150-Horse, at Greatly Reduced Prices. Send for circular.
MYERS, 245 N. Front st., Philadelphia, Pa.

L. & J. W. FEUCHTWANGER,
CHEMISTS & IMPORTERS, 55 Cedar st., New York. Soluble Glass, or Silicate of Soda and Potash, in all forms. Crude Materials for Glass, Steel, and Porcelain Manufacturers. Best Manganese, 94 per cent. Tungsten, Spiegeleisen, Feldspar, Flint, Fluoric Acid, Oxides, Cobalt, Antimony, Copper, Asbestos, Aluminum, Blood-stone, Black Lead, Zaffre, etc.
The rarest chemical preparations made to order.

HENRY W. BULKLEY, ENGINEER, Mechanical Designs, Detail Drawings, Estimates, etc., 70 Broadway, New York.

WOODBURY'S PATENT
Planing and Matching
and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, 91 Liberty street, N. Y.;
Send for Circulars. 67 Sudbury street, Boston

SEWING MACHINE TOOLS—Consisting of 3, 4, and 6 spindle drills, three sizes screw machines, tapping machines, milling machines, cam cutters, cutter grinders, 12 and 15-inch engine and speed lathes. Also engine lathes, 19 to 27-in. swing; crank and geared planers of several sizes; single-spindle drills; planer centers and chucks, and high-pressure water power apparatus for running printing presses, blowing organs, etc., ready for delivery by
THE PRATT & WHITNEY COMPANY,
Hartford, Conn.

CIRCULAR SAW MILLS, PLANERS Matchers, etc. Prices Low. S. HEALD & SONS Barre, Mass., make the Largest and Best Planer to be found for the money. Send for circulars.

H. BOARDMAN, Lancaster, Pa.—Superior Patent Cork-cutting Machinery, Hard-laid Twine Cord, and Rope Machinery, with Pat. Stop & Condenser

BOILER FELTING SAVES TWENTY-five per cent of Fuel. JOHN ASHCROFT,
16 tf 50 John st., New York.

L. W. Pond's New Tools.

NEW AND IMPROVED PATTERNS—Lathes, Planers, Drills, Milling Machines, Boring Mills, Gear and Bolt Cutters Punches and Shears for Iron. Dealer in

MACHINERY.

Works at Worcester, Mass. Office, 98 Liberty st., N. Y
S. N. HARTWELL, General Agent.

COTTON AND WOOL
SHODDY PICKERS
Of the most approved English pattern, built by RICHARD KITSON.....Lowell, Mass.

CINCINNATI BRASS WORKS. — Engineers' and Steam Fitters' Brass Work. Best Quality at very Low Prices. F. LUNKENHEIMER, Prop'r,
Cincinnati, Ohio.

H. B. BIGELOW & CO., Bridge Engineers and Iron Bridge Builders,
New Haven, Ct.

HINKLEY KNITTING MACHINE

FOR Family Use—simple, cheap, reliable. Knits everything. AGENTS WANTED. Circular and sample stocking FREE. Address HINKLEY KNITTING MACHINE CO., Bath, Me., or 176 Broadway, N.Y.

TRADE MARK.

SOLID EMERY WHEELS are guaranteed superior to any now in the market, and sent out on trial.
Price list upon application.
UNION STONE CO.,
32 Pemberton Square,
Boston, Mass.

BURDON IRON WORKS,—Manufacturers of Pumping Engines for Water Works, High & Low Pressure Engines, Portable Engines of all kinds, Sugar Mills, Screw, Lever, Drop & Hydraulic Presses, Machinery in general. Hubbard & Whittaker, 102 Front st., Brooklyn.

VINEGAR.—How Made from Cider, Wine, Molasses, or Sorghum in 10 hours, without using drugs. For circulars, address F. I. SAGE,
Vinegar Maker, Cromwell Conn.

FOUNDERY FACING MILLS, 526 and 528 East 18th street, New York, BOYD & PEASE Proprietors. Office 58 East 18th street, New York, Manufacturers and Dealers in all kinds of
FOUNDERY FACINGS
of the best quality, and at the lowest rates. Sea Coal, Mineral, Lehigh, Charcoal, Lead, Mixed Facings, etc.

We would respectfully refer to some of the parties we furnish with our Facings.

J. B. & W. W. Cornell, New York city; Washington Iron Works, Newburgh, N. Y.; Corliss Steam Engine Co., Providence, R. I.; Hinckley & Williams Iron Works, Boston; Wason Manufacturing Co., Springfield, Mass.

BAG MACHINES—Having the very latest improvements, and superior to all others, for sale and license, by B. S. BINNEY,
64 Kilby street, Boston, Mass.

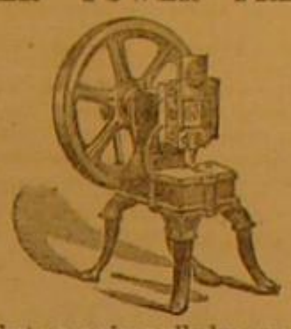
CAMDEN
Tool and Tube Works,

Camden, N. J. Manufacturers of Wrought Iron Tube, Brass Work and Fittings, and all the most improved TOOLS for screwing, Cutting, and Fitting Pipe. Screwing Machines for Pipe, of five different sizes, Pipe Tongs, Common and Adjustable; Pipe Cutters, Pipe Vises, Taps, Reamers, Drills, screwing Stocks, and Solid Dies. Peace's Patent Screwing Stocks, with dies. No. 1 Screws ⅛, ¼, ⅜, ½ Pipe. Price complete, $10. No. 2 Screws, 1, 1¼, 1½, 2 Pipe, $20. No. 3 both screws and cuts off, 2, 2½, 3, 3½, 4 inch

WOODWORTH PLANERS a SPECIALTY —From new patterns of the most approved style and workmanship. Wood-working Machinery generally. Nos. 24 and 26 Central, corner Union street, Worcester Mass. Warerooms, 42 Cortlandt street, New York.
WITHERBY, RUGG & RICHARDSON.

STOCKS, DIES, AND SCREW PLATES Horton's and other Chucks. JOHN ASHCROFT, 50 John st., New York. 14 f

PARKER POWER PRESSES.



Are what are universally known as the
"FOWLER PRESS,"

improved, and *are without a rival* as regards strength and durability, combined with delicacy of adjustment of the Punch. NOTICE is hereby given that the
STILES POWER PRESS
Is a direct INFRINGEMENT OF OUR PATENT dated April 17, 1855, and reissued Aug. 24, 1869, and ALL PARTIES are hereby CAUTIONED against BUYING OR USING said presses WITHOUT OUR PERMISSION.
PARKER BROTHERS,
West Meriden, Conn.
New York office with CHAS. PARKER, 27 Beekman st.

THE BEST PUNCHING PRESSES ARE made by the Inventor and Patentee of the famous Eccentric Adjustment. Infringements upon said Patent will be severely dealt with. N. C. STILES,
Middletown, Conn.

ASHCROFT'S LOW-WATER DETECTOR will insure your Boiler against explosion. JOHN ASHCROFT, 50 John st., New York. 16 tf

STEAM AND WATER GAGES, STEAM Whistles, Gage Cocks, and Engineers' Supplies.
16 tf JOHN ASHCROFT, 50 John St., New York.

THE WOODWARD STEAM-PUMP MANUFACTURING COMPANY, Manufacturers of the Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Also Dealers in Wrought-iron Pipe, Boiler Tubes, etc. Hotels Churches, Factories, & Public Buildings, Heated by Steam Low Pressure. Woodward Building, 76 and 78 Center st., cor. of Worth st. (formerly of 77 Beekman st.), N.Y. All parties are hereby cautioned against infringing the Pat. Right of the above Pump. G. M. WOODWARD, Pres't

THE NOVELTY IRON WORKS Have For Sale at their Shop, foot of East 12th st., Lathes Planers, and all kinds of Machines for manufacturing Engines, Tools, etc.

WROUGHT-Iron Pipe for Steam, Gas, and Water; Brass Globe Valves and Stop Cocks, Iron Fittings, etc. JOHN ASHCROFT, 50 John St., N. Y.

To Electro-Platers.

BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with books of instruction manufactured and sold by THOMAS HALL, Manufacturing Electrician, 19 Bromfield st., Boston, Mass. Illustrated catalogue sent free on application.

TODD & RAFFERTY, Manufacturers and DEALERS IN MACHINERY.
Works, Paterson, N. J.; Warerooms, 10 Barclay st., N. Y. Boilers, Steam Pumps, Machinists' Tools. Also, Flax, Hemp, Rope, and Oakum Machinery, Snow's and Judson's Governors, Wright's pat. Variable Cut-off & other engines.

Niagara Steam Pump.
CHAS. B. HARDICK,
No. 9 Adams st., Brooklyn N. Y

SILICATE OF SODA, IN ITS VARIOUS forms, manufactured as a specialty, by Philadelphia Quartz Co., 733 South 2d st., Philadelphia, Pa.

WROUGHT IRON BEAMS & GIRDERS

THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address the Union Iron Mills, Pittsburgh, Pa.

OTIS' SAFETY HOISTING *Machinery.*
OTIS BROTHERS & CO.,
NO. 309 BROADWAY, NEW YORK.

WARD & STANTON, 52 John st., N. Y., manufacturers of an improved Cut-off Steam Engine, variable by the governor, simple and durable. Consumption of Fuel guaranteed. Also, Direct-acting Steam Pumps, of all sizes, and warranted perfect in their action. Send for circular.

PORTABLE STEAM ENGINES AND Boilers. Complete.

8-Horse Power		$ 700
12 "	"	900
16 "	"	1200
20 "	"	1500
25 "	"	1650

For Sale by H. B. BIGELOW & CO.,
New Haven, Conn.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Barrel and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 97 Liberty st., New York. 11 1

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK,
P. O. Box 1,267, Boston, Mass.
N. B.—This detector is covered by two U. S. patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

PORTABLE STEAM ENGINES, COMBINing the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **750** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J C HOADLEY & CO Lawrence, Mass

LATHE CHUCKS—HORTON'S PATENT —from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON Windsor Locks Conn

Excelsior Lubricator

For Cylinders of Engines. The most durable and best oil cup, manufactured by B. E. LEHMAN, Lehigh Valley Brass Works, Bethlehem, Pa. Send for descr'ive circular

SHINGLE AND HEADING MACHINE—Trevor & Co.'s Improved. The Simplest and Best in use. Also, Shingle, Heading, and Stave Jointers Stave Cutters, Equalizers, Heading Turners, Planers etc. Address TREVOR & CO., Lockport, N. Y.

MODELS, PATTERNS, EXPERIMENTAL, and other machinery, Models for the Patent Office built to order by HOLSKE MACHINE CO., Nos. 535, 539 and 541 Water st., near Jefferson. Refer to SCIENTIFIC AMERICAN office. 14 tf

GALVANO PLASTIC IRON—For Bank Note Printing, Books, Engravings, etc Patent Rights for sale by
C. M. CLAY & CO.,
No. 45 Liberty st. Box 4959.

ILLUSTRATED CAT-

alogue of P. S. STUBS' Tools and Files, Twist Drills and Chucks, Screw Plates and Taps, Machine Screws, Emery Wheels, Foot Lathes, etc. GOODNOW & WIGHTMAN
26 eowtf 23 Cornhill, Boston.

GREAT ECONOMY IN
WATER POWER.

LEFFEL'S DOUBLE TURBINE WATER WHEEL.—Best Wheel in Existence.—Manufactured by
JAS. LEFFEL & CO.,
at Springfield, Ohio, and New Haven Conn.
New Illustrated Pamphlet for 1869 sent free on application. We will warrant our Wheel to give a Higher per centage of Power than any wheel tested at Lowell. 10stis eow

MERRICK & SONS,

PATENT
Safety Hoist
ACCIDENTS
Caused by Breaking of Hoisting Ropes, Absolutely Prevented. Address
MERRICK & SONS,
430 Washington avenue, Philadelphia, Pa.

ALCOTT'S CONCENTRIC LATHES,—For Broom, Hoe, and Rake Handles, Chair Rounds, etc., and all other kinds of Wood-working Machinery, for sale by S. C. HILLS, 12 Platt st., New York.
1 tf d

FOR SALE AT A BARGAIN.
A Babcock & Wilcox
ENGINE.

16-in. cylinder, 42-in. stroke, NEARLY NEW. The above Engine is to be taken out and replaced by a CORLISS Engine, built by WILLIAM A. HARRIS, Providence R. I. New York office, 49 Murray st.

WATERPROOF PAPER FOR OUT, AND and inside of buildings. C. J. FAY, Camden, N.J.

R. BALL & CO., Worcester, Mass., Manufacturers of Woodworth's, Daniel's, and Dimension Planers; Molding, Matching, Tenoning, Mortising Shaping, and Boring Machines; Scroll saws, Re-Sawing, Hand Boring, Wood Turning Lathes and a variety of other Machines for Working Wood. Also, the best Patent Door, Hub, and Rail Car Mortising Machines in the world. ☞ Send for our Illustrated Catalogue.
RICHARD BALL. E. P. HALSTED

40,000 SOLD.—The WONDER of the World. The Magnetic Time Indicator or "Dollar Watch." **A PERFECT GEM.** Elegantly cased in Oroide of Gold, Superior Compass attachment, Enameled Dial, Silver and Brass Works, glass crystal, size of Ladies' Watch. Will denote correct time, warranted five years, superb and showy case, entirely of metal. This is no wood Compass. Is entirely new, patented. 6000 sold in three weeks. Only $1 each, three for $2, in neat case, mailed free. Trade supplied. Address the sole manufacturers, MAGNETIC WATCH CO., Hinsdale N. H.

ROBERT McCALVEY, Manufacturer of HOISTING MACHINES AND DUMB WAITERS.
602 Cherry st., Philadelphia, Pa.

PAPER MACHINE WANTED—36-in., in part or complete. 2 rag engines, and steam engine, 80 to 100-H. P. Address S. W. H., care of Goodeve & Elliott, 45 Broadway, New York.

FOR SALE—The Right of a Valuable invention, secured by several Letters Patent, lately introduced with great success. Will divide the States if desired. A great bargain. C. K. DE HATTON, Phil'a, Pa

P. BLAISDELL, Manufacturer of MACHINISTS' TOOLS,
Engine Lathes, Planers, Upright Drills, Traverse Drills, Boring Mills, Gear Cutters, and Hand Lathes.
Worcester, Mass.

Agents! Read This!

WE WILL PAY AGENTS A SALARY of $30 per week and expenses, or allow a large commission, to sell our new and wonderful inventions. Address M. WAGNER & CO., Marshall, Mich.

ENGINE LATHES.—Twenty 17, 20, and 22-in. swing Thomas' Patent Lathes, nearly ready for shipment. Best Lathes in the world. Send for circular to THOMAS IRON WORKS, No. 5, Cypress st., Merrifield's Buildings, Worcester, Mass.

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

BALL, BLACK & CO.

Nos. 565 and 567 BROADWAY,

Offer an Unequaled Assortment of

JURGENSEN, NARDINE. JACOT, SALTZMAN, NICOUD, GERARD, FRODSHAM, PEARDON, GORDING, RUGENSTEIN, HARRISON, TAYLOR.

ALSO, A FULL LINE OF AMERICAN

WATCHES,

At the Lowest Price.

TO MANUFACTURERS AND OTHERS.—For Sale at Gananoque, Canada, the premises known as the "Globe Works," consisting of Machine Shop, Bolt Shop, and Foundery, with the Machinery contained therein, admirably adapted for manufacturing purposes. The water-power in connection with the above is ample and unfailing. For terms apply to BANK OF BRITISH NORTH AMERICA, Kingston, Canada.

HOME

Insurance Company

Of New York,

Office.....No. 135 Broadway.

Cash Capital --- $2,000,000 00

Assets Jan. 1, 1870.....4,516,368 46

Liabilities.....120,387 83

ABSTRACT OF THE

Thirty-third Semi-annual Statement,

Showing the condition of the Company on the 1st day of January, 1870.

ASSETS.

Cash, Balance in Bank	$239,156 13
Bonds and Mortgages, being first lien on Real Estate	1,460,915 00
Loans on Stocks, payable on demand	498,575 00
United States Stocks (market value)	1,402,578 75
State, Municipal, and Bank Stocks and Bonds (market value)	666,438 00
Other property, Miscellaneous Items	158,805 58
Total	$4,516,368 46

CHAS. J. MARTIN, President.
A. F. WILLMARTH, Vice Pres't.
D. A. HEALD, 2d Vice Pres't.
J. H. WASHBURN, Secretary.
GEO. M. LYON, Assistant Secretary.
T. B. GREENE, 2d Assistant Secretary.

Building Paper.

This is a hard, compact paper, like an ordinary book cover, and is saturated with tar and used on the outside of frame buildings, under the clapboards, also under shingles and floors, to keep out damp and cold. It is also used on the inside, not saturated, *instead of Plastering*, and makes a warm and cheap wall. It costs only from $3 to $30 (according to size) to cover houses on the outside. ☞ Samples and descriptive circulars sent free.

Address, ROCK RIVER PAPER CO., Chicago,

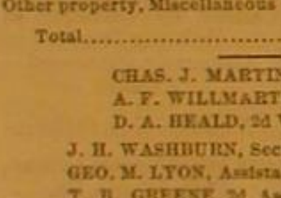
Or R. E. HALE, 22 & 24 Frankfort Street, N. Y., Agent for the Eastern States.

Or, E. C. PALMER & CO., New Orleans, Gen'l Agent for Southern States.

Scrap Steel and

STEEL DISKS.—A large quantity of Scrap from best English cast steel. Also, Steel Disks of various gages, 2 11-16 and 2 inches diameter, for sale. Apply to R. HOE & CO.,
29 and 31 Gold st., New York.

ESTE. **ENOCH MORGAN'S SONS'** 1809.
(311 Washington st., N. Y.)



SAPOLIO
THE BEST THING OUT.

For Cleaning Windows (without water); removing Stains from Marble and Paint; Polishing Knives, (no scratching); Washing Dishes, Scrubbing Floors, Floor Cloth, Tables, Bath Tubs, etc.; Polishing Tin, Brass, Iron, Copper, and Steel Wares; Removing Gums, Oil, Rust, and Dirt from machinery. Indispensable for House Cleaning, and all uses (except washing clothes). It costs but a few cents, and is sold by all good Grocery, Drug, and Notion Stores.

BARNES' CAST STEEL & WROUGHT Iron Self-adjustable Pipe and Stadd Wrench, for Railroad Shops, Gas Fitters, Steam Engines, etc. Price $9 each. Address C. TRESSELT, Fort Wayne, Ind.

PRACTICAL STANDARD PUBLICATIONS OF

GEO. E. WOODWARD

191 Broadway New York.

WOODWARD'S NATIONAL ARCHITECT.

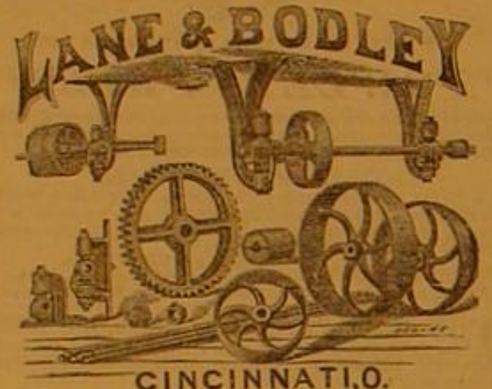
1000 Working Designs, Plans, and Details of Country and Village Houses, with Specifications and Estimates. Postpaid. **Twelve Dollars.**

HARNEY'S BARNS, OUT-BUILDINGS, AND FENCES. Just Published, with designs and Plans of Stables, Farm Barns, Out-buildings, Gates, Gateways, Fences, Stable-fittings and Furniture. Nearly 200 Illustrations. Fully explained. Royal quarto, extra. Postpaid, TEN DOLLARS.

Woodward's Cottages and Farm Houses. 188 Designs and Plans. Postpaid.....$1·50
Woodward's Suburban and Country Houses. 70 Designs and Plans. Postpaid.....$1·50
Woodward's Country Homes. 150 Designs and Plans of moderate cost. Postpaid.....$1·50
Woodward's Graperies, etc. Postpaid.....$1·50
Wheeler's Rural Homes. Houses suited to Country Life. Postpaid.....$2
Wheeler's Homes for the People. For the Suburb and Country. 100 Designs Postpaid.....$3
Jacques' Manual of the House. Postpaid....$1·50
Rural Church Architecture. Designs for Churches. 45 plates, printed in colors. Postpaid.....$12
Jacques' Manual of the Garden, Farm, and Barnyard. New edition. 1 vol., postpaid.....$1·50
Todd's Young Farmer's Manual. Vol. 1. The Farm and Workshop. Postpaid.....$2·50
Todd's Young Farmer's Manual. Vol. 2. How to make Farming Pay. Postpaid.....$2·50
Elliott's Lawn and Shade Trees. Postpaid..$1·50
Fuller's Forest Tree Culturist. Postpaid....$1·50
Husmann's Grapes and Wine. Postpaid ....$1·50
Suburban Homes for New Yorkers.....25c
Woodward's Architecture. Designs and Hints on Building. With priced catalogue of all books on Architecture and Agriculture. Quarterly, 25 cents.

Address **GEO. E. WOODWARD, Publisher,** 191 Broadway, New York.

LANE & BODLEY



CINCINNATI, O.

MANUFACTURERS OF

SHAFTING, HANGERS, PULLEYS AND COMPRESSION COUPLINGS.

BALL AND SOCKET ADJUSTABLE HANGERS WITH SELF LUBRICATING JOURNAL BOX.

We have Two Hundred and Fifty Pulley, and One Hundred Hanger Patterns of uniform style and weight.

Quality of work equal and Prices lower than any other in the market.

Catalogues sent free, or furnished on application.

LANE & BODLEY,
John & Water Streets, Cincinnati, Ohio.

THE COMMERCIAL AGENCY

REMOVAL,

And 1870 Register.

THE PROPRIETORS,

Messrs. McKillop, Sprague & Co.,

Have removed to their New and Spacious Office, 109 and 111 Worth st., one door east of Broadway. The accommodations to meet the demands of increasing business, are double the room heretofore occupied, making it the most extensive, best managed, and thoroughly fitted up in the United States for this business.

The REGISTER, published in January, is more complete and full than any heretofore, making over five hundred thousand (500,000) names, carefully rated with reference to their character and Commercial standing, embracing the capital of each, from one thousand dollars to over millions, the history of which subscribers can obtain from the records at our office. This Agency has been established over one quarter of a century, and purpose still further to develop its facilities to aid in disposing of credit.

We invite business men to call at our new establishment, and see for themselves, also, the completeness of our business system.

McKILLOP, SPRAGUE & CO.,
109 & 111 Worth st.,
One door east of Broadway, New York.

Le Van's
IMPROVED
Governor,
WITH
Balance-Valve Combined.

The simplicity of designs and ease of construction, and small amount of material employed, allows this governor to be offered at a lower price than any good Regulators now made.

Price List and Photographs sent on application, and entire satisfaction guaranteed in all cases.

W. Barnet Le Van & Co.
S. E. cor. 24th & Wood Sts., Phila.

AMERICAN

SPIRAL SPRING BUTT CO.,

37 PARK ROW, NEW YORK.

The Combination Rule

And Lead Pencil, one of the most novel and useful articles ever offered to the public. No person should be without it. Sample pencil sent for 10c. and 3c. postage stamp. Two for 15c. Manufactured wholesale by E. A. WHITFIELD, 81 Dusse st., New York.

ADDRESS Of C. Ducreux & Co., Screw Manufacturers is 93 Elizabeth st., N. Y., instead of 96. See last week's paper.

EMPIRE MULEY SAW HANGINGS—Best in use. Manufactured by SNYDER BROTHERS, Williamsport, Pa.

Oak Leather Belting.

Manufactured by CHAS. A. SCHIEREN, 92 Gold st., N.Y.

SCHLENKER'S PATENT
BOLT CUTTER
NEW INVENTION. ADDRESS,
HOWARD IRON WORKS, BUFFALO, N.Y.

Reynolds'

Turbine Water Wheels.

No Complex, Duplex, or Triplex complications. All such are costly, perishable, easily clogged, inaccessible. Mill Gearing, Shafting, and Pulleys. Send for Illustrated Pamphlet

GEORGE TALLCOT,
96 Liberty st., New York.

Factory, Trenton, N. J.....Office, No. 2 Jacob st., N. Y.
☞ Branch Office for Pacific Coast, No. 606 Front st San Francisco, Cal.

London.....48 Cannon street.

H. KOHNSTAMM,
Manufacturer of
ULTRAMARINE,

And Importer of English, French, and German Colors, Paints, and Artists' Materials, Bronzes, and Metals. No. 3 Tryon Row, New York, opposite City Ha...

WIRE ROPE.

Manufactured by
JOHN A. ROEBLING'S SONS,
Trenton N. J.

FOR Inclined Planes, Standing Ship Rigging Bridges, Ferries, Stays or Guys on Derricks & Cranes Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co., Leeds, Mass.

2d-Hand Machinery

FOR SALE—viz :—
50 Milling Machines, Index and Universal Milling Machines, Horizontal Milling and Drilling Machines, Drill Presses, Hand and Power Lathes, Edging Machines, Drops and Punch Presses, Screw Machines, etc., etc., 1000 feet of 1 5-16 Shafting, with Hangers and Pulleys, etc., etc., by O. F. WINCHESTER,
New Haven, Conn.

FRENCH BAND SAW MACHINES, SAWS, Taper Files, etc., Machines for Scroll, Re-sawing, and Log; Mongin & Co.'s Band Saw Blade all Sizes, on hand and made to order.

All Styles of Band Saw Machines in operation at Mahogany Mill, 10th st., E. R.

GEORGE GUEUTAL,
Sole Agent for the U. S., 39 West 4th st., N. Y.

$20 A DAY TO MALE AND FEMALE Agents to introduce the BUCKEYE $20 SHUTTLE SEWING MACHINES. Stitch alike on both sides, and is the only *LICENSED SHUTTLE MACHINE* sold in the United states for less than $40. All others are infringements, and the seller and user are liable to prosecution and imprisonment. Outfit free. Address *W. A. HENDERSON & CO., Cleveland, Ohio.*

SENT FREE!

M. O'KEEFE, SON & CO.'S
SEED CATALOGUE
AND GUIDE TO THE
FLOWER AND VEGETABLE
GARDEN, FOR 1870.

Published in January. Every lover of flowers wishing this new and valuable work, free of charge, should address immediately M. O'KEEFE, SON & CO., Ellwanger & Barry's Block, Rochester, N. Y.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of Superior Quality, on hand and finishing. For sale Low. For Description and Price, address NEW HAVEN MANUFACTURING CO., New Haven, Conn. 5 tf os

---

ROOT'S WROUGHT IRON SECTIONAL

Safety Boiler.

Composed of best Wrought Iron Tubes, tested to 500 pounds; no large sheet iron, shell or thin cast iron to explode. Absolutely safe, economical, durable, and efficient. Send for pamphlet. Also, Steam Engines, Steam Pumps, etc. ROOT STEAM ENGINE CO.,
95 and 97 Liberty st., New York.

REPEATING FIRE-ARMS

FOR SALE, viz :—

5,000	Winchester Repeating		Muskets.
5,000	"		Carbines.
5,000	"		Sporting Rifles.
7,000	Spencer	"	Muskets.
20,000	"	"	Carbines.
7000	"	"	Sporting Rifles.

2,500 Joslyn Single Breech-loading Carbines.
Metallic Cartridges of all sizes, by
WINCHESTER REPEATING ARMS CO.,
New Haven Conn.

Philadelphia Advertisements.

☞ T. V. Carpenter, Advertising Agent. Address hereafter, Box 773, New York city.

HARRISON
SAFETY
BOILER.

First-Class Medal World's Fair, London, 1862.
First-Class Medal, American Institute Fair, New York, October, 1869, for safety, economy of space, and economy of fuel.

400-H. P. AT A. T. STEWART'S.
437-H. P. AT JERSEY CITY SUGAR REFINERY, and over 1,000 boilers in other places.

Harrison Boiler Works, Philadelphia.

John A. Coleman, Ag't,

110 Broadway, N. Y., and 139 Federal st., Boston

SAWS. EVERY DESCRIPTION Guaranteed under a forfeiture of $1000, to cut the most lumber with the least expense

Henry Disston & Son,

PHILADELPHIA. Special attention paid to our new style Circular, Belt, Cross-cut, Mill, and Hack Saws. Orders received from England, Ireland, and the Continent.

OPTICAL AND MATHEMATICAL INSTRUMENTS. Optical Catalogue sent for Ten cents. Mathematical Instrument Catalogue sent for Ten cents. W. Y. McALLISTER,
728 Chestnut st., Philadelphia, Pa.

STEAM, BLAST, AND VACUUM GAGES. Prices greatly reduced. Only reliable STANDARD Mercury Gage known. PHILIP S. JUSTICE,
14 N. 5th st., Philadelphia. 42 Cliff st., New York.

2d-Hand Machinery

FOR SALE.

2—	8-ft. Planers.	Price	$600 each.
2—	6" "	"	$450 "
1—	3" "	(nearly new)	$300
2—	8" bed, 30-in swing Screw Lathes		$300 each
2—	6" " " " " "		$200 "
2—	6" " 15-in " " "	(new)	$200 "
2—	5" " 15-in " " "		$250 "
1—	4-Horse Power Steam Engine	"	$125
1—	12 " " " "		$425
1—	12 " " " "	(new) with boiler, all complete	$900

H. B. BIGELOW & CO.,
New Haven, Conn.

H. B. Smith's

PAT. WOOD-WORKING MACHINERY, Molding, Mortising, Tenoning, Resawing, and Planing Machines, warranted to be the best in use, and to give satisfaction or be returned within thirty days.
Address H. B. SMITH,
Smithville, Bur. Co. N. J

PORTABLE, AGRICULTURAL, AND STATIONARY

Steam Engines.

Excelled by None—Equaled by Few in Merits of Efficiency, Economy, and Perfection.

Our PORTABLE ENGINE, mounted on LOCOMOTIVE BOILER, having the fire box and ash pit entirely surrounded by water space, is set upon legs and timbers; occupies little room; needs no brick work; is suitable for use in any place where power is required—in Mills, Shops, Foundries, or Printing Rooms, or in Stock Barns, for grinding, cutting, and steaming food for stock.

The AGRICULTURAL ENGINE, supplied with LOCOMOTIVE BOILER, is mounted on wheels, with pole for attaching horses for moving from place to place; is suitable for Grain Thrashing, Corn Shelling, Wood and Shingle Sawing, etc.

The STATIONARY ENGINE is complete, with GOVERNOR, PUMP, and HEATER, with connections fitted.

Circulars, with descriptions and prices, furnished on application to A. N. WOOD & CO.,
Eaton, Madison county, N. Y.

To Hardware Dealers.

THE Tanite Co.'s OIL STONES, carefully made from Tanite and Emery, are Superior to any natural stone. Liberal discount to the trade. For circulars address

THE TANITE CO.,
Stroudsburg, Monroe Co., Pa.

THE TANITE EMERY WHEEL.

For circulars address as above.

CARVALHO'S

Steam Super-Heater,

Saves fuel, and supplies Dry Steam for Heating, Boiling, etc. HENRY W. BULKLEY, Engineer, 70 Broadway, N.Y.

RIGGS' BELMONTYLE OIL. PREVENTS Rust, Tarnish, etc
Send for circular to
H. B. RIGGS,
150 Front Street, New York.

Cotton Seed Oil Mills.

BUILT by Contract, or otherwise. For Estimates and Machinery apply to Oil Machinery Manufacturing Co. of N. Y. city, 96 Liberty st. P.O. Box 1183.

THE TENNESSEE MANUFACTURING COMPANY, AT NASHVILLE, is now engaged in erecting a Cotton Mill of the capacity of ten thousand spindles, for manufacturing goods from yarns numbers 14 to 20, plain and colored, and will be pleased to correspond with parties engaged in building steam engines and all the various machines needed in such a mill. None but FIRST-CLASS and NEW machinery wanted. Address
S. D. MORGAN, Pres't T. M. Co.
Nashville, Jan. 20, 1870.

J. F. WERNER, Model Maker & Machinist, 62 Center st., New York. Working Models, Experimental Machinery, Gear Cutting, & Stud & Rivet Turning.

PATTERN LETTERS KNIGHT BROS

FOR SALE ON REASONABLE TERMS.—The Entire, or State Rights of E. H. Goodes' Improved Hand Thrashing Machine. Patented Jan. 18, 1870. Address Philadelphia Patent and Novelty Co., 717 Spring Garden st., Philadelphia, Pa.

NATIONAL WAGES TABLES—Showing at a glance any wages from $1 to $25, per week, by hours, ¼ days, ½ days, ¾ days, days, etc., to four weeks. Half bound, 50 cents; cloth, 75 cents; Roan Tuck, $1; sent by mail on receipt of Price. Address NELSON ROW, Publisher, 28 and 30 W. Broadway

---

PRINTED with the Ink of CHAS. ENEU JOHNSON & CO., Tenth and Lombard st., Phila 59 Gold, corner Ann st., New York.

SCIENTIFIC AMERICAN

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

Vol. XXII.—No. 9. [NEW SERIES.] NEW YORK, FEBRUARY 26, 1870. $3 per Annum. [IN ADVANCE.]

Wood Molding Machine.

Our engraving illustrates another important wood-working machine, manufactured by Mr. S. A. Woods, manufacturer of the wood planer, illustrated and described on pag 90, current volume.

In this molding machine, the side spindle frames are attached to, and are moved from one side of the machine to the other by means of a screw applied to each of the spindle frames which slide upon round bars, and are so constructed that by simply tightening a thumb or hand screw, which holds or clamps the cap of the box firmly to the bar, all side-tremble, or lost motion —backlash, is entirely obviated. This is considered a great improvement over any other method, as it is well known to practical men that much difficulty is experienced in this particular.

The top cutter-head is not covered up with cumbersome machinery, but can be approached from either side of the machine. The yoke or cutter-head frame, to which the cutter-head boxes are fixed, is turned down between the side pieces of the machine; thus it will be seen that the boxes are always in line with each other, leaving the head which holds the cutter-frame to be "got at" with wrenches, etc.

The under cutter-head frame is also set upon sliding wedges, so that it can be moved up and down at pleasure (without stopping the machine), by simply adjusting the wedges. This is done by means of a set screw applied at their ends.

Balance pulleys are used upon the top and side spindles, adding very much towards regulating the balance of the cutters, when they are not precisely of the same weight, and making a steady cut.

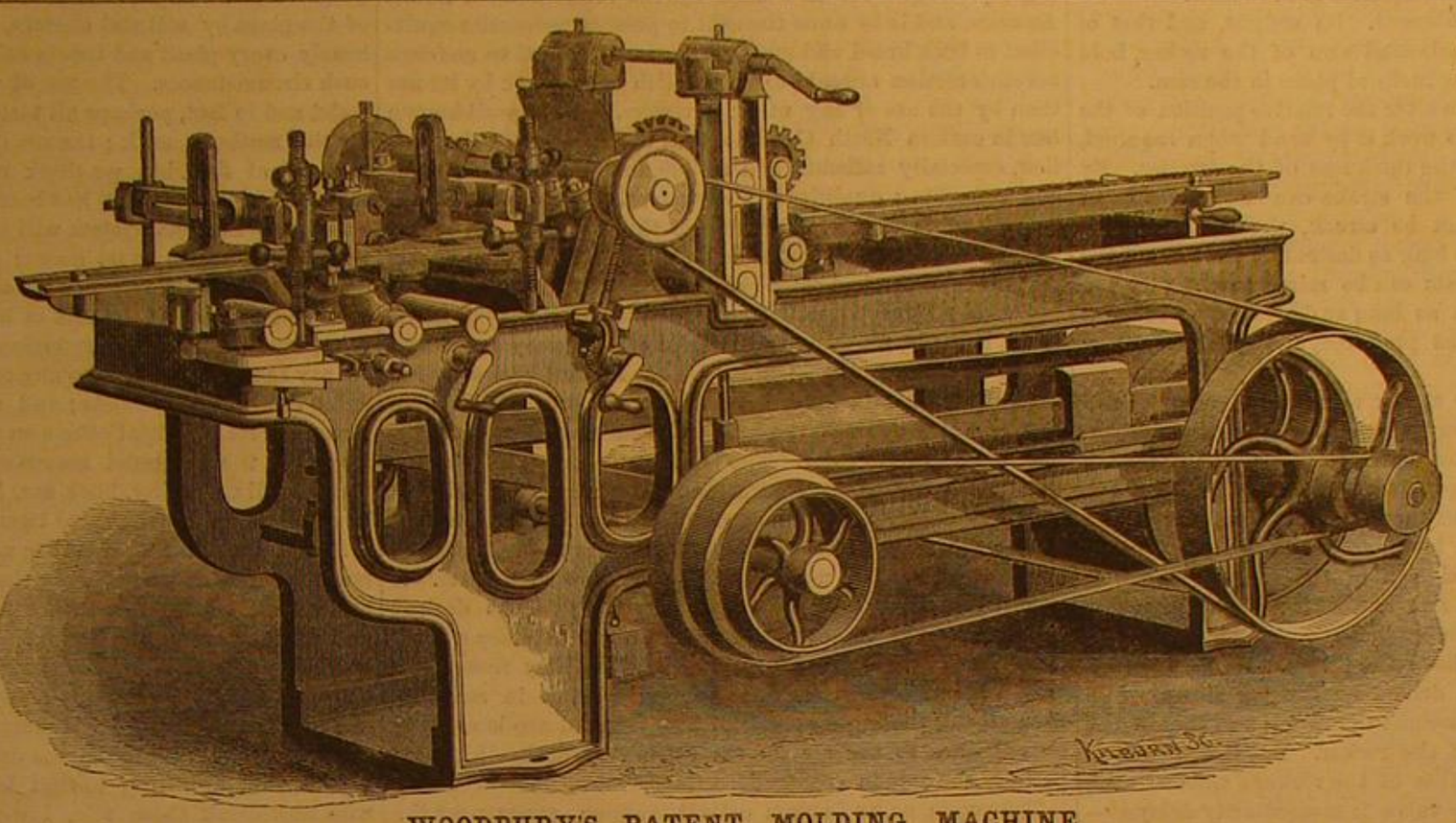
This machine will also match and work sheathing or flooring.

The under cutter-head is slotted, and the table through which the under cutters project can be enlarged so as to admit of the use of molding cutters. This is very convenient in rebating, beading, or "springing" moldings. The table is hinged, and can be swung one side, which allows the operator to "get at" the cutters to adjust and sharpen them.

The machines have three changes of feed and vary in size from 2,000 to 3,000 pounds, working 8, 10, or 12 inches wide.

The machines are very compact, and easy to adjust in all of their parts. A gold medal was awarded to this molding machine, at the Massachusetts Charitable Mechanics' Association Fair, 1869; and also first premium at the American Institute Fair, New York, 1869.

It is manufactured by S. A. Woods, of 91 Liberty street, New York, and 67 Sudbury street, Boston, Mass., to whom communications may be addressed.



WOODBURY'S PATENT MOLDING MACHINE.

Improvement in Steam Hammers.

One of the most important instruments in the orginal manufacture, and, subsequently, in the multifarious forging of iron and steel, is the steam hammer. Any real improvement, therefore, which simplifies its construction and increases its efficiency, is sure to be acceptable to all who are engaged in this extensive branch of industry.

The most successful steam hammers hitherto, are of two well-known and distinct types, or classes, both of English parentage; namely, those whose "ram," or "hammer head," or "tup," or "drop"—by all of which names it is variously called—is guided by the frames or standards below the cylinder, in the manner originally invented by James Nasmyth, of Patricroft, and those in which the hammer bar or piston rod is guided by bearings on or in the cylinder itself, or above it, as designed by Robert Morrison, of Newcastle.

They are commonly referred to, for the sake of brevity, as hammers with guides and hammers without guides, the latter meaning those which are guided in the cylinder. They could be better designated, however, by the names of the inventors. Both Nasmyth and Morrison have had the usual host of imitators, and many important modifications and improvements have been made in the original forms and gearing, but the types have always remained entirely distinct. Each has its respective advantages and of course its advocates.

The Nasmyth system insures greater accuracy and less strain upon the working parts, while the Morrison design leaves the anvil more open to the workmen.

Our illustration represents an improved steam hammer manufactured by Messrs. Ferris & Miles, of Philadelphia, Pa., which combines in a great degree the security of the Nasmyth frame-guide with the convenient openness of the Morrison cylinder guide. It has also two valuable improvements for which patents are being solicited through the Scientific American Agency:

The first relates to the arrangement or design. The second to the valve gearing.

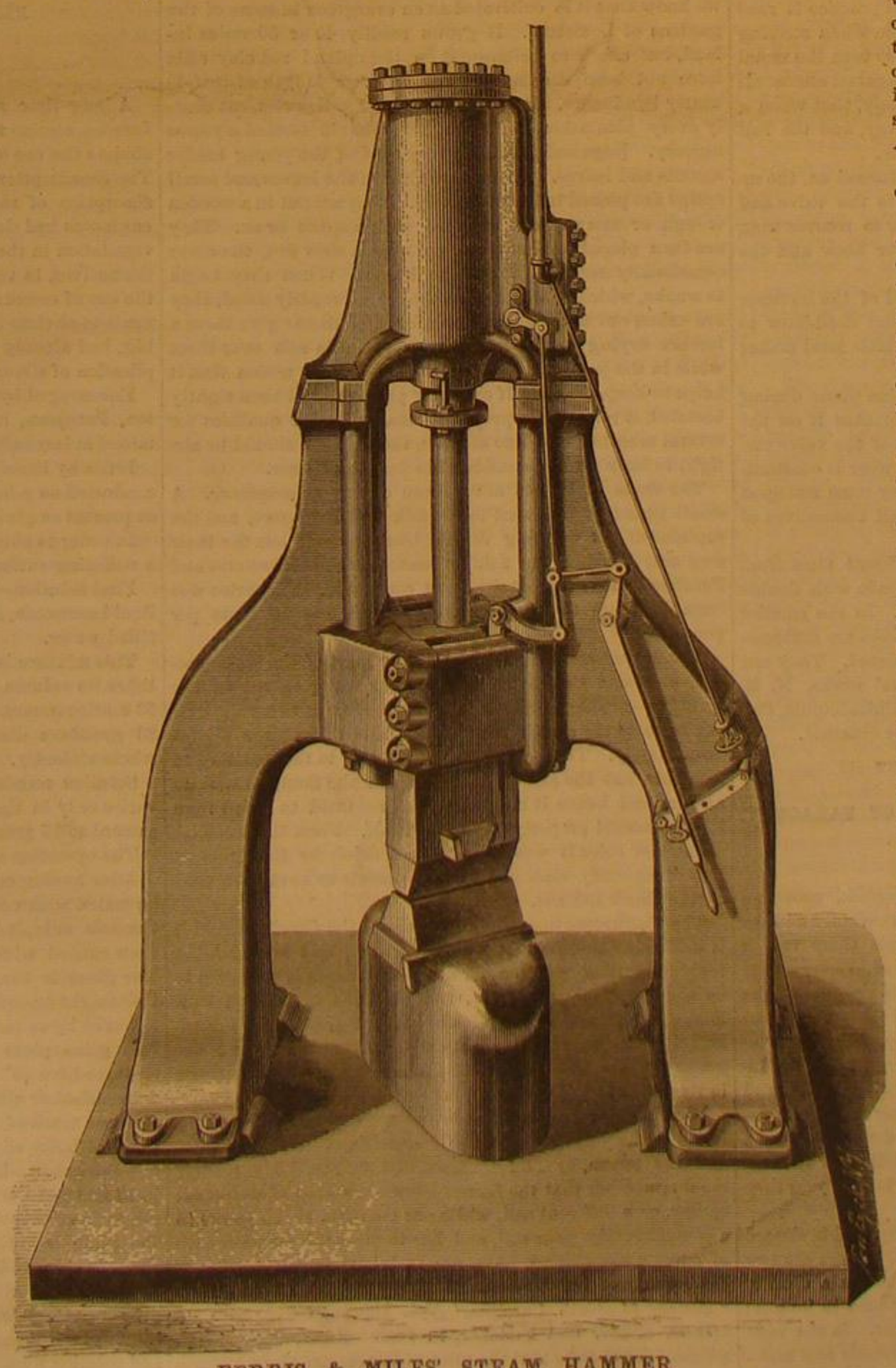
It is well known that in the more generally adopted Nasmyth system the "ram," or "drop," being set flatwise and parallel with the frames, and guided by a rib or groove planed in or on them, it becomes necessary for most kinds of work to employ diagonal, or as they are technically called, "skew" dies (or bitts), whose corners, however, must fall within the edges of the ram whereby their area is much diminished as compared with that of the end of the ram.

It is to be remarked that ample "die," or "bitt," surface is a consideration of the first importance in steam hammers.

In this improved arrangement the ram itself, which is of oblong horizontal section, is placed diagonally to the frames, or "on a skew" and guided by them without either groove or rib. So that a plain oblong die of the full size and shape of the end of the ram can be keyed under it and will pass up through the guides. This gives at once the required "skew die," while at the same time it affords the amplest extent of die surface for any operation that can be performed under the hammer.

In consequence of placing it in this position the ram is only required to be made of the breadth and thickness corresponding to the largest die, and can be made much longer than usual without exceeding the proper weight. This obtains a greater bearing on the guides, which can therefore be placed much higher than usual above the anvil, leaving it nearly as unobstructed as in the Morrison system.

The anvil, which is of oblong section with semicircular ends, is also placed diagonally to the frames but at right angles with the ram. The portion above the floor is made perpendicular for convenience in shouldering down, and in forging a bent or crooked piece of work. The lower die, also of simple, oblong shape, is keyed directly across the top of the anvil; its face corresponding with that of the upper one, and its greatest length being the thickness of the anvil, which is equal to the



FERRIS & MILES' STEAM HAMMER.

greatest breadth of the ram, or nearly one half greater than can be obtained by the parallel arrangement.

The simplicity and numerous other advantages resulting from this double-diagonal construction, will be at a glance appreciated by all familiar with the operation of these machines.

The valve gearing is of the utmost simplicity. A rock lever or bell crank is pivoted on a stud in the frame, one arm of which, A, is connected by three links to the valve spindle, B, and hand lever, C. The other arm, partially hidden behind the guide plate, rests lightly against the face of the ram, but entirely independent of it and not attached in any way. An incline is planed in the full length of the ram (which is longer than the stroke of the hammer), in order to operate this rocker arm when the hammer is in motion.

The valve is perfectly balanced. Its weight, and that of the links resting on the horizontal arm of the rocker, hold the vertical arm against the inclined plane in the ram.

The hand lever serves to alter the relative position of the valve to the piston, so as to work it by hand when required, and to adjust the stroke to the thickness of the forging. By it the force and length of the stroke can be changed in an instant, a single blow can be struck, the metal can be squeezed upon the anvil as long as desired by the force of the top steam. The hammer ram can be raised to the very top of the stroke, held there as long as desired, then brought down gently or violently, as preferred, and by a slight gesture sent up again, etc.

A thousand blows can be struck all alike, or each one can be varied at will. It is always in gear for self-acting motion, while never out of gear for hand working. The two are parts of each other and inseparable.

The working of the self-acting motion is as follows: When the steam is turned on the hammer rises, the incline plane pushes outward the vertical arm of the rocker, which, of course raises the horizontal arm and with it the valve. The position of the hand lever determines at what point the steam is reversed from below to above the piston. When this happens the hammer descends, driven by the top steam, while the valve has only its own weight to lower it and that of the links and horizontal arm of the rocker. But this weight is partly counterbalanced by that of the rocker's vertical arm, and thus the descent of the valve is momentarily delayed—the ram gets the start of it and strikes the anvil before the piston takes steam under it.

A peculiar feature about it is that as the throttle is opened admitting more steam, while the force of the blows is increased in a regular ratio, their rapidity remains about the same or rather diminishes, so that in actual practice it runs rather faster when striking light blows than when striking heavy ones. This new feature gives time to turn the metal on the anvil, and avoids the complaint made against almost all steam hammers of the self-acting kind; namely, that when a full head of steam is turned on they run away, and the full power of the machine is therefore unavailable.

The *rationale* of it is, that as the steam is turned on, the up stroke quickens and gives more momentum to the valve and links upwards. It takes them a little longer to recover from this momentum and fall. Hence the slower blow and the greater force of it.

By the arrangement of the gear, the speed of the hammer can be varied while running from the slowest dead-blow to the quickest "pick-up" that the most insatiable steel maker could desire.

As the rocker glides easily upon the incline plane during the whole up stroke, and, at most barely overtakes it on the down stroke, no jar can come upon any part of the valve motion, nor can any lost motion affect it as the wear is constantly taken up by the weight of the parts. They must rest upon each other during the up stroke and they fall themselves of their own weight.

These hammers are manufactured of different sizes from 100 pounds up to 2,000 pounds. Some are made with double and some with single standards or frames. In the smaller sizes the hand lever is dispensed with, the links are differently situated, and a simpler arrangement effected. They can be seen in operation at the manufacturers' works, N. E. corner Twenty-fourth and Wood streets, Philadelphia, Pa., where any further desired information can be obtained.

[For the Scientific American.]

YAUPON TEAS OF CAROLINA—MATE OF PARAGUAY.

BY PROF. H. E. COLTON.

All along the Atlantic coast, south of Norfolk, grows an evergreen shrub tree, but in the greatest luxuriance and extent in eastern North Carolina. The people there call it Yopon, and from time immemorial its leaves have been used as a tea. The Indians thus used them, and the people of the colony planted by Sir Walter Raleigh, and their successors learned its use from them. Lawson, in his quaint history of the Carolina colony (1707), states that every spring the Indians would come down from the hill country to fish, and that it was also their custom to prepare a strong drink from the leaves of the "Ebpen" shrub, whereof they drank until they were made sick, and purged and vomited until their systems were cleared of all foul matter; thenceforth for the year they were free of sickness.

This plant belongs to the Ilex (holly) family, and is classed by some *Ilex cassena*, by others *Ilex cuponia*. There are two varieties; one bearing a red berry close to the main stem of the branch. This has a small leaf about one inch in length; the other has no berry, and the leaf is longer. In the rude parlance of the country they are classed as female and male. The leaves of the latter are those usually used for tea. In South America there are two similar shrubs, one classed *Ilex Paraguayensis*, the other *Ilex Songonha*. It has ever been our opinion that they are the North American plant altered by climate and soil, and careful investigation confirms us in this opinion.

The Yopon contains tannin and a volatile essence, but probably a smaller proportion of the first than Chinese tea. The Paraguay tea has about the same characteristics. Medicinally, the yopon is a sedative sudorific, and anti-febrifuge, and possesses greater invigorative powers than any Chinese tea, at the same time it leaves no feeling of exhaustion either in the system or the stomach; it is aperient, and, when taken in very strong and large doses, produces vomiting. These are exactly the qualities of the Paraguay tea. That tea is eagerly sought for and used by the inhabitants of South America, and is by some thought to possess properties equivalent to both bread and meat. Laborers required to undergo severe exertion are said to accomplish more work by its use than by the use of any other beverage. It is a well-known fact in eastern North Carolina, that the laborers of that section, especially raftsmen and sailors, find more nourishment and refreshing qualities in the yopon than in any of the imported coffees or teas. Captains of the coasting and sound vessels have told us that it had all the exhilarating effects with none of the bad consequences of spirituous liquors.

The *Ilex Paraguayensis*, from which the Paraguayan maté, or tea is made, grows in the interior of Paraguay and Brazil to the extreme hight of fifteen feet. Its full-grown leaf is from 2½ to 3 inches long, serrated, with flower and fruit on the stem at the foot of the leaf. The bark has a smooth surface and a grayish color. The tea is gathered mostly by the Indians, employed by contractors. The leaves are dried in rudely constructed kilns, then powdered and put in skin bags for market. The trade is known to amount to $2,000,000, or more per year. It is used mostly in the powdered state. A quantity of this, greater or less, according to the desired strength, is put in hot water and allowed to steep a short time. It is drunk through a tube called *bombilha*, from a cup with a cover. With ice it is a favorite drink in summer, even among the higher classes. The covered cup is used, as on exposure to the air the tea turns very dark—this is especially the case in strong decoctions.

The yopon, or, as Lawson calls it, yaupon, grows near the coast on a poor sandy soil. It is claimed that there are several distinct species of it, but we think the distinction is due to difference of soil. It is a beautiful evergreen, and is cultivated for hedges on some of the coast plantations. We have been told that it is also found on the Gulf coast, and we know that it is cultivated as an evergreen in some of the gardens of Louisiana. It grows readily 40 or 50 miles inland, but efforts to cultivate it on the upland red clay soils have not been successful. The extreme length of leaf is nearly two inches. It grows wild in large thickets, but nearly every plantation and farm has what is termed a yopon nursery. Hogs and cattle are very fond of the young tender sprouts and leaves. To prepare the tea the leaves and small sprigs are picked indiscriminately. They are put in a wooden trough or mortar, and chopped with a spade or ax. They are then placed in a covered pot over a slow fire, the cover occasionally removed to stir the leaves. When they begin to smoke, which indicates that they are properly dried, they are taken out and packed away for use. Some give them a further drying in the sun; others sprinkle salt over them while in the pot—this no doubt from a foolish notion that it helps to keep the tea. If carefully prepared and then tightly barreled, it retains its proper aroma and good qualities for several months; but, like all teas, the package should be air-tight to keep for any considerable length of time.

The trade in it has never been of any consequence. A small quantity was sent to Norfolk and Baltimore, and the captains of the coasting vessels bought small lots for their own use. During the fishing season on the Albemarle and Pamlico sounds a great deal was consumed. The price was from 75 cents to $1 per bushel; about 5 or 10 cents per pound.

The leaves can be gathered at any part of the warm season, or if one chooses in winter; but tea gathered in the spring is considered the best. The made tea turns dark on exposure to the air; if very strong, this takes place almost immediately. This has been attributed to the roasting in iron pots, but the same effect occurs in the South American article, and hence it may safely be assumed to result from some chemical property of the tea itself. From this peculiar change of color it was called black drink by the Indians. It is erroneously stated by some botanists to have been used by the Creek Indians.

The Tuscaroras were the great tribe of the Carolinas, and it is in North Carolina that it chiefly grows, and in which the early historians mention its use. The name is supposed to be a corruption of Yeopim, from a tribe of Indians thus named, who lived in the section where it grows most luxuriantly. The supply is practically inexhaustible, and the growth of the tree can be indefinitely increased, as it grows in its native soil from a sprig set out in early spring.

We, perhaps, have not made out a clear case of identity between the yerba, or *Ilex Paraguayensis*, of South America, and the yopon, or *Ilex Cassena*, of Carolina. My readers must remember that the former grows in a land of perpetual spring, on a different soil, while our Carolina shrub grows in a comparatively poor soil, and has to meet the rough breath of many a northeaster. We are sustained in our opinion of the identity of the two plants by the Rev. Dr. Hanks, in his "History of North Carolina," Vol. II., page 218; also by Messrs. Kidder and Fletcher, in their "Brazil and the Brazilians." They state that the town of Paranagua alone exports every year a million dollars' worth of maté. I quote the following, with which they close their article on the subject:

"He found in this out of the way port of Brazil an American woman engaged in the delightful art of preparing *peijoes* and *toncinho* (pork and beans) for the natives and foreigners who patronize her establishment. In conversation with her in regard to the maté, she exclaimed, 'Why doctor, this is the same truck we use in Carolina to make tea.' Here was a most striking confirmation of the true conclusion of science."

Any person who will turn to this work will find still stronger confirmation in the general description of the Paraguay shrub, and the preparation of the tea. It is a matter to be regretted that the botanical characters of either have not been thoroughly investigated. We do not claim exact identity of the plants botanically, but the same chemical qualities of the prepared tea. We have stated our belief as to the alteration of the plant by soil and climate, and all are well aware that nearly every plant and tree is subject to such changes under such circumstances. The use of tea and coffee is an acquired taste, and in fact, perhaps all tastes are acquired, except that for the mother's milk; the use of yopon may be distasteful to some at first, but we think not more so than their first taste of Chinese tea. It has been said that any drink which affects the nervous system will become a popular drink. If this be so, yopon must sooner or later take a high place among infused beverages, as it has sedative qualities superior to any of them. At the risk of being laughed at for want of aristocratic taste, or for preferring a thing entirely American, we say that we prefer it to any tea, coffee, or stimulating or sedative drink that exists; and we know of remarkable instances of its beneficial effects on the decaying systems of the aged, and the shattered nerves of the feeble. One old lady used to tell us "Why, laws me, it's the greatest truck! it's kept me out of heaven these twenty years!"

Even admitting that it has no qualities superior to the best Chinese tea we get, only that it is as good, the question arises, why cannot this tea be made a new article of trade and commerce from the South? If the people there will not enter this new field, let Northern capital and enterprise occupy it. Once introduced, a ready sale might be found for it at 25 cents per pound, and if more carefully prepared, as high as 50 cents. It would be not only a source of profit but of benefit, and a blessing to that large class of our population who now drink those vile, low-priced adulterations called coffee and tea. The cheapness of the article detects the fraud. But if nature must have some such beverage, why not the truly beneficial yopon of the Carolinas?

[For the Scientific American.]

PLATINIZED LOOKING-GLASSES.

BY C. WIDEMANN.

NO. 1.

A long time ago the French sanitary commissions had founded a prize to reward the successful inventor who could obviate the use of mercury in applying tin to looking-glasses. The consumption increasing daily, the diseases caused by the absorption of mercury have increased in proportion. Many engineers had devised a remedy for these evils by successful ventilation in the extraction of the ore. The manufacturers themselves, in view of the disorders and sickness caused by the use of mercury in their works, encouraged every attempt made to obviate it, and, in 1836, the celebrated chemist, Liebig, had already called the attention of scientists to the application of silver on glass.

Encouraged by some successful experiments, Messrs. Drayton, Petitjean, and Tourasse, and lately, Mr. Brosette, obtained at last industrial results.

Little by little this operation was simplified, and is now conducted on a large scale. I shall describe the process used at present as giving the best results.

In order to obtain a silver coating on glass so as to obtain a reflecting surface, two liquids are used.

First solution—100 grammes, nitrate of silver; 62 grammes, liquid ammonia, from 870° to 880° density; 500 grammes distilled water.

This mixture is filtered and is afterwards mixed with 16 times its volume of distilled water, in which 7 grammes and 50 centigrammes of tartaric acid have been added, dissolved in 30 grammes distilled water, care being taken to stir the whole violently. This forms solution number one.

Solution number two is prepared in the same way, and varies only in the proportion of tartaric acid, which is increased to 15 grammes.

The operation of silvering is carried on as follows:

After having carefully cleansed the surface of the glass to be coated with very fine tin pulp and water, applied with a chamois skin, it is then washed over and left to dry. It is then rubbed with a dry chamois skin and with a fine rag. The glass is then laid on a wooden grate, and all the dust that might have fallen on it during the former operations is removed by an india-rubber cylinder dipped in distilled water. The glass plate is then laid upon an iron table, heated by steam to from 40° to 50° Centigrade; this table is covered with a varnished or oiled cloth. The plate being placed horizontally, as much of the solution number one is poured over it as the capillarity of the glass will retain (say almost 3 millimeters thickness) without running over the sides. In about 7 to 10 minutes the deposit takes place; and in about 15 to 20 minutes afterwards this part of the operation is at an end. The plate is then lifted upon one side and washed with a chamois skin, and luke-warm water is poured over it in order to remove the non-adhering dust which may have fallen during the process, which occupies about 25 minutes. The plate is then immediately replaced in the horizontal position, and solution number two is applied in the same way as the first. In 12 or 15 minutes after the operation the application

is completed. The plate is washed carefully and dried, and a protective coat of paint, composed of minium, siccative oil, and spirits of turpentine is applied. After 4 or 5 hours the mirror can be delivered to the buyer. Galvanoplasty can be applied to coat this silver with a surface of copper as a substitute for the paint.

It has been noticed that an old solution of tartaric acid acts with more rapidity than a fresh one.

As it is, this process is still far from satisfying all requirements. The metallic surface of the silver is finer than that of the mercury tinning, but very often the operation fails without any assignable cause for the accident. Another great inconvenience is the action of the hydro-sulphureted vapors blackening the shining surface of the silver and destroying its reflecting property in a very little time. The locomotive headlight reflectors, manufactured by this process, being in constant contact with the smoke of coal, are generally destroyed with very great rapidity, even when protected by the minium paint and the copper coating.

As these defects manifested themselves, Mr. Dode, who for a few years had devoted his time and a small fortune to this important question, announced that his researches had met with success.

For twenty years this inventor has pursued his work with perseverance. Then the idea struck him to apply platina on glass. It is already known that the chloride of platina renders immense services in the arts. By its use porcelain manufacturers already coat wares requiring a metallic luster intermediate between silver white and steel gray. In order to obtain these results a concentrated solution of chloride of platina, mixed with essence of lavender, is applied on the varnish of the china to be coated. The object is then placed in the oven, very soon the platina appears with its metallic appearance, covering all the places where the composition has been applied, hiding the original color of the object, and possessing a brilliancy equal to that obtained by the burnisher.

It was a Prussian chemist, Klaproth, who in 1793 made this process known for decorating porcelain wares. Up to the past year platina had only been applied to decorate china and the application to coat glass in order to obtain a reflecting surface is due to Mr. Dode. Either the front or back of a platinized mirror is a perfect reflector.

Mr. Dode has adopted this metal as the one offering every advantage as it resists all the actions which destroy other metals. At first Mr. Dode platinized his glasses on the posterior surface; to this end he dissolved the platina in an equal mixture of nitric acid and hydrochloric acid. This solution evaporated to dryness was treated by diluted acetic acid; in this solution a certain quantity of amylic alcohol was added. The latter substance precipitates the platina and thus separates it from its aqueous part. The precipitate was then washed and this composition was then applied in a very thin layer on the back of the glass in the usual way. After a little while, exposing this glass in a dryer heated sufficiently to evaporate all the traces of amylic alcohol, the glass possessed a perfect brilliancy; but, unhappily, this coating had no more adherence to the glass than the old amalgam, and a varnish was necessary to prevent accidents that might happen by friction.

[For the Scientific American.]

GUATEMALA, ITS INHABITANTS AND PRODUCTS---ADVICE TO EMIGRANTS.

BY I. CANTINI.

Since the great civil war of America, the emigration from the Southern States to Central America, and especially to Guatemala, has been quite considerable, although the great expectations of the immigrants were not always realized.

Guatemala, which, under the government of its actual president, General Xerna, has enjoyed several years of peace and quietude, blessings which are but little known throughout the Spanish American countries, has been chosen by many for their new adopted country; these people having bought land and property with the intention of carrying on the sugar, coffee, and tobacco culture. Indeed, the laws of that state have, ever since the reign of Rafael Carrera, been so much in favor of foreigners, that there are several instances on record in which natives have acquired the citizenship of some other state, and thus lived as foreigners in their own country in order to enjoy the privileges of such, and to be exempt from military and other duties.

These advantages are, however, of value only as long as the country is not in a state of revolution; but if the latter should take place, it would be fortunate for the settler if he could pack up his coffee or sugar plantation and leave the country, for he will find but little protection on the part of the government from the herds of roving outlaws and revolutionists who swarm over the country, and take or destroy all they can lay hold of. This fact the immigrant ought not to lose sight of

For some time past, and at present, peace and prosperity are reigning throughout the republic; and there is every prospect for a happy future. Providence has emptied its cornucopia in a full measure all over the country, and an improving civilization and cultivation combine to make it a most desirable country for immigration. Those who intend to settle down in Guatemala, would do well, if time and money will permit them, to take a look at the country first before they buy any land. Many have gone there with the intention of cultivating coffee, sugar, or tobacco, without any knowledge as to the soil or climate. They have almost all failed in their attempts, and some of them have left again in disgust, if not wiser, certainly much poorer than when they came

Traveling throughout these Central American states is not expensive, though not always comfortable. What we understand by roads here, is there an object of illusion, and what might be called a good cattle-path here in the North, is there termed a "camino real," a royal road. The mountainous soil and the tropical rains are two great obstacles to the building of good roads. The ascents and descents through the range of the Cordilleras are precipitous and dangerous, the roads rough and narrow, and the privations often great. These "royal roads" do not permit any traveling in vehicles, except in the immediate neighborhood of the larger cities. Mules and horses are the only mode of conveyance. Ladies, or even men sometimes prefer to be carried on a chair by an Indian. This mode of traveling is, however, not advisable to very lively or fidgety persons. Imagine yourself sitting on a common chair, the back of which is attached by a strap, made from the bark of a tree, to the shoulders and forehead of the Indian who is to carry you, and who weighs not more than a hundred and twenty pounds, while his burden weighs a hundred and fifty, and often more; and yet he will carry you for four or five hours successively. You must, however, sit perfectly still in your chair; you may take a look at the passing scenery, but without turning your body or even your head; never attempt to sneeze or cough, else you or your carrier or both together will lose your equilibrium.

The natives possess a great strength for carrying, yet their strength lies only in the head, shoulders, and legs, and never in their arms.

While traveling through the country you are often startled by the sudden appearance of a caravan of these bare-footed Indians, each one carrying a heavy load of maize, cigars, indigo, cheese, or some other article of their commerce. They always travel in single file, one closely following the heels of the other; it is the same whether they are on the narrow mountain path or on the wider "camino real." Should you happen to be in want of any of their goods—which is but too often the case, especially articles of food—you will in vain offer them double the price which they will get in the capital of Guatemala, or other large city they are bound for; they prefer to get less for it and carry the heavy load of four hundred and more pounds a few days longer on their shoulders, in order to go to a city and there have a good time or spree on the few shillings which they get for their goods. They spend all the money on the spot, and then return to their mountain villages, talk over the good time they had during their visit to the city, until another crop has grown, and then the same journey with the same result is made over again. Happy people! they do not care to accumulate riches.

The coffee sugar and indigo planters of the interior have the greater part of their products carried to the sea-ports by the Indians. Their imported machines and agricultural implements are mostly landed at Ystapa, the main sea-port of Guatemala on the Pacific coast, whence they are transported on carts as far as the roads will permit such travel, and then they are carried over the mountains by the natives in a journey of one or more weeks. The Pacific sea-ports are preferred to those of the Atlantic; the roads leading from the latter coast are steep and difficult to pass, especially during the rainy season, while the Pacific coast, or "Costa Grande," is more sloping and much better adapted to the coffee culture than the former.

An impulse is given to the trade of this state by an annual fair, which is held in January in the town of Esquipulas. It is a place of pilgrimage, not only for the states of Central America but also of Mexico, and even South America; it is a "Holy Sepulchre of Palestina," a "Caaba of Mecca." A large crucifix in the principal aisle of the spacious church is the wonder-working effigy which vouchsafes to operate in behalf of true believers; and more than 80,000 persons have been known to assemble, some to assist at the solemnities others to attend the great fair, which is held at the same time, as is the case in all Eastern places of pilgrimage. The church of "our Lord of Esquipulas," is very rich, as many thank-offerings are given by the penitents, and when the government is in want of money, the "Lord of Esquipulas" is ready to make a loan, if the conditions are favorable. Those who have committed some great sin are ordered by the priests to make the journey to Esquipulas on foot, and the hardships of a pilgrimage to Mecca cannot excel those of Esquipulas.

The approach to the capital of New Guatemala is, to the traveler, a most imposing sight. The road leads through deep mountain gorges, that remind us vividly of some scenes in Switzerland; as we descend the mountain ridge, we see far before us the extensive fruitful plains and valleys, with here and there a modest-looking, one story dwelling house.

The never-dying verdure of the tropics is particularly charming on these hights. Whoever travels through these countries must be a lover of the beautiful in nature, otherwise he will find but little compensation for his laborious journey. He certainly should not be a "gourmand," for all he finds to eat are eggs, tortillas, some country made cheese, and beans cooked with garlic, the national dish of all the natives. The frugality of the natives is exemplary, and the stranger is more or less compelled to follow their example, which he will also find is much better for his health.

The houses in the city are only one story high, and built to resist as much as possible the frequent shocks of earthquakes. The streets all bear a look of desolation; the windows of the dwellings all open into the spacious courtyards, after the old Spanish fashion, which imparts a dismal aspect to the streets.

Many foreigners have established themselves in this healthy locality, the temperature being greatly moderated by the cool mountain breeze Though the depredations committed during the revolution under Morazan and Carrera are still fresh in the memory of the inhabitants, yet they have recovered from their heavy losses, and hasten to support all means for the development of education.

The agricultural implements of the natives and their mode of working the ground are somewhat primitive yet, and those who bring any innovations into the country are often laughed at; or if the novelty secures the approval of the Indians, they never fail to show their veneration.

Coffee and sugar are the staple articles of their commerce. The cultivation of indigo, once the main product of Guatemala, is annually decreasing. The coffee crop is often destroyed throughout large districts by night frosts. As the traveler advances from the coast towards the interior of the country, and ascends the range of the Cordilleras, he quite forgets that he is moving under a tropical sky. The temperature is moderate, the nights even cold. Everyone is supplied with a coarse, home-made blanket. The natives no longer sleep in hammocks as they do in the valleys and along the coast, and woolen clothes are worn by almost everybody. The climate is exceedingly healthy and invigorating, and this combined with the products and advantages of a tropical region, make some parts of the Central American states a perfect paradise.

The many languages spoken in the provinces are a great annoyance to the traveler through Guatemala. Twenty-seven separate dialects are known to exist, which differ so much from each other, that the members of one tribe are unable to understand those of their nearest neighboring province. Spanish is, however, the language of the law and government, and those who are able to speak it can easily make known their desires throughout the country. It is necessary, when arriving at a village or town, to seek the hospitality of the priests or *padres*, who, always kind and obliging, are here not only the spiritual advisers, but also the inn-keepers, guides, and provision-dealers. A word from the *padre* has a wonderful effect upon the natives, when often not even the money of the stranger could induce them to move a step to get him something to eat, or to serve him as a guide. Hospitality is, nevertheless, one of their redeeming virtues, yet it is but too often only an idle word; the people are poor, they have nothing to offer, not even a shelter. If they have two ears of corn, the stranger is always welcome to one. They never think of laying up provisions, even when the climate would permit it; nature is so abundant that all the year round fruit and blossoms are beside each other.

Two crops of maize can be gathered within one year. The bananas, which are the bread and potatoes of the tropics, are always blossoming, growing, and ripe on the same tree. Meat is a secondary article; the beef is tough, though cheap. The price of a pound of beef never exceeds six cents, while pork is nine cents, it being considered a greater delicacy. To a stranger this latter meat is particularly disgusting here. It seems as if the pigs were more omnivorous in the tropics than in the North. There is an abundance of game everywhere, though not always inviting to those unaccustomed to such delicacies; for example, a dish of monkey, or a stew of lizards or iguanas. But taste and dislike are often out of question, and the hungry traveler must generally take what is offered to him. A most excellent quality of cocoa beans grow throughout the country, which are hardly inferior to those of the Mexican province, Tabasco. In many places cocoa is a general article of food, taken to allay thirst and appease hunger, both at the same time.

The climate of the west coast is much more preferable to that on the Atlantic side, where malignant fevers are often fatal to the natives as well as the immigrants. The natives mostly object to our mode of curing fevers by the use of quinine. They agree that the medicine may be efficacious in the northern climate, but that it is too heating to the body in a tropical country. Their theory is not without some good foundation, and their own remedies are certainly less destructive to the human system than those overdoses of quinine, taken by foreigners to break off the fever.

It is essential for those who wish to make that country their home, to carefully select a place most adapted to their constitution, and above all things, to lead a life adapted to the climate. The natives give much good advice to newcomers, which, however, is not always followed; such as never to eat any kind of fruit after sundown, and never to expose one's self to the night air. On the other hand, the stranger should never, in his good nature, permit himself to offer good advice to a native; a last remnant of Spanish pride does not permit him to accept it without feeling insulted.

Americans go abroad to see the antiquities of Greece and Italy, or the ruins of Egypt; they are perhaps, ignorant of the fact that they possess works of ancient splendor on their own continent, which are not only as interesting as those of Egypt, but also quite similar in their construction. When the wonders of Italy and Greece, of Egypt and India, have become a little more hackneyed, then the curiosity-seekers may begin to turn their steps towards the ancient palaces of Central America, the sculptures and hieroglyphics of which speak of their former grandeur and magnificence.

A GENERAL order promulgated by the War Department provides that hereafter no volatile oils will be issued or used for illuminating purposes at military posts, and all varieties of coal oil will be regarded as volatile. In general, lard oil will be supplied for issues of oil authorized for the necessary illumination of military posts.

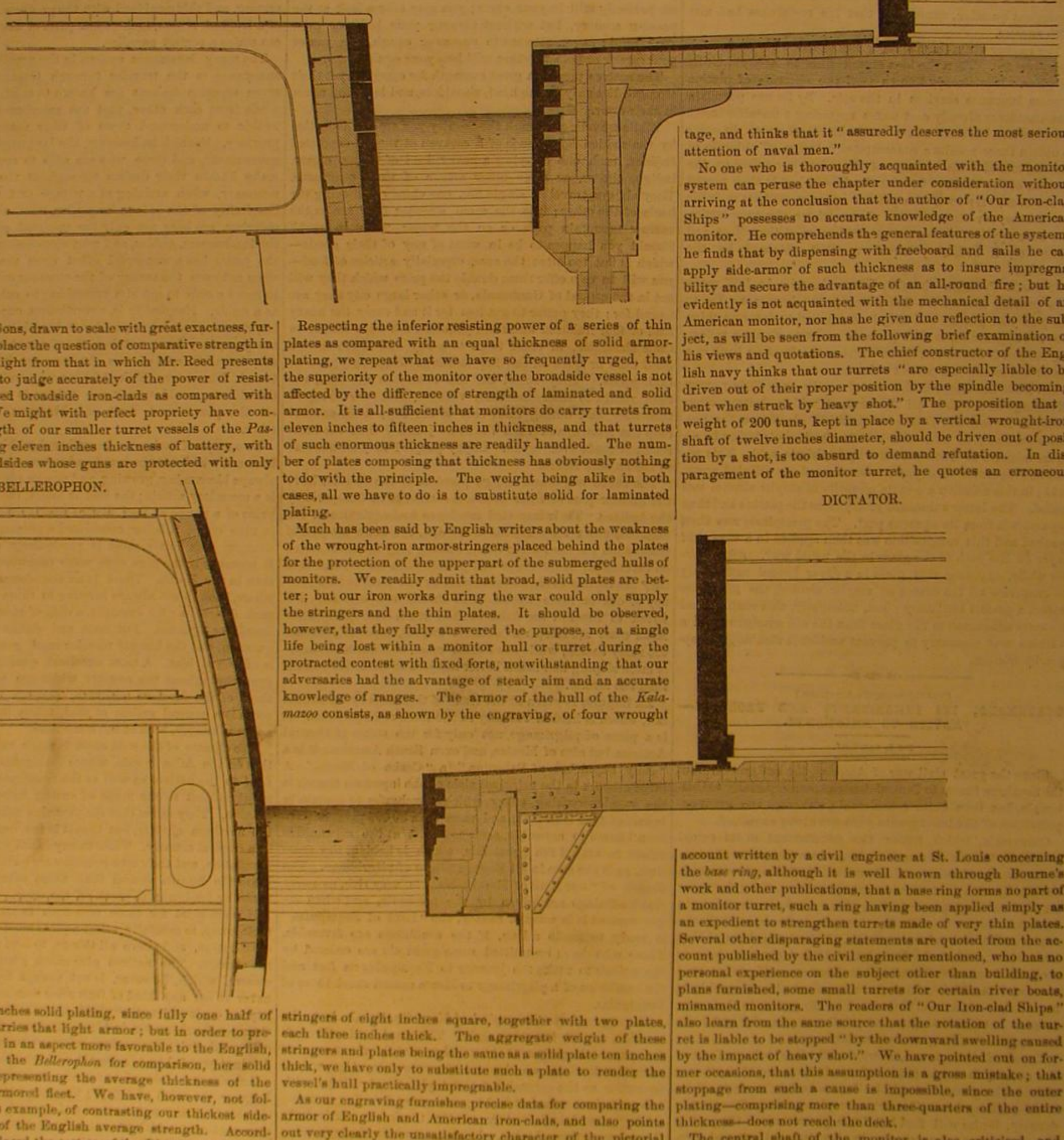
IT is announced that all the disorder attending the strike of the workmen at La Creuzot, France, has been repressed by the troops, and that the strike is ended.

ENGLISH AND AMERICAN IRON-CLADS COMPARED.

[From the Army and Navy Journal.]

The chapter on turret ships, and the tabular statement of the strength of armor-plating of the English iron-clad fleet, contained in Mr. Reed's recent work, "Our Iron-clad Ships," cannot fail to attract attention on this side of the Atlantic.

An examination of Mr. Reed's tables shows that the iron-clad fleet of England is by no means so formidable in point of armor as supposed. Not less than twenty-four ships, nearly all first class, are protected by only 4½-inch armor plating; while, according to the dimensions specified in the tables, the *average thickness* of the solid plates of the entire iron-clad navy is somewhat under six inches. In view of this fact, it is to say the least, inconsistent on the part of Mr. Reed to contrast, as he has done, by pictorial representations, the side-armor of the *Dictator* with that of his last and strongest—not yet completed—vessel, the *Thunderer*, which is wholly unlike any other of the English iron-clad ships. The accompanying illustrations, drawn to scale with great exactness, furnish data which place the question of comparative strength in quite a different light from that in which Mr. Reed presents it, and enable us to judge accurately of the power of resistance of the boasted broadside iron-clads as compared with our monitors. We might with perfect propriety have contrasted the strength of our smaller turret vessels of the *Passaic* class, carrying eleven inches thickness of battery, with the English broadsides whose guns are protected with only four and a half inches solid plating, since fully one half of the entire fleet carries that light armor; but in order to present the question in an aspect more favorable to the English, we have selected the *Bellerophon* for comparison, her solid armor-plating representing the average thickness of the whole English armored fleet. We have, however, not followed Mr. Reed's example, of contrasting our thickest side-armor with that of the English average strength. Accordingly, we have placed the section of the *Dictator* against that of the *Bellerophon*, and the section of the *Kalamazoo* against that of the *Thunderer*.



THUNDERER.

BELLEROPHON.

We cannot pass unnoticed Mr. Reed's deceptive method of keeping the strength of the battery out of view in comparing the resisting power of iron-clads. No one understands better than the constructor of the "breastwork monitor" *Thunderer*, the leading feature of the monitor system, the submerging the hull so nearly as to render the *side-armor* of but secondary importance. Besides, the side-armor of a monitor is not intended to protect the guns. We need scarcely urge that, under such circumstances, it is highly improper to exclude the battery from an illustration put forth for the purpose of imparting information as to the relative offensive and defensive power of broadside ships and monitors.

The sections of the *Bellerophon* and the *Dictator*, represented by our engravings, furnish conclusive evidence that the former could not successfully oppose the latter. The 6-inch plating, 10-inch wood backing, and 1½-inch skin of the *Bellerophon*, offer protection so utterly inadequate to contend against turret guns of adequate power, worked behind fifteen inches thickness of iron, that no question can be raised as to the result of a conflict between these vessels, especially at such ranges as would prevail during harbor defense. It should be borne in mind, with reference to the side-armor, that during defensive operations, a monitor can almost invariably point the bow towards the assailant, in which case, apart from the protection which results from deep immersion, the angle of the armor of the bow is so acute that every kind of projectile will be deflected.

Respecting the inferior resisting power of a series of thin plates as compared with an equal thickness of solid armor-plating, we repeat what we have so frequently urged, that the superiority of the monitor over the broadside vessel is not affected by the difference of strength of laminated and solid armor. It is all-sufficient that monitors do carry turrets from eleven inches to fifteen inches in thickness, and that turrets of such enormous thickness are readily handled. The number of plates composing that thickness has obviously nothing to do with the principle. The weight being alike in both cases, all we have to do is to substitute solid for laminated plating.

Much has been said by English writers about the weakness of the wrought-iron armor-stringers placed behind the plates for the protection of the upper part of the submerged hulls of monitors. We readily admit that broad, solid plates are better; but our iron works during the war could only supply the stringers and the thin plates. It should be observed, however, that they fully answered the purpose, not a single life being lost within a monitor hull or turret during the protracted contest with fixed forts, notwithstanding that our adversaries had the advantage of steady aim and an accurate knowledge of ranges. The armor of the hull of the *Kalamazoo* consists, as shown by the engraving, of four wrought stringers of eight inches square, together with two plates, each three inches thick. The aggregate weight of these stringers and plates being the same as a solid plate ten inches thick, we have only to substitute such a plate to render the vessel's hull practically impregnable.

As our engraving furnishes precise data for comparing the armor of English and American iron-clads, and also points out very clearly the unsatisfactory character of the pictorial representations in Mr. Reed's work, we dismiss the subject of armor-plating and pass on to the chapter headed "Turret ships." We do not propose to criticise Mr. Reed's views with reference to the turrets applied to full-rigged ships, or his disparaging comparisons between Cole's turret ship the *Captain*, and the broadside ship *Hercules*; but we cannot refrain from observing that while his demonstration about the importance of an all-round fire is unanswerable and fatal to Cole's ship, he over-estimates the advantage of the "simultaneous fire of the *Hercules* in six separate directions," and commits a serious mistake in assuming that four guns in two turrets can only fire in *two* directions. If loading, aiming, and firing could all be effected in an instant, the argument would no doubt be sound; but such not being the case, the firing may alternate, viz., one gun may fire while the other is being loaded. By this method objects separated thirty degrees may be kept under fire as effectually as if two guns in broadside were applied. Evidently, the turret may be as well moved from a given position and returned to it, during loading, as to remain stationary. Indeed, reasons are not wanting why it is better to keep moving than remaining still. We have alluded to this subject to correct the general impression that both guns in a monitor turret must necessarily fire in the same direction. Mr. Reed deems the assumed necessity of firing both guns in the same direction to be a great disadvantage, and thinks that it "assuredly deserves the most serious attention of naval men."

KALAMAZOO.

DICTATOR.

No one who is thoroughly acquainted with the monitor system can peruse the chapter under consideration without arriving at the conclusion that the author of "Our Iron-clad Ships" possesses no accurate knowledge of the American monitor. He comprehends the general features of the system; he finds that by dispensing with freeboard and sails he can apply side-armor of such thickness as to insure impregnability and secure the advantage of an all-round fire; but he evidently is not acquainted with the mechanical detail of an American monitor, nor has he given due reflection to the subject, as will be seen from the following brief examination of his views and quotations. The chief constructor of the English navy thinks that our turrets "are especially liable to be driven out of their proper position by the spindle becoming bent when struck by heavy shot." The proposition that a weight of 200 tuns, kept in place by a vertical wrought-iron shaft of twelve inches diameter, should be driven out of position by a shot, is too absurd to demand refutation. In disparagement of the monitor turret, he quotes an erroneous account written by a civil engineer at St. Louis concerning the *base ring*, although it is well known through Bourne's work and other publications, that a base ring forms no part of a monitor turret, such a ring having been applied simply as an expedient to strengthen turrets made of very thin plates. Several other disparaging statements are quoted from the account published by the civil engineer mentioned, who has no personal experience on the subject other than building, to plans furnished, some small turrets for certain river boats, misnamed monitors. The readers of "Our Iron-clad Ships" also learn from the same source that the rotation of the turret is liable to be stopped "by the downward swelling caused by the impact of heavy shot." We have pointed out on former occasions, that this assumption is a gross mistake; that stoppage from such a cause is impossible, since the outer plating—comprising more than three-quarters of the entire thickness—does not reach the deck.

The central shaft of the monitor is also criticised, and Cole's plan of revolving the turret recommended. The chief constructor apparently does not comprehend that the settling of the deck does not affect a turret which, like a mill-stone on its spindle, is supported on a central shaft; while on Cole's plan such settling causes the rollers to recede from the base which they are intended to support. The views expressed relative to turning the ports away during conflict ignore the fact that the American monitors are provided with massive port-stoppers, which are always shut except at the moment of firing. The important circumstance is also wholly overlooked that the turret, during an engagement with a single opponent, is always kept in position by the officer in charge, the gunner having in fact nothing to do with lateral aim; he fires whenever the roll or elevation suits. Again, a *single-turreted monitor*, in nearly all cases, fires over the bow, obviously uninfluenced by the rolling, and but little affected by the state of the weather, as it happens but seldom that the ports are flooded when pointed towards the bow.

The assumed "bending" of the turret shaft is purely imaginary, as the following explanation will show The deck ring which supports the base of the turret rests upon four bulkheads, all as deep as the vessel, two being placed transversely and two longitudinally. The tops of these bulkheads cannot be, and never have been, out of a true plane in our monitors with iron hulls. *Wooden* monitors, be it observed, are makeshifts, incompatible with the turret system.

As no constructor understands this better than Mr. Reed, why does he put before his readers, as a serious objection against the monitor turret, the statement of an inexperienced civil engineer concerning the settling of the deck of the wooden turret vessel *Miantonomoh?* And why does he advance as a point against the *system* the fact that the base of our wooden vessels had "coats round the turrets to keep them water-tight" while crossing the ocean? He knows that the turrets of the monitor fleet, exposed to the waves of the Atlantic during the war, were at all times ready for action. Those who saw the monitors during the gale off Fort Fisher, with their turrets half submerged, can estimate exactly the strength of the objection urged. In fine, the assumption that the joint between the base of the turret and the deck is liable to leak so as to endanger the safety of the vessel, is mere conjecture based on inferences drawn by those who are not correctly informed of the true cause of the foundering of the original *Monitor*—an accident wholly unconnected with any defects of construction.

Referring to the "breastwork monitors" *Thunderer* and *Devastation*, without masts and sails, we are of opinion that they will prove the most powerful ships in existence; but they are costly, first class iron ships, protected with solid armor, such as only England can produce at the present time, and they draw twenty-five feet of water. Our experienced naval officers well know that such vessels are not calculated for the defense of the several harbors, dock-yards, and maritime cities of this country; they know that the points to be defended are too numerous to admit of our employing such costly structures as the *Thunderer* and *Devastation;* and that the American monitor, with its impregnable turret, submerged hull, and light draft of water, is better adapted for our shallow waters.

The writer of the chapter on turret ships, apart from his erroneous views of the American monitor, appears to have forgotton what took place subsequently to Admiral Du Pont being relieved from his command at Charleston. The report of Du Pont that the monitors "are totally unfit for blockading duties" being quoted, it will be asked, why is the report of his successor, Admiral Dahlgren, omitted? The former was detached before he had time to become at all acquainted with the new system; while the latter, during two years, blockaded Charleston with the monitors so effectually that the Confederate stronghold was completely sealed. The report of the several commanders of the monitors during the first demonstration against Charleston, under Du Pont's command, is quoted as decisive against the monitor turret; but no reference whatever is made to the important fact that these officers were wholly inexperienced with them, and that the vessels were brought directly from the engine establishments to the enemy's batteries. Had the fleet not been brought into action again, the reference to the reports from the commanders during this their first essay would have been unavoidable; but what are the facts? Admiral Dahlgren afterward engaged the Confederate batteries, with these same monitors, nineteen times between July 18th and September 8th. The report of this experienced commander and accomplished naval artillerist concludes thus: "The battering received was without precedent. The *Montauk* had been struck two hundred and fourteen times, the *Weehawken* one hundred and eighty-seven times, and almost entirely with 10-in. shot."

New Railway Bridge.

The piers for the new railway bridge over the Connecticut river, at Saybrook, Conn., on the Shoreline railway, are now nearly completed. They are made in a rather novel manner, with a view to prevent damage to the wooden piles from insects.

A cluster of nine or twelve piles are driven as near together as possible, and around this cluster are placed sections of cast iron cylinders of the required diameter, until they reach from the hard bottom of the river to ten feet above high water. After these are in position, the intervening space between the piles and the inside of the cylinders is filled with a concrete of water cement and sand, so that, when finished, the structure is made as solid as one can well imagine.

The center pier of thirteen cylinders—five, eight in diameter, and eight, five feet in diameter—is the one on which will revolve the balance draw, with two openings for the passage of vessels on either side. The draws will be 120 feet in the clear, affording ample room for any vessel that will ever pass up the river to go through the draw. The draw-bridge proper will be of iron, 288 feet in length, and will revolve on a pivot in the center of the large pier, and will be supported by a circular track railway, and so geared that it can be opened or closed by one man.

Another Card from an Advertiser.

The Lamb Knitting Machine Company, Chicopee Falls, Mass., in sending a new advertisement, state as follows: "Please insert this advertisement on last page of your paper for three months. We are happy to assure you that in all of our extensive advertising, no other paper brings so many applications for further knowledge of our machine as the SCIENTIFIC AMERICAN; and one good thing is, it does not cease with the issue of the paper, for we now often get our notice cut out and sent us which was inserted over a year ago."

THE EAGLE CARPET STRETCHER.

Our engraving represents a new carpet stretcher, which, we think, will commend itself to every intelligent upholsterer. It gives a powerful leverage, at the same time being simple in construction, quickly and easily applied, compact, and portable. It does not injure the face of the carpet in putting it down.

It is only a trifle larger than the tack hammer; but a carpet can be stretched better and more strongly by it than anything of the kind we have yet seen. The detail in the margin of the engraving gives a good idea of the construction of the implement. The jaws, A, have goosenecks, pivoted at B. The points, C, engage with the floor when the implement is in use, and the power is applied at the handle, D.

The larger engraving shows the method of applying the tool. With ordinary stretchers the operator can only stretch the portion of the carpet between the point where he stands and the base boards. With this he may draw himself, furniture, or what not, along with it, as he has a good fulcrum on the floor, by the engagement of the points therewith.

In use the carpet is doubled back, as shown in the engraving. The jaws which are self-clutching, hold tighter and tighter as more power is applied to the lever or handle, D. The carpet being stretched is tacked temporarily back from the base board, and the edge being then released is turned down and permanently tacked to the floor. The temporary tacks are then withdrawn. The jaws thus come in contact only with the back of the carpet, and the face is not marred and torn as by the use of the old style of carpet stretcher.

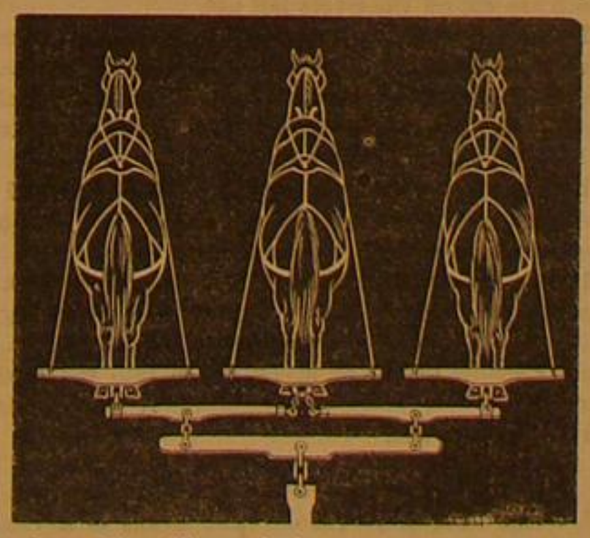
The instrument is excellently adapted for stretching canvas on the decks of steamboats for painting, and for stretching webs on sofas.

The instrument has been in practical use about one year, and has, we are informed, given the most perfect satisfaction. The inventor, a practical upholsterer, states that those who use this tool, and thus become practically acquainted with its merits, will never exchange it for any carpet stretcher yet introduced to the public.

Patented, through the Scientific American Patent Agency, Feb. 8, 1869, by William Brown, New York city. Address for State or manufacturing rights The Whitlock Exposition Co., Nos. 35 and 37 Park Place, near Church street, New York.

HOW TO HITCH THREE HORSES TO ONE PLOW.

The diagram published in No. 2, current volume, showing how to hitch three horses to one plow, has received some severe criticism, which it doubtless deserves. It is stated that no equalized draft can be obtained by it, unless the horses draw equally, naturally. Nothing about the device compels



them to draw alike. The method proposed has, it is said, been tried in many portions of the country, and found of no value.

We have received several diagrams illustrative of ways in which draft may be equalized, one of which, as being the most practical, we give herewith. This will close the subject as we can give space to no more communications upon it.

The diagram explains itself sufficiently without description.

M. BOILLOT states that he filled jars with hydrogen and placed some sulphur in the same, and, having passed an electric spark through the latter, igniting and volatilizing it, that a perceptible quantity of sulphureted hydrogen was produced.

Correspondence.

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

Steam Engines at the American Institute.

MESSRS. EDITORS:—The steam engine trials at the late Fair of the American Institute, has resulted in an unfortunate controversy between the competitors, and, as it at present stands, between one of the competitors and the judges.

We propose not to continue the controversy in which we have no interest, and in which we think the public has none, but to look at and discuss the causes of dissatisfaction, that we may, in case another similar contest takes place, avoid all questions that have arisen in the trial alluded to.

The rules published for regulating the trial were for the scientific engineer satisfactory, inasmuch as he knows that the measure of the steam in the cylinder is the measure of the power exerted by the engine. He also knows the quantity of water due to the steam, from which he calculates the cost of the power.

The engineer also knows that the water pumped into the boiler is unreliable, either as a measure of steam at the end of the stroke or power evolved; inasmuch as more or less water goes over to the cylinder in suspension with the steam, which is not power to propel the piston, but, on the contrary, tends to obstruct it. This was fully illustrated during the trial when the steam was notably wet, with the exception of some six hours during the second day.

To the public—to users of steam engines, who are accustomed to rate the cost of their power from the coal consumed, the steam test is neither understood nor satisfactory. Hence, the fuel consumed should have been accurately weighed and reported, and such deductions made as the actual steam indicated. This would have satisfied both scientific and purely practical men.

From the acknowledged ability and experience of the superintendent, an able and impartial report was expected by the exhibitors and others interested. While we fully accord to him impartiality, we cannot but regret that the circumstances which surrounded him rendered it utterly impossible to do himself or the subject justice.

His duties as the general superintendent of the whole exhibition, precluded the possibility of giving the special subject of the trial of the engines that undivided attention which its importance imperiously demanded; and it surprises us that the report has attained the high grade of respectability it possesses, considering also that he was almost entirely unaided by the judges.

The non-attendance of the judges is to be severely reprehended. By accepting the office they accepted the duties thereof, and could no more do it by proxy than could the judges of a court in a capital trial. It is true that men's lives were not at stake; but there was what men often value next to it—mechanical and professional reputation.

We have nothing further to say of the judges, but would suggest to the Board of Managers with all due deference, if future trials should be had, to make it a condition that the judges shall be present and assist, that the number shall be not less than five, and that at least three of them be practical men in the business, and the balance scientific men whose attainments, through study and observation, have fitted them for the office; men of these attainments, we are happy to know, are members of the American Institute.

Another point of great importance remains to be mentioned. It is the short time that was allotted to the trial. Being the last week of the fair, there was not time, nor half time to give the superintendent, even if he had nothing else to do and had been properly aided by the judges, an opportunity to do justice to such an important trial. The exhibitors had not time, if any occult or accidental defect should manifest itself, to correct or repair it. The public, too, has a right to complain of being deprived of the instruction in the use of steam and the steam engine, which an extended and properly conducted set of experiments would have afforded.

The character and reputation of the Institute suffers by these half-way experimental trials.

While we would not make these expositions for the money they would put in our treasury, *per se*, yet we would make all the money we could to expend in diffusing knowledge and stimulating improvements; and if we may judge by the crowds collected in the machinery department during the late short trial, we may safely say it was the most attractive and paying part of the exposition. And, had the experiments been continued for four weeks, it would have shown well on the credit side of the ledger, and given better satisfaction to all concerned.

A MEMBER OF THE AMERICAN INSTITUTE.

Burning Bituminous Coal.

MESSRS. EDITORS:—In Illinois the consumption of bituminous coal (or as it is better known, Illinois soft coal) is immense, and anything calculated to do away with some of its inconveniences will be of benefit to hundreds of thousands.

This coal is found in abundance in nearly every section of the State and is a most economical and convenient fuel, but it has its "drawbacks." With a poor draft considerable smoke escapes when the fire is being replenished, and its action upon various substances seems to be not that of pure carbon. I have never analyzed it, which perhaps I should do before addressing you upon the subject.

This nuisance *inside* our dwellings is entirely abated by having a strong draft which will carry up and discharge from the top of the chimney the unconsumed flaky lampblack. But where is it to be deposited? On our roofs, of course, and here lies our great trouble—our somber hued "skeleton." Once settled upon the roof, its apparent destination is the cistern.

Some one says, "Use Mosher's rainwater cut-off, which will conduct the first washings of your roofs on to the ground, and then allow your clean water to enter your cistern." A very good suggestion if we governed the rainfall; but in a dry season, when a shower would just suffice to wash the roof nicely, how could we make it available?

In sparsely settled neighborhoods this coloring of the water is scarcely perceptible, but in the large towns and cities it becomes a serious matter, as such water is really unfit for laundry purposes; clothes washed in it always looking *dingy*, not to say *dirty*. You will say, "Filter it;" but how? We have never been able to obtain a filter which would give us *clean* water and not also give us *hard* water.

I notice in the SCIENTIFIC AMERICAN you recommend Kedzie's filter for general use; but I am informed by a gentleman who has used one, that although he is able to obtain from it clear water, the "sudzing" properties are wanting or greatly impaired.

From my own observations, I am led to believe that we separate with our filters, not the *mechanically* combined "soot," but something *chemically* combined with the useful constituents of rain-water.

If you do not agree with me, and are of the opinion that any form or kind of filter will answer the purpose, will you please indicate it? or if you agree with me that the trouble needs a chemical remedy, can you not suggest some agent which shall destroy the combination and precipitate the "soot" in its original form?

If you find this impossible in the absence of sufficient data, perhaps some of your scientific readers, more competent than myself, will feel enough interest in the matter to make analyses and report through your columns the remedy.

Aurora, Ill. M. L. BAXTER, M. D.

[We publish this letter in full that those who have experience in the same direction may contribute if they can to help our Illinois friends our of their troubles. We advise the trial of alum, say 1 oz. to twenty gallons, as we are informed it has been successfully used to purify water in other districts similarly troubled.—EDS.

Hardening and Tempering Steel.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of February 5, I find an article upon "Solutions for Hardening Steel," upon which subject I should like to make a few remarks.

When heated steel is plunged beneath the surface of a liquid, as in the process of tempering, chemical changes affecting both substances are not unfrequently produced. The nature of such changes often renders a particular liquid peculiarly favorable for the production of steel of a certain hardness and elasticity. When pure water is employed hydrogen gas is set free by the action of the heated metal, which, at the same time, becomes covered with a film of rust. The preparation of hydrogen by this reaction is a common lecture experiment, and a red-hot poker may be employed by way of illustration. These changes do not take place, at least to any considerable extent, below a red heat, and may not consequently be active where the metal is dipped when at a comparatively low temperature. If, however, the metal has been more strongly heated, this surface oxidation probably occasions a partial removal of carbon from the superficial layers of the metal, producing a mild or softer variety.

This decarburization takes place at a low red heat in the preparation of steel by the Sheffield process of cementation; and though I am not aware whether any analyses of steel, before and after tempering, have been made such as definitely to decide the question, several experiments by the well known metallurgist, Dr. Percy, F. R. S., which will be found in his "Manual of Metallurgy," show that, in the process of tempering, the state and probably also the quantity of the carbon is decidedly changed.

As, therefore, the tempering heat is greatest where the hardest varieties are required, the employment of water is probably undesirable, as being in such cases prejudicial to the quality of the metal. The various oils and fats frequently used for tempering would not be open to the same objection, as the chemical changes produced in them are not such as to decarburize the metal.

When irons or steels are heated with animal matter containing nitrogen, and yielding ammonia by distillation, a portion of that element is absorbed by the surface of the metal, and, entering into its composition, produces great changes in its hardness and other properties. Thus, in the operation known as "case-hardening," iron is heated with leather shavings, horns, hoofs, or other such animal refuse. By this means a hardened surface is obtained, and as the metal is found to contain nitrogen, the phenomenon is doubtless due to the introduction of that element. In Sweden the surfaces of iron pile-heads are hardened by the introduction of arsenic. The metal is coated to the thickness of one tenth of an inch with arsenious acid (dissolved in hydrochloric acid) mixed with organic matter containing nitrogen, and is then strongly heated. The surfaces so obtained are undoubtedly hardened, and are said, but with what truth I have been unable to ascertain, to resist the action of the atmosphere and of water better than the unprepared metal.

A similar introduction of nitrogen is effected when nitrogenous liquids, such as urine or leather parings, are used in the tempering of steel; and in all cases the preference of a practical workman will, if real and well grounded upon experience, admit of verification by the light of scientific research.

In conclusion I would remark that the changes taking place in the process of tempering have, as yet, been but imperfectly investigated, and there is no doubt that their further study would not be devoid of scientific interest as well as of practical utility.

GORDON BROOME, F.G.S.,
Associate of the Royal School of Mines, London, England.

Mechanics' Fairs.

MESSRS. EDITORS:—I notice that the subject of the judges' decisions at the late exhibition of the American Institute, in your city, has received considerable attention in the SCIENTIFIC AMERICAN of late.

Not being particularly interested, I have not followed the discussion closely, but from facts within my knowledge, touching the acts of judges at a similar exhibition in this vicinity, I have no doubt that your remarks on the report of the judges referred to, were not only right and just, but eminently proper. I think it is quite time that the transactions on such occasions were called by their right names, and the community at large be relieved from the impositions practiced upon it by so-called judges at these mechanics' fairs. In the early days of these exhibitions, the promotion of the mechanic arts, by enabling the mechanics and inventors of the country to exhibit their productions to the public, and submit them to the examination of competent and *honest* judges, who should decide upon the comparative merits of the same, was the true and laudable object held in view. Then, judges' decisions were of value to the proprietor of the manufacture, and to the public. But following in the wake of political and other organizations, the mechanics' fairs of the present day, in most cases if not in all, are such only in name. Mercenary considerations are now the governing principles of such exhibitions, and judges' decisions are not only worthless in the majority of cases, but positively injurious to all concerned. Corruption stalks through all their departments, and judges sell themselves, not, perhaps, to the extent practiced by the corrupt politician, body and soul, but barter their judgments for gain, where they should be rendered free and unbiased.

At the late exhibition of the Mass. Charitable Mechanics' Association, in this city, cases of this character were not wanting. A gold medal was awarded for a certain machine, and after the award was made, the chairman of the board of judges for that department called at the place of business of the proprietor, and received a machine of that make free of charge; while another person connected with the Association demanded one for his influence in procuring the award, but failed to convince the party of the value of his services.

This is one instance, probably there were many more of a similar nature. I will not occupy your space with further comments at the present time, but would suggest to future managers of this institution that the next time they hold a fair, they advertise for proposals for the prizes, and distribute them according to the bids; as securing to the exhibitors a more equitable distribution, giving them all an equal chance for the highest.

I may have a word to say at a future time, in regard to the *character* of the judgments rendered upon articles on exhibition, and other matters relating thereto. G. L. B.

Boston, Mass.

English and American Steam Boilers.

MESSRS. EDITORS:—English boilers are made of ½-inch and ⅝-inch plate. Here they are made of ¼-inch and ⅜-inch iron. The foreman in an English shop makes a templet for every new boiler, with the proper camber for the thickness and width of plate he is going to use; here a wooden strip saves that trouble, the camber is alike in all thicknesses and width of plates, and the warping of the old strip is inconsiderable!

It will be observed that in punching boiler iron the holes are rendered taper or wider at the under side than the top. In England, the wide side is put outside of the boiler, so that the rivet is partly countersunk. When the head is cut off, it is found to be tight in the hole. Here, the plates are bent so that the wide sides of the holes are outside; when the rivet-heads are cut off the rivets fall out.

In England the riveters always commence in the middle of the rings and work all the slack iron into the seams. Here the plates are riveted across the seams first, and all the slack iron which has to be left in the rings, to get them together, has to be puckered in as best it can.

In England, a man is placed inside a boiler to hold up the rivets and close the lap. Here a "lump" of iron holds up the rivets, and nobody closes the lap.

I have been shot at three times within the last twelve months, and wounded once, with these exploding tin-pot boilers, and I think it is getting time that a Christian community should ask for an investigation into these wholesale murders. A BOILER MAKER.

Indianapolis, Ind.

Electric Heat Applied to Industry.

MESSRS. EDITORS:—Through the means of a voltaic battery, a heat is produced in a metallic wire sufficient to bring it to a red heat, and even to a melting point.

I believe that this property could receive an application in industry. By having a metallic wire properly stretched, and heated by a regular or intermittent electrical current, a large log of wood might be divided. Some qualities of woods of South America, as the iron wood and nearly all the dye woods are cut into boards with the greatest difficulty; the saws or instruments have to be sharpened very often. With a set of wires all heated by the electrical current, the log would be divided into boards. As for the way of preventing the further combustion of the wood, I believe that very dry sand allowed to pass over the divided place as soon as the wire would have operated, would answer the purpose.

C. WIDEMANN.

Steam Rollers.

MESSRS. EDITORS:—It seems that New York and vicinity are having some experience in the use of the steam road-roller; and it appears from the facts we gather upon the subject that this machine is not yet out of the twilight of experiment.

We believe that there is now sufficient experimental knowledge upon the subject of steam machinery, as applied to locomotion, to produce a successful and standard machine for road rolling, as well as for general traction purposes.

One party condemns cog wheels and adopts the chain belt as the best method of applying the power to the traction wheel; another party rejects, with equal emphasis, the chain and adopts the cog wheel; another party rejects both chain and cog wheel, and is equally positive that a direct connection with the traction wheel, as in railway engines, is the best method. One adopts one cylinder with a fly wheel; another adopts two cylinders without a fly.

While we believe that much elaborate and costly experiment is unavoidable, in bringing such an important matter to a successful issue, we nevertheless believe that there is considerable needless floundering in the dark upon this subject.

It is quite evident that a steam locomotive, whether applied to road rolling or any other purpose, can never work very successfully with only one cylinder applied to a crank; it is equally evident that either of the methods we have just named, of applying the power from the piston to the traction wheel is the best for certain purposes, and that neither of them is, by any means, adapted to all.

For light and quick work on good level roads a direct connection with the traction wheel is the best. The two cylinders should be placed as closely together as possible. They may be cast in one piece, and be common to one steam chest or valve box. One traction wheel is sufficient. For indifferent roads and considerable elevations, and for light and medium purposes and quick motion, the chain, if properly made and applied, is preferable to cog wheels. The chain wheels should have the ratio of one to six, or more, according to the exigency.

Whichever differential device is used, whether chain or cog wheels, we believe in making considerable difference between the driver and the driven, reducing the cylinders to a minimum capacity, and working the pistons quite rapidly; in this way the framing and other parts may be much lighter, being subjected to less stress; and the whole movement is more equable and satisfactory. The teeth of the chain wheels should be large in the direction of their motion, and as thin in the other direction as is consistent with strength, and they should be cast in a "chill." The thimbles of the chain that act upon these teeth should also be cast in a "chill." The large chain wheel should be attached to the spokes or rim of the traction wheel, and so attached that it may be easily replaced by a new one. One permanent traction wheel will be sufficient in most cases; but the opposite wheel should be so fixed as to be engaged when necessary.

For such severe work as plowing, road rolling, or for draft purposes on common roads, we believe that cog wheels will prove, in the long run, far more economical and satisfactory than the chain, but the cogs should have less breadth and depth in proportion to their thickness than it has been customary to give them. There is hardly any danger of making the cogs too massive in the direction of their motion or thickness. The cogs should be cast on a "chill," and the large cog wheel should by all means, be fixed to the spokes or rim of the traction wheel or roller, instead of the shaft, and in such a manner that it may be easily replaced by a new one. We should make this wheel as near the size of the traction wheel as possible, and the pinion that drives it as small as is consistent with good service. This would bring the traction wheel more perfectly under control of the engine. Bevels and inside gears, or cogs, are more objectionable than the spur wheels for this kind of service. Z.

Damage to Trees from Borers.

MESSRS. EDITORS:—From what I have seen in this country, I have come to the conclusion that the borer will not trouble a healthy tree; but let any of our common fruit trees be neglected for a year or two and they will be full of these destructive insects. They don't attack the same part of the tree here that they do in the Eastern States. Here they go into the body, limbs, crotches, or any part exposed to the sun; in the East they go in near the ground where the tree has a bulge around it. What makes that bulge? Is it not the freezing and thawing, and the effort of the tree to heal the injured part? The trees here have no such bulge. Now it will not cost much for some of your fruit growers to experiment a little, by putting something around their trees to keep the frost from injuring them.

I think the borers serve a good purpose; for if the owner of a tree does not think enough of it to take care of it, let the worms have it.

If a pine or oak is cut down here and allowed to lie for six months or a year with the bark on, the borers will eat it half up. I don't know that they are the same kind that work in the fruit trees, but they have a family resemblance.

I. X. I.

Men of Progress.

MESSRS. MUNN & CO:—Please accept my best thanks for prize engraving, "Men of Progress." I am happy to announce its arrival in *good order*, and an ample repayment for procuring subscribers, whose papers come to hand promptly and regularly. And were it not for the tightness of the one thing needful in this mountainous district, I should sally forth and endeavor to procure another copy or two for complimen

tary presentation. May every success attend your widely spread journal, and may her wings never grow less.

I am, gentlemen, yours truly,

Whitehall, N. Y. ROBERT IRWIN.

A Voice from the South.

The following letter is from a distinguished citizen of Mississippi, for whom we have recently taken a number of patents in this country and abroad:

MESSRS. MUNN & CO.,—*Gentlemen:* I have received all my European patents. You must allow me toexpress my sincere thanks to you for the manner in which you have conducted the whole business. I do, and shall, most cordially recommend you to all persons wishing to take out patents.

Fayette, Miss. D. HARRISON.

[It is a noticeable fact that the inventions submitted to this office from the South, exhibit a degree of novelty and practicability not formerly evinced from this section of our country. Whether it was the war that had sharpened the native genius of the South, or that these inventions emanate from Northern men located there, we are unable to state; but the fact is patent that many good inventions are coming from the Southern States.—EDS.

Another Case in Point.

J. L. Alberger, Treasurer of the Ransom Siphon Condenser Company, Buffalo, N. Y., writes us as follows:

"We are under obligations for the clear aud perfect manner you have illustrated our invention in your issue of Feb. 12th. Letters are pouring in from all parts of the country, and we conclude that everybody reads and appreciates the SCIENTIFIC AMERICAN.

A JOURNEY WITH A RAFT.

From the Building News.

The timber trade of Germany has often been described, but few persons have gone down the great and little rivers with a raft, encountering the various obstacles of this awkward navigation, and entering into the enthusiasm of the crew, who are neither landsmen nor seamen, neither engineers nor sailors, but pilots and steersmen exclusively, who build their cabins as they go, and make their craft larger as the water it floats in deepens. We will not pretend to have made the voyage from the Black Forest to Amsterdam without a good many breaks, or, indeed, on the same batch of timber; but, having joined a woodland company at various points, and followed the trees of the mountains from their fall under the ax to the mighty saw mills of the Lower Rhine, we think a few sketches of our broken journey may be interesting to those who frame for use these gatherings from the German forests.

And, to begin, the ax-bearing population, which hews, and barks, and splits, is one of the most simple, regular, and devout in the whole world. It was a pleasure to be among them and their quiet, primitive, humble manners, as, in a state of independence, suggestive rather of a newly cleared settlement than of a region with a history older than that of most Roman camps, they offered the hospitality, made rich by welcome, of their sylvan dwellings—huts scattered apart, and not in villages—to the stranger, whose systematic inquisitiveness they are quite intelligent enough to understand. This agreeable novelty have we enjoyed, and, in describing it, premise that we are making a whole from a series of fragments.

First, among the firs that grow in gloomy masses from the center of Wurtemberg, across a hundred and twenty miles, and right through South-western Germany. In the earliest light of the morning, stalwart men, book and pencil in hand, are perambulating beyond all trodden paths, knocking at lowly doors, notching particular trunks, leaving messages and marks with the women and children—unless the last are already out collecting beech nuts or resin, and indicating thus the felling which is to be authorized during the day. These "masters of the wood," or stewards are, in general, fellows of Herculean mold, with skins like leather that has been tanned in Canadian tincture. Anon, the forest is alive, and clamorous with its own peculiar industry. The silver fir, one hundred and fifteen years old, so nearly as the surveyor may calculate, is coming down with an echoing crash. It is only pine, but we have seen it 130 ft. high, and nearly 7 ft. in diameter. In about two hours an average stem gives way, and swoops in a dead weight to the earth,there to be stripped of branch, bark, and foliage, which are burned or cut up as fuel, or converted into charcoal, while the "log" itself is prepared for transit to the sea—that is, if it be of proportions sufficiently noble. To be "Holland Wood," worth transport down, it must be 72 ft. long, and 16 in. wide at the narrowest extremity; but, being of this size, how to move it, until the carrying water current be reached? We saw this process four miles off the Euz, which is a prodigy of a stream. Fir trees, in parallel lines of three, are split, barked, smoothed, and soaked; then laid, like immense rails, down and round the slopes of the hills, conducted from the hewing ground to the banks of a river. When the river is full, and they are wet with rain, the lumber is laid upon them, and, impelled by a sudden push, away it glides, accumulating force in going—perhaps several miles; now leaping a precipice, then, shifting its course, and snapping like a match midway; again, getting into the dry bed of a torrent, which the foresters flush from an artificial lake, creating a tremendous cataract in half an hour; finally, arrested by dams or gratings before it commences the seaward journey, for the purposes of sorting and identification. Hitherto it has traveled alone, henceforth it is under guidance; and here, for a time, we join it.

Now,in order to appreciate this sort of experience,you must remember what the Euz is.

The Euz is a small river, issuing from the mountains about fifteen miles above Wildbad, very rapid, very noisy, very irregular in its course, exceedingly shallow, crowded by enormous boulders, and interrupted by countless cascades. The problem, which would seem insoluble, were it not constantly solved, is, how to manage down this boisterous flood a raft several hundreds of feet in length, composed of tree trunks, each being enough for a sea clipper's mainmast, fastened together by osier twigs, which is to vandyke when the waters vandyke, stop when they fall, take leaps with them, shoot all the rapids, turn all the corners, and find its way, now to the Neckar, and next to the Rhine, and so into the general timber trade of Europe. We can testify that the adventure, for those who attempt accompanying the timber, is not luxurious. It is half swimming and half running. You feel as-if riding, without being used to it, upon a tender behind a locomotive. The logs will not lie together; you are ankle-deep, if not knee-deep, in the stream; a false step may involve a merciless contusion; your upper clothing, although hung on a post, is liable to perpetual wetting, and every now and then your companions change. Let us confess that, in the good hamlet of Calmbach we quitted the raft, weary for a while of its romance,and suffered that portion, at any rate, of the summer tribute from the Black Forest to the carpenters' shops of Europe to go upon its voyage unblessed. But, with a courage worthy of a better cause, we found ourselves, two days later, upon a like slippery and inconstant platform, which gradually grew longer and wider, until a more generous channel opened, and we left again on an inland excursion, only to rejoin on the Upper Rhine. Here the spectacle becomes a wonder. The raft resembles one of Sinbad's impossibilities; morning and evening it expands; it stops at a landing station, and lo! you might fancy that a town was on a tour, paying a visit to the village! It is no longer a raft; it is an island which you inhabit. Men are erecting huts upon it. There is one for you, with a bed and a stove,and a locker full of provisions. You go aft: nothing except the gigantic logs, trailing with the stream; you go forward, and only twelve helmsmen, with oars of Grecian shape, silent and steady,who will answer no question, but keep their eyes intent upon the piers of bridges, the quick curves, the well-known shoals,and with very good reason. For,supposing a timber raft to strike a bridge, the bridge would float away with it. Supposing it struck by a steamer, so much the worse for the steamer. Yet everything is not propitious to the "rafting master." A saying is current about him, that he should, before venturing, possess £30,000—£10,000 in the forest, £10,000 on the water, and £10,000 at the bank, to cover disasters. But that is an exaggeration. The commerce in timber is at once gigantic and profitable. It not only built Amsterdam—it built the very foundations upon which Amsterdam is erected; it supplies nearly the entire home industry of Holland; it is a source of competence to the poor, and wealth to the rich. The great rafting companies of Calmbach, Gemsbach, Phorzheims, Wolfbach, and Illbach, employ their thousand, and the demand continually increases. It would not be an adequate supply,were it not that the forest culture of this region is about as ignorant and faulty as can be conceived. A scarcity is, from year to year, dreaded, while the land under protection increases.

But we must go on with our raft. It is now a populous territory; it contains human abodes, magazines, altars, a Calvary, a miniature market, a dairy, and an overseer, who holds a strict eye over his inventory. We count beneath our feet 190 trees,all proper length and girth, loaded with shaped deals. Two or three nights spent—not, we confess, on the raft, but, more comfortably, ashore—aggrandise our raft, and the logs are beyond reckoning. The head man assures us, however, that they number about 6,000. The aggregate value is, at this time, about £4,000. Fresh raftsmen are on board; more skilful pilots are engaged; you tread an unyielding deck; the floor seems sound as mother earth itself. And, all the while, not a stick has been brought down except from a single district. We accept, gratefully, the help of a learned German economist, whose works have been gracelessly robbed by the guide-book makers in estimating the importance of this trade for one year:

575	oaks at	30 florins each.
2,089	stems of Holland at	46 "
2,000	stems at	23 "
800	do.	15 "
1,500	do.	12 "
25,000	stems of measured wood at	9 "
121,935	of common wood at	3 "
4,696	sawing blocks	4 "
180,946	of deals at	1 "
2,497	cords of fir wood for fuel at	9 "
6,671	pieces of timber at	4 "

—in all, about £80,000 in round numbers. The prices of the year were for the cord of 144 cubic feet (firewood):—oak, 17s.; beach, 10s.; fir, 5s. For building:—4d.; 3½d., and 2d. a cubic foot. But in this estimate must be included the cost of the navigators, and, although they earn no more than sixteen pence a day, and this not all the year round, they are not to be lightly considered, arithmetically speaking. We have the bill of fare before us of a raft between the mountains and Dordrecht, and it reads like the *menu* of a city besieged. Cattle are actually kept and slaughtered on these mighty moving decks. Well, the company consumed in the interval we have mentioned, 5,600 lbs. weight of bread, 3,000 lbs.of meat, 2,000 lbs. of cheese, 50 sacks of dried vegetables,and 500 casks of beer. But then the voyage, only from Bingen to Dordrecht, though occasionally done in eight days, often lasts nearly as many weeks.

The timber in charge of these hungry pilots was worth £24,000. It was one parcel out of many, representing a yearly value of nearly half a million sterling. And there are reasons for calling this Holland wood. Holland has no forests worth speaking of, but it is a wooden country. Its cities—Amsterdam and Rotterdam especially—are built upon foundations of German timber; German timber is the mainstay of its dykes, and the material of its bridges; it has sunk whole forests in the bog, and the mystery is how they last so long without decaying. We were present, the other day, when, to facilitate an experiment in drainage, a shaft was attempted to be sunk through the rotten soil of the Zuyder Zee, and the workmen came upon a structure of piles that had been buried for upwards of two hundred years. They were nearly sound,and had simply been coated with pitch. Again, the Dutch build above ground, as under, with the oak and fir of the Hartz, and it is a proverbial saying among them that, in the course of time, they shall require every tree growing upon a German hill. But this is mere boasting. For every log floating down to Dordrecht,ten are chopped up and burned, or converted into scantlings, for use in the upper country. There it is wanted in immense quantities for barrel staves and boats,for house building and railway works, for endless miles of palisading, and a thousand forms of industry, from fortification to toys, in which the German artificer employs wood. This, however, is only by the way. Our principal purpose was to give a notion of what a voyage must be, and is, to judge from fragments, on a river raft. Up in the valleys it seems at first incredible that you should succeed in making any way at all. The load appears too ponderous for the slim stream of water to carry; every moment, while the force of the current continues strong, it threatens to get wedged in between the banks; now its tail hangs among tremendous boulder stones, while the foremost part is entangled in deviousness, out of which all methods of escape are invisible; then, after a few rainy hours, comes down a rush from the mountains, and the unwieldy mass, taking a fresh start, is guided along with indescribable dexterity, the men maneuvering with a perfect knowledge of every twist and shallow, every turn and obstruction, all the way. But, for any one unused to the navigation, it is a ridiculous series of small dangers and mischievous slips, there being no formidable depths, and the only real perils consisting in getting a fall with a weight so gigantic rushing down behind you, or in crossing the course of a rapid, and being dashed against the timber. On the Rhine, where the decks are, in a way, solid, there is no more difficulty in treading them than in pacing the *Great Eastern;* but here, on the Euz, the hold is like that on a greasy pole, and the transitions from one rate of speed to another are amazingllly embarrassing. You might fancy yourself, for an hour, gliding through a trout pond; then the water is artificially raised by means of weirs and sluice-gates; suddenly, an escape is allowed, and masts enough for a dozen East Indiamen go tumbling away together with a furious clamor, the pilots never flinching or doubting; but the poor, daring passenger, of whom they make no account, staggering about, and clinging here and there in utter helplessness—for him it is bliss to enter on a broader and more regular stream. But for him, also, there are privileges. He can go ashore; he can follow the course of the raft at an easy distance; he can get together a few planks and make an unsteady and rising-and-falling floor for himself; and he may feel perfectly sure that, in the event of risk, there will be plenty of hands held out. But, for all that, it may not be the wisest thing for the Princess of Wales, coming to Wildbad for a cure, to float knee-deep on a raft, when rheumatism is her malady, and Wildbad exactly the place to exasperate it—on a raft.

Adventures of a Diamond.

The Sancy diamond is for sale at a jeweler's in Calcutta just now. Here is the account the jeweler gives of it: "This diamond is of an almond shape, and weighs 60⅝ ruttie. The stone was found on the body of the Duke of Burgundy, and was afterwards, in 1470, bought by the King of Portugal. He afterwards sold it to Nicholas de Barly, Baron de Sancy, from whom it derives its name. Sancy sent it to the King as a present by the hand of a servant, who, being attacked by robbers, swallowed the stone, and after his death the stone was found in his body. It finally came into the hands of James II., of England, who sold it to Louis XIV. for 25,000*l*. Its almond form, completely facetted over (a mode quite unknown then or at any other time in Europe), indisputably proves that it was an Indian-cut stone. In the French revolution it disappeared for some time; some years later it was sold to Prince Paul Demidoff; and now, after a strange series of vicissitudes, finds its way to Calcutta.

MEN of genius have had so frequently to struggle under poverty, that certain individuals seem to think that in order to advance science it is necessary to keep the workers therein poor. We are told that the authorities of the South Kensington Museum, London—some of whom receive thousands of dollars annually for simply signing their names to papers they never even examine—are cutting down the emoluments of the science teachers. It is said that this course has caused great dissatisfaction among the teachers; but "dissatisfaction" we think is hardly the proper word; their pay was formerly so low that now they must be giving utterance to the last despairing groans of death from inanition.

THE rise of sap in trees and plants has been explained on the principle of capillary attraction, but M. Becquerel considers that electricity is an acting cause. A capillary tube that will not allow water to pass through it does so at once on being electrified, and he considers that electro-capillarity is the efficient cause of sap traveling in vegetable life.

Improved Photoscope or Panorama Album.

Photographs are now so common, cheap, and durable that it is desirable to have something more convenient than the common photograph album for their classification, preservation, and display.

The invention we herewith describe and illustrate is designed to do this permanently, and to that end is constructed of metal and glass only.

It is a sheet metal box with a glass top and bottom. Fig. 1 shows it in perspective as mounted on a suitable stand. The box is composed of two similar rectangular inclosures, one of which slides into the other. Across the middle of the interior of the box there is a partition composed of two pieces of sheet metal, one of which is soldered to one portion of the metallic case, and the other to its counterpart, as shown in the sectional view, Fig. 2. These pieces lap each other as shown in Fig. 2, and are so made as to leave the thickness of two cards between the glass and the edge of the partition.

To the under side, and at one end of the glass top and bottom, are cemented narrow strips of glass, extending from the end of the case to within a short distance of the partition, as shown in Fig. 1; the ends next the partition being beveled off.

At each end of the box there is a thumb-screw for adjusting the size of the box to any number of cards. These thumb-screws are turned down when the instrument is not in use.

A number of cards—always an odd number—being cut to fit the chambers formed by the middle partition; if we suppose—say twenty-five, to be put into the chamber having the glass strips above described on the bottom side, and twenty-four in the other chamber, the pile of cards in the former will be higher than that in the latter chamber, so that there will be one card above the partition. If now the box be lifted and slightly inclined so that the end having twenty-five

Fig. 2

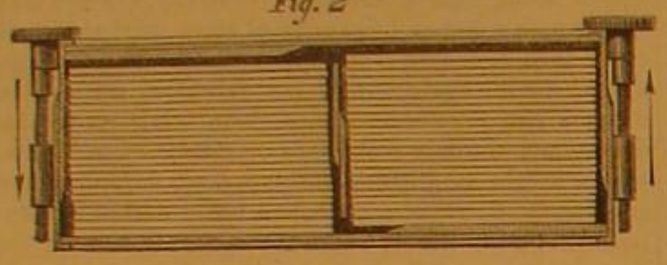


Fig. 1

BROWNLEE'S IMPROVED PHOTOSCOPE.

cards shall be uppermost, a card will slide across the partition on that side which is inclined under, and by turning the case so that the other end shall be uppermost, a card may be slid from the second chamber back again to the first, so that each card in the case may be successively brought to view.

The cards are each made up of two photographs with their backs pasted together, in such a way that a uniform thickness may be secured.

In order to do this the cards are sorted and arranged in small lots, until the proper thicknesses are secured. They are then numbered as a guide for pasting and also for cataloguing.

The instrument could be employed as a children's toy, using, instead of the photographs, letters or figures, or toy pictures. The cards might be made of sheet metal, and the same principle might also be extended to clock dials.

The stand which supports the instrument can be folded together so as to occupy very little space.

This instrument was patented, through the Scientific American Patent Agency, November 23, 1869, by George Brownlee, of Princeton, Ind., who will negotiate for the sale of the patent, and who may be addressed for further information.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the month of December, 1869:

During the month, 341 visits of inspection have been made; 575 boilers examined, 492 externally and 192 internally; while 57 have been tested by hydraulic pressure. Number of defects in all discovered, 341, of which 30 were regarded as dangerous. These defects in detail are as follows:

Furnaces out of shape, 16; fractures, 34—1 dangerous; these too often result from urging the fires too fiercely, especially when "getting up steam" from cool boilers. Instances are known were furnaces or fire-boxes have been badly distorted by carelessness of this kind, and in internally fired boilers the tubes or flues heat more rapidly than the surrounding shell, and expand at a much greater rate. When boilers have been allowed to cool, the next time they are worked the firing should be slow and moderate at first, so that the heat may be diffused gradually, and the evil arising from undue expansion and contraction prevented as far as possible.

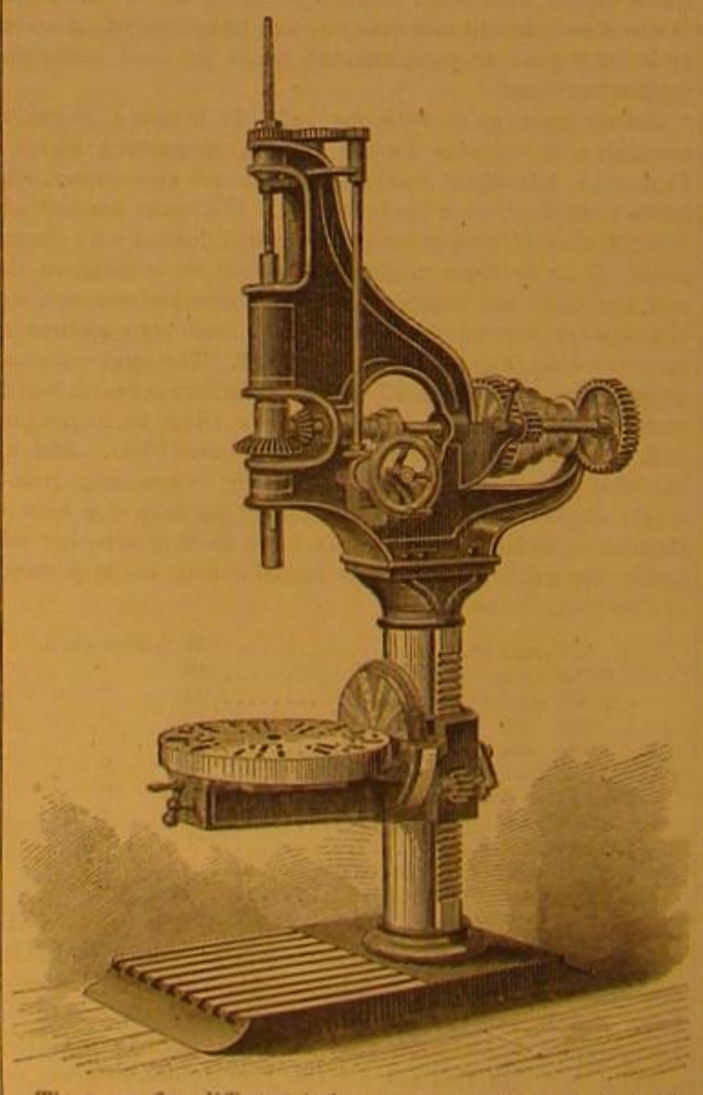
Burned plates, 33—4 dangerous; blistered plates, 36—5 dangerous; incrustation and scale, 73—7 dangerous; external corrosion, 19—3 dangerous; internal grooving, 5; water gages out of order, 8; blow-out apparatus out of order, 3—1 dangerous; safety valves out of order and overloaded, 22—4 dangerous; steam gages out of order, 40—2 dangerous, varying from 5 to + 25; boilers without gages, 2—2 dangerous; cases of deficiency of water 1—1 dangerous; insufficient staying, 2 cases.

Of the cases of external corrosion, one was found where the sheet was corroded for 2½ feet, so that a light tap of the hammer would penetrate it. This boiler was bricked in, and the evil arose from a leak in the joints. We not unfrequently find cases similar to this, though not in the same degree. Another case, two boilers were found with hand hole plates, bolt and yoke, completely corroded away, and the surrounding parts greatly weakened. These cases show the necessity of stopping all leaks about boilers at once; the work of corrosion is so insidious and one never knows the danger they may be exposed to. Two safety-valves corroded first in their seats, and need no comment to show that there was careless management.

Those who have the care of boilers cannot be too attentive to their duties. All the parts and appliances of the boiler should receive frequent and careful attention, and it should be the pride of every engineer and fireman to have everything in his care neat and in order.

Improved Patent Vertical Drill.

This machine differs from the original drill, patented by N. P. Eddy, April 24, 1866, patent No. 54,248, in this important particular, that the drilling table turns (from a horizontal to a vertical or intermediate position) on a center *in the plane of its face.*



There are five different independent motions of the table; namely:

1st. Turning, as above described, for angular drilling.

2d. Turning on its own center while in any position.

3d. Sliding to or from the post.

4th. Raising or lowering on the post.

5th. Turning around the post to bring the work in place, or to be out of the way while using the platform table.

By means of these motions a piece of metal once fastened to the table can receive the drill in *any direction* without being removed from the table.

There is a small device in the top of the spindle for taking up the backlash and preventing a break when the tool comes through the bottom of the piece drilled.

These drills are back geared, have steel spindles, self-oiled bearings, and power feed.

The castings weigh from 1,500 to 4,500 pounds, and are sufficiently heavy and strong to prevent spring.

Specimens can be seen at S. A. Wood's machinery depot, 91 Liberty street, New York, and at Rhode Island Locomotive Works, Providence, R. I.

These drilling machines are manufactured by the Assonet Machine Company, at Freetown, Mass. Address Thomas G. Nichols, Treasurer.

Missouri Tin.

About two years ago considerable interest was manifested in regard to the discovery of very extensive deposits of tin ore in this State, and land owners and speculators were accused of having the "Tin Fever." Weeks and months were spent by prospecting parties, and all the tin lands that could be purchased at reasonable rates changed hands. One company was organized, and invested about $80,000 in tunneling the hill and in work preparatory to the erection of a furnace. But their work has been stopped for several months—whether from want of capital, or energy and enterprise, we are not informed. Meanwhile, they have discovered tin ore in California, which is said to be inferior to the Missouri ore, and we now see by a California paper, that "The first article of tinware manufactured from tin mined in the United States has just been completed in San Francisco."

Numerous assays have been made of this ore by chemists and assayers of national reputation, who have repeatedly stated *here* that the ore will yield from 3 to 5 per cent of pure tin; yet, when they reach the Atlantic cities, where the tin importers hold sway, they fail to find tin in paying quantities.

Chemical analyses and assays are not wanted now; but, instead, we need a furnace to smelt the prepared ore and produce the pigs and bars of tin. A test furnace need not be very expensive, and this question, if decided affirmatively, will be of the greatest importance to this city, State, and the whole nation, as the importation of foreign tin into the United States now amounts to from five to six million dollars annually, and is constantly increasing. Who can say that the practical investigation of this subject will not prove as satisfactory as the experiments in smelting iron with our native coals?—*The Iron Age.*

Recutting Files with Acids.

By request, we republish the recipe for recutting files with acids, as patented by Albert I. Ferguson, of Sharon, Pa.:

"The files must be thoroughly cleansed in warm water containing a small quantity of potash, which readily removes any grease or dirt from them. After the files are thus cleansed, they must be washed with warm water and dried by artificial heat. Next, place one pint of warm water into a wooden vessel, and put into it as many files as the water will cover. Then add two ounces of blue vitriol, finely pulverized, and two ounces of borax, well mixed, taking care to turn the files over, so that each may come in contact with the mixture. To the above mixture now add seven ounces of sulphuric acid and one fourth of an ounce of cider vinegar, which will cause the files to assume a red appearance at first, but they will, in a short time, resume their natural color. Then they must be removed, washed in cold water, and then dried by artificial heat. When dry, they must be sponged with olive oil, wrapped in porous paper, and laid aside for use."

Who Made the Cardiff Giant.—T. Mohrmann, of 146 North Water street, Chicago, writes to the Chicago *Tribune* that he and an assistant cut the Cardiff giant from a block of gypsum provided for the purpose. He further states that George Hull, formerly one of the owners of the giant, agreed to pay $150 for the work, which he has neglected to do, and hence Mohrmann does not feel bound to keep the secret. He adds that both himself and the assistant spoken of, will make affidavits as to the truth of his statement.

A Baltimore gentleman has converted the roof of his stable and carriage-house into a garden for the purpose of growing ornamental plants. Water is conducted to the top of the building by means of pipes, for convenience of watering the flowers in dry seasons, and to supply a fountain which he contemplates erecting in the center of the garden. Many of the inhabitants of large cities would find a similar utilization of the flat roofs of buildings a source of pleasurable, healthful, and instructive recreation.

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

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

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

☞ "The American News Company," Agents, 121 Nassau street, New York.
☞ "The New York News Company," 8 Spruce street.
☞ Messrs. Sampson, Low, Son & Marston, Crown Building 188 Fleet st., Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.
☞ A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.

VOL. XXII., No. 9. . . [NEW SERIES.] . . *Twenty-fifth Year.*

NEW YORK, SATURDAY, FEBRUARY, 26, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

*Wood-Molding Machine.....135
*Improvement in Steam Hammers.135
Yaupon Teas of Carolina — Mate of Paraguay.....136
Platinized Looking-glasses.....136
Guatemala, its Inhabitants and Products — Advice to Emigrants.....137
*English and American Iron-Clads Compared.....138
New Railroad Bridge.....138
Another Card from an Advertiser.139
*The Eagle Carpet Stretcher.....139
*How to hitch three Horses to one Plow.....139
Steam Engines at the American Institute.....139
Burning Bituminous Coal.....139
Hardening and Tempering Steel..140
Mechanics' Fairs.....140
English and American Steam Boilers.....140
Electric Heat Applied to Industry.....140
Steam Rollers.....140
Damage to Trees by Borers.....140
Men of Progress.....140
A Voice from the South.....141
Another Case in point.....141
A Journey with a Raft.....141
Adventures of a Diamond.....141
*Improved Photoscope or Panorama Album.....142
Hartford Steam Boiler Inspection and Insurance Co.....142
*Improved Patent Vertical Drill..142
Missouri Tin.....142
Recutting Files with Acids.....142
Editorial Summary.....142
The Water Wheel Tests at Lowell.143
The Wages of Machinery.....143
Waste of Labor in Building.....143
French Experiments with Liquid Fuel.....143
The Economy of Steam Engines...144
Liebig on Fermentation.....144
Positive Philosophy.....144
A mile a Minute.....144
Scientific Intelligence.....145
Patent Decisions.....145
New Books and Publications.....145
Recent American and Foreign Patents.....145
Applications for the Extension of Patents.....146
Answers to Correspondents.....146
List of Patents.....146
Inventions Patented in England by Americans.....146

THE WATER WHEEL TESTS AT LOWELL.

The opinions we have already expressed in regard to the tests of turbine water wheels, made at Lowell last summer, have strong confirmation from letters received by us from exhibitors and others, cognizant of the facts in the case.

The announcement of the tests contained a general invitation to those who wished to exhibit the working qualities of their wheels, and it gave the impression that everything would be complete, open, and fair, and that each wheel would stand or fall solely upon its merits.

We are informed that the tests were not properly made. The apparatus for measuring the water delivered to the wheels was perfect at first, being constructed after the specific published directions of Mr. Francis; but the edges of the weir became much battered by the action of rubbish that passed over it, in consequence of draining the canal every night for repairs. This compelled the opening of the wheel-gates and also the flood-gates to allow *debris* to escape. The foundation of the bulkhead also became unsettled by the large volume of water passed through and under it, throwing the weir out of level.

We are further informed that the flume, or bulkhead, was not so constructed that the exact available head of water upon the wheels could be determined. No two wheels could be put in alike or occupy the same relative positions. Thus it was impossible to approximate similarity of conditions in the different tests. As one correspondent says, the experiments were, in this respect, mere "cut and try." In one case the water had to turn three right angles, resulting in a loss of two per cent of the head as ascertained by measurement, and of course also giving rise to commotion in the water which injured the effectiveness of the wheel to a greater or less extent.

Fault is also found with the friction brake used in the test, as being unreliable and treacherous. It is said that this brake did not allow the wheels to run steadily; that at times it would allow a wheel to move with a uniform motion, and then would suddenly stop motion altogether. It is stated that at best it would not hold the weight steady one second.

The following terms were prescribed for the test: The wheels should be the ordinary manufacture, and should give about forty-horse power under 14 feet, the cost of test not to exceed a stipulated sum.

Notwithstanding, wheels of various degrees of finish were brought to the test. There was no uniformity in size, some giving not more than eighteen-horse power. The expense, it is said, also exceeded the stipulated sum six-fold.

The apparatus was located on a canal already too small to supply the necessary water to the mills located on it. For weeks at a time there could not a drop of water be had for testing in the day time save a few minutes at noon; and the tests made after September were only such as could be snatched from time to time, at short intervals.

It seems that this incompleteness of the arrangements prevented the satisfactory performance of even preparatory experiments; and it is understood that only one public test was made.

It will thus be seen that the public has lost nothing by the suppression of any report of these tests.

IT is said that an English firm has recently fitted up the engines of a small steamer on Warsop's aero-steam principle with highly satisfactory results.

THE WAGES OF MACHINERY.

"There are in the United States about thirteen millions of laboring *men*, *women*, and *children*. There are also a very large number of laboring *machines*. It is estimated that there is steam machinery in the United States equal to two million horse power, or more than fourteen millions of full-grown men. A large portion of this machinery works day and night. It is never sick, never idle, never goes on sprees, never strikes. It always works, when required, up to its full capacity, and never tires. It is not unreasonable to estimate the work of the machinery as equal to that of twenty-eight millions of full-grown industrious men. It is evident, therefore, that only one third of the work of the country is done by its *laboring men*, and two thirds are done by its *laboring machinery*. Is it not clear that the wages of the laboring machinery constitute a larger portion of the cost of manufactured goods than the wages of the laboring men? Would not a reduction of the wages of the laboring machinery go further to reduce the price of goods and facilitate competition than a reduction of the wages of the laboring men. Of course it would."

The above from *The Free Trader* is a fair sample of the ingenuity brought to the support of the doctrine of free trade; an ingenuity which expends itself in concocting sophistical arguments to mystify and delude those who have not the time or the facts wherewith to test their accuracy. We would only add a single word to the above quotation, and that at the very end of it, "*Of course it would not*," is the way we would read it, and for the following reasons:

First, it does not follow that because machinery does the largest portion of the labor performed, that it does it at a greater cost than that of the aggregate manual labor of the country. There is no doubt that it does it at much less cost. It is not clear that the wages of laboring machinery constitute a larger portion of the cost of manufactured goods than the wages of laboring men.

In 1860, the capital employed in the United States, in manufacturing, was $1,009,855,715. The wages paid for manual labor amounted the same year to $378,878,966. Twenty per cent of capital invested will, on the average, pay the entire current expenses of establishments driven by steam power, including the interest on the capital at seven per cent, repairs and depreciation, and exclusive of cost of the material worked and the manual labor employed.

We have purposely made a large average for steam-power manufactories. Where water power is employed the cost of running is much less, owing to the reduction in the fuel account. An average fully large enough for all kinds of power would be 15 per cent. Fifteen per cent of the total manufacturing capital above given would be $151,488,357, for the wages of machinery in 1860, as compared with $378,878,966—the wages of manual labor employed in the manufacturing business.

But the value of manufactured products was, the same year, $1,885,861,676. The wages of machinery was only a trifle over eight per cent of the value of the goods and wares produced. So that if, instead of demanding such enormous wages as the *Free Trader* would have us believe, the machines would be generous to the consumer, and work for nothing and repair themselves, the reduction in the price of goods thus secured would be only eight per cent.

But as the machines will not work for nothing and repair themselves, the free traders have determined on reducing their wages by a removal of duties on iron and coal. The cost of iron in the construction of machines made wholly of that material will not average over ten per cent of their selling price. So, provided that iron were to be obtained without any cost, machines could be thereby cheapened only one tenth, and as the interest on the first cost of machines, and the depreciation which eventually necessitates the purchase of new machinery are items in the entire wages of machinery, which perhaps may be estimated at ten per cent of capital invested, we find that the reduction in the cost of manufactured goods consequent upon the reduction of the wages of machinery caused by getting the iron for nothing at all, would be only one tenth of one half of eight per cent of the entire value of manufactured products, or two fifths of one per cent.

We have already said enough on the subject of the tariff on coal, about which there has been such a hubbub. There is no reason to believe that its removal would affect the price of coal in any appreciable degree.

This attempt to show that machinery is overpaid and that the workingman suffers thereby, deserves to be ranked with the attempt to prove that the tariff on salt—18 cents per 100 lbs.—must inevitably render the luxury of salt codfish inaccessible to the poor.

WASTE OF LABOR IN BUILDING.

Of all the painful sights we are called upon to witness in this day of steam engines, and labor-saving appliances, none strikes us as being so absurd and unnecessary as the waste of human toil in building as it is generally conducted. Hodmen crawling up long ladders with small burdens of bricks and mortar, carrying at each trip some sixty or seventy pounds of building material, with thirty or forty pounds of hod, and one hundred and sixty or more of flesh and blood—not to mention beer—seems something so foreign to this age of machinery that we should scarcely feel it more incongruous to see the stocks and pillories restored to our market-places.

If a huge beam or girder is to be raised, we see the crane, tackle, and steam engine employed, but the ordinary carrying is done by human legs. These legs, although they can do climbing passably, are certainly inferior in this respect to other legs designed by nature to make climbing a specialty.

A ladder is a very serviceable appliance in its way; we however, believe it to be as hard a road to travel as ever the genius of man devised. The hod belongs to an ancient and honorable family of implements, but it does not seem the most agreeable companion in the world to clasp in affectionate embrace or place one's cheek fondly against.

Therefore we say down with the hod; let it take its place with the host of implements, on the tomb of which modern progress has written the epitaph—"PLAYED OUT."

Let us suppose the two side pieces of a ladder to be replaced by iron rails and the rounds by ties, and let us suppose some genius to conceive the happy idea of causing a locomotive to crawl tediously up this heavy grade, drawing after it a load of one third its own weight. What gibings, what laughter, what derision would such a scheme excite among mechanics! Yet we are importing annually large numbers of locomotives to do the same thing; only these locomotives run on the ties instead of the rails.

They do these things better in France. Either derricks are employed, or the brick and mortar carriers are used as stationary engines, rather than as locomotives. In passing a building in process of erection in Paris, one may often see a number of men stationed one above the other along a ladder, each of whom passes his load to the next above him, until the load reaches its destination. In this way a continuous procession of materials is kept up, and a large quantity may be elevated in a short time.

This is an improvement on the climbing process, but there must even in this way be an enormous waste of power. And this waste is not only useless, but so easily avoided that the continuance of the employment of human power to perform such rude work, is a disgrace to modern civilization. It can be demonstrated that a small one-horse power engine, with suitable tackle, and the employment of a single man to attend it, will do the work of six men at elevating bricks and mortar, at a cost of less than the wages of two men.

No mechanic who reads this will fail to see many ways in which this application of steam power could be advantageously made. The ladder might be replaced by a railway up and along which a car-load of bricks or mortar might be made to roll, which track might be joined to and made continuous with a horizontal track, by means of an easy curve at the summit, the whole being adjustable to suit the progressive hights of the wall as they advance towards completion. It would require little genius to adjust the detail, and the cost of building would be greatly lessened by dispensing with the hod carriers.

FRENCH EXPERIMENTS WITH LIQUID FUEL.

For more than ten years M. H. St. Clair Deville has been experimenting with mineral oils as fuel. *Comptes Rendus* and *Le Journal de l'Eclairage au Gaz*, have lately published some interesting facts in regard to these experiments, a *resume* of which is our present purpose.

The oils employed have been obtained from various natural sources, and the experiments have also included the heavy oil from the Parisian Gas Company's works.

The experiments have determined the following points: In twelve kinds of crude oils analyzed, there was found to be from 82 to 87·1 per cent of carbon, 7·6 to 14·8 per cent of hydrogen, and 0·9 to 10·4 per cent of oxygen.

The heavy oil of the Parisian Gas Company has a specific gravity at 32° Fah. of 1·044, and at 88° Fah. 1·007. It is of a dark brown color, and contains 82 per cent of carbon, 7·6 per cent of hydrogen, and 10·4 per cent of oxygen, nitrogen, and sulphur. Heated to 424° Fah., only 12·5 per cent volatilizes. It remains fluid at 12° Fah. A tun of it contains about 220 gallons, and its cost is about fifty francs per tun, or in round numbers ten dollars in gold, our currency.

The amount of carbon added to the hydrogen contained in this fuel, must make it a very powerful heat generating combustible. It has nearly the lowest expansibility of all the oils, its coefficient of expansion being 0·000743, and the lowest coefficient being 0·000652.

The most important experiments with the heavy oil were made with a locomotive of the Strasbourg Railway Company. This locomotive has uncoupled wheels and outside cylinders. Its weight is twenty tuns, and that of the tender is fifteen tuns. It has a heating surface of 72 square yards.

The oil was supplied to the furnace from a tank, being fed by its own gravity. An additional supply was carried on the the tender, wherewith to renew the supply in the tank as required.

The fire was kindled by lighting some shavings and sticks on the floor of the fireplace and at the same time admitting a small quantity of oil. A jet of steam was sent into the smoke pipe from the blow-off pipe of another engine to increase the draft. It took an hour and a quarter to get up steam, during which time 11 gallons of oil were consumed. It was shown, however, that by consuming 12½ gallons of oil, steam could be got up in two and one half hours, without assistance from another engine, but with the inconvenience of a large amount of dense black smoke.

On the first experimental trip it was found that a speed of forty miles per hour was obtained with a consumption of about 14 lbs. of oil per mile.

In a second experiment a train of 70 tuns was drawn at a speed of forty miles per hour, with a consumption of about 17 lbs. of oil per mile.

Subsequent experiments gave results not differing essentially from those mentioned.

The grate consists of 20 bars of iron cast in one piece, with channels for the oil to run down, and it is set perpendicularly before the furnace which is lined with fire brick. A separate cock supplies oil to each grate bar.

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

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

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

THE ECONOMY OF STEAM ENGINES.

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

The coal bills of a steam engine foot up rapidly, and a very small percentage of saving will pay for a great many improvements. It is easy to show that it is true economy to sell an old steam engine for scrap iron and purchase an improved engine at full market rates rather than pay for the extra coal required by the former. For instance, there are few engines working of the old style, regulating by the throttle valve, that furnish an indicated horse power for four and one half pounds of coal per hour. This is equivalent to say five pounds per hour for each net or effective horse power. An engine developing eighty net horse power would then require (80×5×10—) 4,000 pounds of coal per day, or say 4,200 including banked fires at night. This for a year, or 300 working days, would equal (4,200×300÷2,000—) 630 tuns per year, which would cost, in many localities, upwards of four thousand dollars. Now, a new engine, with cut off adjusted automatically by the governor, of a size capable of furnishing economically eighty net horse power, costs from $4,000 to $4,500. So it is safe to say that engines constructed with no regard for economy, require yearly, for fuel alone, an expenditure of money equal to the first cost of a new engine. This would be true, also, in many places where fuel is cheap, if the original cost of the new engine were reduced by the sale of the old one, even for scrap iron.

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

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

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

LIEBIG ON FERMENTATION.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

POSITIVE PHILOSOPHY.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

A MILE A MINUTE.

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

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

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

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

SCIENTIFIC INTELLIGENCE.

PREPARATION OF STRONTIUM.

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

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

RED DYE FOR LEATHER, IRON, WOOD, ETC.

M. Pushner recommends picric acid for this purpose.

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

RECOVERY OF OXALIC ACID FROM MADDER.

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

IF THE EARTH WERE TO STAND STILL.

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

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

PURIFICATION OF GLYCERIN.

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

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

OZONE.

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

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

PATENT OFFICE DECISIONS.

SEED PLANTER.

In the matter of the application of D. W. Hughes for the extension of letters patent granted to him for improvement in hand seed planters Nov. 29, 1869.—Applicant is the inventor of a cheap, simple, and useful device for planting seed by hand.

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

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

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

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

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

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

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

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

The extension is refused.

SAMUEL S. FISHER, Commissioner.

PAVEMENT.

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

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

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

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

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

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

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

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

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

SAMUEL S. FISHER, Commissioner.

UMBRELLA.

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

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

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

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

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

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

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

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

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

SAMUEL S. FISHER, Commissioner.

NEW BOOKS AND PUBLICATIONS.

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

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

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

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

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

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

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

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

PHOTOGRAPHIC MOSAICS FOR 1870. Philadelphia: Benerman & Wilson.

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

Recent American and Foreign Patents.

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

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

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

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

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

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

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

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

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

coarse silk cloth, such as commonly used in the place where the wire is placed in this case, so as to provide a space between it and the wire, and designed for the reception of the coarse bran or feed which will thus be separated from the hulls of buckwheat when grinding this grain, and be delivered into a receptacle over which the hulls are chuted and discharged to another receptacle, the object of which is to provide a bolt by which feed may be obtained separate from the hulls, which are injurious to animals, and which will, at the same time, be suitable for bolting the meal of other grain.

PACKING THE PLUNGERS OF STEAM PUMPING ENGINES.—John Clark, Harrisburgh, Pa.—This invention is intended to be an improvement upon the well-known Worthington & Baker steam pumping engine, and consists in the application of an adjustable packing, constructed so as to compensate for wear, to the central transverse partition of the barrel of such an engine, through which the plunger plays.

METALLIC ABUTMENT FOR BRIDGES.—A. Wheelock, Fort Wayne, Ind.—This invention relates to a new metallic abutment for bridges, constructed in a novel and improved manner.

NUT LOCK.—Maurice Langhorne, Washington, D. C.—This invention has for its object to prevent the turning back spontaneously of a nut after it has once been screwed on its bolt or axle as tightly as may be necessary in order to clamp the material through which the bolt or axle passes.

STEAM PUMPING ENGINE.—William H. Roberts, Mauch Chunk, Pa.—This invention has for its object to make the stroke of the piston of a steam pump uniform as to speed throughout.

KINDLING WOOD ELEVATOR.—James E. Kelsey, Brooklyn, N. Y.—This invention has for its object to furnished an improved elevator, designed especially for elevating kindling wood in the factory where it is prepared for market.

ADJUSTABLE PLOW BACK BAND HOOK.—John Seaman, New York city.—This invention has for its object to furnish an improved plow back band hook, which shall be so constructed that the length of the back band may be easily adjusted according to the size of the animal upon which it is to be used or to regulate the pitch of the plow, and which shall, at the same time, be so constructed that it will not become accidentally unhooked or catch upon the trace of the other horse.

RUBBER MOLDING.—William Miller, Boston, Mass.—This invention has for its object to furnish an improved rubber molding, which shall be so formed as to adapt it for use around windows, doors, etc., as weather-strips, to prevent the wet and cold from finding their way in around said doors and windows.

MEDICAL COMPOUND.—George V. Sheffield and John A. Sheffield, Northbridge Center, Mass.—This invention has for its object to furnish an improved medical compound, simple in its composition and preparation, and effective as a blood purifier, and a sure remedy for many diseases, such as scrofula, salt rheum, dyspepsia, liver complaint, worms, jaundice, etc.

SHINGLE MACHINE.—Wm. H. H. Palmer, Rockville, R. I.—This invention relates to certain improvements in that class of shingle machines in which the blocks to be cut are held in a rotating frame, and exposed to the action of horizontal circular saws. The invention consists in various details of construction, whereby the blocks are brought into the proper alternate inclined positions, and caused to be firmly clamped while being sawed.

SKEIN WARPING MACHINE.—Samuel Campbell, Palmer, Mass., and Duncan McFarlane, Troy, N. Y.—This invention relates to a new machine which can be used to lay the yarn in skeins or in separate threads around the section-beam. The invention consists chiefly in the application of a traversing bugle or guide, which collects all the threads into a single skein, to apply the same to the section-beam. This bugle, however, and its appurtenances are removable, and when they are taken off, the machine may be used to apply the yarn in separate threads, as on the ordinary warping machine.

WHIFFLETREES AND TRACES.—J. V. Norton, Plainville, N. Y.—The object of this invention is to provide a convenient construction of harness, wherewith to connect the ropes of hoisting apparatus, such as derricks, horse hay-forks, etc., with the draft animals.

HARVESTER.—J. B. McCormick, Dayton, Ohio.—This invention has for its object to improve the construction of the kind of reapers which are so constructed that the grain may be bound before being dropped from the machine, so as to make them simpler in construction, and more effective and satisfactory in operation than when constructed in the usual manner.

SAW SET.—H. A. Harris, Center, Texas.—This invention relates to a new implement which can be used for setting the teeth of all kinds of saws, by hand, and without requiring any intricate machinery.

SPRINGS FOR CARS, ETC.—C. M. Banks, Roxborough, Philadelphia, Pa.—This invention will soon be illustrated in the SCIENTIFIC AMERICAN.

FEED CUTTER AND THRASHER.—Norman McLeod, Clio, S. C.—This invention relates to new and important improvements in the machine for which a patent was granted to the same inventor, November 10, 1868, No. 83,584, which said machine is designed for use either for straw or feed cutting, or for thrashing grain, and comprises certain improved arrangements of a feeding trough, feeding rollers, and revolving cutters, working across the end of the feeding trough, and in a large case for controlling the cut straw and delivering it through a spout.

NEEDLES.—Robert J. Roberts, 416 Broadway, New York city.—This invention relates to improvements in sewing needles, and consists in providing the said needles, which are commonly made of steel, which is very liable to damage by corrosion, with coatings of non-corrosive metal, such as gold, silver, copper, or tin; the said metals being applied to the needles after they have been otherwise finished, by the common and well-known methods of gilding, plating, or tinning.

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 advertisemets at $1·00 a line, under the head of "Business and Personal."

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

W. M.—The Hudson River railroad is 144 miles long. There is a flagman for each mile, charged with the duty of examining the track after the passage of every train. It is one of the safest roads in the country. The resistance in moving a tun weight upon a level railroad is one four-hundredth of that load, or, say, 5 pounds. This is realized at slow speeds, and if the construction of track and wheels were mechanically accurate, the above resistance would be constant at all speeds. But so defective is the average construction that, at high speeds, the resistance is found to be 30 pounds and over. The reason why the Erie railway trains are so irregular, is because of the wretched condition of the track. The trains lose from two to five hours on the schedule time in passing over the whole length of the road.

R. C. P. B., of Pa.—No exact ratio between the diameter of a circle and its circumference has ever been discovered. The ratio of 7 to 22, is, however, near enough for many purposes.

A. S., of Iowa.—Annealing depends, like hardening, on molecular changes not yet fully understood. The why of many things cannot yet be answered.

S. W., of Ind.—Bricks do not increase in weight by the process of burning.

H. W., of N. Y.—A good rule in setting boilers in regard to the distance of the bridge walls, is to have the extremities of each 3 inches from the boiler. Then let the bridge walls retreat from the boiler uniformly, so that their distances from the boiler measured halfway between the extremity and the middle of the wall, multiplied into the entire length of the curve, shall give an area of 36 square inches for each square foot of grate surface for the first bridge wall, 24 square inches for the second bridge wall, and 20 square inches for the third. This when three bridge walls are used. In all cases the last bridge wall should be at the same distance from the boiler, so that if one is omitted it is the one giving the greatest area; if two, the ones giving the two greatest areas.

E. B., of Mass.—The Portland cement concrete made in the same proportions as the concrete for building, will make a good cellar bottom. There will be no danger of fire from the registers of a hot-air furnace, unless they are closed so that no air passes through. In such cases they may sometimes communicate fire to the surrounding woodwork. The registers of a furnace should never be all closed at once when a fire is burning. An iron tube well sunk near the foundations of a heavy building, would, we think, if the water flow and demand were large, be apt to cause sinking of the foundations.

M. H. S., of N. Y.—The widths of belts to drive a given horse power depends on their velocity and the surface of contact of the belt with the smaller pulley. These data you do not give, therefore your question cannot be answered. We know no such wheel as a *pitch-back* water wheel. The power required to drive a saw depends upon many conditions not one of which you give. You might just as well ask "how large is a piece of chalk?" You ought to secure the services of a practical mill-wright if you wish to save money and time.

R. J. P. G., of N. H.—The nature of magnetism is not yet understood. Nobody knows why certain bodies are magnetic and others are not, or why bodies under certain circumstances become magnetic and again lose their magnetism. The most that is known is that magnetic phenomena uniformly occurs under certain circumstances. All beyond this remains yet a *terra incognita*.

J. S., of Pa.—The cement called "marine glue" will unite leather to gutta-percha and is impervious to damp. It is made by dissolving by the aid of heat, one part of India-rubber in naphtha, and when melted, adding two parts of shellac, and melting until mixed. Pour it while hot on metal plates to cool. When required for use melt and apply with a brush.

J. H. B., of Mass.—We recommend a wire of aluminum bronze as combining in the greatest degree the qualities of strength, ductility, and cheapness. We do not think it is made in this country, but if you understand wire-drawing, and have facilities, you can make it for yourself. The alloy is nine parts aluminum and ninety parts copper.

R. L. A., of N. C.—The old idea of caloric as a material substance pervading bodies and enveloping their atoms, has been long abandoned by scientific men. You will find more modern and philosophical views in the writings of Tyndall, Grove, Helmholtz, and many others upon heat. We respectfully decline your communication.

E. C. C., of N. Y.—Any well-tempered spring not overtaxed will retain its strength an indefinite length of time. No spring should have a load sufficient to permanently "set" it. Flat coiled springs are the most convenient for driving wheel work.

H. R. A., of Conn.—The spring and the weight are the only mechanical depositories of power which retain their power for indefinite periods, and when released expend it, if we except such as require chemical action to release their imprisoned energy.

C. D. S., of N. Y.—Tin and lead in equal parts makes a good soft solder. Easier of fusion is a solder made of equal parts of tin, lead, and bismuth. For soft soldering brass tinfoil may be used and makes a good joint. Care should be taken not to employ too great heat.

C. B., of N. Y.—An excellent cement to mend cut leather is as follows: 1 pound gutta-percha; 4 ounces india-rubber; 2 ounces pitch; 1 ounce shellac; 2 ounces of oil. Melt the ingredients together and use hot.

C. C., of N. Y.—The periods of artificial incubation of different kinds of eggs are the same as when incubation is performed by the parent bird.

B., of N. Y.—Ornamental iron bars with spiral or undulating lines, are made by rolling between a pair of rollers, the axis of one roller being set at an angle to the axis of the other

S. C. S., of Mass.—We know of no process by which you can make the rusty heads of screws bright again without injury to other parts of the screws, except by repolishing.

W. S., of Iowa.—Your letter and diagram of circles observed about the moon are interesting, but possess hardly enough novelty to warrant publication.

E. C. A. of N. Y.—Black pins are made black by japanning. The japan is made by mixing drop ivory black with anime varnish. The pins are dipped in this and the coat is baked on in an oven.

G. C. H., of Mass.—We know of no cement which will unite leather while damp and hold it strongly.

B. H. H., of Ind.—Boilers do not always explode at the top Neither, in our opinion, do they burst from the generation of gas other than steam, which is a gas to all intents and purposes. Boilers may doubtless be sometimes strained almost to bursting by unequal expansion, but in the majority of cases steam does the work of destruction on boilers weakened by neglect or inherently weak from faulty construction.

W. D. Beecher, of Mass.—You should introduce your blower about half way between the bottom of the ash pit and the grate of your boiler furnace. If the blast is properly introduced into the chimney, provided the volume of air is sufficient, it will add about one half to the draft, but it will be much more efficient applied under the grate.

M. M., of Va.—Mink and other skins are dressed in this country before being made up. We presume this is done more or less by all large fur dealers, but we are not acquainted with any furrier that makes it a specialty.

R. A., of N. C.—A steam engine may be made to assist a water wheel when water is low by belting on to a pulley on the first line of shafting, but the water wheel would hardly take the place of a fly-wheel.

J. S. D., of N. H.—We cannot adopt your suggestion to star each new advertisement. All advertisers must be treated alike, and we wish our readers to read the advertising columns each week from beginning to end.

H. M. & Co., of Ohio.—We do not think that arching over your boiler with brick so as to lead the flame and heated products of combustion over its entire surface, adds directly to the danger of explosion, but by concealing leaks and hiding from view the condition of the boiler, it does so indirectly. Besides, as a measure of economy, it is not good practice to so set a boiler. It is well to cover the top of a boiler with some non-radiating substance, easily removed when necessary, of which felt is undoubtedly the best though more expensive than some other substances that will answer quite well. Sand or coal ashes are used often, and there are some patented compositions in market which are quite cheap, and which are more or less effective.

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.

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

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

To Rent—East River water front, stores and vacant lots suitable for manufacturing or mercantile purposes, together or separate Daniel W. Richards & Co., 92 Mangin st.

Machinists and all others who use nice tools, should send for Goodnow and Wightman's Illustrated Catalogue advertised on last page.

Adam Brown's Patent (No. 98,023), animal trap. Purchasers wanted for every State and Territory not yet sold. For particulars, address Adam Brown, Bridgeport, Polk county, Oregon.

A half interest in the new and very valuable patent, Shackleton's System of Utilizing Exhaust Steam, for sale on reasonable terms. We give a few testimonials where it has been in use for some months. Moore & Sealy Brothers; Yates, Wharton & Co.; P. W. Vail & Co.; M. Gould & Son, Newark, N. J. Perth Amboy Fibre Co., 40 Broadway, N. Y. Tweedy & Co., and Randle & White, Danbury, Conn. Crane, Tubbs & Co.; A. T. Lum, and J. Y. Brokaw, Elizabeth, N. J., etc., etc., etc. The above save from 25 to 50 per cent. For particulars apply to A. Carr, 45 Cortlandt st., N. Y., or address P. O. Box 19, Elizabeth, N. J.

Portable Pumping or Hoisting Machinery to Hire for Coffer Dams, Wells, Sewers, etc. Wm. D. Andrews & Bro., 414 Water st., N. Y.

Best Decarbonized Cast Steel for armory uses, shafting, spindles, stay bolts, axles, set screws, keys, agricultural works, etc., 10 to 11c.; or in sheets, tough as copper, 9 to 12c., ordinary gages. Offices: 42 Cliff st., N. Y.; 14 N. 5th st., Phil'a. Philip S. Justice.

Wanted—A steam dispatch boat, carrying three persons only, to run in smooth water. Builders address "Gazette," Lexington, Va.

The most perfect Door and Gate Spring ever invented. County and State Rights, or the whole interest for sale. Address the Inventor, E. D. Norton, Cuba, N. Y.

Benj. W. Thompson, of Williamsport, Pa., desires the address of Prof. L. I. Marcy, inventor of Sciopticon.

Wanted to manufacture light but useful articles of sheet or cast metal by contract or on royalty. A. F. Champlin, Toy Manufacturer, Westerly, R. I.

Wanted—A Thorough, Practical Machinist, one who has worked in an Oil Mill, and who understands the machinery connected with the same. None other need apply. Address J. J. Powers, glass box 233 Vicksburg, Miss.

Crutch.—Chas. Wheeler, Mt. Gilead, Ohio, wishes to obtain the most approved crutch.

Two 60-Horse Locomotive Boilers, used 5 mos., $1,300 each. The machinery of two 500-tun iron propellers, in good order, for sale by Wm. D. Andrews & Bro., 414 Water st., New York.

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

Anti-friction Horse-powers, for from one to eight horses. This power, as now made, is the easiest of draft for the amount of work done and we recommend it to all who want a strong machine. Prices reduced Send for a circular to R. H. Allen & Co., Postoffice Box 375, New York.

American Boiler Powder—A safe, sure, and cheap remedy for scale. Send for circular to Am. B. P. Co., P. O., Box 315, Pittsburgh, Pa.

Steam Crane Cars, or Derrick Cars, wanted by Baltimore Bridge Co., 49 Lexington st., Baltimore, Md.

For fire brick, fire clay, furnace tile, glass pots, stove linings, sewer pipe, drain tile, garden vases, pedestals, hydraulic cement, plaster of Paris, etc. Address D. B. Ecker, No. 13 Smithfield st., Pittsburgh, Pa.

See advertisement of Thomas' Lathes in another column.

For Hub-mortising Machines, address Exeter Machine Works, Exeter, N. H.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

G. W. Lord's Boiler Powder, 107 W. Girard ave. Phila, Pa., for the removal of scale in steam boilers is reliable. We sell on condition.

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

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

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

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

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

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

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

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

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

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

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

159.—LOOM FOR WEAVING.—Isaac E. Newton, Waterbury, Conn. January 19, 1870.

182.—NEEDLES AND NEEDLE ARMS FOR SEWING MACHINES.—Mary P. Carpenter, San Francisco, Cal. January 20, 1870.

Caveats are desirable if an inventor is not fully prepared to apply for a patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Patent Office fee on filing a Caveat, $10. Agency charge for preparing and filing the documents from $10 to $12. Address MUNN & CO., 37 Park Row, New York.

CITY SUBSCRIBERS. — The SCIENTIFIC AMERICAN will be delivered in every part of the city at $3·50 a year. Single copies for sale at all the News Stands in this city, Brooklyn, Jersey City, and Williamsburgh, and by most of the News Dealers in the United States.

U. S. Patent Office.

How to Obtain Letters Patent
FOR
NEW INVENTIONS.

Information about Caveats, Extensions, Interferences Designs, Trade Marks; also, Foreign Patents.

For a period of nearly twenty-five years, MUNN & CO. have occupied the position of leading Solicitors of American and European Patents, and during this extended experience of nearly a quarter of a century, they have examined not less than fifty thousand alleged new inventions, and have prosecuted upward of thirty thousand applications for patents, and, in addition to this, they have made, at the Patent Office, over twenty thousand preliminary examinations into the novelty of inventions, with a careful report on the same.

The important advantages of MUNN & CO.'S Agency are, that their practice has been ten-fold greater than that of any other Agency in existence, with the additional advantage of having the assistance of the best professional skill in every department, and a Branch Office at Washington, which watches and supervises, when necessary, cases as they pass through official examination.

CONSULTATIONS AND OPINIONS FREE.

Those who have made inventions and desire a consultation are cordially invited to advise with MUNN & CO. who will be happy to see them in person at the office, or to advise them by letter. In all cases, they may expect an HONEST OPINION. For such consultations, opinion, and advice, NO CHARGE is made. A pen-and-ink sketch and a description of the invention should be sent.

TO APPLY FOR A PATENT,

A model must be furnished, not over a foot in any dimension. Send model to MUNN & CO., 37 Park Row, New York, by express, charges paid, also, a description of the improvement, and remit $16 to cover first Government fee, and revenue and postage stamps.

The model should be neatly made, of any suitable materials, strongly fastened, without glue, and neatly painted. The name of the inventor should be engraved or painted upon it. When the invention consists of an improvement upon some other machine, a full working model of the whole machine will not be necessary. But the model must be sufficiently perfect to show with clearness the nature and operation of the improvement.

PRELIMINARY EXAMINATION

Is made into the patentability of an invention by persona search at the Patent Office, among the models of the patents pertaining to the class to which the improvement relates. For this special search, and a report in writing, a fee of $5 is charged. This search is made by a corps of examiner of long experience.

Inventors who employ us are not required to incur the cost of a preliminary examination. But it is advised in doubtful cases.

REISSUES.

A patent when discovered to be defective, may be reissued by the surrender of the original patent, and the filing of amended papers. This proceeding should be taken with great care.

DESIGNS, TRADE MARKS, AND COMPOSITIONS

Can be patented for a term of years, also, new medicines or medical compounds, and useful mixtures of all kinds. When the invention consists of a medicine or compound, or a new article of manufacture, or a new composition, samples of the article must be furnished, neatly put up. Also, send a full statement of the ingredients, proportions, mode of preparation, uses, and merits.

PATENTS CAN BE EXTENDED.

All patents issued prior to 1861, and now in force, may be extended for a period of seven years upon the presentation of proper testimony. The extended term of a patent is frequently of much greater value than the first term; but an application for an extension, to be successful, must be carefully prepared. MUNN & Co. have had a large experience in obtaining extensions, and are prepared to give reliable advice.

INTERFERENCES

Between pending applications before the Commissioners are managed and testimony taken; also, Assignments, Agreements, and Licenses prepared. In fact, there is no branch of the Patent Business which MUNN & Co. are not fully prepared to undertake and manage with fidelity and dispatch.

FOREIGN PATENTS.

American inventors should bear in mind that five Patents—American, English, French, Belgian, and Prussian—will secure an inventor exclusive monopoly to his discovery among ONE HUNDRED AND THIRTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such, that patents can be obtained abroad by our citizens almost as easily as at home. MUNN & Co. have prepared and taken a larger number of European Patents than any other American Agency. They have Agents of great experience in London, Paris, Berlin, and other Capitals.

A Pamphlet, containing a synopsis of the Foreign Patent Laws, sent free.
Address MUNN & CO., 37 Park Row, New York.

COST OF APPLICATIONS.

When the model is received, and first Government fee paid, the drawings and specification are carefully prepared and forwarded to the applicant for his signature and oath, at which time the agency fee is called for. This fee is generally not over $25. The cases are exceptionally complex if a higher fee than $35 is called for, and, upon the return of the papers, they are filed at the Patent Office to await Official examination. If the case should be rejected for any cause, or objections made to a claim, the reasons are inquired into and communicated to the applicant, with sketches and explanations of the references; and should it appear that the reasons given are insufficient, the claims are prosecuted immediately, and the rejection set aside, and usually

Without Extra Charge to the Applicant.

MUNN & CO. are determined to place within the reach of those who confide to them their business, the best facilities and the highest professional skill and experience.

The only cases of this character, in which MUNN & CO. expect an extra fee, are those wherein appeals are taken from the decision of the Examiner after a second rejection; and MUNN & CO. wish to state very distinctly, that they have but few cases which can not be settled without the necessity of an appeal; and before an appeal is taken, in any case, the applicant is fully advised of all facts and charges, and no proceedings are had without his sanction; so that all inventors who employ MUNN & CO. know in advance what their applications and patents are to cost.

MUNN & CO. make no charge for prosecuting the rejected claims of their own clients before the Examiners and when their patents are granted, the invention is noticed editorially in the SCIENTIFIC AMERICAN.

REJECTED CASES.

MUNN & CO. give very special attention to the examination and prosecution of rejected cases filed by inventors and other attorneys. In such cases a fee of $5 is required for special examination and report, and in case of probable success by further prosecution, and the papers are found tolerably well prepared, MUNN & Co. will take up the case and endeavor to get it through for a reasonable fee, to be agreed upon in advance of prosecution

CAVEATS

Are desirable if an inventor is not fully prepared to apply for a Patent. A Caveat affords protection, for one year, against the issue of a patent to another for the same invention. Caveat papers should be carefully prepared.

The Government fee on filing a Caveat is $10, and MUNN & Co.'s charges for preparing the necessary papers are usually from $10 to $12.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING FEB. 15, 1870.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$10
On an application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years $1
A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1
upward, but usually at the price above-named.
The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them ..... $1·25
Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.
Full information, as to price of drawings, in each case, may be had by addressing
MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York

99,744.—PIPE COUPLING.—Wm. D. Alford and J. H. Pitkin, Cuyahoga Falls, Ohio.
99,745.—CIGAR MACHINE.—William G. Ayres and Seth L. Cole, Brooklyn, N. Y. Antedated February 9, 1870.
99,746.—CABINET.—Robert Bacon (assignor to himself and Joseph Lincoln, Jun., Boston, Mass.
99,747.—WASHING MACHINE.—Fortune L. Bailey, Freeport, Ind.
99,748.—FIRE-PLACE BACK.—J. I. Bard, New Orleans, La.
99,749.—GRIPPER AND GAGE FOR PRINTING PRESSES.—Henry Barth, Cincinnati, Ohio.
99,750.—FRAME FOR DYEING IN VARIOUS COLORS FOR MANUFACTURE OF SCOTCH PLAIDS, ETC.—Charles Barton, Paterson, N. J., assignor to Dexter, Lambert & Co.
99,751.—GOVERNORS FOR STEAM AND OTHER ENGINERY.—Joseph Bell, Cincinnati, Ohio. Antedated January 29, 1870.
99,752.—BOILER FOR COOKING STOVES.—Frank S. Bissell, Pittsburgh, Pa.
99,753.—WASH BOILER.—Charles D. Blinn, Port Huron, Mich.
99,754.—AIR PISTOL.—Reuben Brooks, Jun., Rockport, Mass.
99,755.—FOLDING BEDSTEAD.—W. H. Buell, Laughlintown, Pa.
99,756.—SLATE FRAME.—Ebenezer Butler, Salina, N. Y.
99,757.—BANK NOTES, BONDS, REVENUE STAMPS, ETC.—George W. Casilear, Washington, D. C.
99,758.—RULING MACHINE—George W. Casilear, Washington, D. C.
99,759.—GAGE FOR PAPER-CUTTING MACHINES.—Cyril C. Child, Boston, Mass.
99,760.—WINDOW FRAME.—A. J. Cleveland, Baltimore, Md. Antedated January 31, 1870.
99,761.—FRICTION CLUTCH MECHANISM.—Moses G. Crane, Newton, and A. M. Polsey, Boston, Mass., assignors to Wm. Smith Hall, Quincy, Mass.
99,762.—SAFETY VALVE.—George W. Cushing (assignor to himself and Horatio Anderson), Chicago, Ill.
99,763.—FRUIT JAR.—Wm. H. Daniels, Bryan, Ohio.
99,764.—TOBACCO BOX.—Charles Doering, Charlestown, Mass.
99,765.—SPRING BED BOTTOM.—Charles H. Dunks, Detroit, Mich.
99,766.—HAY DRAG.—Daniel Eddelman and Amos Eddelman, Madison, Ind.
99,767.—STIRRUP AND SPUR FOR SADDLES.—Henry Fellows, Bloomington, Ind. Antedated December 20, 1869.
99,768.—CORN SHELLER.—Daniel E. Field, Leaksville, N. C., assignor to himself and Collett Leventhrope, New York city.
99,769.—GAS-CARBURETING APPARATUS.—John Gair, New York city, assignor to himself and Joseph J. Walton, Newark, N. J.
99,770.—SLEIGH KNEE.—John P. Garland, Newbury, Vt.
99,771.—WAGON SPRING.—Lewis L. Gordon, Detroit, Mich.
99,772.—MOP-WRINGER AND SCRUBBING BRUSH.—Lewis L. Gordon (assignor to Richard W. Hutchinson), Detroit, Mich.
99,773.—PROCESS AND MATERIAL FOR ORNAMENTING TEXTILE FABRICS.—Carl Gunther, assignor to Frederick Volkman, Berlin, Prussia.
99,774.—CAR TRUCK.—Aaron Higley, Cleveland, Ohio.
99,775.—SHOVEL BLANK.—George W. Jope, Pittsburgh, Pa., assignor to himself and Wm. Buntan.
99,776.—ELLIPTIC SPRING.—Frank Keeler (assignor to Tomlinson Spring and Axle Company), Bridgeport, Conn.
99,777.—METALLIC HEARTH.—Oliver Kells, Steubenville, Ohio.
99,778.—SOFA LOUNGE.—Charles Kurfiss, Louisville, Ky.
99,779.—SPRING BED.—Hermon W. Ladd and Geo. F. Ladd, Chelsea, Mass.
99,780.—MATCH MACHINE.—L. T. Luther, Oak Grove, Pa.
99,781.—SCREW DRIVER.—William H. Martyn, Boston, Mass.
99,782.—APPARATUS FOR FRIZZLING CLOTH.—Schamu Moritz Moschcowitz, New York city, assignor to Wheeler & Wilson Manufacturing Company), Bridgeport, Conn.
99,783.—SEWING MACHINE.—Nicholas Meyers (assignor to Globe Sewing Machine Company), Buffalo, N. Y.
99,784.—GRINDING AX AND HOOK COMBINED.—Philetus W. Norris, Detroit, Mich.
99,785.—FASTENING HANDLES TO CUTLERY.—Elias G. Ost, Shelburne Falls, Mass.
99,786.—MECHANISM FOR RELIEVING THE PRESSURE ON SHUTTLE-BOX SWELL.—Joseph Potter, Danielsonville, assignor to Geo. L. Lyon, Brooklyn, Conn.
99,787.—COMPOUND RAILWAY RAILS.—Daniel R. Pratt, New York city.
99,788.—BEADING MACHINE FOR SHEET METAL.—Charles H. Raymond, Southington, Conn.
99,789.—OIL CAN.—Patrick Scanlan, Indianapolis, Ind.
99,790.—SPRING BED BOTTOM.—John L. Secomb, Detroit, Mich.
99,791.—COMPOUND PROPELLER PUMP.—Thomas Shaw, Philadelphia, Pa.
99,792.—SELF-WORKING ROTARY CORN PLANTER.—John Simonton, Taylorsville, Ind. Antedated February 14, 1870.
99,793.—FURNACE FOR BURNING EDGINGS, SAWDUST, ETC.—Ira O. Smith, Muskegon, Mich.
99,794.—ENGRAVING MACHINE.—J. Civilian Spencer, Phelps, N. Y.
99,795.—TOOL FOR MAKING SPLINTS.—Charles F. Stewart, Corunna, Mich.
99,796.—FENCE.—M. Vanwormer, Troy, Ohio.
99,797.—HARVESTER KNIFE.—George J. Hardwell, Rutland, Vt. Antedated February 6, 1870.
99,798.—HOUSE TRIMMINGS.—J. R. Webber, Morris, Ill.
99,799.—SCAFFOLD.—George W. Wells, Lawton, Mich.
99,800.—LUBRICATOR FOR BEARINGS OF SHAFTS.—Peregrine White, Dixmont Center, Me. Antedated February 11, 1870.
99,801.—STOVE FOR BURNING STUMPS.—Henderson Willard, Grand Rapids, Mich. Antedated January 29, 1870.
99,802.—ELEVATING APPARATUS.—George G. Winans, Scranton, Pa.
99,803.—DRILLING MACHINE.—Edward J. Worcester, Worcester, Mass.
99,804.—FARE BOX FOR STREET CARS.—W. H. Young, Chicago, Ill.
99,805.—PROCESS OF WELDING CAST OR BESSEMER STEEL.—John Absterdam, New York city.
99,806.—MODE OF COVERING MOLDS AND OTHER ARTICLES WITH A METALLIC SURFACE.—Joseph Alexander Adams, Brooklyn, N. Y.
99,807.—PADDLE-WHEEL.—David Anderson, Philadelphia, Pa.
99,808.—PLANING MACHINE.—Moses L. Andrew, Cincinnati, Ohio.
99,809.—CARRIAGE-WHEEL HUB.—Simeon Atha, West Liberty, Ohio.
99,810.—WOOD-TURNING LATHE.—Loring Atwood and Edward Ripley, Rutland, Vt., assignors to themselves and Baxter D. Whitney, Winchendon, Mass. Antedated February 5, 1870.
99,811.—SOAP MIXTURE.—Jacob M. Austin (assignor to himself and Wm. Tash), York, Pa.
99,812.—GLOBE VALVE.—J. W. Baldwin, Laconia, N. H.
99,813.—SPRING FOR RAILWAY CARS.—C. M. Banks, Roxborough, Philadelphia, Pa.
99,814.—ROTARY WINDOW WASHER.—Gottleib M. Barth, Philadelphia, Pa.
99,815.—SASH HOLDER.—Charles Bean, North Providence, assignors for one-half to James Langley, Jun., Providence, R. I.
99,816.—UMBRELLA.—Charles Becker, New York city.
99,817.—CAR COUPLING.—W. W. Bell, Chicago, Ill.
99,818.—RAILWAY CAR COUPLING.—Charles W. Benson (assignor for one half to Richard C. Waters), Frederick City, Md.
99,819.—CHURN.—H. H. Bigard, E. H. Kellogg, and N. A. Prentiss, Fowler, N. Y. Antedated February 14, 1870.
99,820.—COMBINED REEL AND RAKE FOR HARVESTERS.—S. H. Bingman, Laurelton, Pa.
99,821.—HOE.—L. L. Bond, Chicago, Ill.
99,322.—GATE.—C. S. Bonney, Syracuse, N. Y.
99,823.—INDIGO SOAP.—H. C. Borgner, Lebanon, Pa.
99,824.—INSTRUMENT FOR DIVIDING CIRCLES.—M. Bowker and J. L. Stratton, Fitchburg, Mass.
99,825.—HANDLE FOR CROSS-CUT SAWS.—E. M. Boynton, Grand Rapids, Mich.
99,826.—CLAMP.—S. C. Bradley (assignor to C. E. Thompson & Co.), New Haven, Conn.
99,827.—SASH HOLDER.—E. K. Breckenridge, West Meriden, Conn.
99,828.—BOLT WORK FOR SAFE DOORS, ETC.—Martin Briggs, Rochester, N. Y.
99,829.—TABLE-LEAF SUPPORT.—W. R. Briggs (assignor to M. G. Briggs), Boston, Mass.
99,830.—PLOW.—T. E. C. Brinly, Louisville, Ky.
99,831.—SEAL LOCK.—F. W. Brooks, New York city.
99,832.—SCHOOL DESK.—John David Browne, Madisonville, Ohio.
99,833.—HAY TEDDER.—R. Bryson, Schenectady, N. Y.
99,834.—BRIDLE.—Mathew Hay Buchanan, Washington Co., Va.
99,835.—GRAIN SEPARATOR.—Hiram Burdick, Monroe, Wis.
99,836.—WASHING MACHINE.—Oscar S. Burges, Sr., Battle Creek, Mich.
99,837.—CURTAIN FIXTURE.—T. Burgin, Rutland, Vt.
99,838.—HEAD BLOCK FOR SAW MILLS.—J. H. Burket, Findlay, and G. Burket, Bluffton, Ohio.
99,839.—BOILER FURNACE AND FLUE.—W. H. Burns, Unionville, Mo.
99,840.—TEASLE-GRADING MACHINE.—G. A. Burrough, Providence, R. I. Antedated Feb. 10, 1870.
99,841.—SLATE FRAME.—S. B. Bushfield, Jr., Parkersburg, W. Va.
99,842.—WASHING MACHINE.—N. W. Calhoun, Upper Tract, W. Va.
99,843.—WARPING MACHINE.—S. Campbell, Palmer, Mass., and Duncan McFarlane, Troy, N. Y.
99,844.—BLIND HINGE.—C. B. Clark, Buffalo, N. Y. Antedated Jan. 5, 1870.
99,845.—LATCH.—J. A. Clarke, New York city.
99,846.—PISTON PACKING.—John Clark, Harrisburg, Pa.
99,847.—FOLDING BEDSTEAD.—T. G. Clifford (assignor to himself and W. B. Clifford), New York city.
99,848.—DIE AND PLUNGER.—J. H. Cole, Millbury, assignor S. P. Emerson and A. White, Worcester, Mass.
99,849.—FISH JOINT FOR RAILWAY RAILS.—Hiram Cook, Norwich, Conn.
99,850.—HARVESTER.—G. T. Coolman and Chs. M. Young, Corry, Pa.
99,851.—WHEEL FOR CARRIAGES AND OTHER VEHICLES.—A. F. Cooper, San Francisco, Cal., assignor to himself and J. G. Tappan, Boston, Mass.
99,852.—BRICKKILN.—R. D. Cox, Philadelphia, Pa.
99,853.—INSTRUMENT FOR DESCRIBING SPIRALS, ETC.—Germond Crandell, Washington, D. C.
99,854.—PICTURE FRAME FASTENING.—J. D. Crocker, Norwich, Conn.
99,855.—STEAM ENGINE.—J. E. Culver, Hudson, N. J.
99,856.—PAINT.—T. H. Currey, Cincinnati, Ohio.
99,857.—DEVICE FOR ATTACHING SPITTOONS TO FLOORS OF RAILROAD CARS.—John S. Daggett, Hope, Me.
99,858.—DRIVE WELL TUBE.—Deloss A. Danforth, Elkhart, Ind.
99,859.—MACHINE FOR DIGGING SWEET POTATOES.—R. Darlington and E. L. Watson, Auburn, N. J.
99,860.—APPARATUS FOR GENERATING ILLUMINATING GAS.—Darius Davison, New York city.
99,861.—FLOUR BOLT.—A. J. Dibble, Franklin, N. Y.
99,862.—REFRIGERATOR.—Henry M. Diggins, Cincinnati, Ohio.
99,863.—TOOL FOR CHECKING TIMBER.—A. W. Dorr, Lake Valley, Taho P. O., Cal.
99,864.—ATTACHMENT FOR HOT-AIR REGISTERS.—O. A. Ebert, Baltimore, Md.
99,865.—SHIFTING BUGGY TOP.—David Eldridge, Salem, Ohio.
99,866.—MACHINE FOR LAYING OUT DOORS AND SASH.—S. C. Ellis, Jersey City, N. J.
99,867.—SPRING BRACE FOR CARRIAGES.—William Evans, Eureka, Wis.
99,868.—MACHINE FOR ROLLING RAILROAD CHAIRS.—David Eynon, Richmond, Va. Antedated Feb. 7, 1870.
99,869.—MACHINE FOR SLOTTING RAILROAD CHAIRS.—David Enon, Richmond, Va. Antedated Feb. 7, 1870.
99,870.—HAND CLOTHES WASHER.—P. Falardo, Newark, N. J., and G. H. Snow, New Haven, Conn.
99,871.—SKELETON CORSET.—D. H. Fanning, Worcester, Mass.
99,872.—COMBINATION PADLOCK.—George K. Farrington, Alcatraz Island, Cal., assignor to himself and Frederick and Victor Schulz.
99,873.—INSULATOR FOR TELEGRAPHS.—S. L. Finley, Morrisania, N. Y., assignor to himself and Marshall Lefferts, New York city. Antedated Feb. 3, 1870.
99,874.—BOOM FOR VESSELS.—Eugene G. Gailac, Cutler, Me.
99,875.—CANDLESTICK.—Samuel Gardiner, Jr., New York city.
99,876.—BLOWING APPARATUS.—Rufus H. Gilbert, Washington, D. C.
99,877.—PUMP.—R. J. Gould, Newark, N. J.
99,878.—VAPOR BURNER.—B. D. Greene, Sturgis, Mich.
99,879.—MANUFACTURE OF LOZENGES AND CONFECTIONERY.—Ernest Greenfield, New York city.
99,880.—CRACKERS OR MEAT BISCUIT.—Ernest Greenfield, New York city.
99,881.—APPARATUS FOR REFRIGERATING.—A. Guthrie, Chicago, Ill., assignor to himself and E. A. Goodrich.
99,882.—RAILWAY CAR AXLE BOX.—J. T. Hagerty, Camp Point, Ill.
99,883.—EGG BEATER, ETC.—William Henry Haines (assignor for one half of his right to Thomas Albert Sandford), Newark, N. J.
99,884.—PUMP.—M. P. Hall, Gayville, Ill.
99,885.—COLORING MATTER TO BE USED IN VULCANIZED RUBBER.—John Halliday, Lynn, Mass.
99,886.—BRICKKILN.—S. M. Hamilton, Baltimore, Md.
99,887.—BRICKKILN.—S. M. Hamilton, Baltimore, Md.
99,888.—THRASHING MACHINE.—G. B. Hamlin, Willimantic, Conn.
99,889.—SAWSET.—H. A. Harris, Center, Texas.
99,890.—THILL COUPLING.—A. S. Harry, Wooster, Ohio.
99,891.—SPLIT RING.—T. S. Hattersley, Trenton, N. J.
99,892.—RELAY FOR TELEGRAPHIC INSTRUMENTS.—E. S. Hidden, Millburn, N. J.
99,893.—REVOLVING FIREARM.—Byron R. Hill, Cranston, R. I.
99,894.—LUBRICATOR.—Timothy Holland, New York city.

99,895.—SCHOOL DESK AND SEAT.—M. L. Holt and I. C. Abbott, Eaton, Ohio.
99,896.—TREATING FISH AND ANIMAL MATTERS TO OBTAIN OILS, FATS, AND OTHER PRODUCTS.—Wm. J. Hooper and T. Hooper, Baltimore, Md.
99,897.—HORSE HAY RAKE.—Benjamin F. Horton, Ithaca, N. Y.
99,898.—BREECH-LOADING FIREARM.—B. B. Hotchkiss, New York city.
99,899.—PRIMER FOR CARTRIDGES.—B. B. Hotchkiss, New York city.
99,900.—OYSTER-DREDGE WINDLASS.—W. T. Howard and Oliver Reeder (assignors to Oliver Reeder and S. R. Waite), Baltimore, Md.
99,901.—ATTACHMENT FOR LAMP CHIMNEYS.—John Hughes, New Berne, N. C.
99,902.—ADJUSTABLE DIAL FOR TRAVELERS'] WATCHES.—E. Jas. Hulbert, Portland, Conn., and Alme Nicholas Napoleon Aubin, Montreal, Canada.
99,903.—GRAIN SEPARATOR.—Herbert A. Hummer, Frenchtown, N. J.
99,904.—OBTAINING MADDER EXTRACT.—James Hunter, Philadelphia, Pa.
99,905.—CLOD AND CORN STALK FENDER.—Geo. H. Jackson, College Corner, Ind. Antedated Feb. 2, 1870.
99,906.—CRIMPING MACHINE.—Samuel W. Jamison, New York city.
99,907.—PIGMENT FOR DISTEMPER PAINTING.—H. M. Johnston, New York city.
99,908.—REFLECTOR FOR LAMPS.—Fred. Judson, Castleton, N. Y.
99,909.—WATER METER.—Joseph F. Kelley, Washington, D. C.
99,910.—KINDLING WOOD ELEVATOR.—J. E. Kelsey, Brooklyn, N. Y.
99,911.—FENCE.—James Kerr, Corsicana, Texas.
99,912.—YARD AND TANK CRANE.—L. Y. Ketcham and Jas. Taynton, Port Jervis, N. Y.
99,913.—MACHINE FOR SMOOTHING SPOKES.—Horatio Keys, Terre Haute, Ind.
99,914.—TRACE BUCKLE FOR HARNESS.—Wm. R. Knowles, Columbiana, Ohio.
99,915.—BLACKBALLS FOR BOOT AND SHOEMAKERS.—G. A. Knowlton, Natick, Mass.
99,916.—STOVE SHELF.—John G. Krichbaum, Youngstown, Ohio.
99,917.—SLIDING SQUARE AND CALIPER.—L. L. Lamb, Fitchburg, Mass.
99,918.—NECKTIE.—George Lane, New York city.
99,919.—LOCK NUT.—Maurice Langhorne, Washington, D. C.
99,920.—SHOWCASE FOR SPOOLS AND OTHER ARTICLES.—J. N. Leonard, Rockville, Conn. Antedated Feb. 14, 1870.
99,921.—ROAD SCRAPER.—Cyrus Little, Van Wert, Ohio.
99,922.—BOAT-DETACHING APPARATUS.—S. L. Lord, Surry, Me.
99,923.—RAKE AND TEDDER COMBINED.—J. M. Low, Portlandville, N. Y.
99,924.—MANUFACTURE OF FERTILIZERS AND IN EXTRACTING OILS AND FATS.—O. Lugo, Baltimore, Md.
99,925.—WOOD-BENDING MACHINE.—J. W. Martin (assignor to himself and W. A. Brown), Philadelphia, Pa.
99,926.—FEED HOPPER.—Judson Madison, Oswego, N. Y. Antedated Feb. 5, 1870.
99,927.—APPARATUS FOR GENERATING GAS FOR HEAD-LIGHTS.—H. S. Maxim (assignor to Rodley McAllster & Co.), New York city.
99,928.—MACHINE FOR CUTTING WAX FOR ARTIFICIAL FLOWERS, ETC.—Mary Jane McColl, Chicago, Ill.
99,929.—HARVESTER.—J. B. McCormik, Dayton, Ohio.
99,930.—ORNAMENTAL CORNICE.—T. J. McGeary, Newark, N. J.
99,931.—FEED CUTTER AND THRASHER.—Norman McLeod, Clio, S. C.
99,932.—WEATHER-STRIP.—Wm. Miller, Boston, Mass.
99,933.—CORN AND COB CRUSHER.—J. M. Mower, Milheim, Pa.
99,934.—STOVE LINING AND FIRE BRICK.—Christian Muir, Lockhaven, Pa.
99,935.—MANUFACTURE OF INDIA-RUBBER AND GUTTA-PERCHA GOODS.—John Murphy, New York city.
99,936.—WHIFFLETREE.—J. V. Norton, Plainville, N. Y.
99,937.—LOZENGE MACHINE.—Charles A. Oehl, Portsmouth, N. H.
99,938.—HEDGE TRIMMER.—David Oliver, Galesburg, Ill.
99,939.—HORSE HAY RAKE.—John K. O'Neil, Kingston, N. Y.
99,940.—SHINGLE MACHINE.—Wm. H. H. Palmer, Rockville, R. I.
99,941.—SCAFFOLD BRACKET.—Edward Parker, Plymouth, Conn.
99,942.—HUB FOR CARRIAGE WHEELS.—Wm. C. Pearsall, McMinnville, Tenn.
99,943.—STOP VALVE FOR STEAM AND OTHER MACHINERY.—S. J. Peet, New York city.
99,944.—STOP VALVE FOR STEAM AND OTHER MACHINERY.—S. J. Peet, New York city.
99,945.—PREPARING CERTAIN KINDS OF COTTON WASTE FOR CLEANING MACHINERY.—A. Peple, East Billerica, Mass.
99,946.—COMBINED HARROW, ROLLER, AND SEED SOWER.—C. E. Pierce, New York city.
99,947.—HAY LOADER.—Almon E. Preston, Battle Creek, Mich.
99,948.—RAILWAY RAIL SPLICE.—Richard Randolph, Washington, D. C.
99,949.—PROCESS AND APPARATUS FOR THE MANUFACTURE OF SALT.—D. Reynolds, Albany, N. Y.
99,950.—UMBRELLA.—H. T. Robbins, Boston, Mass.
99,951.—HORSE POWER.—Cyrus Roberts and John A. Throp, Three Rivers, Mich.
99,952.—PLATED NEEDLE.—Robert J. Roberts, New York city.
99,953.—STEAM PUMPING ENGINE.—Wm. H. Roberts, Mauch Chunk, Pa.
99,954.—HEATING STOVE.—Wm. F. Ross, Davenport, Iowa.
99,955.—PENCIL.—Franklin Rowell and E. C. Loud, Springfield, Mass.
99,956.—COLORING VULCANITE OR HARD RUBBER.—A. D. Schlesinger, College Point, L. I., N. Y., assignor to the India-Rubber Comb Company.
99,957.—HARNESS HOOK.—John Seaman, New York city.
99,958.—APPARATUS FOR FORGING METALS.—Thomas Shaw, Philadelphia, Pa.
99,959.—MEDICAL COMPOUND.—G. V. Sheffield and J. A. Sheffield, Northbridge Centre, Mass.
99,960.—CHURN.—Nichols Shelton, Odessa, N. Y.
99,961.—CALIPERS.—William Siar, Franklin, Pa.
99,962.—FEEDING MECHANISM FOR SEWING MACHINES.—G. A. Smith, Philadelphia, Pa.
99,963.—HOT AIR FURNACE.—Wm. Smith, Cicero, Ind.
99,964.—COTTON BALE TIE.—W. M. Smith, Augusta, Ga. Antedated Feb. 10, 1870.
99,965.—TABLE CASTOR.—W. M. Smith, Augusta, Ga. Antedated Feb. 5, 1870.
99,966.—HORSE RAKE.—Wesley Squier, Edon, Ohio.
99,967.—TREADLE FOR SEWING MACHINES.—Frederick Stamler, Hamburg, N. Y.
99,968.—GRAIN HARVESTER AND BINDER.—L. B. Stilson (assignor to himself and J. W. Childs), Minneapolis, Minn. Antedated Feb. 6, 1869.
99,969.—COOKING STOVE.—David Stuart, Philadelphia, Pa.
99,970.—MACHINE FOR GRINDING AND POLISHING BITS.—James Swan, Seymour, Conn.
99,971.—TOASTING FORK.—H. H. Taylor and G. H. Graham, Rochester, N. Y. Antedated Dec. 21, 1869.
99,972.—AUTOMATIC HEAT-REGULATOR FOR HOT AIR FURNACES.—A. H. Tingley, Providence, R. I.
99,973.—BUILDINGS.—Jules Touaillon, San Francisco, Cal.
99,974.—TRESTLE-TREE FOR VESSELS.—Henry Townsend, Jr., Philadelphia, Pa.
99,975.—MANUFACTURE OF PARAFFINE AND PARAFFINE OIL.—H. W. C. Tweddle, Pittsburgh, Pa.
99,976.—APPARATUS FOR ASCERTAINING THE AMOUNT OF ACID IN LIQUIDS.—Henry Twitchell, Cincinnati, Ohio.
99,977.—FOLDING CRATE.—F. R. Van Dake, Jackson, Miss.
99,978.—FERTILIZER FROM GLUE RESIDUUM.—Anthony Van Haagen and Wm. Adamson, Philadelphia, Pa.
99,979.—SOAP PRODUCT FROM GLUE RESIDUUM.—Anthony Van Haagen and Wm. Adamson, Philadelphia, Pa.
99,980.—HORIZONTAL WIND WHEEL.—J. A. Vaughn, Downieville, Cal
99,981.—GRAIN DRILL TOOTH.—Frederick Villard, Mount Eaton, Ohio.
99,982.—HAY AND MANURE FORK.—Frederick Villard, Mount Eaton, Ohio.
99,983.—CHIMNEY COWL.—Frederick Villard, Mount Eaton, Ohio.
99,984.—WASHING MACHINE.—J. V. Wackerman, Buffalo, N. Y.
99,985.—CHURN.—Friedrich Wegner and Charles Schleeter, West Troy, N. Y.
99,986.—APPARATUS FOR DIFFUSING VAPORS THROUGH CUSHIONS, MATTRESSES, ETC.—Wm. Welch, Yarmouth, England.
99,987.—COMBINATION TOY.—Robert Went, Brooklyn, E. D., N. Y.
99,988.—WINDMILL.—H. M. Wheeler, Woodbine, Iowa.
99,989.—METALLIC ABUTMENT FOR BRIDGES.—Alpheus Wheelock, Fort Wayne, Ind.
99,990.—STEAM PISTON PACKING.—Jerome Wheelock, Worcester, Mass.
99,991.—CAM LEVER.—Silas Whitman, Londonderry, Vt.
99,992.—MOTIVE POWER APPARATUS.—Horatio Wilkins and W. H. Sangster, Paris, Ky.
99,993.—MACHINE FOR RE-TURNING CRANK-PINS OF LOCOMOTIVES.—Nathan Wright, Cleveland, Ohio.
99,994.—BEEHIVE.—J. M. Youart, Indianapolis, Ind.
99,995.—ANIMAL TRAP.—W. F. Collier, Worcester, Mass., assignor to Howe, Bigelow, & Co.
99,996.—LOW-WATER INDICATOR.—Robert Berryman, Philadelphia, Pa. Antedated Aug. 16, 1869.
99,997.—SUCKER-ROD COUPLING FOR OIL WELLS.—Adam Good, Jr., Titusville, Pa.
99,998.—CIRCULATING TUBE FOR STEAM GENERATORS.—J. C. Stevens, South Norwalk, Conn.
99,999.—HINGE.—Timothy Smith, Boston, Mass.

REISSUES.

3,834.—FEED-WATER HEATERS AND FILTERS.—James Armstrong, Bucyrus, Ohio.—Patent No. 81,971, dated Sept. 8, 1868.
3,835.—MANUFACTURE OF CAST STEEL.—Wm. W. Averell, Bath, N. Y., assignee of Louis La Brecho-Viger.—Patent No. 95,238, dated Sept. 28, 1869.
3,836.—CORN PLANTER.—Jas. Campbell and Wm. Campbell, Harrison, Ohio, assignees of Jas. Campbell.—Patent No. 54,642, dated May 8, 1866.
3,837.—ALCOHOLIC LIQUOR FROM THE RHUBARB PLANT.—J. H. Deacon, Lumberton, N. J.—Patent No. 86,284, dated January 26, 1869.
3,838.—SURGE RELIEVER.—J. J. Emery, Owl's Head, Me., for himself and E. R. Cheney, Boston, Mass., assignee of J. J. Emery.—Patent No. 94,960, dated Sept. 21, 1869.
3,839.—APPARATUS FOR SCRAPING AND WORKING HIDES.—Henry Lampert, Rochester, N. Y.—Patent No. 60,536, dated December 18, 1866.
3,840.—MANUFACTURE OF FERTILIZERS OR GUANO FROM FISH.—Orazio Lugo, Baltimore, Md.—Patent No. 97,999, dated December 14, 1869.
3,841.—RAILROAD STATION INDICATOR.—A. C. Rogers and Lewis Schaffer, Fort Washington, Pa., assignees of A. C. Rodgers.—Patent No. 95,945, dated Sept. 21, 1869.
3,842.—MANUFACTURE OF HOSE, TUBING, AND OTHER RUBBER FABRICS.—Junius Schenck, Brooklyn, N. Y.—Patent No. 90,397 dated May 25, 1869.
3,843.—Division No. 1.—STEAM HEATER.—Jos. Shackleton, Rahway, N. J.—Patent No. 87,301, dated Feb. 23, 1869.
3,844.—Division No. 2.—STEAM HEATER.—Jos. Shackleton, Rahway, N. J.—Patent No. 87,301, dated Feb. 23, 1869.
3,845.—Division No. 3.—STEAM HEATER.—Jos. Shackleton, Rahway, N. J.—Patent No. 87,301, dated Feb. 23, 1869.
3,846.—SEEDING MACHINE.—W. A. Van Brunt, Horicon Wis—Patent No. 9,436, dated Aug. 31, 1869.

DESIGNS.

3,846, to 3,848.—BOTTLE.—G. J. Byrne, New York city Three patents.
3,849.—TOY STEAM ENGINE.—Walter Holt, Brooklyn, N. Y.
3,850 and 3,851.—CLOCK CASE.—Elias Ingraham, Bristol, Conn. Two patents.
3,852 and 3,853.—SHADE FOR GAS OR LAMP BURNERS.—John Letchworth, (assignor to Hartell & Letchworth), Philadelphia, Pa.

SUBSCRIBERS—who wish to have their volumes bound, can send them to this office. The charge for binding is $1.50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

RECEIPTS—When money is paid at the office for subscriptions, a receipt for it will be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgment of their funds.

Advertisements.

The value of the SCIENTIFIC AMERICAN *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $250 per line to advertise in one of thirty thousand.*

RATES OF ADVERTISING.

Back Page - - - - $1·00 a line.
Inside Page - - - - - 75 cents a line.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

PATENTEES

Who have failed in their efforts to dispose of their rights will do well to consult us, either personally or by mail, free of charge. Many valuable inventions are lying dormant for want of proper management that might realize a fortune for their owners if placed in our hands and brought to the attention of capitalists. Only those will be accepted which we feel satisfied can be sold, as our object is solely the realization of a commission. A candid opinion can therefore be relied upon. No charge for services unless successful.
References on application.
E. E. ROBERTS & CO., Consulting Engineers, 15 Wall st., New York.

GOOD CANVASSERS Wanted for THE WORKSHOP, an Illustrated Monthly, devoted to Art Industry, and for THE WORKSHOP ALBUM. Sales easy and profits large. Send for terms, etc., to the Publisher. E. STEIGER, 22 and 24 Frankfort st., New York.

MOTH-PROOF TUBE BEE HIVE, Patented Nov. 23, 1869. Patented through Munn & Co.'s Agency. Right for sale for $50,000, worth $100,000. State $750 to $1,500; City $150 to $250. Apply to Patentee, W. A. ELAM, Milan Depot, Tenn.

ENGINE LATHES.—Twenty 17, 20, and 24-in. swing Thomas' Patent Lathes, nearly ready for shipment. Best Lathes in the world. Send for circular to THOMAS IRON WORKS, No. 5, Cypress st., Merrifield's Buildings, Worcester, Mass.

Buy Barber's Bit Brace.

THE PLANCHETTE RAZOR HONING Machine. Agents Wanted in every State to sell on Commission. Some State Rights also for sale. Apply to the Patentee, WILLIAM BROWN, Thomaston, Conn.

Excelsior LUBRICATOR

For cylinders of Engines. The most durable and best oil cup, manufactured by
B. E. LEHMAN,
Lehigh Valley Brass Works, Bethlehem, Pa.
Send for descriptive circular.

MOLESWORTH'S POCKET-BOOK OF Useful Formulæ and Memoranda for Civil and Mechanical Engineers. By Guilford L. Molesworth, Member of the Institution of Civil Engineers, Chief Resident Engineer of the Ceylon Railway. From the Tenth London Edition. Price, by mail, free of postage, $2 50.

Among the contents, which are to be extended for an advertisement will be found: Civil Engineering—Surveying, Levelling, Setting Out, etc.; Earthwork, Brickwork, Masonry, Arches, etc.; Beams, Girders, Bridges, etc.; Roofs, Floors, Columns, Walls, etc.; Railway, Roads, Canals, Rivers, Docks, etc.; Water Works, Sewers, Gas Works, Drainage, etc.; Warming, Ventilation, Light, Sound, Heat, etc.
Mechanical Engineering.—Gravity, Mechanical Centers and Powers; Mill-work, Teeth of Wheels, Shafting, Belting, etc.; Alloys, Solders, and Workshop Recipes; Steam Boilers and Steam Engines; Water-wheels, Turbines, etc., and Windmills; Paddle and Screw Steamers; Miscellaneous Machinery.
Weights and Measures, English and Foreign; Logarithms of Numbers; Triangles, Trigonometry, and Tables of sines, etc.; Properties of Ellipse, Parabola, Circle, Areas, and Circumferences of Circles; Weights and Properties of Materials; Squares, Cubes, Powers, Roots, and Reciprocals of Numbers; Engineering Memoranda and Tables; Supplement by J. T. Horst, C. E., contains Additional Engineering Memoranda and Tables; Tables by Lewis Olrick, C. E.

☞ The above or any of my Books sent by mail, free of postage, at the publication prices. My new revised and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS, 81 pp. 8vo, now ready, complete to Feb. 14, 1870, will be sent, free of postage, to any one who will favor me with his address.
HENRY CAREY BAIRD, Industrial Publisher, 406 Walnut st., Philadelphia, Pa.

WANTED.—A MACHINE TO WORK either by hand or power, to cut wire from (1-16) one sixteenth to (⅝) five eighths inch in diameter, in pieces of from (¾) three quarters to (1) four inches (by gage) in length. Making a clean, smooth cut, and not bruising or jamming the wire. Address A. B. C., 439 Broad st., Providence, R. I.

Foundery Materials, Facings, Sand, Clay, Bricks, Crucibles, Tools, Vitriol, etc. Babbit Metal Belting. VANTUYL & CO., 215 Cherry st., N. Y.

ANDREWS' PATENTS.

Noiseless, Friction Grooved, Portable, and Warehouse Hoisters.
Friction or Geared Mining & Quarry Hoisters.
Smoke-Burning Safety Boilers.
Oscillating Engines, Double and Single, half to 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical.
Send for Circulars.
WM. D. ANDREWS, ANDREWS & BRO., 414 Water street, New York.

AMERICAN PAVEMENT.—Rights for sale. C. W. BAILY, 543 N. 3d st., Philadelphia, Pa.

GOLD PENS re-pointed equal to new, and warranted. Price 50 cents by mail. LEWIS H. MARTIN & CO., 413 Chestnut st., Philadelphia, Pa.

JUST THIS ONCE. Reader, the "Star Spangled Banner," the cheapest, richest, raciest, and wittiest sheet ever printed, asks you a favor. It has TENS OF THOUSANDS of good, jolly, sensible readers. It isn't a beggar but it is independent—fearless—free. Its only enemies are swindlers, humbugs—and a very few pitiful, weakly apologies for newspapers, who, jealous of its immense success, waste their precious (!) time in giving it gratuitous advertising. Let us tell you what it is. It is a large LEDGER size sheet, 8 pages, 40 columns, illustrated, literally overflowing with Wit, Humor, Fun, Quips, Quirks, and all the combined jollity that can be condensed into its bright and sparkling pages. It has good stories, sketches, poetry, nonsense (the sensible kind), a very little sense, and a perfect avalanche of rich, rare, and racy literature for you and everybody else. It shows up every swindle, ventilates every humbug. It hates and fights liars, slanderers, thieves, rascals, and their class—while it works for good humor, good objects, and for TRUTH. We have still plenty of "Evangeline" (our superb $3 steel plate). We will carefully mount one on a roller—send it to you prepaid, and will send the paper a WHOLE YEAR, FOR ONLY 75 CENTS.
Will you not TRY it once. It is not a "humbug"—we are responsible. We promise to refund your money, if you are not delighted. NOW IS JUST THE TIME. Specimens 6 cents. Will you not send only 75 cents to the people's favorite
STAR SPANGLED BANNER, Hinsdale, N. H.

C. M. CLAY & CO., 45 Liberty st., N. Y., Manufacturers of, and wholesale dealers in our Patented "Perpetual Candle," and Self-generating Gas Safety Lamps, and Terrane. This candle, with Terrane, burns 8 hours, with a light, by the photometer, of 1¼ stearine candles of 4 to the pound. The stearine candle, at 20 cents per pound, costs five cents each; the one gallon of Terrane, at 25 cents per gallon, equals 60 stearine candles, costing 41·66 hundredths of one cent; that is, more than 12 times as cheap as stearine!
Description and prices sent by post to inquirers. Agents wanted in every State and Territory in the United States, and in the New Dominion. Goods furnished at a liberal discount.

100 Sold every day—30th thousand just out. The "Hunter's Guide." It is the only really useful book. It tells "ALL ABOUT" hunting, fishing, trapping, and tanning. It is all in all, the only cheap, reliable book on hunting and trapping; nearly 100 pp., and we will mail it to you, prepaid, for only 25c. Send to the original publishers, HUNTER & CO., Hinsdale, N. H.

HINKLEY KNITTING MACHINE

FOR Family Use—simple, cheap, reliable. Knits everything. AGENTS WANTED. Circular and sample stocking FREE. Address HINKLEY KNITTING MACHINE CO., Bath, Me., or 176 Broadway, N. Y.

Industrial Literature.

BAIRD'S CATALOGUE, FEB. 15, 1870.
81 PAGES, 8vo.

This New and Enlarged Catalogue of the magnificent collection of PRACTICAL AND SCIENTIFIC BOOKS, in all departments, now published by me, will be sent FREE OF POSTAGE, to any one who will favor me with his address. No such list of Industrial Books, of his own publication, is issued by any other publisher in the United States or Great Britain.

HENRY CAREY BAIRD, Industrial Publisher, 406 Walnut st., Philadelphia, Pa

BOUND Vols. Scientific American, 1850 to 1870, for sale. D. F. TOWNER, Baltimore, Md.

THE SCIENTIFIC AMERICAN *FOR 1870.*

A SPLENDID PREMIUM.

This Illustrated Weekly Journal of Practical Information, Art, Science, Mechanics, Invention, Chemistry, and Manufactures—Entered its Twenty-fifth Year on the 1st of January.

The SCIENTIFIC AMERICAN stands at the head of the Industrial Journals of the world in point of Circulation and Influence.

Every number has Sixteen Imperial pages, embellished with Engravings of New Inventions, Machinery, Tools for the Workshop, House, and Farm, also Public Buildings, Dwelling Houses, and Engineering Works.

The Illustrated Department of the SCIENTIFIC AMERICAN is a very striking feature, and has elicited the praise of the Press; and all articles appearing in its columns are written in a popular and instructive style.

Any one sending
10 Names for 1 year, and $20, will receive one picture
20 " " 30, " " "
30 " " 75, " two pictures.
40 " " 100, " three "
50 " " 125, " four "

Competitors for the above prizes can send in names at any time and from any postoffice. For full particulars and sample copies of the SCIENTIFIC AMERICAN, address the Publishers.

Terms of the SCIENTIFIC AMERICAN: Single copies one year, $3·00; six months, $1·50; and one dollar for four months. To Clubs of ten and upward, $2·50 each per annum.
MUNN & CO., 37 Park Row New York.

FOR SALE.—A MANUFACTURING BUSiness; with 20-horse power engine, and boiler, shafting, pulleys, belting, drop and tilt hammers, lathes, edging machines, mills and drilling machines, etc., etc., and all the small tools suitable for manufacturing GUNS, PISTOLS, ETC. Machinery adaptable for manufacturing any kind of hardware goods; also,
FIVE YEARS' LEASE OF A LARGE, NEW 5-STORY FACTORY, with every convenience, at a very cheap rent. The above will be sold very low, and goods manufactured by the purchaser taken in part payment.
EDWARD K. TRYON, JR., & CO.
No. 19 North 6th street, Philadelphia, Pa.

GREGORY'S SEED CATALOGUE

MY ANNUAL CATALOGUE, containing a list of many novelties, besides all the standard vegetables of the garden (OVER 100 OF WHICH ARE OF MY OWN GROWING), with a choice selection of Flower Seed will be forwarded GRATIS to all. I warrant my seeds shall prove as represented. I warrant it shall reach each purchaser. I warrant all money forwarded shall reach me. Send for a catalogue.
JAMES J. H. GREGORY, MARBLEHEAD, MASS.

TO BUILDERS OF MACHINERY of any kind, who wish to introduce their manufactures in or increase their orders from the Pacific States. BERRY & PLACE (machinery depot 112 and 114 California street), San Francisco, are agents for most first-class Eastern machinery builders, receive consignments of sample machines, and keep in store a large variety of wood-working, mill, and other improved machinery. Their house makes the business a specialty. Correspondence solicited.

LECOUNT'S PATENT HOLLOW LATHE DOGS AND CLAMPS.—A set of 8 Dogs from ⅜ to 2-in., inclusive, $8. A set of 12 from ⅜ to 4-in., $17·30. Five sizes Machinists' Clamps, from 2 to 6-in., inclusive, $11.
Send for Circular.
C. W. LECOUNT.
South Norwalk, Conn.

PORTABLE STEAM ENGINES, COMBINing the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **750** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J C HOADLEY & CO Lawrence, Mass

WANTED—CIRCULARS AND INFORmation of improved Wood-work Machinery, Engines, and Foundery Fixtures, for a new establishment. Address GEORGE MUNGER, East River, Conn.

FOR THE BEST STEAM JACKET KETtles, made without Bolting or Packing for High Pressure Steam, address E. WHITELEY, Patentee, 57, 59, 61, 63 Charlestown st., Boston, Mass.

$2500 TO $3000 PER YEAR.—An agent is wanted in every town in the Union to make and sell an article of daily consumption in every family. It is entirely new. Sale permanent as flour. Address LOUIS COBLENTZ,
Middletown, Md.

ESTE. ENOCH MORGAN'S SONS' 1809.
(211 Washington st., N. Y.)

SAPOLIO
THE BEST THING OUT.

For Cleaning Windows (without water); removing Stains from Marble and Paint; Polishing Knives, (no scratching); Washing Dishes, Scrubbing Floors, Floor Cloth, Tables, Bath Tubs, etc.; Polishing Tin, Brass, Iron, Copper, and Steel Wares; Removing Gums, Oil, Rust, and Dirt from machinery. Indispensable for House Cleaning, and all uses (except washing clothes). It costs but a few cents, and is sold by all good Grocery, Drug, and Notion Stores.

TO AMATEURS.—
For Sale—One of Holtzappfel's Best Lathes, with a great variety of Chucks and Cutters, for Ornamental Turning. Also, Apparatus for Curvilinear and Spiral Turning. Sliding Mandrel, with screw guides, over-head motion, slide rest, and over 100 tools for metal and wood turning, ornamental drills, etc., etc. Price $1000—less than one half original cost. Apply to
JNO. E. HYDES' SONS,
22 Maiden Lane, New York.

LOOK AT
The Bright Side.

It is a paper of sixteen illustrated quarto pages, published monthly at 50 cents a year, "for all children." The very best writers. Large premiums for clubs. Three months on trial for 10 cents. Send for it and say where you saw this advertisement. Specimen copy FREE.
ALDEN & TRUE, Publishers,
Chicago, Ill.

WATERPROOF PAPER FOR OUT, AND inside of buildings. C. J. FAY, Camden, N.J.

R. BALL & CO., Worcester, Mass., Manufacturers of Woodworth's, Daniel's, and Dimension Planers; Molding, Matching, Tenoning, Mortising Shaping, and Boring Machines; Scroll Saws, Re-sawing, Hand Boring, Wood Turning Lathes and a variety of other Machines for Working Wood. Also, the best Patent Door, Hub, and Rail Car Mortising Machines in the world. ☞ Send for our Illustrated Catalogue.
RICHARD BALL. E. P. HALSTED

40,000 SOLD.—The WONDER of the World. The Magnetic Time Indicator or "Dollar Watch." A PERFECT GEM. Elegantly cased in Oroide of Gold, Superior Compass attachment, Enameled Dial, Silver and Brass Works, glass crystal, size of Ladies' Watch. Will denote correct time, warranted five years, superb and showy case, entirely of metal. This is no wood Compass. Is entirely new, patented. 6500 sold in three weeks. Only $1 each, three for $2, in neat case, mailed free. Trade supplied. Address the sole manufacturers, MAGNETIC WATCH CO., Hinsdale N. H.

ROBERT McCALVEY, Manufacturer of HOISTING MACHINES AND DUMB WAITERS.
602 Cherry st., Philadelphia, Pa.

P. BLAISDELL, Manufacturer of MACHINISTS' TOOLS,
Engine Lathes, Planers, Upright Drills, Traverse Drills, Boring Mills, Gear Cutters, and Hand Lathes.
Worcester, Mass.

Agents! Read This!

WE WILL PAY AGENTS A SALARY of $30 per week and expenses, or allow a large commission, to sell our new and wonderful inventions. Address M. WAGNER & CO., Marshall, Mich.

THE INVENTOR'S AND MECHANIC'S GUIDE.—A valuable book upon Mechanics, Patents, and New Inventions. Containing the U.S. Patent Laws, Rules and Directions for doing business at the Patent Office; 112 diagrams of the best mechanical movements, with descriptions; the Condensing Steam Engine, with engraving and description; How to Invent; How to Obtain Patents; Hints upon the Value of Patents; How to sell Patents; Forms for Assignments; Information upon the Rights of Inventors, Assignees and Joint Owners; Instructions as to Interferences, Reissues, Extensions, Caveats, together with a great variety of useful Information in regard to patents, new inventions, and scientific subjects, with scientific tables, and many illustrations. 108 pages. This is a most valuable work. Price only 25 cents. Address MUNN & CO., 37 Park Row, N. Y.

MODELS, PATTERNS, EXPERIMENTAL, and other machinery, Models for the Patent Office built to order by HOLSKE MACHINE CO., Nos. 528, 530 and 532 Water st., near Jefferson. Refer to SCIENTIFIC AMERICAN office. 14 tf

SHINGLE AND HEADING MACHINE—Trevor & Co.'s Improved. The Simplest and Best in use. Also, Shingle, Heading, and Stave Jointers Stave Cutters, Equalizers, Heading Turners, Planers etc. Address TREVOR & CO., Lockport, N. Y.

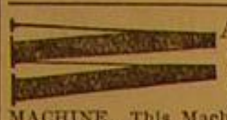
BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK,
P. O. Box 1,057, Boston, Mass.
N. B.—This detector is covered by two U. S. patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

THE CHALMERS-SPENCE
Patent Non-Conductor

For covering Boilers, Pipes, etc. Saves fuel, is non-bustible, never deteriorates. Head Office foot of Ninth st., E. R., New York. Branch at St. Louis, Mo. Agencies Boston, Philadelphia, and New Orleans.

The Albany Iron Manufacturing Co. Offer for Rent

On very moderate terms, the whole or a part of their large and splendid new building, just completed, together with the steam power belonging thereto. The building is 200x70 feet, four stories high; the engine of 150-horse power. Address S. V. TALCOTT, Sec.,
Albany, N. Y.



WANTED—AGENTS—$75 to $200 per month, everywhere, male and female, to introduce the GENUINE IMPROVED COMMONSENSE FAMILY SEWING MACHINE. This Machine will stitch, hem, fell, tuck, quilt, cord, bind, braid, and embroider in a most superior manner. Price only $18. Fully warranted for five years. We will pay $1000 for any machine that will sew a stronger, more beautiful, or more elastic seam than ours. It makes the "Elastic Lock Stitch." Every second stitch can be cut and still the cloth cannot be pulled apart without tearing it. We pay Agents from $75 to $200 per month and expenses, or a commission from which twice that amount can be made. Address SECOMB & CO.,
Pittsburgh, Pa., Boston, Mass., or St. Louis, Mo.

CAUTION.—Beware of all Agents selling Machines under the same name as ours, unless they can show a Certificate of agency signed by us. We shall not hold ourselves responsible for worthless Machines sold by other parties, and shall prosecute all parties either selling or using Machines under this name to the full extent of the law, unless such Machines were obtained from us or our Agents. Do not be imposed upon by parties who copy our advertisement and circulars, and offer worthless Machines at a less price.

INVENTORS, AGENTS, MERCHANTS, and all Dealers in Patents or Patented Goods, should subscribe for the PATENT STAR, devoted to their Interests. Terms 50c. per year. Send stamp for sample to BENT, GOODNOW & CO., Boston, Mass.

Write to or call on BUCK who makes a machine that no one but has a right to make; and be assured by that it is the only one that will Mortise or Bore Blind Stiles for fixed or rolling Slats in all kinds of Wood, regardless of knots, in both stiles at once, at the rate of 50 mortises per minute; discarding chisels and substituting cutters that leave the mortise clear of chips. M. BUCK, Ag't, Lebanon, N. H.

Chas. E. Emery,

CIVIL AND MECHANICAL ENGINEER,
No. 7 Warren st., New York.
Drawings and Specifications furnished. Steam Machinery practically tested. Inventions examined for Capitalists. Refers, by permission, to Horatio Allen, Esq., Capt. John Ericsson, C. H. Delamater, Esq., Hecker & Bro., and other eminent engineers and manufacturers

STEAM ENGINES AND BOILERS, NEW and Second-hand, 2 to 150-Horse, at Greatly Reduced Prices. Send for circular.
MYERS, 245 N. Front st., Philadelphia, Pa.

L. & J. W. FEUCHTWANGER,
CHEMISTS & IMPORTERS, 55 Cedar st., New York. Soluble Glass, or Silicate of Soda and Potash, in all forms. Crude Materials for Glass, Steel, and Porcelain Manufacturers. Best Manganese, 94 per cent. Tungsten, Spiegeleisen, Feldspar, Flint, Fluoric Acid, Oxides, Cobalt, Antimony, Copper, Asbestos, Aluminum, Blood-stone, Black Lead, Zaffre, etc.
The rarest chemical preparations made to order.

HENRY W. BULKLEY, ENGINEER,
Mechanical Designs, Detail Drawings, Estimates, etc., 70 Broadway, New York.

WOODBURY'S PATENT
Planing and Matching

and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, 91 Liberty street, N. Y.;
Send for Circulars. 67 Sudbury street, Boston

CIRCULAR SAW MILLS, PLANERS Matchers, etc. Prices Low. S. HEALD & SONS Barre, Mass., make the Largest and Best Planer to be found for the money. Send for circulars.

H. BOARDMAN, Lancaster, Pa.—Superior Patent Cork-cutting Machinery, Hard-laid Twine Cord, and Rope Machinery, with Pat. Stop & Condenser

BOILER FELTING SAVES TWENTY-five per cent of Fuel. JOHN ASHCROFT,
16 tf 50 John st. New York.

L. W. Pond's New Tools.

NEW AND IMPROVED PATTERNS—Lathes, Planers, Drills, Milling Machines, Boring Mills, Gear and Bolt Cutters Punches and Shears for Iron. Dealer in

MACHINERY.

Works at Worcester, Mass. Office, 98 Liberty st., N. Y.
S. N. HARTWELL, General Agent.

COTTON AND WOOL
SIMONDS PICKERS
Of the most approved English pattern, built by RICHARD KITSON.....Lowell, Mass.

CINCINNATI BRASS WORKS.—Engineers' and Steam Fitters' Brass Work. Best Quality at very Low Prices. F. LUNKENHEIMER, Prop'r,
Cincinnati, Ohio.

H. B. BIGELOW & CO.,
Bridge Engineers and Iron Bridge Builders,
New Haven, Ct.

SOLID EMERY WHEELS are guaranteed superior to any now in the market, and sent out on trial.
Price list upon application.
UNION STONE CO.,
32 Pemberton Square,
Boston, Mass.

BURDON IRON WORKS,—Manufacturers of Pumping Engines for Water Works, High & Low Pressure Engines, Portable Engines of all kinds, Sugar Mills, Screw, Lever, Drop, & Hydraulic Presses, Machinery in general. Hubbard & Whittaker, 102 Front st., Brooklyn.

VINEGAR.—How Made from Cider, Wine, Molasses, or Sorghum in 10 hours, without using drugs. For circulars, address F. I. SAGE,
Vinegar Maker, Cromwell Conn.

FOUNDERY FACING MILLS, 526 and 528 East 18th street, New York, BOYD & PEASE Proprietors. Office 568 East 18th street, New York, Manufacturers and Dealers in all kinds of
FOUNDERY FACINGS
of the best quality, and at the lowest rates. Sea Coal, Mineral, Lehigh, Charcoal, Lead, Mixed Facings, etc.

We would respectfully refer to some of the parties we furnish with our Facings.

J. B. & W. W. Cornell, New York city; Washington Iron Works, Newburgh, N. Y.; Corliss Steam Engine Co., Providence, R. I.; Hinckley & Williams Iron Works, Boston; Wason Manufacturing Co., Springfield, Mass.

BAG MACHINES—Having the very latest improvements, and superior to all others, for sale and license, by B. S. BINNEY,
64 Kilby street, Boston, Mass.

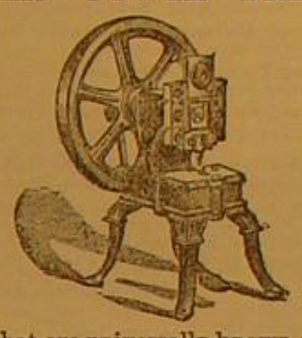
CAMDEN
Tool and Tube Works,

Camden, N. J. Manufacturers of Wrought Iron Tube, Brass Work and Fittings, and all the most improved TOOLS for Screwing, Cutting, and Fitting Pipe. Screwing Machines for Pipe, of five different sizes. Pipe Tongs, Common and Adjustable; Pipe Cutters, Pipe Vises, Taps, Reamers, Drills, Screwing Stocks, and Solid Dies. Peace's Patent screwing Stocks, with dies. No. 1 Screws ¼, ⅜, ½, ¾ Pipe. Price complete, $10. No. 2 Screws, 1, 1¼, 1½ 2 Pipe, $20. No. 3 both screws and cuts off, 2½, 3, 3½, 4, $65

WOODWORTH PLANERS a SPECIALTY—From new patterns of the most approved style and workmanship. Wood-working Machinery generally. Nos. 24 and 26 Central, corner Union street, Worcester Mass. Warerooms, 42 Cortlandt street, New York.
WITHERBY, RUGG & RICHARDSON.

STOCKS, DIES, AND SCREW PLATES Horton's and other Chucks. JOHN ASHCROFT, 50 John st., New York. 16 tf

PARKER POWER PRESSES.



Are what are universally known as the
"FOWLER PRESS,"

improved, and *are without a rival* as regards strength and durability, combined with delicacy of adjustment of the Punch. NOTICE is hereby given that the
STILES POWER PRESS
Is a direct INFRINGEMENT OF OUR PATENT dated April 17, 1855, and reissued Aug. 24, 1869, and ALL PARTIES are hereby CAUTIONED against BUYING OR USING said presses WITHOUT OUR PERMISSION.
PARKER BROTHERS,
West Meriden, Conn.
New York office with CHAS. PARKER, 27 Beekman st.

THE BEST PUNCHING PRESSES ARE made by the Inventor and Patentee of the famous Eccentric Adjustment. Infringements upon said Patent will be severely dealt with. N. C. STILES,
Middletown, Conn.

ASHCROFT'S LOW-WATER DETECTOR will insure your Boiler against explosion. JOHN ASHCROFT, 50 John st., New York. 16 tf

STEAM AND WATER GAGES, STEAM Whistles, Gage Cocks, and Engineers' Supplies.
16 tf JOHN ASHCROFT, 50 John St., New York.

THE WOODWARD STEAM-PUMP MANUFACTURING COMPANY, Manufacturers of the Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Also Dealers in Wrought-iron Pipe, Boiler Tubes, etc. Hotels Churches, Factories, & Public Buildings, Heated by Steam Low Pressure. Woodward Building, 76 and 78 Center st., cor. of North st. (formerly of 77 Beekman st.), N.Y. All parties are hereby cautioned against infringing the Pat. Right of the above Pump. G. M. WOODWARD, Pres't

THE NOVELTY IRON WORKS
Have For Sale at their Shop, foot of East 12th st., Lathes Planers, and all kinds of Machines for manufacturing Engines, Tools, etc.

WROUGHT-Iron Pipe for Steam, Gas, and Water; Brass Globe Valves and Stop Cocks, Iron Fittings, etc. JOHN ASHCROFT, 50 John St., N. Y.

To Electro-Platers.

BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with books of instruction manufactured and sold by THOMAS HALL, Manufacturing Electrician, 19 Bromfield st., Boston, Mass. Illustrated catalogue sent free on application.

TODD & RAFFERTY, Manufacturers and DEALERS IN MACHINERY.
Works, Paterson, N. J.; Warerooms, 10 Barclay st., N. Y. Boilers, Steam Pumps, Machinists' Tools. Also, Flax, Hemp, Rope, and Oakum Machinery, Snow's and Judson's Governors, Wright's pat. Variable Cut-off & other engines.

Niagara Steam Pump.

CHAS. B. HARDICK,
No. 9 Adams st., Brooklyn N. Y

SILICATE OF SODA, IN ITS VARIOUS forms, manufactured as a specialty, by Philadelphia Quartz Co., 783 South 3d st., Philadelphia, Pa.

WROUGHT IRON BEAMS & GIRDERS

THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address the Union Iron Mills, Pittsburgh, Pa.

OTIS' SAFETY HOISTING Machinery.

OTIS BROTHERS & CO.
NO. 349 BROADWAY, NEW YORK.

WARD & STANTON, 52 John st., N. Y., manufacturers of an improved Cut-off Steam Engine, variable by the governor, simple and durable. Consumption of Fuel guaranteed. Also, Direct-acting Steam Pumps, of all sizes, and warranted perfect in their action. Send for circular.

PORTABLE STEAM ENGINES AND Boilers, Complete.

8-Horse Power			$ 700
12	"	"	900
16	"	"	1200
20	"	"	1500
25	"	"	1650

For Sale by H. B. BIGELOW & CO.,
New Haven, Conn.

LATHE CHUCKS—HORTON'S PATENT—from 4 to 96 inches. Also for car wheels. Address E. HORTON & SON Windsor Locks Conn

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st., New York. 17 1

MACHINERY.—S. C. HILLS, No. 12 Platt st., New York, dealer in all kinds of Machinery and Machinists' supplies. 2 tf s

DOUBLE TURBINES

AFTER THE "KINDLEBERGER PATENTS," Manufactured Exclusively by
NILES WORKS, Cincinnati, Ohio.
Catalogues sent free on application.

MASON'S PAT'T FRICTION CLUTCHES are Manufactured by Volney W. Mason & Co., Providence, R. I. Agents, R. BROOKS & CO., 128 Ave. D, New York · TAPLIN RICE & CO. Akron, Ohio 16 tfeow

Independent Steam BOILER SUPPLY, OR Feed Pump.

RELIABLE FOR HOT OR COLD WATER.
Circulars sent free. COPE & CO.,
No. 118 East 2d st., Cincinnati, Ohio

PLATINUM. H. M. RAYNOR
57 Bond st., N. Y.

$200 per month guaranteed. Ag'ts wanted in every County in the U. S. to sell Buk's Burglar Alarm. Price $5. Sells on sight. Address GEORGE H. BECKER & CO., 132 N. 3d st., Phil'a, Pa.

HARTFORD
Steam Boiler INSPECTION & INSURANCE CO.

CAPITAL.....$500,000

ISSUES POLICIES OF INSURANCE, after a careful inspection of the Boilers, covering all loss or damage to

Boilers, Buildings, and Machinery,

—ARISING FROM—

STEAM BOILER EXPLOSIONS.

The business of the Company includes all kinds of
STEAM BOILERS,

STATIONARY, MARINE, AND LOCOMOTIVE.

Full information concerning the plan of the Company's operations can be obtained at the
HOME OFFICE, in Hartford, Conn.
Or at any Agency.
J. M. ALLEN, President.
C. M. POND, Vice President.
T. H. BABCOCK, Secretary.

BOARD OF DIRECTORS:

J. M. Allen.....President.
Lucius J. Hendee.....President Ætna Fire Ins. Co.
F. W. Cheney.....Ass't Treas. Cheney Bro's Silk Mfg. Co.
John A. Butler.....Pres. Conn. River Banking Co.
Charles M. Beach.....of Beach & Co.
Daniel Phillips.....of Adams Express Co.
G. M. Bartholomew.....Pres't American Nat'l Bank.
R. W. H. Jarvis.....Pres't Colt's Fire-Arms Mfg. Co.
E. M. Reed.....Sup't Hartford & N. Haven Railroad.
C. M. Pond.....Treas. Hartford & N. Haven Railroad.
T. O. Enders.....Sec. Ætna Life Ins. Co.
Leverett Brainard.....of Case, Lockwood & Co.
GEN. WM. B. FRANKLIN, Vice Pres't Colt's Pat. Fire Arms Man'f'g Co.
Geo. Crompton.....Crompton Loom Works, Worcester.
D. L. Harris.....Pres't Conn. River R. R., Springfield.
Earl P. Mason.....Pres't Prov. & Wor. R. R., Providence.
Hon. E. D. Morgan.....U. S. Senator, New York.

New York Office,
106 Broadway.
THOS. S. CUNNINGHAM, Agent.
R. K. McMURRAY, Inspector.

Molding Machinery.

THE MOST VALUABLE MACHINE FOR Planing Irregular and Straight Work in all branches of Wood-Working, is the Combination Molding and Planing Machine Co.'s "Variety Molding and Planing Machine." Our improved guards make it safe to operate; our combination collars save one hundred per cent; and for planing, molding, and cutting irregular forms, our Machine is unsurpassed. The right to make and vend these Machines is owned solely by us, and we will defend Purchasers in case litigation is forced upon them by any parties pretending to own Patents on any part of our Variety Machine. COMBINATION MOLDING AND PLANING MACHINE CO., 424 East 23d st., or Postoffice Box 3230 New York City. Silas M. Hamilton, Baltimore Samuel Leggert, New York. 19 tfeow

Gear's Variety Moulding Machine,
WARRANTED THE BEST IN THE WORLD for Moulding and Cutting Irregular Forms, with Patent Improvements for Combination Cutters, and Patent Guard to protect operator and material. Secured by six Patents. Deeds of Right to use furnished with every Machine sold, to protect parties in using them. Before purchasing Combination Moulding and Planing Machine Co.'s or Grosvenor's Maugrel Infringing Machines, (which they and their agents, in behalf of the singer Sewing Machine Co., and the Central Pacific R. R. Co., and others to whom they had sold Machines to be used out of the State of New York, have been made to pay us for using) or Ball's or Fay's infringing Machines, which users have had to pay us for right to use. Address for particulars said Machines, Sole Owners and Lawful Manufacturers for all the United States, except New York A. S. & J. GEAR & CO., New Haven, Conn., or 91 Liberty Street, New York.

AMERICAN TINNED SHEET IRON,
Coating uniformly over the entire sheet, by an entirely new and patented process. All sizes and gages on hand and made to order.
H. W. BUTTERWORTH & SON,
25 cow tf 29 and 31 Haydock st., Philadelphia, Pa.

MERRICK & SONS, Southwark Foundery,

430 Washington Ave., Philadelp'a, Pa.,
MANUFACTURE NASMYTH & DAVY STEAM HAMMERS
CORNISH PUMPING, BLAST, HORIZONTAL, VERTICAL, AND OSCILLATING ENGINES.
Gas Machinery of all descriptions.
Sugar Refineries fitted up complete, with all modern apparatus.
New York office
62 Broadway.

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

BALL, BLACK & CO.

Nos. 565 and 567 BROADWAY

Offer an Unequaled Assortment of

JURGENSEN, NARDINE. JACOT,
SALTZMAN, NICOUD, GERARD,
FRODSHAM, PEARDON, GORDING,
RUGENSTEIN, HARRISON, TAYLOR.

ALSO, A FULL LINE OF AMERICAN

WATCHES,

At the Lowest Price.

$732 IN 31 DAYS

Made by one Agent, selling SILVER'S PATENT ELASTIC BROOM. Over 50,000 now in use. Recommended by Hon. Horace Greeley and American Agriculturist. One county reserved for each Agent. C. A. CLEGG & CO., 58 Cortlandt st., N. Y., or 126 Washington st., Chicago, Ill.

LAMB KNITTING MACHINE

"THE OLD RELIABLE."—Over 10,000 Machines in use—sold mostly by canvassing agents. The only kind that knits circular and flat work of all sizes, and narrows and widens on both. Send for circular and SAMPLE STOCKING.

LAMB MACHINE CO., Chicopee Falls, Mass.

UNITED

NICKEL COMPANY,

173 BROADWAY, NEW YORK.

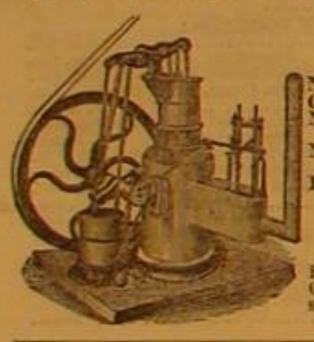
THIS Company is now prepared to GRANT LICENSES, on reasonable terms, to manufacturers and others, to Electroplate metallic articles with NICKEL, under the patented processes of Dr. Isaac Adams and William H. Remington. Nickel does not tarnish as easily as silver, wears longer, and is cheaper.

EDWARD A. QUINTARD, President.
FRANCIS A. MARDEN, Sec. and Treasurer.

☞ L. L. SMITH, a licensee of the Company, is ready to Electroplate any articles with Nickel at
65 CROSBY ST., NEW YORK.

ROPER'S NEW

Caloric Engines.



No Water Used! Cannot Explode! No Insurance demanded! Not Liable to get out of Order! Requires no Skilled Engineer, & cost to run 25c. per day per horse-power.

ROPER CALORIC ENGINE CO., 49 Cortlandt st., New York.
☞ Send for circular.

E. Allen & Co's
NEW MODEL
Cartridge Revolver.

Weight only 5 oz. Can be carried in the vest pocket. Seven Shots, 22-100 calibre. Lightest and best Revolver in the world.

Address, ETHAN ALLEN & CO.
WORCESTER, Mass.

NATIONAL WAGES TABLES—Showing any wages at $1, $1·25, $1·50, $1·75, $2, etc., to $37 per week, by hours, ¼ days, ½ days, ¾ days, days, etc., to four weeks. Half bound, 50c.; cloth, 75c.; Tuck, $1. Sent by mail on receipt of Price. Address NELSON ROW, Publisher, 28 and 30 W. Broadway.

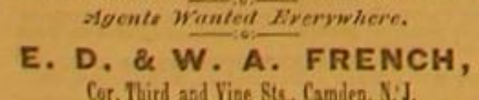
PATTERN LETTERS — KNIGHT BROS. SENECA FALLS N.Y.

MACHINISTS

Illustrated Catalogue of P. S. STUBS' Tools and Files, Twist Drills and Chucks, Screw Plates and Taps, Machine Screws, Emery Wheels, Foot Lathes, etc.

GOODNOW & WIGHTMAN, 23 Cornhill, Boston.

Excelsior Glass Cutter.

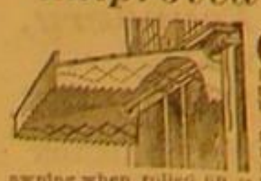


Cuts Glass equal to a Diamond, Price, $1.50

Agents Wanted Everywhere.

E. D. & W. A. FRENCH,
Cor. Third and Vine Sts., Camden, N. J.

Improved Awning.



COMMUNICATIONS concerning purchase of Rights should be addressed to J. B. ARMSTRONG, Urbana, Ohio.

It obviates the necessity for posts or supports at the front edge, provides a neat and effective shelter for the awning when rolled up, is perfectly easy to spread out or roll up, is simple in construction, and remarkably tasteful in appearance. It can be fully or partially extended to admit or exclude light without the aid of a step ladder, and in a moment's time. We consider this form of Awning as far superior to any form of canvas awning heretofore employed, combining, as it does, durability, convenience, and comeliness. On exhibition at Whitlock's, Nos. 35 and 37 Park Place, New York. See Scientific American, dated Nov. 27, 1869.

PRACTICAL STANDARD PUBLICATIONS OF

GEO. E. WOODWARD

191 Broadway New York.

WOODWARD'S NATIONAL ARCHITECT.

1000 Working Designs, Plans, and Details of Country and Village Houses, with Specifications and Estimates. Postpaid.

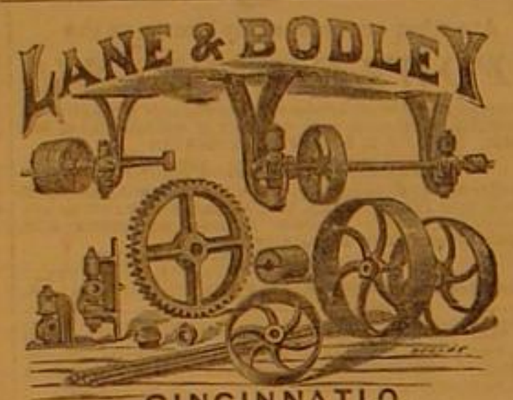
Twelve Dollars.

HARNEY'S BARNS, OUT-BUILDINGS, AND FENCES.

Just Published, with designs and Plans of Stables, Farm Barns, Out-buildings, Gates, Gateways, Fences, Stable-fittings and Furniture. Nearly 200 Illustrations. Fully explained. Royal quarto, extra. Postpaid, TEN DOLLARS.

Woodward's Cottages and Farm Houses. 188 Designs and Plans. Postpaid.....$1·50
Woodward's Suburban and Country Houses. 70 Designs and Plans. Postpaid.....$1·50
Woodward's Country Homes. 150 Designs and Plans of moderate cost. Postpaid.....$1·50
Woodward's Graperies, etc. Postpaid.....$1·50
Wheeler's Rural Homes. Houses suited to Country Life. Postpaid.....$2
Wheeler's Homes for the People. For the Suburb and Country. 100 Designs Postpaid.....$2
Jacques' Manual of the House. Postpaid....$1·50
Rural Church Architecture. Designs for Churches, 45 plates, printed in colors. Postpaid.....$12
Jacques' Manual of the Garden, Farm, and Barnyard. New edition. 1 vol., postpaid.....$2·50
Todd's Young Farmer's Manual. Vol. 1. The Farm and Workshop. Postpaid.....$2·50
Todd's Young Farmer's Manual. Vol. 2. How to make Farming Pay. Postpaid.....$2·50
Elliott's Lawn and Shade Trees. Postpaid..$1·50
Fuller's Forest Tree Culturist. Postpaid....$1·50
Husmann's Grapes and Wine. Postpaid ....$1·50
Suburban Homes for New Yorkers......25c
Woodward's Architecture. Designs and Hints on Building. With priced catalogue of all books on Architecture and Agriculture. Quarterly, 25 cents.

Address **GEO. E. WOODWARD, Publisher,**
191 Broadway, New York.



CINCINNATI, O.

MANUFACTURERS OF

SHAFTING, HANGERS, PULLEYS AND COMPRESSION COUPLINGS.

BALL AND SOCKET ADJUSTABLE HANGERS WITH SELF LUBRICATING JOURNAL BOX.

We have Two Hundred and Fifty Pulley, and One Hundred Hanger Patterns of uniform style and weight.

Quality of work equal and Prices lower than any other in the market.

Catalogues sent free, or furnished on application.

LANE & BODLEY,
John & Water Streets, Cincinnati, Ohio.

$20 A DAY TO MALE AND FEMALE Agents to introduce the BUCKEYE $20 SHUTTLE SEWING MACHINES. Stitch alike on both sides, and is the only *LICENSED SHUTTLE MACHINE* sold in the United states for less than $40. All others are infringements, and the seller and user are liable to prosecution and imprisonment. Outfit free. Address *W. A. HENDERSON & CO., Cleveland, Ohio.*

HAYES' RAILROAD FAST EXPRESS WAGES COMPUTING TABLES.

Computed by the day and hour, from 1 to 399 hours, and from 60c. to $5 per day. Splendidly printed and bound. Price $2·50, sent by mail. Circulars, with sample table, free. Address LESTER HAYES,
Cleveland, Ohio.

TO MANUFACTURERS AND OTHERS.—For Sale at Gananoque, Canada, the premises known as the "Globe Works," consisting of Machine Shop, Bolt Shop, and Foundery, with the Machinery contained therein, admirably adapted for manufacturing purposes. The water-power in connection with the above is ample and unfailing. For terms apply to BANK OF BRITISH NORTH AMERICA, Kingston, Canada.

Building Paper.

This is a hard, compact paper, like an ordinary book cover, and is saturated with tar and used on the outside of frame buildings, under the clapboards, also under shingles and floors, to keep out damp and cold. It is also used on the inside, not saturated, *instead of Plastering*, and makes a warm and cheap wall. It costs only from $8 to $30 (according to size) to cover houses on the outside. ☞ Samples and descriptive circulars sent free.

Address, ROCK RIVER PAPER CO., Chicago,
Or E. E. HALE, 22 & 24 Frankfort Street, N. Y.,
Agent for the Eastern States.
Or, E. C. PALMER & CO., New Orleans, Gen'l Agent for Southern States.

BARNES' CAST STEEL & WROUGHT Iron Self-adjustable Pipe and Studd Wrench, for Railroad Shops, Gas Fitters, Steam Engines, etc. Price $5 each. Address C. TRESSELT, Fort Wayne, Ind.

IRON-FRAME GANG MILLS—Require no Millwright Work to set them up. Manufactured by

SNYDER BROTHERS,
Williamsport, Pa.

J. F. WERNER, Model Maker & Machinist, 62 Center st., New York. Working Models, Experimental Machinery, Gear Cutting, & Stud & Rivet Turning.

THE COMMERCIAL AGENCY

REMOVAL,

And 1870 Register.

THE PROPRIETORS,

Messrs. McKillop, Sprague & Co.,

Have removed to their New and Spacious Office, 109 and 111 Worth st., one door east of Broadway. The accommodations to meet the demands of increasing business, are double the room heretofore occupied, making it the most extensive, best managed, and thoroughly fitted up in the United States for this business.

The REGISTER, published in January, is more complete and full than any heretofore, making over five hundred thousand (500,000) names, carefully rated with reference to their character and Commercial standing, embracing the capital of each, from one thousand dollars to over millions, the history of which subscribers can obtain from the records at our office. This Agency has been established over one quarter of a century, and purpose still further to develop its facilities to aid in disposing of credit.

We invite business men to call at our new establishment, and see for themselves, also, the completeness of our business system.

McKILLOP, SPRAGUE & CO.,
109 & 111 Worth st.,
One door east of Broadway, New York.

AMERICAN

SPIRAL SPRING BUTT CO.,

27 PARK ROW, NEW YORK.

Factory, Trenton, N. J.. ..Office, No. 2 Jacob st., N. Y.
☞ Branch Office for Pacific Coast, No. 606 Front st San Francisco, Cal.

London.....48 Cannon street.

H. KOHNSTAMM,
Manufacturer of

ULTRAMARINE,

And Importer of English, French, and German Colors, Paints, and Artists' Materials, Bronzes, and Metals. No. 3 Tryon Row, New York, opposite City Ha...

WIRE ROPE.

Manufactured by

JOHN A. ROEBLING'S SONS,
Trenton N. J.

FOR Inclined Planes, Standing Ship Rigging Bridges, Ferries, Stays or Guys on Derricks & Cranes Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co., Leeds, Mass.

2d-Hand Machinery

FOR SALE—viz :—

50 Milling Machines, Index and Universal Milling Machines, Horizontal Milling and Drilling Machines, Drill Presses, Hand and Power Lathes, Edging Machines, Drops and Punch Presses, Screw Machines, etc., etc., 1000 feet of 1 3-16 Shafting, with Hangers and Pulleys, etc., etc., by

O. F. WINCHESTER,
New Haven, Conn.

FRENCH BAND SAW MACHINES, SAWS, Taper Files, etc., Machines for Scroll, Re-sawing, and Log; Mougin & Co.'s Band Saw Blade all Sizes, on hand and made to order.

All Styles of Band Saw Machines in operation at Mahogany Mill, 10th st., E. R.

GEORGE GUEUTAL,
Sole Agent for the U. S., 29 West 4th st., N. Y.

SENT FREE!

M. O'KEEFE, SON & CO.'S

SEED CATALOGUE

AND GUIDE TO THE

FLOWER AND VEGETABLE

GARDEN, FOR 1870.

Published in January. Every lover of flowers wishing this new and valuable work, free of charge, should address immediately M. O'KEEFE, SON & CO., Ellwanger & Barry's Block, Rochester, N. Y.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of Superior Quality, on hand and finishing. For sale Low. For Description and Price, address NEW HAVEN MANUFACTUR[illegible] New Haven, Conn. 5 tf os

ROOT'S WROUGHT IRON SECTIONAL

Safety Boiler.

Composed of best Wrought Iron Tubes, tested to 500 pounds; no large sheet iron, shell or thin cast iron to explode. Absolutely safe, economical, durable, and efficient. Send for pamphlet. Also, Steam Engines, Steam Pumps, etc.

ROOT STEAM ENGINE CO.,
95 and 97 Liberty st., New York.

REPEATING FIRE-ARMS

FOR SALE, viz :—

5,000	Winchester	Repeating	Muskets.
5,000	"	"	Carbines.
5,000	"	"	Sporting Rifles.
2,000	Spencer	"	Muskets.
20,000	"	"	Carbines.
500	"	"	Sporting Rifles.

2,000 Joslyn Single Breech-loading Carbines.
Metallic Cartridges of all sizes, by
WINCHESTER REPEATING ARMS CO.,
New Haven Conn.

☞ T. V. Carpenter, Advertising Agent. Address hereafter, Box 773, New York city.

HARRISON

SAFETY

BOILER.

First-Class Medal World's Fair, London, 1862.
First-Class Medal, American Institute Fair, New York, October, 1869, for safety, economy of space, and economy of fuel.

400-H. P. AT A. T. STEWART'S.
437-H. P. AT JERSEY CITY SUGAR REFINERY, and over 1,000 boilers in other places.

Harrison Boiler Works, Philadelphia.

John A. Coleman, Ag't,

110 Broadway, N. Y., and 139 Federal st., Boston

SAWS. EVERY DESCRIPTION Guaranteed under a forfeiture of $1000, to cut the most lumber with the least expense

Henry Disston & Son,

PHILADELPHIA. Special attention paid to our new style Circular, Belt, Cross-cut, Mill, and Hack Saws. Orders received from England, Ireland, and the Continent.

Oak Leather Belting.

Manufactured by CHAS. A. SCHIEREN, 92 Gold st., N. Y

SCHLENKER'S PATENT

BOLT CUTTER

NEW INVENTION. ADDRESS,
HOWARD IRON WORKS, BUFFALO, N. Y.

Reynolds'

Turbine Water Wheels.

No Complex, Duplex, or Triplex complications. All such are costly, perishable, easily clogged, inaccessible. Mill Gearing, Shafting, and Pulleys. Send for Illustrated Pamphlet

GEORGE TALLCOT,
96 Liberty st., New York.

2d-Hand Machinery

FOR SALE.

2—	8-ft. Planers.	Price	$600 each.
2—	6" "	"	$450 "
1—	3" "	(nearly new)	$300
2—	8" bed, 20-in swing Screw Lathes		$900 each
2—	6" " " "	" "	$300 "
2—	6" " 15-in "	" " (new)	$360 "
2—	5" " 15-in "	" "	$250 "
1—	4-Horse Power Steam Engine	"	$125
1—12	" " " "	"	$435
1—12	" " " "	(new) with boiler, all complete	$900

H. B. BIGELOW & CO.,
New Haven, Conn.

FROM 4 to 500-H. P., including celebrated Corliss Patent Variable Cut-off Engines Slide Valve Stationary Engines Portable Engines, etc. Also, Circular Mulay, & Gang Saw Mills Sugar Cane Mills, Shafting, Pulleys, etc. Wheat and Corn Mills Circular Saws, Belting, etc. Send for Circular and Price List.

WOOD & MANN
STEAM ENGINE CO.,
Utica, N. Y.

NEMO EST QUIN

"THERE IS NO ONE WHO DOES NOT" say, after trying "PRATT'S ASTRAL" OIL, that it is the best Oil they ever burned. It requires no change of lamps; is perfectly pure; will not explode; and is pronounced by chemists to be the best and safest oil ever made. The following testifies as to its merits:

MR. CHAS. PRATT, 108 Fulton st., N. Y.

Dear Sir;

I wish to add my testimony to the good qualities of the "Astral" Oil, as seen in the following: A few nights ago, at my residence in Clifton, N. J., the servant girl accidentally knocked over a lighted lamp filled with your "Astral" Oil. The lamp fell to the floor and was instantly broken, scattering the contents over the carpet. The wick, which was still burning, fell into the oil, but did not ignite it, and was picked up and blown out, without causing any damage, further than the loss of the lamp. I have been burning your "Astral" Oil for a number of months and am highly pleased with it. I consider it perfectly safe, and would use no other.

Yours very truly.

CHARLES D. SPENCER, with H. B. Claflin & Co., 140 Church st., N. Y.

See our circular and price list.

OIL HOUSE OF CHARLES PRATT,
108 Fulton st., N. Y.

POWER PLEDGED
Equal to any overshot, with
N. F. BURNHAM'S
New Turbine
Water Wheel.

Illustrated Pamphlet, for 1870, "with Reduced Price List," sent free by N. F. BURNHAM, "Patentee," York, Pa., or S. N. Hartwell, "Ag't," 98 Liberty st., N. Y.

To Hardware Dealers.

THE Tanite Co.'s OIL STONES, carefully made from Tanite and Emery, are Superior to any natural stone. Liberal discount to the trade. For circulars address

THE TANITE CO.,
Stroudsburg, Monroe Co., Pa.

THE TANITE EMERY WHEEL.

For circulars address as above.

CARVALHO'S

Steam Super-Heater,

Saves fuel, and supplies Dry Steam for Heating, Boiling etc. HENRY W. BULKLEY, Engineer, 70 Broadway, N. Y

Cotton Seed Oil Mills.

BUILT by Contract, or otherwise. For Estimates and Machinery apply to Oil Machinery Manufacturing Co. of N. Y. city, 98 Liberty st. P. O. Box 1183

The Combination Rule

And Lead Pencil, one of the most novel and useful articles ever offered to the public. No person should be without it. Sample pencil sent for 10c. and 2c. postage stamp. Two for 15c. Manufactured wholesale by

E. A. WHITFIELD, 61 Duane st., New York.

PRINTED with the Ink of CHAS. ENEU JOHNSON & CO., Tenth and Lombard st., Philadelphia, 59 Gold, corner Ann st., New York.

SCIENTIFIC AMERICAN

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

Vol. XXII.—No. 10. [NEW SERIES.] NEW YORK, MARCH 5, 1870. $3 per Annum. [IN ADVANCE]

Improved Machine for the Manufacture of Spoked Wheels.

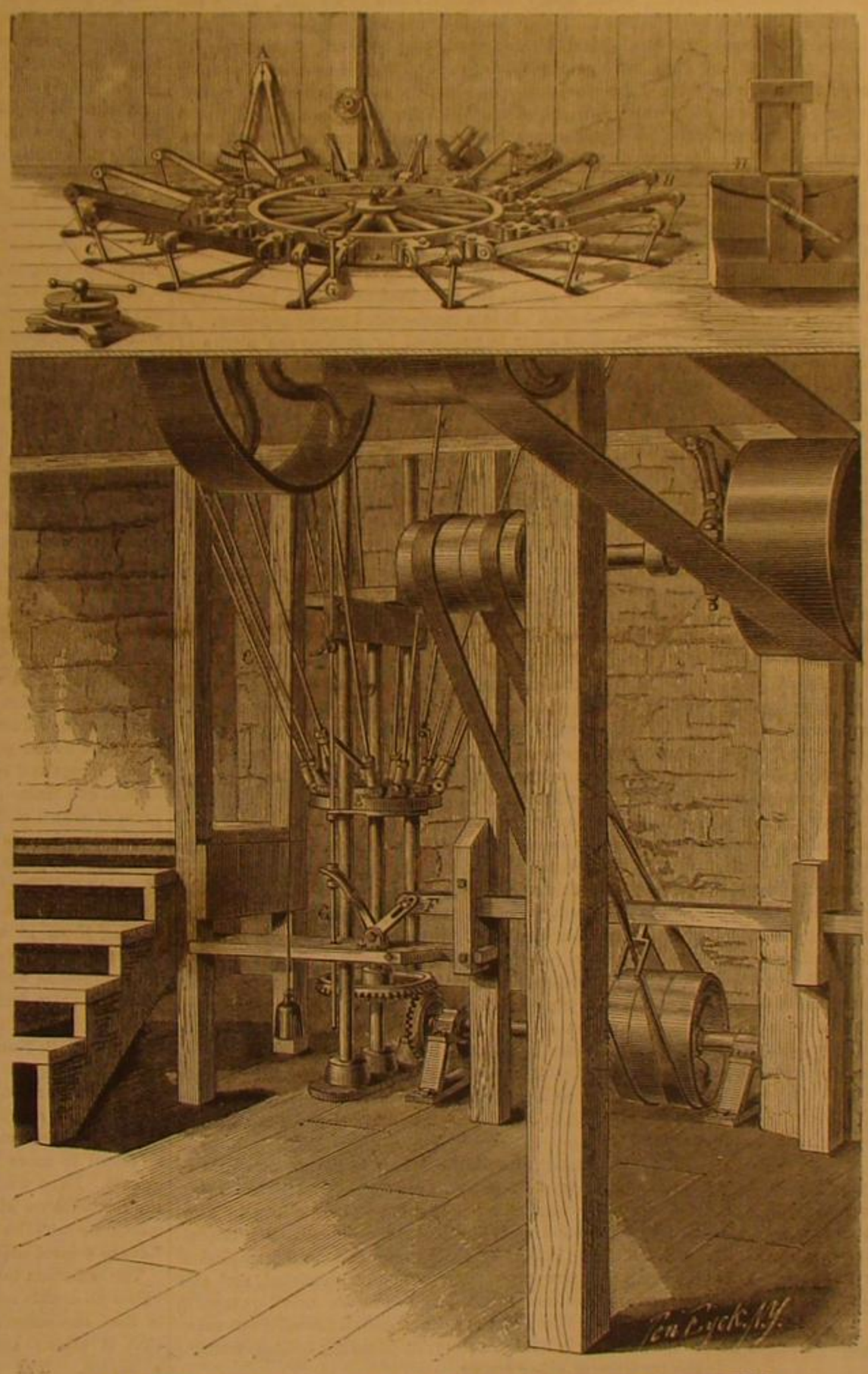
This machine is designed to facilitate and improve the manufacture of that class of spoked wheels used upon heavy vehicles, in which the nave ends of wooden spokes are secured between flat nave plates of metal, one of which has a hub in which the axle bearing is made, and between which the nave ends of the spokes formed, as shown at A in the engraving, are firmly clamped by screw bolts.

The machine acts to force into close contact the flat surfaces of the spokes at their inner ends, and thus compact them, so that their faces form true circular planes upon which the inner faces of the flanges rest.

It will be seen that the machine occupies space upon two consecutive floors. A strong circular plate of cast iron, about seven feet diameter, having its upper surface faced off true, is placed horizontally level with the floor of the shop. Arranged at equal distances around its outer edge, are a number of levers, B, equal to the number of spokes to be set in the wheel—sixteen in this case—having their fulcrums securely bolted to the plate. The long arms of the levers radiate from the plate, about three feet, all around; the short arms are formed into cams, or rolling inclines, or curved wedges, acting upon sliding pins of cast iron, which move freely in a radial direction, in guides formed in the fulcrum blocks. When the long arms of the levers are raised, the sliding pins may be easily pressed outwards until they bear upon the cam-shaped short arms of the levers at the point nearest the fulcrum or center of motion of the lever. When the long arms of the levers are lowered, their sliding pins are forced inwards by the cams, and unite in pressing inward the wheel properly placed in their embrace. The levers are all actuated with rapidity, uniformity, and certainty, by means of wrought-iron rods, C, extending downwards from the ends of the levers, converging to a vertical column, D, under the center of the plate, much as the braces of an umbrella extend downwards from the ribs to the stick. A screw is cut upon the central column, and a nut, E, answering to the slide upon an umbrella stick, raises or lowers all the levers at once, with great facility, and with any required power. Motion is given to the nut by means of beveled gears and a belt with fast and loose pulleys, so arranged that, at the upward and downward limits the belt is thrown automatically upon the loose pulley, and the motion of the nut and levers stopped. Any required motion, either up or down, within the range of the screw, can be obtained with great delicacy and convenience by a shipper, F, actuated by a shipping rod, G. The fellies and spokes, of seasoned second-growth oak, having been perfectly shaped and completely finished by machinery, are first put together by driving two spokes into a felly, one at a time, the felly being held firmly in a vise, H, specially constructed to prevent splitting of the felly or twisting of the spoke, so that a very good fit is obtained at this important point. Eight fellies, with their sixteen spokes, are then placed in the press, when the perfection of the fitting is shown by the perfect joint made by the spokes when they meet in the circle to be curved and embraced by the cast-iron hub; and by the coincidence of the half-holes in the contiguous sides of the spokes, A, which together form the holes for the eight bolts that are finally to hold the hub plates together.

Temporary hub plates, I—one above and one below—with a powerful screw in their center, hold the ends of all the spokes truly in the plane of the circular plate while undergoing the pressure of the levers. The extent of this pressure is ascertained by marking carefully with a sharp pencil around the circumference of the upper temporary hub plate, after the spokes have been brought to a close, firm joint; and then the pressure is put on till the joint of the fellies close up. Another similar mark being made upon the removal of the temporary hub plate, it is found that a space of a quarter of an inch is made between the two pencil marks—a reduction in diameter of half an inch. Now as the difference in circumference corresponding to a difference in diameter of half an inch, is 1·5708 inches, this, divided by 16 (the number of spokes), gives 0·098 of an inch, or substantially one tenth of an inch, as the lateral compression of each spoke. This is by no means the limit, but is probably sufficient to secure the spokes against being loosened by shrinkage in any climate.

The hubs are firmly bolted together while the wheel is in the press, and hold the spokes securely. The fellies spring apart a little, but only a little; and the tire easily makes that all firm again.



MACHINE FOR THE MANUFACTURE OF SPOKED WHEELS.

So great is the facility with which this machine is operated, that we are assured one man with an assistant easily puts together six sets—twelve fore wheels and twelve hind wheels—in six hours and forty minutes, including the time of adjusting machinery for the difference in diameter of the wheels. It is thought that the same machine would so compress wood as to make most admirable car wheels.

The great point in a wheel made in this manner is the thorough compactness of the hub-end of the spoke. The other end of the spoke receives scarcely less benefit. By observing an old wheel it will be seen that the spoke is bedded into the felly. This is done by degrees, and is unavoidable in wheels made in the usual way. The only way to keep the wheel together is to reset the tire so as to take up the looseness caused by this slow crushing process. By putting on a pressure of more than ten times the amount the wheel will ever be called upon to sustain in actual use, it is claimed that the spoke and felly are so compacted that if the tire is properly set, it will remain tight until worn out. The wheels are made by this method perfectly round and true. The pressure distributed about the rim can be varied from nothing to one hundred tuns, if required.

There are reasons why iron-hubbed wheels made in this manner should be far superior to wheels with wooden hubs. The spokes cannot crush into the hub, as they will do into wooden hubs, whether driven full size into a very large hub as was the practice fifty years since, or, as at present, into a smaller hub, the spokes having tenons and shoulders. With wooden hubs the spokes are weakened just where they need the greatest strength.

In the iron-hubbed wheel the spokes are more than twice as large as a wooden hub wheel of corresponding size. It is also claimed that a wheel made on this plan will not shrink, and that as the bases of the spokes are as firmly compressed against each other as it is possible for wood to be, and held by metallic flanges firmly bolted together, it is the most mechanical and perfect method of constructing wagon wheels for heavy work yet devised.

Iron-hubbed wheels are becoming very popular in many localities even when constructed in the comparatively imperfect manner employed before the application of this invention; and there is no doubt that the improvement resulting from the method described will tend to make them more generally popular than hitherto.

Patented, Dec. 28, 1869, by E. A. Archibald, of Methuen, Mass., whom address for State rights or manufactured wheels.

Polishing Granite.

Granite, after having been worked into form with heavy dumpy picks, and then with the hammer and chisel or diamond point, is first ground to a moderately smooth surface with a heavy iron plate fed with sharp sand or coarse emery and water, and put into reciprocal motion, or in turned works the granite is put in quick circular revolution against the rubber. Secondly, the work is smoothed with another iron plate and coarse flour emery. Thirdly, it is further advanced by wooden rubbers with fine flour emery, the rubbers being made the end way of the wood. Fourthly and lastly, crocus is used on thick felt laid on wood or metal. On account of the softness of the mica compared with the quartz and felspar, which together constitute the granite, the hard rubbers must be persevered in until near the conclusion, to keep the work flat, otherwise the mica is too quickly worn away, and leaves minute hollows. Sometimes lumps of granite are used as rubbers instead of the iron plates.

Granite, when worked by the lapidary, is slit and roughly ground in the common mode adopted both with carnelian and alabaster, namely, the slicer with diamond powder and the roughing or lead mill with coarse emery; afterwards it is found best to smooth it on a mahogany wheel with flour emery, and to polish it on the lead wheel with rottenstone; but it requires great care to prevent the soft mica from being unduly worn away.—*Byrne's Handbook for the Artisan, Mechanic, and Engineer.*

The Growth of Tree Trunks.

A paragraph has been round the scientific papers stating that a French naturalist has been measuring the tree-trunks in a forest, and found them all broader in the east-west than in the north-south direction; the cause of the unsymmetry, being ascribed, not very obviously, to the rotation of the earth. Well, another French arborist has been similarly gaging the trees in the neighborhood of Toulouse, and he finds that the greatest swelling of their trunks is towards the east-south-east point of the compass. The explanation offered by this second investigator is more philosophical than that of his predecessor. He refers the deformation to the early morning sun, which warms the easterly parts of the tree more suddenly than the rest, stimulates the flow of the sap, which grows sluggish during the cool of the night, and draws up the nourishing moisture from the soil in greater

abundance on the exciting side than on those portions of the trunk where the warming is more gradual and its effects less active. Naturally, increased vitality on one side, be it animal or plant, results in developments, or larger growth of that side. There are traditions of some plants turning their flowers toward the sun; the truth may be that the sun only promotes the growth of those blossoms upon which it sheds its direct warmth. As Dulong said, every degree of the thermometer entails a law of nature.

[For the Scientific American.]

COBALT--ITS PROPERTIES AND USES.

BY PROFESSOR CHARLES A. JOY.

In olden times the word cobalt was used to designate a whole group of worthless metals. The miners of those days were full of superstition and imagined that the genii of the mountains would resist all attempts to penetrate their mysteries, and hence they were supposed to throw all sorts of false ores and unripe metal in the way of the workman for the sake of discouraging them from their undertaking. The name of the mountain gnome or sprite was Kobold, and hence the miners called the worthless ore "Cobalt." The bright, shiny ore that vexed the workmen so much was at one time supposed to contain bismuth, and was very little used.

These are the first recorded notions, but there is little doubt that cobalt ores were used for coloring glass some thousands of years before, in Nineveh, Thebes, and Pompeii, as specimens found in those places resemble the beads and ornaments of modern times.

The first really authentic discovery of cobalt appears to have been made in 1735, by the Swedish chemist Brandt, who called it Cobalt King. Chemical analysis had not attained sufficient progress in that early day to enable any one to separate the constituents of ores with absolute certainty, and it was not until 1780 that the existence of cobalt was confirmed by Bergmann. It is a favorite idea on the part of some chemists that nickel and cobalt are one and the same thing, but this doctrine finds very few adherents, and for our purposes we shall regard it as an actual, tangible metal, with characteristic properties of its own. Cobalt is one of the metals found in the atmosphere of the sun, and in the materials that are of extra mundane origin. It usually occurs associated with nickel, arsenic, and sulphur, and is frequently an incidental product in the working of copper, bismuth, and nickel ores.

The best known minerals are smaltine, called also speiss cobalt, cobaltine, or glance cobalt, cobalt bloom, and earthy cobalt. The fact that some of the minerals contain arsenic has lead to applying the name cobalt to the black arsenic sold as a fly powder. It will be seen from the above list that this element is by no means so abundant as manganese or nickel, and in the event of its being required for certain purposes in the arts, it would be difficult to obtain it in large quantity.

There are several ways in which metallic cobalt can be prepared from its compounds, one of the earliest of which was from the oxalate. It is possible to reduce the oxide by heating two parts of the pure oxide of cobalt and one part of pure cream of tartar, for six hours, in a covered crucible lined with charcoal and at a temperature sufficient to melt steel. The regulus obtained in this way is exceedingly hard and brittle, has the color of bismuth, is magnetic, and has a specific gravity of 8·43. By re-melting in a clay crucible it can be freed from carbon, and it then has a silver-white color, specific gravity of 8·754, is softer than steel, very elastic, does not oxidize in air, nor after several days' immersion in water, and is as magnetic as iron. Becquerel found that by electrolysis a brilliant white metal goes to the negative electrode when the chloride of cobalt is first neutralized with ammonia. Prepared in this way it is quite pure, and is malleable and magnetic. By treating an aqueous solution of the chloride of cobalt with sodium amalgam, an amalgam of cobalt is formed from which the mercury can be expelled, and the cobalt obtained in the condition of a fine powder; it can afterwards be fused to a pure regulus.

The above are the chief methods for obtaining the pure metal, and we can now pass to the consideration of some of its properties.

The metal resembles steel, with a slight red tinge, is very hard, and is said by Deville to be more tenacious than iron. This latter property may hereafter give a value to wires made of cobalt where it is required to attain great strength in small compass. Arsenic and manganese render it brittle. Like pure iron it requires a very high heat to melt it, and the temperature of fusion appears to be between that of iron and gold. Its specific heat is 0·1096, and its density ranges between 8·513 and 8·7.

It is said to be magnetic when perfectly pure, and can be converted into a magnet by contact. At a very high temperature cobalt burns with a red flame yielding an oxide. Acids generally dissolve cobalt, nitric acid being especially adapted to this purpose. The metal decomposes water at a red heat, but not at ordinary temperatures. Plunged into fuming nitric acid, it is converted into the passive state, the same as iron, and the duration of this passive state is augmented by previously heating the metal.

Antimony and cobalt fused together evolve heat and light, and afford an iron-gray alloy. The alloy of cobalt and iron is exceedingly hard. Gold and cobalt yield a yellow and very fragile alloy.

The alloy of platinum and cobalt is fusible. Cobalt amalgam is white, like silver. Silver is rendered brittle by it. Alloys of lead and cobalt, and tin and cobalt, have been made, but possess little interest.

Many chemists suppose nickel to be an alloy of cobalt and some other metal. Fairbairn found that the tenacity of cast iron was greatly reduced by its mixture with nickel, and the same result is probable in the case of cobalt. Cobalt is said to reduce copper from solutions. Weiske found that cobalt was contained in nearly every brand of commercial iron he examined, sometimes to the extent of seven grammes in 100 pounds.

Finely divided metallic cobalt is soluble in a boiling solution of caustic potash, and yields a blue liquid, which is supposed to contain cobaltic acid. The finely divided cobalt for this purpose is prepared by heating an intimate mixture of pure oxide with ten to twelve per cent starch meal, or by reducing the oxide with hydrogen.

Cobalt contaminated with phosphorus has a different color from ordinary metal, and loses its luster in the air.

We can now speak of some of the compounds of cobalt that find application in the arts. The oxides and salts are distinguished for their beautiful colors—red, blue, yellow, green—hence they were early used for pigments.

If a little oxide of cobalt be added to melted glass, we obtain a mass, which, after cooling is intensely blue. When this is ground to powder it yields the well-known smalt that at one time was extensively employed by papermakers and in the laundry. The color is very fast, as it is not affected by the atmosphere or by acids or other liquids—and this fact afforded a method of detecting adulterations, as sand or pulverized glass, which was simply immersed in some coloring liquid, could easily be washed clean by an acid. Since the extensive and cheap manufacture of artificial ultramarine was established, the demand, and naturally the supply, of smalt, have greatly diminished. There is another blue color formed by the union of alumina and the oxide of cobalt, known as Thénard's blue, which has long been applied in the arts, but in consequence of its high price cannot compete with ultramarine. It can be prepared by mixing 3 parts freshly precipitated moist phosphate or arsenate of cobalt with 12 to 15 parts also freshly precipitated hydrate of alumina, and exposing, after drying, to a red heat. Thus produced it is a compact, insoluble mass, which can be ground to a fine blue powder. Rinmann's green, which is a compound of the oxides of zinc and cobalt, we described under the head of the compounds of zinc. It is a much-prized green pigment. A beautiful yellow color is produced by mixing the nitrite of potash with a solution of cobalt. A double nitrite of cobalt and potash is produced in the form of an insoluble yellow crystalline body, which is not only of value as a color but offers a remarkably delicate test for the presence of cobalt in solutions. This yellow has been used sparingly, on account of the expense, in aquarelle and oil painting.

By precipitating cobalt with phosphate of soda we have a red violet color, the shade of which varies according to the temperature at which it is prepared.

A fine cobalt brown is produced by calcining a mixture of sulphate of cobalt, ammonia, and iron.

Some of the salts of cobalt, when they contain water, are red, when they are anhydrous they appear blue. This property is made use of in what is called sympathetic ink. If we write with a dilute solution of chloride of cobalt on paper and allow the tracing to dry at ordinary temperatures, the letters will scarcely be visible. Upon the application of heat the writing becomes visible, with a blue color, or sometimes green if nickel be present. The color again disappears on the absorption of moisture.

A fine green color is produced by precipitating cobalt from its solutions by means of a mixture of prussic acid and potash, but the cost of production must prevent any extensive application of this color.

Since the discovery of photography the use of cobalt blue glass has greatly increased. It is an interesting fact in optics that blue glass permits all of the chemical rays of light to pass freely through it, while the yellow rays are intercepted. Pieces of blue glass are used to eliminate the yellow rays when the colors of flames are to be examined for the violet hue of potash, and in other cases of optical research.

The oxide of cobalt, prepared by precipitating the chloride with potassa, has been employed in rheumatism. It is emetic in the dose of 10 to 20 grains. The salts of cobalt are irritant poisons.

The employment of metallic cobalt in the manufacture of German silver would make that article too expensive for general use, but in small quantities it enters into alloys in association with nickel as an incidental component. The deposition of metallic cobalt by the battery can be accomplished the same as is now so extensively done with nickel, and this method is sometimes resorted to, to procure small quantities of the metal. Some of the salts of cobalt are of great value to the chemist in his laboratory, as affording delicate tests for the presence of other bodies.

One of the methods for the manufacture of oxygen gas from bleaching powders, is founded upon the somewhat obscure formation and subsequent decomposition of cobaltic acid. A very small quantity of a solution of cobalt suffices to evolve all of the oxygen from chloride of lime.

We have thus given the principal properties and uses of cobalt without attempting to exhaust the subject.

An Invention Wanted.

The *Herald of Health* says an instrument is very much needed to test the purity of the atmosphere, and the person who will invent and introduce such an article, which shall be simple and cheap, will not only enrich himself, but confer a great boon upon poorly ventilated humanity. We have the thermometer to tell us the temperature of the air, and we have the barometer to tell us the moisture of the air, but we have no means of cheaply and easily measuring the purity of the air. Such an apparatus is needed in every church, lecture room, and place of public gathering, and in every room occupied by human beings, either in public or in private. If people could *see* the amount of poison they were taking into their systems at every breath, they would be more careful to secure pure air to breathe. Such an invention is greatly needed, and the want will soon be supplied. Who will be the one to confer this blessing upon the race?

[For the Scientific American.]

PLATINIZED LOOKING-GLASSES.

BY C. WIDEMANN.

NO. II.

The glass being prepared by the usual method, is soaped, polished and cleansed. The Platinized Glass Works, at Wailly-sur-Aisne (France) where this new industry is carried on, possesses highly improved polishing tables, so much so that the polishing operation occupies only three hours. At the St. Gobain Works this operation requires a manipulation of 48 hours.

After the cleaning operation the glass is carried into the platinizing shop, and the composition giving the metallization is applied to the glass by means of a brush the plate is placed vertically and receives the platinizing liquid to a convenient thickness. It is first applied from bottom to top, then from left to right, and at last from right to left; by these means the oily coating is equalized. This composition, containing a large quantity of essence of lavender, spreads itself instantly over the surface, drying slowly and without any running. Great care must be taken to avoid all dampness and dust; dampness would crisp and wrinkle the surface, and the dust would destroy the regularity of the work, as every grain of dust absorbs liquids concentrically, and thus deprives the surrounding parts.

The platinizing composition needs nothing else to be perfect than great cleanliness on the part of the operator.

In making the platinizing liquid the following materials are used: 100 grammes carefully laminated platina in very thin sheets are taken. It is soaped in order to remove all the grease that might have accumulated during the laminating operation. It is then dissolved in an aqua-regia, composed of 400 grammes nitric acid for 1,000 grammes pure hydrochloric acid. It is heated by means of a sand bath to dryness, care being taken not to decompose the chloride by excessive heat. It is then crushed in a porcelain or glass mortar, and laid on a grinding glass plate, where it is mixed with small quantities at a time of essence of lavender (rectified) care being taken not to work at too high temperature or the reaction would take place on this glass plate. Having added about 1,400 grammes of essence of lavender, the mixture is collected in a porcelain dish and left to itself for eight days, without the least disturbance. The liquid is next decanted, filtered, and left again for six days, and this filtered liquid must then be about 5° at the acid test Baumé. For the above quantity, 25 grammes litharge and 25 grammes barate of lead are taken, and ground to an impalpable powder, with 8 to 10 grammes essence of lavender. This last mixture is then added and stirred with the platinizing liquid. It is then applied as above described, care being always taken to avoid dampness and dust.

As soon as the glass plate to be platinized has received the metallic coat and is sufficiently dry, it is placed in muffles, formed of a frame of cast iron, tongued and grooved, and the parts of which slide in each other.

The fire-place is placed at the back of the oven, which arrangement gives free access to the door, through which the glass is placed in the oven. Movable frames are placed in the cast-iron frame, and receive the glasses to be heated, maintaining them in a parallel and vertical position. Hooks, properly constructed, support a large number of these frames. Also, movable sheets allow glasses of different sizes to be placed in these frames.

The vertical and longitudinal section of the oven is a long parallellogram, and its cross-section is a square. The cooking is regular; and the accidents of fire are regulated by registers or iron gates in the posterior and anterior part of the oven. A series of muffles are placed under the dome.

The platinized mirror thus obtained is of great solidity, and no metal is more resistant to the influence of atmospheric agents. Even when a mirror is thrown into a great fire, at the temperature at which the glass melts, it will have retained its metallic surface. The mirrors do not give false tints to colored objects, as the common mercury alloy does.

The reflection being obtained by the anterior surface, there exists no double reflection; but what is still more remarkable is that the substitution of platina for tin and mercury is that it allows any kind of glass to be transformed into a mirror. The nitrous matter is polished on one face only, and having been submitted to the platinizing process reflects images without distortion from the surface of the metal itself.

Let us now come to the actual process in use; the following conditions had to be filled:

After having suppressed the use of mercury, the glass was to be perfectly colorless and deprived of every defect. The cost had to be reduced, or the old routine would not give place to progress. Not only has Dodé suppressed the use of mercury, but he has by his improvement been able to make better mirrors, for he hides by his process the faults in the glass plates, and obviates half the work of planing and polishing. In order to obtain this result it was necessary to apply the reflecting surface on the front of the glass-plate and not at the posterior surface.

A FLAG for the national Capitol has been made in California of silk produced in the State, and it will soon be sent to Washington.

A PLEA FOR "OUR DUMB SLAVES."

Mr. Bergh, the President of the Association for the Prevention of Cruelty to Animals, recently made the following plea for the kind treatment of animals in an up-town church of this city.

He began by saying that he felt somewhat embarrassed at having to lecture in a place where the eloquent pastor had given, on the previous evening, one of the most touching sermons he had ever heard, but though his fare would be plain, the meat would not be diseased, the vegetables would not be stale, and the drink would not be swill milk. The opponents of our cause, said the speaker, go so far as to declare that certain living creatures are not animals.

One of the earliest acts of our society was the arrest of the captain and mate of a vessel from Florida, having on board a cargo of turtles lying on their backs, with their fins pierced with holes, and firmly secured by rope yarns. In this attitude, and deprived of nourishment and water, they had been confined for several weeks. This arrest, as well as the subsequent legal proceedings, were conducted by myself, and I distinctly remember the confidence with which the counsel for the defense announced his theory that the turtle is not an animal, and he asked for a dismissal of the complaint. The judge sustained the counsel's physiological idea, and consequently discharged the prisoners, who immediately commenced suit against me for false arrest, but as no malice was shown the plaintiffs lost their case. I at once dispatched a messenger to Prof. Agassiz, who, of course, refuted the preposterous assumption of the "no animal party." Here Mr. Bergh quoted from learned authorities touching the subject. The opinion of Des Cartes, that animals are mere breathing machines, is controverted at every step. Can they not be educated, and have they not the same passions and affections which exist in mankind? The half-reasoning elephant is not a machine. The cat shows both care and artifice in concealing her kittens. The hen which has been robbed of her eggs goes where she can lay in greater security. If the dog has no perception, how is he to distinguish a man from a hare or pheasant? The learned men of every age have accorded to many animals the power of communicating by language. Their idiom seems strange to us; so do the German, Greek, and Chinese until we have learned them. Oxen and cows will not fatten by themselves, and often they neglect the finest pastures not recommended by the charms of society. Dr. Reed defines instinct as a blind impulse to action, without deliberation or any end in view. Is the wonderful mechanism of the honey-comb mere blind impulse devoid of purpose? It has been said that nature follows a continuous and ascending chain from the mineral to the plant, and from the vegetable to the animal kingdom, the apex of which is crowned by the most perfect work of creation—Man—but I feel satisfied that this perfection is largely shared by the inferior animals. Cruelty to animals is a sin but little thought of by the majority of people; often, owing to the criminal selfishness of mankind, a characteristic which lies at the foundation of a greater part of the sins of this life. The effect produced by cruelty to animals is to demoralize the man who indulges in it. It blunts the finer feelings of the heart, and gradually hardens and depraves the whole character. In the history of nations we find that in their period of decline wild beast shows, in which animals were made to tear each other until the pavement of the arena was red with blood, formed the favorite pastimes of the masses. In the palmy days of Rome, the people loved to witness exhibitions of feats of arms, and contests of the athletes. By force and discipline they became famous for war and law, and, afterward, for refinement and letters; but when luxury came in, dissipation and effeminacy relaxed the better propensities, and when the nation was decaying, then it was that the Roman citizens demanded Indian elephants, and lions from Ethiopia, and bears from the Caucasus. The music which then best pleased a Roman audience was not the chants of those who sang of a nation's valor, but it was the yell of the dying slave that awoke the plaudits of the multitude. It has been the same in Spain, and so it is to-day in that semi-civilized land. When a nation delights in witnessing exhibitions of cruelty, its dissolution is near. He who torments a brute soon forgets to be kind to his own family or to his fellow men. Those who frequent the cock-pit or the prize-ring, are already on the road to the penitentiary and the gallows. A man who habitually abuses his dog or horse is unworthy of confidence. It is well known that the dog, the horse, and the ox weep. Yes! Smile not. I say weep. They have tears of despair as well as the beautiful gazelle. I have heard of a horse which accidentally trod on the foot of his groom, and seeing that he had fallen and fainted from the pain, the animal licked him and covered him with tears. Was this instinct? While I am speaking an effort is being made in the State Legislature to abolish our Society for the Prevention of Cruelty to Animals. The day after this bill is passed the Emblem of Mercy on the corner of Broadway and Fourth street, will be taken down, and then the revolting scenes of the past will be again reenacted. I beg of you as Christian people to protest against this inhuman movement which is about to be made.

In conclusion, my friends, suffer me to commend this subject to the serious consideration of you all, not alone as a religious duty, but because of the perfect personal happiness which the practice of protection to all defenseless dumb creatures secures. For my own part, I have sought and shared the ordinary employments of life in various parts of the world, under the most favored circumstances, but I declare that all these evanescent pleasures combined could never fill my soul with the pure contentment which possesses it, as I lie me down at night, after a day successfully passed in shielding these dumb companions and servants of our race from suffering and abuse.

Civilization will never be a reality until we shall have succeeded in subduing the semi-barbaric spirit which inflicts wanton cruelty on any harmless creature. Morality, public and private interest, and the sentiment of true religion, impose on us the duty of treating with kindness these docile and intelligent beings, which live, work, and die for us.

Something About Gold.

Gold is found sparingly in many hard rocks, such as granite, mica-slate, chlorite-slate, and clay-slate, and sometimes even in limestone and other similar rocks. It occurs far more abundantly in quartz, pure unmixed flint, or silex. In igneous or metamorphic rocks, the quartz usually occurs in veins, or in large, irregular bunches or lumps, with veins diverging from them. These veins are most commonly only a few feet wide, and for the most part traverse the rocks in a vertical or highly inclined position. Sometimes, however, veins or irregular masses occur many yards across in every direction; and sometimes, but very rarely, quartz is found in such abundance as to make what even might be called hills of itself. The gold is disseminated in this quartz, sometimes in such exceedingly minute particles as to be invisible, not only to the naked eye, but even to the eye aided by a powerful lens. Most commonly, the gold is seen as little yellow specks, flakes, or grains scattered through the quartz. When the quartz has a crystalline structure, which it often has, little nests of gold, likewise crystalline, may be seen embedded between the interlacing crystals of the quartz. Where the interstices in the quartz are large, these are sometimes entirely filled up with gold; but not unfrequently irregular holes and crevices seem to have been formed in the quartz by decomposition or rottenness, which have sometimes been subsequently filled with gold. In these cases, the gold assumes irregular forms, such as melted lead will when poured into water—forms which have given people the idea of the gold having been deposited in a state of fusion, a notion in all probability utterly unfounded. How the gold got in the quartz, is a point at present so uncertain, that no man of science would take upon himself the responsibility of answering the question. The size of the irregular lumps thus entangled in the quartz varies greatly, the largest hitherto known single lump in the world being an Australian one of 2,166 ounces weight. It is, however, usually found in small flakes, grains, and dentritic strings, weighing only a few grains.

Whenever the moving waters of the sea, by which drift-materials were formed and deposited and attacked rock containing gold, it would of course break off lumps of it, just as of any other rock, and equally wash, roll, and knock it about, and thus break it into smaller fragments round it into pebbles, and grind it into sand. In this way, much of the gold would be knocked out of the rock, and much water-worn gold accumulated, or water-worn fragments of gold and quartz together.

From this point of time, however, there is a remarkable difference observable in the action of the water on the gold, and on the rock which contains no gold. All kinds of rock, or earth, or stone, at all events all the common kinds, are pretty nearly of the same specific gravity—that is to say, of the same weight, bulk for bulk. Chalk, clay, limestone, compact sandstone, granite, marble, basalt, have all specific gravities varying from 2 to 3—that is, they are twice or thrice the weight of their bulk of water. Pure gold has a specific gravity of 19, or is nineteen times as heavy as its bulk of water; and the most impure ore of gold that occurs in nature has at least a specific gravity of 12 to 15. Gold is about six or seven times as heavy as quartz, or any other stone it is likely to be associated with. The consequence of this is, that moving water has at least seven times less power over it—less power to move it along, either suspended in the water or rolling along its bed. When the drift, therefore, was formed, vast quantities of stone might be removed to great distances, while the gold was left behind, not far from its native site. All the large lumps of gold will certainly be but little removed, as also all the large lumps of quartz, heavily freighted with gold. Grains of gold and small lumps may be carried further, while scale-gold and fine dust, especially if flat and thin, may be carried to very considerable distances.—*Morgan's British Trade Journal.*

Extracting Juice from Sugar-Cane, Beetroot, etc.

M. Julius Robert Scelowita has discovered a new method of obtaining the juice from such substances as sugar-cane. The process is one of diffusion. The cane, or substance from which the juice is to be extracted, is cut into slices by a special machine. It is then put into a so-called battery of diffusion vessels, consisting of a series of closed water-tight tanks, and is brought into contact with water at an elevated temperature, in a certain succession and systematic order, which is requisite for complete extraction, and for the proper concentration of the juice obtained. Another application is also described, the main feature of which consists in carrying out the whole process of diffusion in one single vessel, or diffuser, in which the extraction of the sugar is carried on continuously by introducing slices of cane through a feeding apparatus at the bottom of the vessel, from which they rise slowly to the top, while fresh water is constantly running in at the top of the diffusion vessel, and is drawn off at the bottom as diffusion juice, after having remained in contact with the slices for a sufficient length of time. The liquid during this operation is agitated by machinery. Could not this principle be applied on a small scale for domestic uses, as in the making of such drinks as lemonade?

Size of Mortar Joints in Brickwork.

This subject may be considered in a variety of ways. First, if we consider that the strength and capability of sustaining weight will be increased by having thicker mortar joints than those commonly made, then it would appear probable that a building erected with mortar walls and without any bricks, would be of still greater strength; but we know that the mortar usually used would stand no such test. It therefore seems probable that thin joints would be preferable. But it may now occur to us—then, why have joints of any thickness; or why should they be of a certain thickness, and neither less nor more? This will lead us to consider the properties of mortar, and the duties it actually performs in brickwork, and to endeavor to discover how we can cause it to most effectually perform those duties.

Respecting its properties, it would be unsafe to consider that mortar is generally capable of bearing the compressile power that brick will bear, therefore the less of it we can manage with the better; but as thin, flattish pebbles will pass through a fine sieve, and may chance to lodge on edge when in a mortar joint, such would in too thin a joint cause the brick above it to ride, and the extra thinness of such joint would consequently be an element of instability instead of strength.

The duties mortar has to perform may be considered principally as two; viz., first, to be the means by which each successive course of bricks may be solidly bedded; secondly, to be the agent which shall enable each brick to bond with those beneath it.

We have already seen that it would generally be inadvisable to have thick joints, on account of any imaginary compressible superiority of the mortar over brick; we shall now see that joints as thin as they can with safety be made will also generally be desirable, when considered in their action, as the means by which "bond" is effected, for bond is the tying, as it were, of bricks by one or more bricks laid across and uniting them, and which is effected by means of the mortar placed between them, which, filling the inequalities of the bricks so placed, will, with a sufficient weight on the upper course, be the means of preventing the bricks in the under course from being dragged apart.

Then to consider whether thick or thin joints will more effectually achieve the bonding, let us consider the action of two stretchers bonding (in English bond) three "headers." If the joint in such case be made thin—say ¼ in. thick—then as the stretchers would bear 2¼ in. on each of the two outer "headers," and the bonding connection between them would be the mortar under each end of the stretchers, and in each case being in sectional area (taken parallel to the face of the wall) equal 2¼ in. by ¼ in.; then such would in the tearing asunder of the two outer "headers" be subjected to a compressile strain acting in a direction (nearly or quite) identical with a diagonal to the said area. Now, if we were to increase the thickness of our joint, then the length of the diagonal would also increase, and would consequently be unlikely to resist so great a strain as the shorter one, for the same reason that a long column will generally bear less pressure than a short one of equal diameter; also the angle of inclination of the shorter diagonal, being less than that of the longer, would give it an advantage over the latter.

But let us yet consider it in another way: If a ¼-in. joint be stronger than a ½-in. ditto, then why not a 1-in. also stronger than a ½-in., and a 2-in. than a 1-in., a 4-in. than a 2-in., an 8-in. than a 4-in., and so on? Let us consider an 8-in. joint, then our old sectional area of 2¼ in. by ¼ in. will become 8 in. by 2¼ in., the 8 in. being its hight, and consequently the mortar connecting the ends of the "stretchers" with the "headers" will be easily cracked; and the "bond," in this case, show itself to be no bond in reality, as the strain would here be a tensile one, and which mortar would be unlikely to bear.

And, again, if thick mortar joints be the element of strength, why should voussoirs, or arch-bricks, be cut, or rubbed for the sake of strength? or, better still, why not have, as before, joints of, say 8 in. in thickness, or to gain the utmost strength arches of mortar altogether, no bricks being used?—*London Builder.*

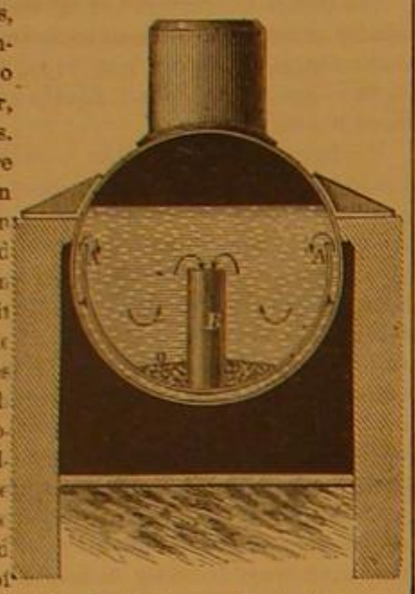
NEW METHOD OF OBTAINING GELATIN.—Crude animal substances, such as the flesh, fat, skin, tendons, bones, etc., either with or without a previous treatment with lime, are treated with benzine, or some other similar hydrocarbon, in a vessel provided with a condensing apparatus for saving any vaporised benzine, or in a closed vessel at an elevated temperature. After a few hours' digestion, the hydrocarbon solution of the fats and oils is drawn off, and may be treated by any of the well-known methods for recovering the volatile hydrocarbon, which may be again used in subsequent operations. The oils and fats are saved and utilized. The animal matters, or purified glue-stock, is now ready for conversion into gelatin by heating with water in the ordinary way.

M. LESSEPS announces that the minimum depth of the Suez Canal is nineteen feet, and that this is over the rock at Serapeum. The rock is to be removed shortly, and then the minimum depth will be at a spot near Suez. It will range from twenty-three feet to twenty-seven feet, according to the hight of the sea.

THE Royal Danish Society of Science, among other prizes, has offered one amounting to $170 for the best essay containing an investigation of the movement of the air in a system of ventilation. The essay may be written in English, French, German, Danish, or Swedish, and must be handed in before October, 1870.

Mud Collectors for Boilers.

We give below a sketch of an arrangement for preventing the incrustation of boilers, designed by Herr Popper, and which was applied rather more than a year ago to a boiler at the machine shop of Herr. G. Sigl, of Vienna, and with good results. Herr Popper's arrangement, which is shown in the sketch as applied to a plain cylindrical boiler, consists of long strips of sheet iron, about twelve inches in width, which are introduced through the man-hole into the boiler and there united, so as to form a half cylinder placed parallel to the lower half of the boiler. This half cylinder is kept in place and supported at a certain distance from the boiler shell, by projections on its exterior. Sigl's boiler, to which the apparatus was applied, is four feet six inches in diameter, and the space in this case between the half cylinder and the external shell was an inch and a quarter at the sides, and two inches and a half at the bottom, the upper edges of the half cylinder being on the level of the low-water line. So far the apparatus does not differ greatly from several arrangements of screen plates for increasing the circulation which have been applied to boilers in many instances, both in this country and on the Continent, during the past few years; but, on referring to the annexed section, it will be seen that Herr Popper attaches to the half cylinder a series of central pipes, through which a downward current can flow to the bottom of the boiler, as shown by the arrows. These pipes, which are made of sheet iron, are, in Sigl's boiler, 5 inches in diameter, and are placed about 24 inches apart from center to center; but it appears to us that the number of these tubes might be increased with advantage, particularly towards that end of the boiler which is exposed to the greatest heat. Around the pipes just mentioned, and filling the lower part of the half cylinder for a depth of eight or nine inches, are placed a number of pebbles, about the size of an egg, these pebbles not only serving to keep the whole apparatus in place, but being also found to perform the functions of taking up the deposits from the water. The trials of Herr Popper's arrangements at Herr Sigl's works have, so far as we have heard, proved very satisfactory, it being stated that the internal surfaces are kept quite clear of scale, and the whole of the matters forming incrustation being deposited on the internal surface of the half cylinder and among the pebbles, the water in the interstices between these latter being always in a quiet state. Where plain cylindrical boilers heated by waste gases, or other means, are in use, it appears to us that the arrangement we have described is worthy of a trial; and we shall be glad to hear of the results of its working in the event of its being applied in this country. In conclusion, we may state that we have been informed that Herr Popper intends applying a similar arrangement to Cornish, marine, and locomotive boilers; but we must confess that we do not at present see how such an apparatus can be advantageously applied in these cases.—*Engineering.*



A Misunderstanding.

The antagonism between capital and labor, like that between religion and science, is more talked about than understood. Its basis is the simple fact that it is to the interest of the employer to purchase labor as cheaply as possible, and of the employé to sell it for as high a price as he can get. But the interests do not present the degree of antagonism implied by the general statement; for, whereas, that of the employer lies distinctly and unqualifiedly upon the side of cheap labor, that of the employé is not to a like extent upon the side of high wages.

A lower rate of wages tends to develop industries and originate enterprise quite impossible to either start or maintain with the higher rates. This widens the field of labor, and, by making cheap the articles produced, goes far toward compensating the laborer for his direct loss in actual salary.

So, a reduction of wages, though an immediate injury to the individual employé, is eventually a benefit to the community—a benefit of which he as a part of the community gets his share. These truths are ignored by workingmen.

THE PNEUMATIC TUNNEL UNDER BROADWAY, N. Y.

We give this week illustrations of this remarkable work, which, with a brief description of the details of construction and mode of operation, will give the general reader a good understanding of the nature of this mode of transit. Having fully set forth the benefits to be derived from it in a previous article, we shall confine ourselves at present entirely to a description of the work and a brief history of the origin and progress of transit by means of air inclosed in tubes.

Fig. 1.

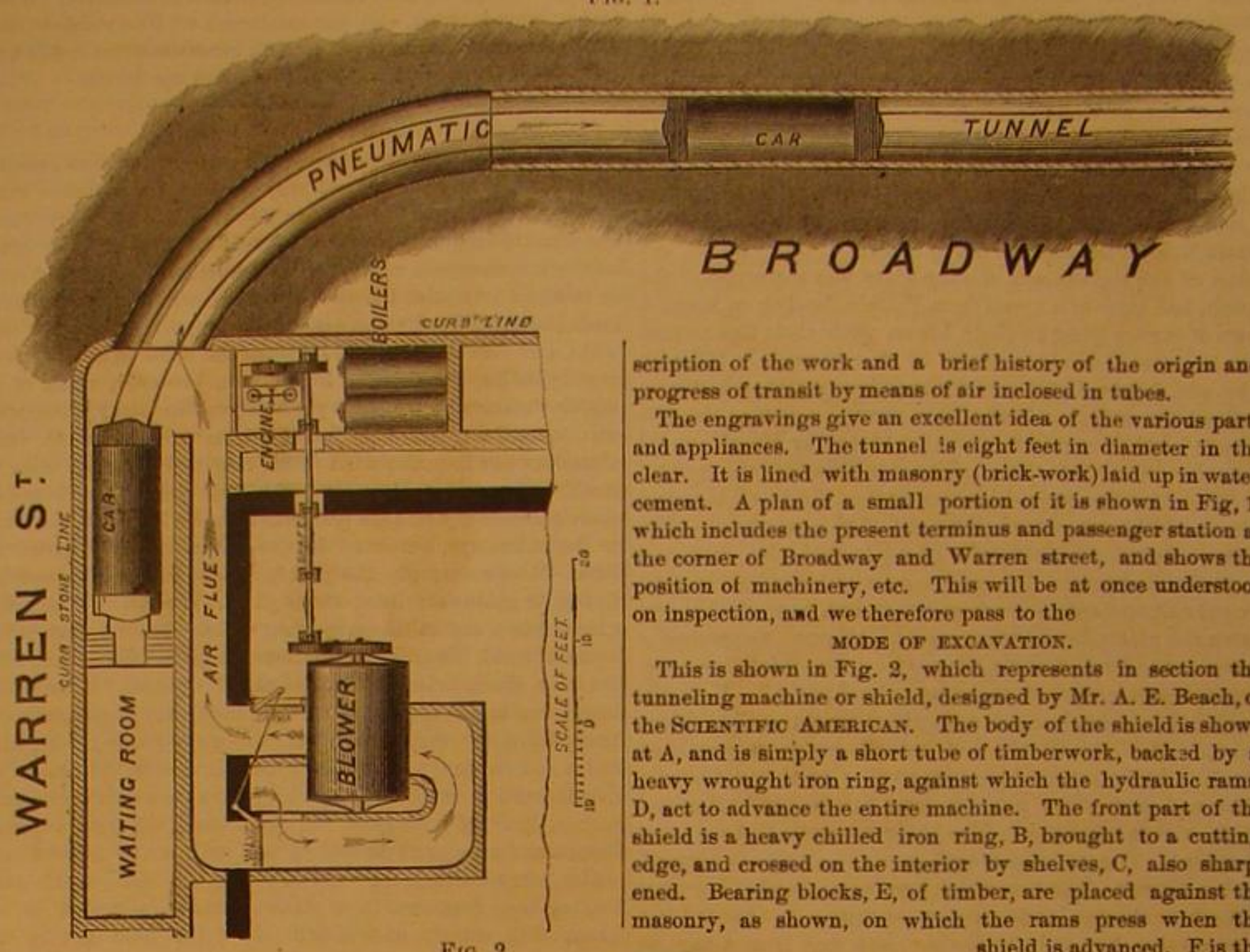


Fig. 2.

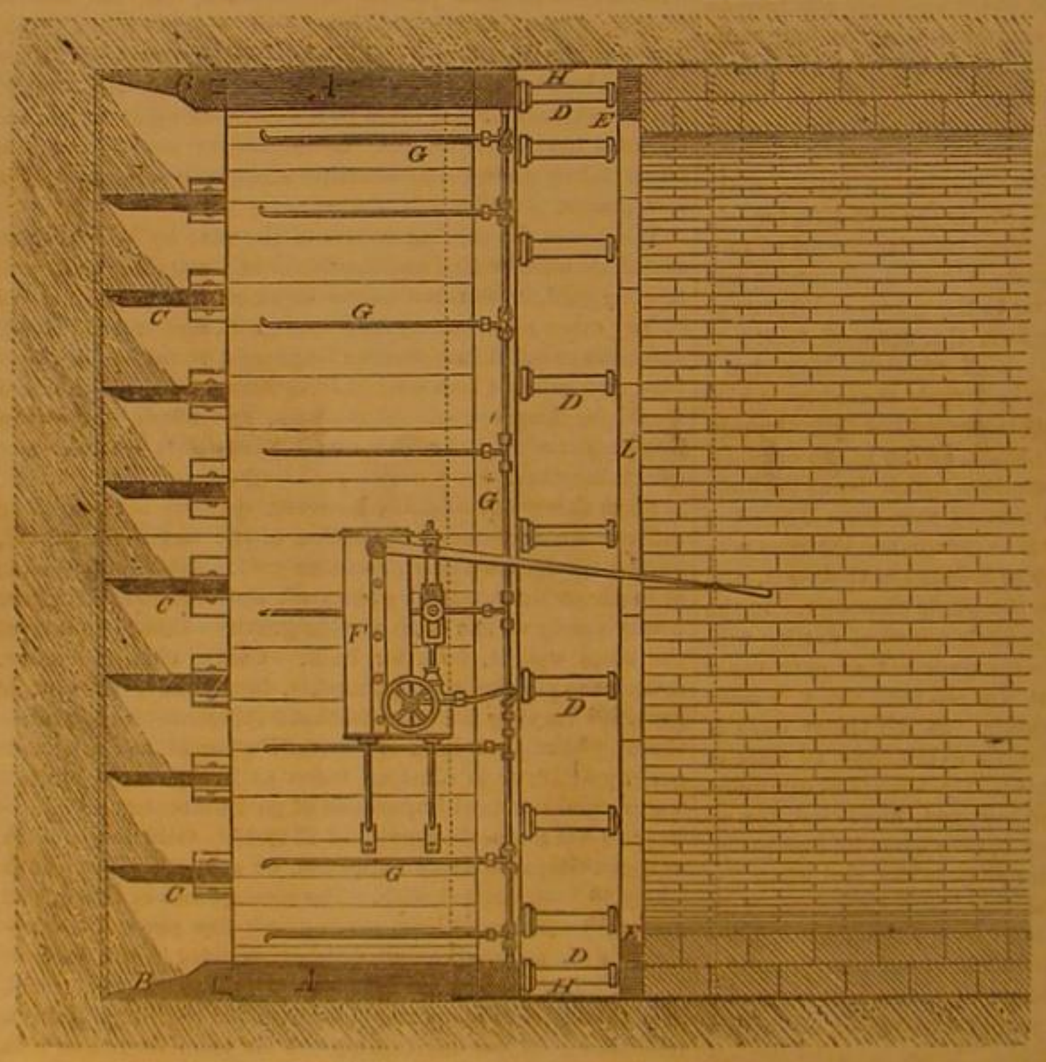


Fig. 4

The engravings give an excellent idea of the various parts and appliances. The tunnel is eight feet in diameter in the clear. It is lined with masonry (brick-work) laid up in water cement. A plan of a small portion of it is shown in Fig. 1, which includes the present terminus and passenger station at the corner of Broadway and Warren street, and shows the position of machinery, etc. This will be at once understood on inspection, and we therefore pass to the

MODE OF EXCAVATION.

This is shown in Fig. 2, which represents in section the tunneling machine or shield, designed by Mr. A. E. Beach, of the Scientific American. The body of the shield is shown at A, and is simply a short tube of timberwork, backed by a heavy wrought iron ring, against which the hydraulic rams, D, act to advance the entire machine. The front part of the shield is a heavy chilled iron ring, B, brought to a cutting edge, and crossed on the interior by shelves, C, also sharpened. Bearing blocks, E, of timber, are placed against the masonry, as shown, on which the rams press when the shield is advanced. F is the pump from which the water is carried to the rams by the pipes G. H is a hood of thin sheet steel within which the masonry is built, in rings of 16 inches length, the bricks interlocked.

The operation of this machine is as follows: The pump is worked by one man, and the rams press with a force of 126 tuns against the end of the masonry. This forces the cutting edge and the shelves into the earth to a distance corresponding to the length of stroke in the hydraulic cylinders and the earth being removed the masonry is again advanced, and so on step by step.

Whenever it is desired to alter the course of the shield, it is done by turning cocks in the pipes which lead from the pumps to the rams, on that side which is not to be advanced. The rams then acting upon the opposite side advance it, thus changing the course of the shield. In this way the machine may be guided with the utmost exactness.

The soil through which the tunnel is advancing is of a loose sandy character. Stones are, however, occasionally met with, and of course must be drilled and split out. The hydraulic rams were furnished by E. Lyon, 470 Grand street, New York. We shall refer to them again.

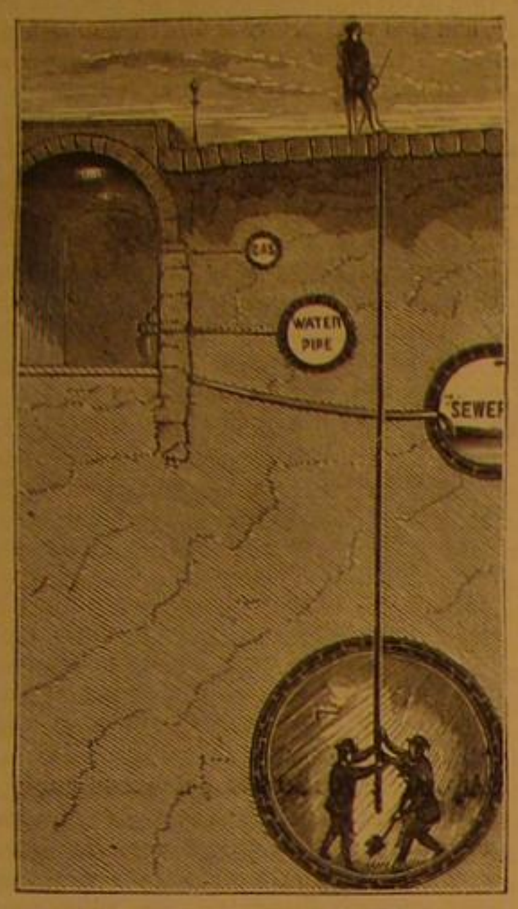
The method of testing the position at night is shown in Fig. 3. This is done by driving up from the center of the tunnel a tube in sections until it reaches the surface, by which the position of the shield is accurately determined. It is generally done at night because the street is then vacant.

A WAY STATION,

is shown in Fig. 4. It will be seen that these stations are not to be damp and dimly lighted cellars, but commo-

dious, airy, and comfortable apartments, wherein passengers may await the arrival of a car with as little inconvenience as they could in the best steam railway stations, and without any of the annoyances that attend the waiting for street cars at street corners.

FIG. 3.



THE TUNNEL AND WAITING STATION.

The portal of the tunnel, shown in Fig. 5, is a massive ornamental structure, of circular form, nine feet in diameter, its bed twenty-one and a half feet below the surface of Broadway. The mouth of the tunnel opens directly into a large

FIG. 5.

underground apartment, one hundred and twenty feet in length, fitted up in good style, for the purposes of a waiting and reception station. This apartment is lighted from the pavement, and occupies the entire space under the Warren street sidewalk.

THE PNEUMATIC CAR.

Fig. 6 is a sketch of the interior of the passenger car used in the present tunnel. It is of circular form, richly upholstered, and very comfortable, with seats for eighteen persons. Its interior hight is greater than the cars of the London underground railways. When the pneumatic tunnel is further extended, luxurious cars, 100 feet in length, will be used. The car is brilliantly illuminated by means of a single zircon light.

THE MODE OF PROPULSION

is one of the most simple things imaginable. Air is forced into the tunnel by a gigantic blowing engine made by P. H. & F. M. Roots, of Connersville, Ind., a section of which is shown in Fig. 7. This blower is actuated by a steam engine of 100-horse power, and is calculated to deliver when worked at maximum speed, a volume of 100,000 cubic feet of air per minute. A pressure of one fourth of one pound to the square inch would be an aggregate of three-fourths of a tun on the end of the car, far more than required for propulsion.

The blowing engine is positive in its action, pressing the air into the tunnel in the direction shown by the arrows on the ground plan, Fig. 1. When the air current is reversed a partial vacuum is produced in the tunnel, and the pressure of the atmosphere then propels the car in an opposite direction.

THE SCOPE OF THE WORK.

The tunnel will when completed, extend from the Battery to the Harlem river.

The tunnel starts from the east end of the reception room,

FIG 7

corner of Warren street and Broadway, and extends on a curve to the center of Broadway, thence in a straight line down to a point a little beyond Murray street, where the shield, or tunneling machine now rests. The excavations have been temporarily suspended, for the purpose of affording the press and public an opportunity to examine the works, and witness the operations of the machinery. Mr. Joseph Dixon is the superintendent of the works.

SKETCH OF THE HISTORY OF THE SYSTEM OF PNEUMATIC TRANSIT.

In 1824, John Vallance took out a patent in England for a method of propelling carriages through tubes by atmospheric pressure, and in 1826 he had a car running on this plan. This attempt was succeeded by similar efforts by Messrs. Medhurst and Pinkus. The plan adopted by these gentlemen was the propulsion of the cars by means of a piston

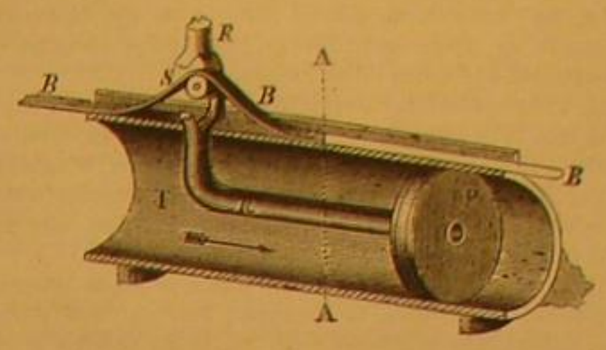
FIG. 8.

running in a slotted tube; an arm projecting through the slot, forming the point of attachment for the cars, and an endless band closing the slot both before and after the arm as shown in Figs. 8 and 9. The air was in this method exhausted from the tube in front of the piston. This propulsion of cars was successfully performed in this way, but the system is not at present in use.

Vallance's system was again put in operation in 1861, by T. W. Rammell, in London, on a small scale, for carrying letters and packages, where pneumatic tubes, 2½ miles long, and 3 feet in width, have been operated with success for the past seven years.

In 1864 a large tunnel for passenger cars was erected at Sydenham, ¼ of a mile long, and thousands of passengers

FIG. 9.



were transported. This resulted in the incorporation of the Waterton and Whitehall Railway, which is to extend from Charing Cross under the Thames to the Southwestern Railway. It is not yet completed.

Opening of the Broadway Tunnel to the Public.

The doors of the Beach Pneumatic Transit Company were thrown open to the public for the first time on the 26th ult., when an "Under Broadway Reception" was given, by special invitation to the State authorities, city officials, and members of the press. All the prominent personages of the city and State were present, and the inspection of the works gave the greatest satisfaction. The various daily newspapers have published long accounts of the event, which has produced quite a novel sensation in the metropolis.

The New York *Herald* says "it was virtually the opening day of the first underground railway in America."

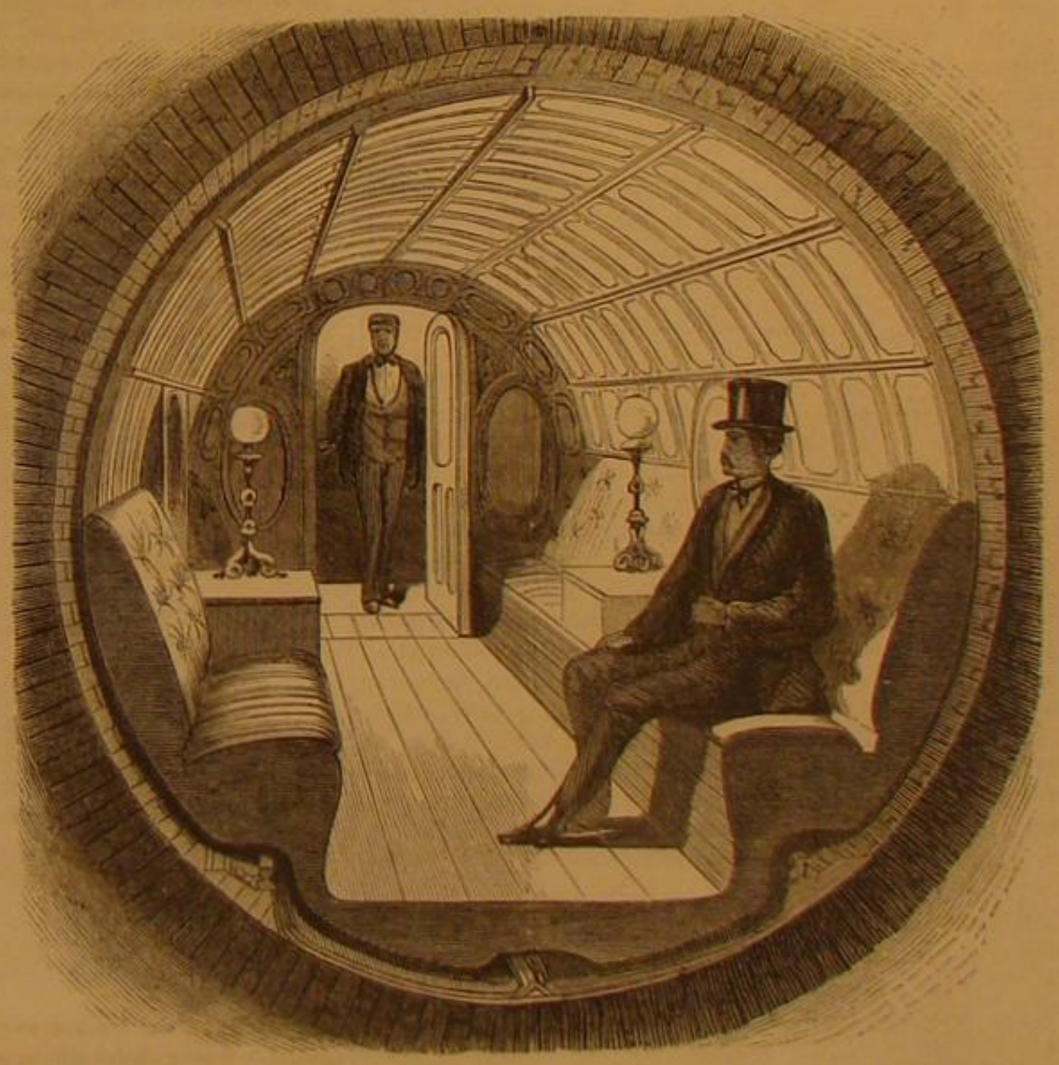
The New York *Times* says: "Certainly the most novel, if not the most successful, enterprise that New York has seen for many a day is the pneumatic tunnel under Broadway. A myth, or a humbug, it has hitherto been called by everybody who has been excluded from its interior; but hereafter the incredulous public can have the opportunity of examining the undertaking and judging of its merits.

"Yesterday the tunnel was thrown open to the inspection of visitors for the first time and it must be said that every one of them came away surprised and gratified. Such as expected to find a dismal cavernous retreat under Broadway, opened their eyes at the elegant reception room, the light, airy tunnel, and the general appearance of taste and comfort in all the apartments; and those who entered to pick out some scientific flaw in the project, were silenced by the completeness of the machinery, the solidity of the work, and the safety of the running apparatus."

The *Evening Mail* says: "The problem of tunneling Broadway has been solved. There is no mistake about it. Even as we write, a comfortable passenger car is running smoothly and safely between Warren and Murray streets, demonstrating, beyond contradiction, that it is only a question of time and money to give us rapid and comfortable transportation from the Battery to Harlem river."

The Company has temporarily suspended operations on the tunnel in order to give the public an opportunity to examine their works, which are now open for inspection. The entrance is at 260 Broadway, cor. Warren st., directly opposite the City Hall. The ladies of the Union Home for the Orphans of Sol-

FIG. 6.



diers and Sailors, a most deserving charity, are in possession of the doors, and receive the proceeds of the admission fee, 25 cents.

The Louisville Railroad Bridge.

The great bridge over the Ohio river at Louisville wa formally opened to travel on the 18th. By this bridge three great and distinct systems of railways are directly connected.

1st. As Louisville is almost directly on the line between Pensacola or Mobile and Chicago, this bridge completes the direct north-and-south all-rail route.

2d. It furnishes the missing link in the connection between Memphis, New Orleans, and points in the lower Mississippi Valley and in Texas, with New York, Boston, Washington, Baltimore, and the principal cities in the Northeastern States, forming a continuous and unbroken line between the Southwest and Northeast.

3d. It forms the last link in the chain of roads connecting Savannah, Charleston, Wilmington, Norfolk, and the principal cities in the southeast, with St. Louis, Quincy, Burlington, Rock Island, and the lines starting from points on the upper Mississippi river and penetrating the Far West to the Pacific—making Louisville the central point on the line of unbroken rail route between the Southwest and Northwest.

On the first day of August, 1867, the first stone was laid, with imposing ceremonies, by Mr. W. B. Hamilton, President of the Bridge Company.

The canal draw was delivered in June, 1868, and swung on the 3d of July following. The succeeding spans were put in place as fast as the masonry was ready. The last span was put together and swung on its pier bearings February 1, 1870. Several days were required to change the gage of the track, and on the evening of February 12, the first train, consisting of an engine and twenty-four flat cars, passed over.

The track connecting the Louisville and Nashville Railroad with the bridge, leaves the yard of the depot, north of the engine house near Tenth street, and entering Maple street follows that street to Fourteenth, thence down Fourteenth to Portland avenue, and thence to High street on a prolongation of the line of Fourteenth street, and thence curving to the right, crosses the river at right angles to the direction of the current, striking the Indiana shore at a point fifteen hundred feet below Smith & Smyser's mill. From there the line continues in the same direction in which it crossed the river until it strikes the dirt road between New Albany and Jeffersonville. Thence curving to the right, it enters Ninth street, Jeffersonville, and continues along that street to the depot of the Jeffersonville, Madison, and Indianapolis Railroad. The total length of the bridge proper is five thousand two hunand ninety-nine feet.

The bridge, when entirely finished, will have foot walks four feet wide on each side, with hand railings. It has a single line of track, and is so arranged that, if desirable, the space of twenty feet six inches between the foot walks may be floored and used for the accommodation of carriages when not occupied for railroad purposes.

A Good Word for the Mole.—Some interesting experiments have recently been made in the grounds attached to the school of Saint Remy, France, as to the useful qualities of the common mole. On the 23d of July a mole was placed in a piece of shrubbery, and was given wornils and grubs for food. In four days he ate 432 wornils and 250 grubs. Another mole was placed on the 7th of August in a large wooden box, and in 12 days he ate 540 grubs and 872 wornils. From time to time vegetable matter, such as was believed to be his usual food, was placed before him, but he never touched it except to make his bed upon it. A third, which had lost a foot in a trap, ate 150 wornils on the first day. It is now argued, from the results of these experiments, that the devastations in the soil committed by the mole are more than counterbalanced by his destruction of noxious insects.

Tanned Cotton Cloth.—The Paris *Cosmos* states that cotton fabrics have been treated with a solution of tannin in the same manner as hides are in the manufacture of leather, and that the cotton thereby acquires greater strength, and better resists moisture and disintegrating effects. The *Cosmos* does not attempt to explain the chemical reaction which produces this important change. We suspect the change cannot be great, since it has escaped the notice of practical tanners. Those who are accustomed to wearing cotton clothes often saturated with tan-liquor, as well as similar clothing untouched by tannin, would not be long in detecting and making known a new virtue in their favorite solution.

Waterproof Garments.—At present in the use of waterproof garments great inconvenience is experienced from the want of escape of the natural moisture exuded from the body. A method of obviating this has been patented in England. The inventors apply to waterproof garments a series of elastic tubes of vulcanized india-rubber, or other material of sufficient thickness and strength to resist any ordinary compression, but still of sufficient elasticity to yield freely to the movements of the wearer. These tubes are attached to the interior of garments by strips or bands coated with adhesive solution; by this means they assert that a free circulation of air under the garment is obtained.

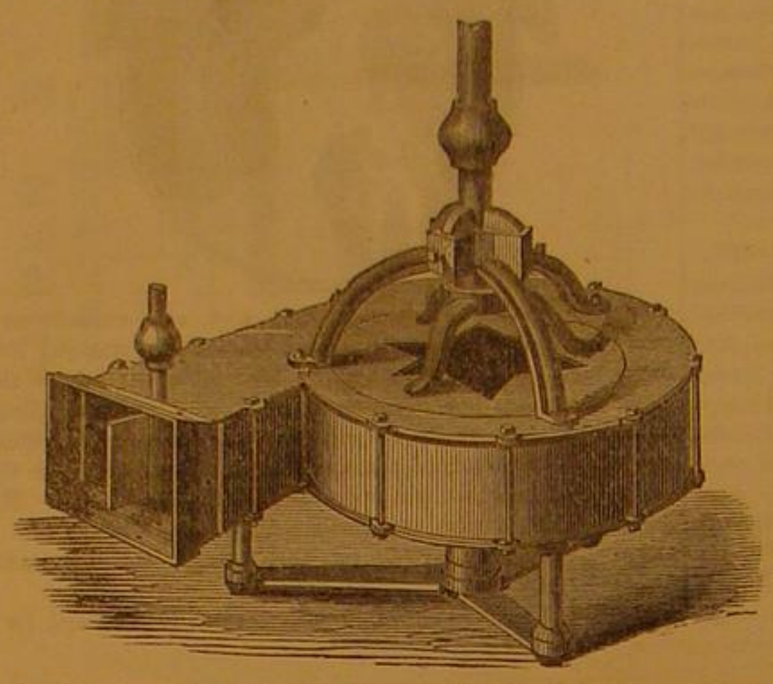
Vine Pests.—Many of the vineyards in France and Italy have been attacked this year by a grub which infests the root of the plant. M. Marchaud proposes the extermination of this pest by watering the soil with sulphureted hydrogen water, which is well known to be very fatal to small animals.

HUBBELL & CAPRON'S IMPROVED TURBINE WHEEL.

A turbine wheel may be properly considered as an instrument for converting the velocity of water into work. The greater its capacity for converting the velocity into work the better the wheel. Provided none of the momentum is, by bad construction, consumed in the effort of the water to escape from the wheel, or an undue portion of it absorbed in friction over rough surfaces, the lower the velocity at which the water leaves the wheel the greater will be the percentage of work obtained from a given initial velocity.

It follows that without sufficient provision for a free escape of that portion of the water which has performed its work, a certain portion of the power residing in the water, whose energy is not wholly exhausted, must be absorbed in forcing out the dead water. The want of such a provision is as important a defect as the want of a free exhaust in a steam engine.

One of the most striking features in the wheel which we this week illustrate is the ample provision made for the escape of the dead water.

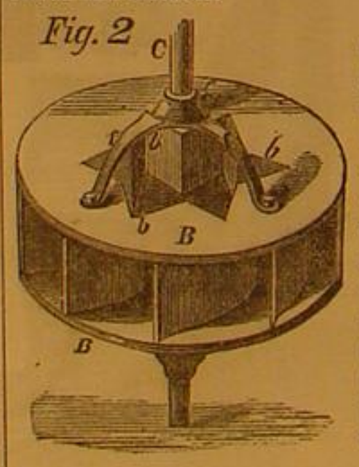


It will be seen that the wheel is one of the class known as center-discharge wheels, and further, that the hub and shaft in the center of the wheel are entirely dispensed with, the wheel being bolted near its perimeter to a tripod which is attached to the vertical shaft. A second tripod resting upon the scroll immediately surrounding the wheel, supports the lower bearing of the vertical shaft.

The wheel may be either cast entire or be made in parts bolted together. The openings for the escape of the water at the top and bottom of the wheel are of star shape, as shown, and occupy about one third the diameter of the wheel.

The buckets are curved metal plates of the form shown in Fig. 2. They are placed tangentially so that the inner end of each bucket extends along the side of one of the notches in the star-shaped openings of the top and bottom plates of the wheel, the other side of the notch being the width of the mouth or space through which the water is discharged between the buckets.

Fig. 2



The water is conveyed to the buckets through a scroll which forms the external case of the wheel, and as it enters, the water acts first upon the outer concave portion of the buckets. It is then deflected toward the center, still continuing its action upon the rear side of the buckets, until it reaches the notches of the star-shaped openings, when its power is exhausted and it discharges by the natural action of its gravity.

The peculiar form and arrangement of the bucket secures the full utilization of the available power of the water, while the free discharge, secured by the star-shaped openings and the absence of hub and shaft in the center, prevents the subtraction of power from the performance of useful work existing in many forms of turbine wheels.

We have not seen this wheel in actual work, but the sound principles upon which it is constructed give evidence that the many warm testimonials to its efficiency, which have been shown us, are well deserved. These testimonials are from practical men, and are of a nature to fully establish all that is claimed for the wheel as being one of maximum efficiency not liable to get out of repair or to be choked by matters deposited by the water, and in all respects satisfactory in its operation. Patented May 8th, 1869.

For further information address Hubbell & Capron, No. 21 Cortlandt street, New York. The wheels are manufactured at Long Pond Mills. Post office address, Ore Hill, Conn.

A German paper states that a train composed of all the locomotives and railroad carriages in Europe would reach from St. Petersburgh to Paris, and would contain 400,000 passenger carriages and 500,000 luggage vans. The network of European railroads represents a length of 70,718 miles; 18,000 locomotives are employed on it, and these rush over a distance of 60,000,000 miles in a year. 150,000,000 cwts. of iron have been used for the rails, and 80,000,000 cwts. of coal are required yearly to feed the engines.

How Wall Paper is Made.

A correspondent of the *Evening Mail*, one of our most interesting daily papers, has recently visited the large wall paper manufactory of Howell Brothers, Philadelphia.

Think, he says, of a building three hundred and ninety-six feet long, five stories in hight, and sixty feet wide. The eastern wing of the same elevation is one hundred and forty feet long, and this vast factory is filled with machinery that is producing all varieties and shades of wall paper at a rate almost incredible. Take the article of sun shades for windows alone, and imagine what the perfection of the apparatus must be that turns out fifty thousand of them weekly. For ordinary wall papers there are ten presses steadily at work, running off some ten thousand rolls a week. The visitor may have his organ of wonder excited by witnessing some of these presses taking in clean paper and turning it off with twelve colors impressed on it, with the most unerring regularity. Then again the arrangement is such that these rolls may be made of any length. If the Royal Geographical Society wanted a belt to go round the earth, any of these machines would turn out a girdle of the required dimensions.

Roll after roll becomes united by the simplest process in the hands of a boy, and thus the work goes on. Great length of building is required in such an establishment in order to dry the printed paper; for at one end the printing is going on, and ere the sheet has been carried forward over heated pipes by a simple but most ingenious process to the end of the factory, it is dried and ready for the measuring apparatus, for the folding and condensing or tightening process, in order to its being secured in numbered bundles for the store.

MANUFACTURE OF WALL PAPER.

The division of labor in such an enormous factory presents a most interesting study. Here, for instance, in a separate apartment, are the designers of patterns, evidently thoughtful men; adjoining them are the skilled workmen engaged on the cylinders, where, by means of brass and wood-carvings, the patterns are prepared for use in the printing presses. Here again are men at vast receivers engaged in preparing the *body* that is to be applied to the paper. The earths that are used in this process come from regions far apart. For instance, Perth Amboy, in New Jersey, supplies large quantities of it; but, strange to say, from Atlanta, in Georgia, an article is procured which, to the eye of the uninitiated, appears to be much finer, and yet its price is much less than the duller looking Jersey article. From Atlanta this earth is sent by rail to Savannah, and thence by steamboat, and great though the distance is, the firm pays considerably more for the article which is procured almost at the next door.

HOW IT IS POLISHED.

Then again, glazing or polishing paper. How is that done? Few of our readers imagine that a simple brushing apparatus accomplishes the work. A number of cylinders armed with Tampico grass are made into large brushes. These are caused to revolve with immense velocity as the paper is carried over them and the result is the high polish and glancing appearance that such paper displays. To produce flock paper the process is exceedingly easy,—that is to say, once you know how, and are provided with the proper machinery. A capacious chest is provided and the lid is opened up backwards. Into this chest a roll of newly-stamped paper is conducted, and, of course, it is quite wet. Cloth is pulverized and prepared of the proper shade, and when this chest has received a length of the newly-printed paper the lid is shut down on the dust and the paper, and the boy in attendance commences in the most ridiculous manner to beat the bottom of the chest, which appears to be elastic. The action of the rods raises the pulverized cloth dust and causes the proper quantity to rest on the damp surface, to which it adheres; and so length after length is dusted and thus the work goes on.

THE GILDING.

In another apartment is the gilding process. Girls, with delicate fingers, lay the metal leaf on the proper spot, which by an adhesive paste has been prepared for its reception, and then the roll passes under the press, where the figure is formed, and other hands brush off the superfluous matter. This is one of the most delicate operations in the establishment, as the air caused by the motion of a passing stranger, or even by the lifting of a hand will cause a foot or two of the leaf to fly off.

The capital required for such an establishment must be enormous. Rich papers and of the most *recherché* patterns are manufactured in Paris and in Germany, but France has no establishment so large as this. In England there are several firms of considerable magnitude, but competition has prevented them from attaining the overwhelming size of this concern. As might be expected, it is from the cheaper articles that the great profit is derived. Better for the firm to make two cents a roll off cheap paper than twenty-five or even fifty cents off richer styles. Five millions of rolls in the year at two cents each would produce one hundred thousand dollars, and the capacity of this factory is such that a much greater amount of work may be done.

Any subscriber for the year 1870, whether he receives his paper by mail or through news agents, can have a copy of the prize engraving by remitting seven dollars to this office. This announcement is made to answer a large number of inquiries on this point.

During the seventeen years that the late Prefect of the Seine, Baron Haussman, held office, the city of Paris has expended on extraordinary works alone about $423,500,000.

Correspondence.

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

Asphalt Roads.

MESSRS. EDITORS:—In your issue of the 12th ult., you have a very interesting article on the French asphalt roads, constructed with the Seyssel rock, and the attempts in this country to imitate them. I would here state that I resided in Paris at the time these pavements were laid, and investigated them with great interest.

I notice in that editorial that the New York Central Park Commissioners have been for some time engaged in testing the Seyssel asphalt for constructing roads, and that the results have been very favorable, showing that these gentlemen spare neither labor nor money to have the best known roads, and for which the public is indebted to them. But is the Seyssel asphalt the only substance adapted to give us good and durable roads? I think that I can fully convince you that an asphalt is found in this country as good, if not superior to it, although it has hitherto been known to but very few. I term it the American asphalt.

To answer this statement in a practical and scientific way, permit me to show the comparisons between the Seyssel and American asphalts and the qualities that each possesses.

1st. Do the qualities of the Seyssel asphalt road, as many believe, depend upon the natural combination of the asphalt with the rock wherein it is found?

2d. What is the difference between the Seyssel and the American asphalts; and what is the difference between natural and so-called artificial asphalt, such as coal tar?

In answer to the first query, I would state that the Seyssel, French, asphalt does not depend upon the limestone or carbonate of lime being naturally mixed with it. This is only a mixture and not a chemical combination, and the real quality of the roads formed of it depends entirely upon the asphalt itself.

To the second query we would state that the only difference between the Seyssel asphalt and the American, is that the American contains more asphaltene than the Seyssel. Asphaltene is a derivative substance which requires a very high degree of heat to melt, and is a very bad conductor of heat, as will be seen by the report of Boussignault and Raignault, two celebrated French chemists, the discoverers of asphaltene.

The difference between natural and so-called artificial asphalt, such as coal tar, is very important, and to give a proper illustration of it, it will be necessary to give a chemical description of each.

Natural asphalt is a neutral substance, with which neither acids nor alkalies will combine, and is decomposed by distillation into neutral hydrocarbons of the alcohol series, and chiefly of the paraffine series. It is true that traces of pyrolignic acid and ammonia are produced at about 900 degrees of heat, but these compounds are not pre-existing, and are formed by the decomposition of heterogeneal matters mixed with the pure asphalt at the above-named temperature.

The coal tar, or artificial asphalt, contains:

1st. Acid oils, soluble in alkalies, such as carbolic acid, rosolic acid, brunolic acid, acetic acid, and butyric acid.

2d. Alkaline oils, soluble in acids, ammonia, aniline, and leucoline, etc.

3d. Neutral oils not affected by alkalies, and very little by acids—these are generally called coal oils, and are composed of a great variety of hydrocarbons, the alcohol series, the benzole series, the paraffine series, naphthaline, para-napthaline, pyrene, and chrysene. In fact we see that the natural asphalt is a neutral substance, not affected by alkalies, and only in a small degree by some acids, and certainly not by water, and we see more, that the American asphalt is similar in composition and nature to the Seyssel asphalt, except that it contains more asphaltene requiring a greater degree of heat, to melt it. The Seyssel asphalt melts at 212° Fah., and the American requires about 400°.

The SCIENTIFIC AMERICAN is correct in stating that "most people when asphalt roads are mentioned, get only a confused idea of some sort of artificial concrete made of coal tar and gravel, or some inferior abomination like that which now disgraces the Fifth avenue in this city."

Now let us look at the artificial asphalt or coal tar, and endeavor to explain the causes of the quick destruction of roads constructed with it.

We have remarked that the coal tar is composed of a great many different compounds—the alkaline and acid compounds may combine with water and produce hydrates, and may change the entire nature of the substance, and destroy much of its cohesion; besides this, the artificial asphalt having been submitted to a destructive heat, all these above-named compounds pre-existing in the coal tar, and being simply a mixture of the above-named bodies, between which no affinity exists, the heat will separate many, and leave a road cracked and brittle, which will certainly not last the necessary and expected time.

The foregoing explanation, of which all scientific men will understand the truth and importance, shows that the American asphalt is similar for the construction of roads, if not superior, and that roads constructed with it will last as long or longer than the French asphalt roads, and will stand all the variations of temperature of our climate.

In fact such is the confidence felt in the American asphalt by a few capitalists that a patent has been obtained by a party in one of our Southern cities, and I think it will not be long before our city can have roads precisely similar to those in Paris, but better adapted to our climate.

E. J. DE SMEDT.

New York city.

Crystallization of Boiler Rivets.

MESSRS. EDITORS:—Six cylinder boilers 36' diameter 30' long, made in 1835, were in use more than thirty years, with a steam pressure from 60 to 80 pounds, and are now in use, and so far as wear or corrosion are concerned, are in good condition; in fact there is no perceptible deterioration.

The water used in the boilers is from a New England river and perfectly soft, the only impurities being a small quantity of vegetable and earthy matter.

The only defect the boilers had manifested during their use was a blister on a sheet over the furnace, which was cut out, and a patch put on with rivets in 1837; and now so far as the eye can detect, the boilers are as good and as safe as when new, 35 years since—incontestable proof of good water and careful usage. The only suspicion entertained against them is old age.

These boilers were removed from their original position after some ten years service, transported something like a half mile, reset without requiring repairs, and gave an acceptable result, but were taken out to make room for modern improvements. In removing them, though the plates were in apparent perfect condition, another and serious defect was revealed. The jarring incident to their removal caused many of the rivet heads to fly off. A smart tap of the hammer near a rivet caused the same result. On examination the iron in these broken rivets was found to be crystallized.

Now when the plate was cut through and a patch was riveted on no rivets started; seven years after, when they were removed and reset no rivets started.

Now how came this crystallization? It cannot be said that they were so when inserted, because it would have been impossible to have closed them by hand riveting if the iron was crystrallized. Then again, they were transported by wagon ten miles, and bore the hammering incident to cutting holes for steam pipes, etc., through each, without showing defects, and were once more moved and reset ten years later, showing no defect.

It is to be regretted that no examination has been made of the texture of the plates to see what the state of the grain is; but it is presumed that they have not changed because they have not given out, and the boilers were sold and put at work again in the full knowledge of the condition of the rivets.

Another similar case in the same establishment: Ten boilers 42" diameter 30' long, cylinders, made in 1847, using water from same river, carrying same steam pressure (60 to 80 pounds) are found to be in the same condition and are still at work. Of course anxiety is felt for safety, yet what renders them unsafe; is it old age? Have they, like an old man or beast, though without apparent disease expended their vitality and ceased to exist? If so, why should the rivets, which are invariably of the best fibrous iron, succumb first?

We will suggest as an answer, that the rivets have very much more work to do than the plates, because they have to sustain the strain on a plate the width of the distance from center to center of the rivets, say 2¼" wide, and a section of the rivet is but ·306 □" while the plate is ·562 □".

Then again, the rivet is under a constant and accumulating strain, and has no time to rest, while the strain on the plates ceases when there is no pressure on. It has time to rest, to recuperate.

We say the strain on the rivet is constant and accumulative, because the rivet is closed down hot; as it cools it is obvious that it contracts in length, and the result is a constant tensile strain. It is accumulative because of the constant oxidation between its heads and the plates and between the plates where they lap, and the well known fact that an oxide occupies more space than the material from which it was made, resulting, of course, in increasing tensile strain. With no rest, no time to recuperate, the vitality of the rivets are exhausted and they "die of age." They have done their allotted work.

We are aware that we have not absolutely proved our suggested theory. We are also aware that it will be difficult to prove that it is not the correct one. It is not offered for controversy, but with the hope that it may elicit inquiry and perhaps bring out other views more in accordance with every day occurring facts.

F. W. BACON.

New York city.

The Foot-Pound.

MESSRS. EDITORS:—The foot-pound, as generally explained, is called a unit of force, equal to raising 1 pound 1 foot high against gravitation at the surface of the earth.

In this definition the essential item of time to determine its mechanical value is omitted, and the natural inference would place the time and force as that expended in the descent of 1 pound 1 foot by gravity, or its equal, but reversed action of 1 foot upward, in the same time.

The time of 1 foot descent by gravity is ¼ of a second, by which the value of a foot-pound would be equal to raising 1 pound, 1 foot high, in ¼ of a second; 4 pounds, 1 foot high, in ½ of a second; 16 pounds, 1 foot high, in 1 second.

This may be demonstrated by 1 pound attached to each end of a line over a pulley, thus balanced and moving without friction.

Call the pound at one end, F, the force; and that at the other end, P, the pound to be raised; add 1 pound to F, and it will fall 1 foot and raise P 1 foot in ¼ of a second; or add ½ pound to F and it will fall 1 foot and raise P 1 foot in ½ of a second; or add $\frac{1}{16}$ pound to F and it will fall 1 foot and raise P 1 foot in 1 second.

It is probable, however, that the foot-pound is estimated by a constant force equal to 1 pound, neglecting the accelerating impetus due to falling bodies. Assuming 1 second as the time intended, the conventional horse-power of Watt would consist of 550 foot-pounds raised 1 foot in 1 second. The foot-pound may also be measured by the quantity of steam of a given density required to raise one pound 1 foot, and without regard to time, by which mode we have 12 cubic inches of 1 pound to the inch in density.

This may be shown mechanically by a supposed cylinder and its piston of 1 square inch area, admitting the steam at the bottom, against a resistance of 1 pound weight without friction, and thus consuming 12 cubic inches of steam of 1 pound to the inch in density.

The infinitesimal fraction of a lb. of coal for the above product, I leave to be deduced by the faithful from the speculative flights given in connection with the foot-pound, wherein the total force in steam developed by the combustion of 1 pound of coal is stated equal to the raising of 2,240,000 pounds, or 1,000 tuns, 1 foot high, and therefore requiring 12 cubic inches of steam at a density of 1,000 tuns to the square inch.

T. W. B.

Pittsburgh, Pa.

[Our correspondent is in error in his assumption that a pound raised one foot is the accepted *unit of force*. It is *the unit of work*. It may take more or less force to perform a unit of work, and the unit of work has not been regarded as the measure of force except when performed in a definite time. One minute is the time generally adopted. Thus the horse-power is equal to the raising of 33,000 foot-pounds per minute.—EDS.

The Length of Belt, Distance Between the Centers of two Pulleys and the Diameter of one Pulley being Given to Find the Diameter of the other.

MESSRS. EDITORS:—Mr. Mersom's rule for the diameter, etc., of speed pulleys, given on page 98, current volume, reduced to algebraic symbols, may be stated as follows:

Let R r be the radii of the pulleys, l=the length of belt, and a=the distance between the centers of the shaft. Then

$$r = R - a \left\{ 1{\cdot}5708 \pm \sqrt{{\cdot}4674011 + \frac{l - 6{\cdot}28318531\,R}{a}} \right\}$$

This agrees with Mr. Mersom's rule, and the problem may be found worked out by J. B. Henck, C. E., of Boston, in vol. I., page 390, "Mathematical Monthly," published at Cambridge, Mass. 1859. Other solutions will be found on pages 359 and 360 same volume.

X.

Camden, S. C.

Prize Engravings---Cash Prizes.

Under this head we publish a few letters, selected from many others of similar purport, which have been received at this office within a few days.

MESSRS. MUNN & CO.—*Gentlemen:* The copy of your engraving, "Men of Progress," sent to me, arrived yesterday in good order. Accept my sincere thanks for it. I have presented it to the officers of the S. P. R. R. Co. It will ornament the principal office of the Company.

Very respectfully, M. GILLETT.

Marshall, Texas, Feb. 11, 1870.

MESSRS. MUNN & CO.—*Dear Sirs:* I shall ever feel grateful to you for sending me the magnificent picture ("American Inventors") for the club I sent you, and I only regret that my town is not large enough to secure another club for your valuable paper. My family prize it very highly, and all who have seen it exclaim, "Oh what a glorious picture! Sell it to me," but I refuse.

I remain, respectfully yours, DANIEL SHORT.

Nashville, Ill., Feb. 15, 1870.

MESSRS. MUNN & CO.—*Dear Sirs:* To-day, through the Farmers and Merchants' Bank of Uhricksville, O., I had forwarded a draft on you in my favor for the amount of two hundred and fifty dollars. As you have announced in your paper of February 19th, this is the prize awarded me for my list of subscribers.

Please accept my most sincere thanks for this generous appreciation of my labor in procuring the list. Although in a financial point of view the present result may not be very satisfactory to you, yet in future the foremen at Dennison shops, as well as myself, will combine our efforts to keep up the large list sent from here and add others to it from time to time.

As I have no personal acquaintance with you, and you are under no special obligations to me, it proves that you have made a just and equitable distribution of your prizes. We all feel very much elated, as we think it reflects considerable honor on our "new town" showing the literary taste of the employés at Dennison shops P. C. and St. L. R. W.

Very respectfully,

M. MOODY, Chief Clerk.

Dennison, Ohio, February 21, 1870.

MORTAR.—The disadvantages arising from those kinds of mortar at present in use are chiefly owing to inferior sand being used, and the great difficulty of obtaining sand at a moderate price. A material has been invented which does away with these difficulties, for when used it requires only to be mixed with water. In order to make one tun of this mortar, the following substances should be ground by machinery: 288 lbs. of lime (either caustic or the hydrate), 1728 lbs. of slag, and 224 lbs. of calcined coal-shale clay. These materials having been ground to the degree of fineness required, are mixed, and are ready for use. From the nature of the substances used, there would be, doubtless, a more rapid chemical action than that which takes place in ordinary mortar. For plastering purposes the compost seems to be eminently suitable.

Improved Clay Crusher.

This is an improved form of machine for the crushing of clay and other similar substances, preparatory to its manipulation with water to render it plastic and fit it for molding.

Its construction will be readily understood by reference to the drawings; Fig. 1 being a perspective view, and Fig. 2, a cross section through the crushing cylinders.

These cylinders are armed with cogs as shown in both engravings. Between each row of cogs or teeth are formed deep rectangular grooves. To metallic plates bolted to the cross-pieces of the frame of the machine are bolted bars, or scrapers, distinctly shown in Fig. 2, and in perspective Fig. 1. These bars are not bolted down rigidly but are allowed some play to accommodate themselves to any slight inequalities of surface in the grooves, into which their points penetrate. Their office is to scrape off the clay compacted between the cogs and in the grooves of the cylinders. The crushed material then falls directly beneath the cylinders, from whence it is removed as occasion requires.

The arrangement of the gearing with the fly-wheel for regulating its movement will be readily understood upon inspection of the engraving Fig. 1.

Instead of using cylinders with cogs and grooves cut on them, the inventor prefers to construct toothed rings which may be fastened on the central shafts or cylinders, and separated by collars which form the bottoms of the grooves.

When this form of construction is adopted, the toothed rings and collars are firmly bound together by rods and nuts running parallel with the axes of the cylinders, the object of which is to prevent their spreading by the wedge-like action of the clay as it crushed into the grooves.

It will be seen that the machine is perfectly free from any weakness arising from complications, and that it must not only be effective but durable in practice.

The difficulties designed to be overcome by this invention and which led to its construction are sufficiently instructive to the general reader to merit notice.

The machine is intended to crush any hard, tough clay, whether it be dry, half dry, green as dug from the pit, or mixed, for the purpose of making it into brick.

It crushes, tears, and disintegrates it so that the water percolates freely through it, when put into a pit or vat to soak, preparatory to grinding it into "mud," as the prepared clay is called by brickmakers; after which, being tempered by means of the common tub tempering mill, or by any other means, it becomes perfectly homogeneous without which no clay will make good brick.

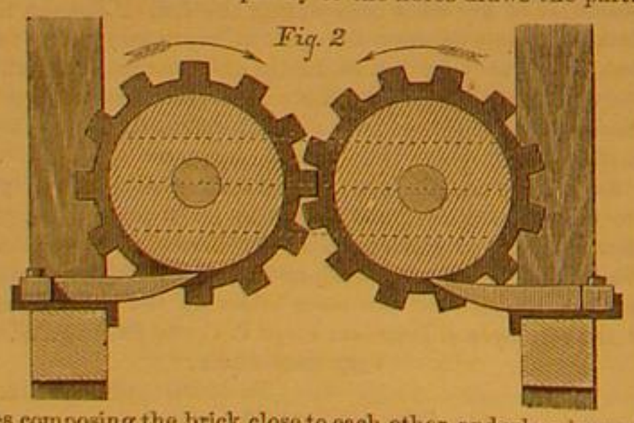
It does its work thoroughly, rapidly, and with about the same power as required to drive the common tub-tempering mill.

It was gotten up more especially to prepare *fire-clay*, a very tough, hard clay, used in making fire-brick; but is equally useful in preparing any common tough clay, such as cannot well be used without freezing or drying.

Tough, hard, fresh dug clay from the pit, passed directly through this machine, will, we are assured, soak and temper into homogeneous "mud," equally as well as that which has been disintegrated by means of frost or drying.

Brick, made of mud, a part of which is in lumps—large or small, and a part plastic, are liable to crack, and are generally very rough or uneven, the plastic parts shrinking away from the lumps; but if the clay is properly disintegrated by any means the mud becomes homogeneous, that is, it becomes all plastic alike, and in drying and burning the shrinkage is uniform. The adhesive quality of the fibres draws the particles composing the brick close to each other, and when burned the substance becomes like stone, fine or coarse, according to the nature and quality of the clay and sand used in the composition. The finer and tougher the clay used, the more solid and durable will be the brick, especially for wear in pavements and to bear great weight.

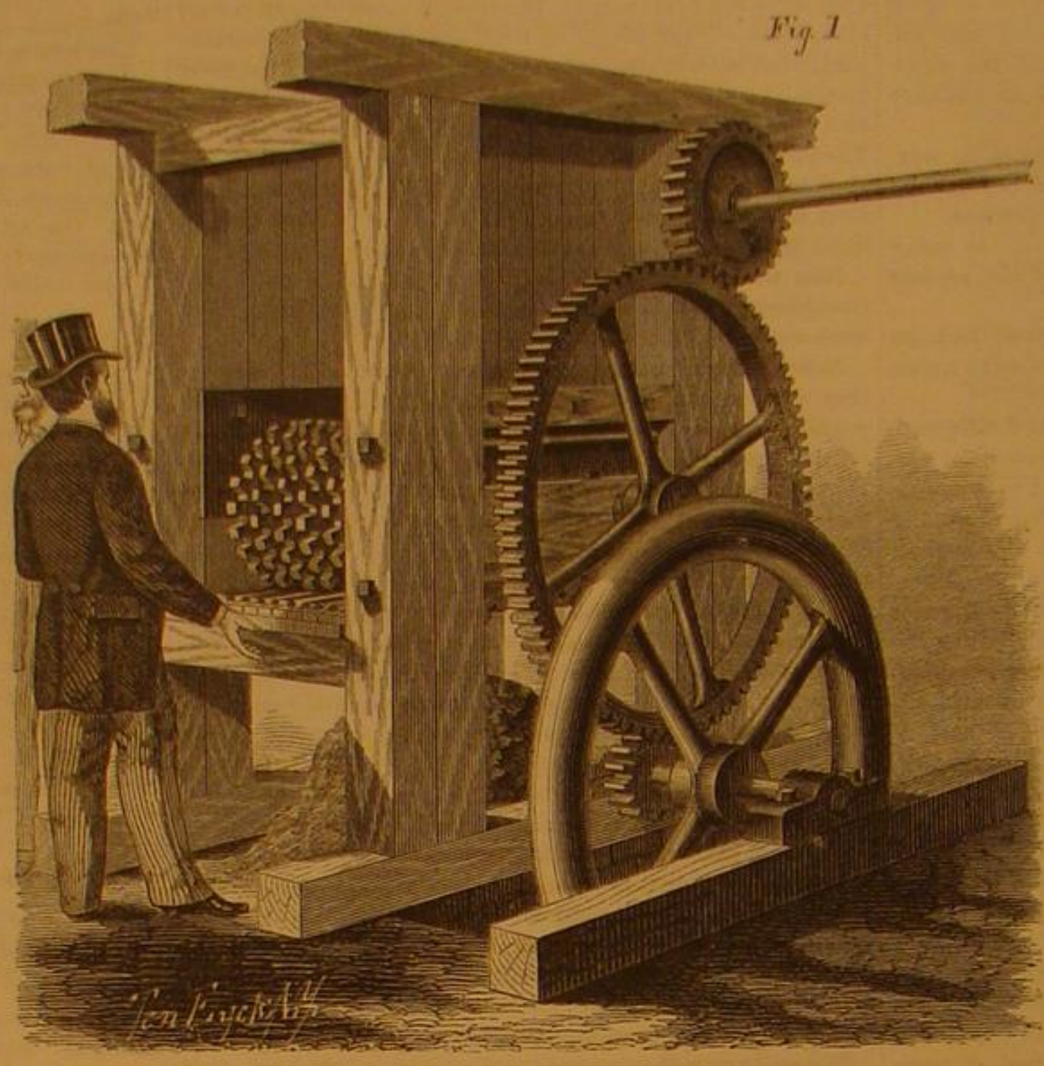
Fig. 2



The most common method of preparing fire-clay and other tough clays, is to chop it by hand with spades, but this method leaves it in small solid lumps, impervious to water, and is expensive, requiring the labor of eight or ten men to prepare the clay as fast as the clay crusher will do it, and then it is very imperfectly prepared.

If clay is thoroughly dried, there is nothing better to crush it than the common bark mill, such as is used by tanners for grinding bark. The pores being open, water dissolves and readily makes it homogeneous, but if any of the clay be but half dried it sticks to the teeth of the mill and at once clogs it; but practically clay is seldom dried or frozen to any great extent, especially fire-clay. This fire-clay (as it is called on account of its peculiar properties for resisting fire) when used for manufacturing iron and other like purposes, is found east of the Allegheny mountains, mostly in the town of Woodbridge and vicinity, in the State of New Jersey; and the best quality, such as is used for making fire-brick, is worth six dollars a tun at the mines. It is deposited from twenty to thirty feet below the surface, the surface being all cleared off down to the clay. The clay is dug with gouge-formed spades which require the full power of a man to drive them into it, being dug in lumps or "spits" which are thrown out of the pit by the hands of men, sometimes from a depth of ten or more feet on to a platform, ready to transport either to the factories in the vicinity, or to the docks for shipment. The spits of clay, as they are called, are thrown into wagons,

Fig. 1



HALL'S CLAY CRUSHING MACHINE.

carted to the docks, and put directly into vessels for transportation to the factories in Philadelphia, Boston, Troy, Buffalo, and other places, or stacked in heaps ready for shipment; and when delivered at the factories is stowed in large heaps under cover, a portion of it dry, a portion half dry, and a large portion about as green as when dug from the pits, and occasionally, when some dry clay is put in the bottom of the vessel and the vessel leaks, a portion of mud. Thus, when the cargo is discharged we have dry, half dry, green clay, and mud all mixed together; and this condition of the clay when deposited at the works, was the moving cause of the invention of the clay crusher.

The bark mill for grinding dry clay, and a revolving cutting machine, which cut the half dry clay into thin slices, preparing it much faster than the chopping process with spades but not much better, were formerly employed; but a machine that would work the clay in all conditions combined, was the desideratum sought.

After several costly experiments, the present machine was found to work to the entire satisfaction of the inventor, and the experimental machine has, we are told, been constantly at work, eight months or more, at the factory of Hall & Sons, Buffalo, readily devouring every kind of clay put into it, without the least difficulty. This firm has also used one of the crushers at their Perth Amboy Factory several months, and have abandoned all other means of preparing clay.

The machine is necessarily strong and heavy, weighing over two tuns. Experiments had to be tried on a full size machine, and were costly; and to reimburse himself either through the exclusive use of it by the firm of which he is a member, or by both using and selling to others, the inventor obtained a patent, through the Scientific American Patent Agency, January 11, 1870.

Not wishing to monopolize the use of so useful a machine, he now offers it to the public for sale. At present machines will only be made to order. They can be seen in operation at any time during working hours, at A. Hall & Sons' Fire Brick Works, at Perth Amboy, N. J., or at Hall & Sons' Fire Brick Works, Buffalo, N. Y.

For machines or information apply to Alfred Hall, Perth Amboy, N. J.

The Fear of Men in Animals.

The fear of men in animals is a slowly-acquired instinct. Mr. Darwin, in his account of his travels, gives some interesting instances of the fearlessness of birds little exposed to man in South America. The crew of Byron's vessel were astonished at the manner in which the wolf-like dog of the Falkland Islands approached them merely out of curiosity. Compare these traits with the admirably organized expeditions for the plunder of baboons, elephants, etc., and the rude customs acted upon for self-preservation of the half-wild dogs of the Peninsula and the East, wherein the care of the weak and young, the usefulness of sentries, the value of signals, the difference between sham and real danger, and the advantage of confusing traces of retreat, seem all to be known, and it will be pretty evident that man, the thinker, has to a considerable extent reacted on animals wild and domestic. Even in my own quarter it is the steady belief of the shepherds that the common sheep-dog has progressed in intelligence and docility within the last fifty years by careful selection. "Where the dog is not valued for intelligence, as in some Eastern countries, it is a much more stupid animal than with us."

The China Trade on the Pacific Railway.

Some moons ago, says the San Francisco *News Letter*, we were tossing high our ready caps in air at the supposed advent of the Oriental merchant, who was believed to be awaiting a pilot just outside the heads, with a ship full of tea, silk, porcelain, and curiously-carven ivory, which he was to dump upon our wharves and permit us to send *via* Chicago, to Liverpool. He didn't come. Fact is, he has gone round the other way, through the Dutch Gap canal at Suez Whence this cold shoulder? After having expended a few hundred millions in preparing a highway for the nations, the nations stubbornly decline to walk over it. The gorgeous East, albeit somewhat disposed to loll sleepily upon divans and smoke opium, has yet a business kind of eye, and sends his wares by vessels having immediate dispatch.

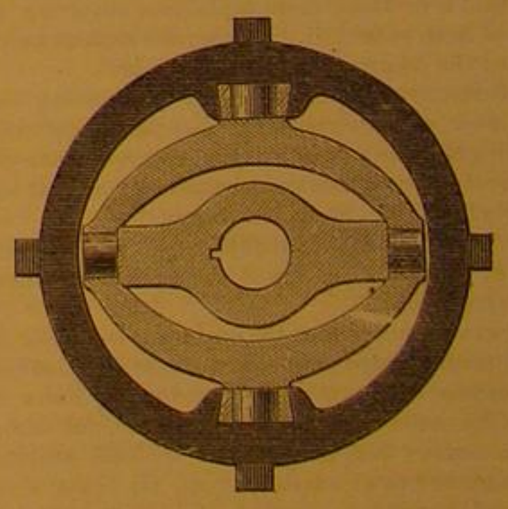
Practically our highway of the nations (we are not alluding to the sea) stops abruptly at the Pacific Mail Company's wharf. We run a monthly line of steamers to China; the Peninsular and Oriental run a weekly line. That is the delicate shade of difference, and it is quite sufficient to cook our commercial goose.

We are not sufficiently affluent to do better, although we have the steamers all afloat, and Thomas Mooney is clamorous to have them put on. If this were a private affair of our own, affecting only the interests of California, we could regard it with some faint touch of satisfaction. It is a charger of a radically different hue. The entire country is interested in securing the trade of China, by which alone we can hope to harvest what we have sown from the Missouri river to Pacific tide-water. We must get our money back on that railroad, and to do so the railroad must be virtually extended to Hong Kong, by semi-monthly trips of the Pacific Mail. This will do it, and Congress must do this. It is arrant nonsense to talk of doing it without additional subsidy. The Company can afford to dispatch a steamer monthly, but some years must elapse before they can afford to do more. Indeed, if something be not speedily done to secure the China trade, they can never afford it, and we shall have the gratification of sitting meditatively by the seaside with our chin in our palms, and translating the murmur of the waves into a pronounced jeer at a very Stupendous Ass.

UNIVERSAL BALANCE FOR MILLSTONES.

A correspondent of the English *Mechanic* has invented a universal balance for millstones, of which we copy the engraving.

The invention consists of an outer ring built in or let into the stone 4 or 5 inches from the face. In this ring are two



dovetail grooves, and in each a brass step is fitted, so as to slide up and down tight; these steps are regulated by two set screws, fixed in the top side of the ring; inside this ring is another oval one with a stud or center on each side fitted into the above-mentioned steps; and inside this ring is fitted the driver; all the centers are equal in length and line.

Charles Lever, the "Harry Lorrequer" of many a novel, the "Cornelius O'Dowd" of *Blackwood*, and the British Consul at Trieste, requires no less than eighteen hours of sleep a day. He writes but two hours at a time and never makes an alteration.

A writer in *Notes and Queries*, says: "An old gentleman informed me that he had made it a constant practice for the last fifty years, during the frost, to watch a mole-hill, and had always found that if the mole threw up fresh earth, within forty-eight hours the frost would be gone."

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

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

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

☞ "The American News Company," Agents, 121 Nassau street, New York.
☞ "The New York News Company," 8 Spruce street.
☞ Messrs. Sampson, Low, Son & Marston, Crown Building 188 Fleet st., Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL. XXII., No. 10. . . [NEW SERIES.] . . *Twenty-fifth Year.*

NEW YORK, SATURDAY, MARCH 5, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

*Improved Machine for the Manufacture of Spoked Wheels.....151
Polishing Granite.....151
The Growth of Tree Trunks.....151
Cobalt—Its Properties and Uses...152
An Invention Wanted.....152
Platinized Looking-glasses.....152
A Plea for our Dumb Slaves.....153
Something about Gold.....153
Extracting Juice from Sugar cane, Beet root, etc.....153
Size of Mortar Twists in Brickwork.....153
*Mud Collectors for Boilers.....154
A Misunderstanding.....154
*The Pneumatic Tunnel under Broadway.....154
Editorial Summary.....155
Opening of the Broadway Tunnel to the Public.....155
The Louisville Railroad Bridge...156
*Hubbell & Capron's Improved Turbine Wheel.....156
How Wall Paper is Made.....156
Asphalt Roads.....157
Crystallization of Boiler Rivets...157
The Foot-pound.....157
The Length of Belt, Distance Between the Centers of two Pulleys and the Diameter of one Pulley being given to find the Diameter of the other.....157
Prize Engravings.....157
*Improved Clay Crusher.....158
The Fear of Men in Animals.....158
The China Trade on the Pacific Railroad.....158
*Universal Balance for Millstones.....158
The New Explosive Dualin.....159
The Law of Vis Viva.....159
What Oysters Eat.....159
A plea forthe Society for the Prevention of Cruelty to Animals.....159
Systematic Thinking.....160
Concerning Patent Office matters.160
The Lightest Machine.....160
Mr. Rutherfurd's Star Photographs.....160
Materials for Telegraphic Insulators.....160
The Mormon Tabernacle.....160
Tyndall on Haze and Dust.....161
Fecundity of Fishes.....161
Preservation of the Body of Mr. Peabody.....161
The Zircon Light.....161
Action of Magnetism on Various Cases.....162
Answers to Correspondents.....162
List of Patents.....163
Recent American and Foreign Patents.....163
Applications for the Extension of Patents.....164
Inventions Patented in England by Americans.....164
New Books and Publications.....164

THE NEW EXPLOSIVE DUALIN.

Beyond a brief notice of the new explosive, dualin, as it is called, we have purposely said nothing about it, preferring to wait and see whether it possessed enough merit to warrant much attention, rather than cumber our space with an account of what might prove, after all, but another example of a long list of compounds which have never attained any practical importance.

If, however, the accounts that reach us are to be relied upon, this compound bids fair to prove of some value. It is claimed for it that it possesses the slow combustibility of gunpowder with the intense rupturing force of nitro-glycerin, that it may be handled with safety, and that it is not liable to spontaneous combustion.

This explosive is the invention of Carl Dittmar, of Charlottenberg, Prussia, who thus describes it.

"Dualin is a yellowish-brown powder, resembling, in appearance, Virginia smoking tobacco. It will, if lighted in the open air, burn without exploding; but, if confined, it may be made to explode in the same manner as common powder. It is not sensitive to concussion; will not decompose by itself, nor cake or pack together; may be readily filled into cartridges; and it matters not whether the place where it is stored be warm or cold, dry or damp. It has from four to ten times the strength of common powder, and is stronger than dynamite. * * *

"Dualin consists of cellulose, nitro-cellulose, nitro-starch, nitro mannite, and nitro-glycerin, mixed in different combinations, depending on the degree of strength which it is desired the powder should possess in adapting its use to various purposes."

The preparation of cellulose, nitro-starch, nitro-mannite, and nitro-cellulose, involves distinct processes, which will be found described in another column.

How future trials may affect the popularity of dualin, if it can at present be said to have acquired popularity, we can not undertake to say. It is only fair to say that in the opinion of some good judges, it is decidedly inferior in power to dynamite, though it is said to be cheaper. It will explode in contact with flame which does not ignite dynamite. On the contrary, it may be used in temperatures which freeze dynamite and render the latter incapable of being directly exploded. But dynamite may be used when wet and may even be exploded under water in drill-holes, while dualin, like gunpowder, is, we are informed, useless when wet. This fact gives dynamite an immense advantage over dualin for mining and engineering purposes.

The claims of dualin to take front rank as an explosive can not yet be conceded, but there is little doubt that it is far better than many other compounds which the last few years have brought forth. Before it can gain the full confidence of miners and engineers, it must undergo many more trials than have yet been made. It is, however, only just to say that reports from the Hoosac tunnel, where it has been successfully tried, are highly favorable.

We learn that experiments were made in the United States, January 5th, 1870, in a quarry near Washington City, belonging to the Messrs. Lewis & Hall; January 18th and 19th, at Hoosac Tunnel; and January 22d, at Roxbury, near Boston, Mass.

The attested results of these trials leave no doubt in our minds that dualin is much safer than nitro-glycerin It is also stated that such experiments as have been performed with this explosive in Europe have given the most satisfactory results.

THE CULTIVATION OF TIMBER.

"When you have nothing else to do plant a tree; it will grow when you are sleeping." This advice we think may be extended to times when people are not at leisure, and to the United States Government as well as private individuals. Why not make a business of planting trees? We are well aware that in many cases trees have been planted and grown with success, by private individuals and on private estates, but the fact remains that large areas of public domain are to-day entirely without timber, and the sources from which lumber can be derived to supply the needs of this territory upon its future settlement, are undergoing a drain which will ultimately exhaust them.

If there exist reasons why the agricultural department of our Government could not, if disposed, greatly increase the value of the public lands by rendering nude portions tree-bearing, they are not now obvious to us.

Our continent possesses a variety of forest trees of industrial value, exceeded by no area of similar extent. Certainly in all this variety there may be found some adapted to vigorous growth in almost any climate, or any soil capable of sustaining vegetation.

THE LAW OF "VIS VIVA."

One of the best definitions we have seen of the term *vis viva* is that it is "the measure of mechanical work developed by motive forces or inertia, *in variable motion*." When the full import of all its terms is comprehended, this definition will be found to accord with the notion of force as precedent to motion. So long as this notion of force prevails, so long must the term *vis viva* or its equivalent be a necessity in the intelligent conception of the laws of motion.

Let us briefly examine this definition with a view to clear away some of the vagueness with which this subject is attended in the popular mind.

What is meant by mechanical work? Certainly, this can be expressed in terms of its accepted unit the foot-pound. A foot-pound is a pound raised one foot without regard to time. This is the *unit of work*. It is not a unit of force, as it is sometimes erroneously considered. More or less force will be required to perform it, according as the time in which it is done is shorter or longer. Power is force in relation to time. The mightiest force requires time to produce an effect. The most infinitesimal force will produce an effect in time.

All this is inseparable from the idea of force as existing independently of matter and antecedent to motion. A mechanical effect is *motion produced*; motion involves the idea of distance traversed, distance traversed involves the idea of time in which it is traversed. But distance traversed does not necessarily imply mechanical work performed. It is only when a resistance is overcome that work is accomplished. A body moving in absolute space performs no mechanical work, though it move with a constant velocity forever. Let it, however, encounter some other body having less motion and it performs work. It increases the motion of the mass which it strikes against, or some of its particles, or it may produce both these effects. The mass-motion produced is mechanical work. The effect upon the striking body is no less work. Its motion is decreased by the impact.

Increase or decrease of mass-motion is, properly speaking, *mechanical work*, and we shall find upon strict examination that this is all implied by the term. But as no increase or diminution of motion can take place in a body without its receiving or imparting motion from or to another imparting or receiving body, it follows that *vis viva* practically relates only to transmission of motion from one body to another, in *space and time*.

It will be seen that the idea of *vis viva* is, therefore, essentially different from the term momentum, which is simply the amount of motion a body possesses, considered with relation to definite periods of time and definite distances, and which is expressed by mass or weight multiplied by the time it traverses a definite distance. Momentum has no reference to the amount of motion a body can impart or receive in time and space.

The terms "motive forces" and "inertia" convey the idea of material forces or matter in motion. The expression, "in variable motion," seems unnecessary, since the very idea of imparting or receiving motion implies variable motion. The expression MV^2 (mass or weight multiplied into the square of velocity) is the mathematical symbol of *vis viva*; that is the measure of the mechanical work developed by a moving body—or in other words the change of motion produced by it on another body in space and time—is measured by its mass multiplied into the square of its velocity.

It must be further observed that *vis viva* is not a measure of force, but of the mechanical work performed, or the change of mass motion produced.

Whether we accept the notion of the existence of occult force which acts upon matter, or accept the doctrine that there is no force which the human mind can recognize other than moving matter, there still remains the necessity for an expression of the law of the transmission of motion. One thing is certain, a body cannot transmit motion it does not possess, and if momentum expressed by MV (mass multiplied into velocity) be the absolute amount of motion a body possesses, it certainly cannot impart the motion expressed by MV^2 or its mass multiplied into the square of its velocity. Evidently there must be some limitation to the interpretation of one or both of these expressions, which will reconcile their apparent conflict. This limitation is, we think, to be found in the fact that in momentum definite spaces and times are considered with uniform motion, while in *vis viva* the motion considered is a variable one, or one in which motion is constantly received or imparted; and that MV^2 determines the space through which a body will move before it comes to rest, when opposed by a resistance capable of absorbing all its motion. MV, or momentum, is the expression of the motion of a body neither imparting or receiving motion, and therefore performing no work. Momentum is an absolute expression when the factor of time in the velocity is constant. *Vis viva* is a proportional or relative term only.

Thus a body moving uniformly through a definite space in a definite time, has a momentum expressed by its mass or weight multiplied into its velocity. While passing through the space, or when it has passed over the space, it has the power to overcome a certain constant resistance, and to move a certain distance before it imparts all of its motion to a resisting medium. Its relative or proportional power to move through such a resisting medium or to overcome an attractive force is its *vis viva* (MV^2) as compared with other bodies moving through similar media or opposing an equal attractive force. It is not an absolute expression of the quantity of motion in a body, like momentum. It has reference only to space traversed, while motion is being absorbed by resistance.

WHAT OYSTERS EAT.

Not long since a journal which claims to instruct the public in regard to the preservation of health, came out with a sweeping denunciation of oysters as an article of diet. What little of argument could be gleaned from the whirlwind of denunciation with which the use of oysters as an edible was assailed amounted to this. Oysters are nasty. Whatever is nasty is injurious to health. *Ergo*, oysters are unwholesome diet.

In whatever particular oysters are generally nasty, or whether they are particularly nasty in general, was not, to our thinking, made out very clearly; but the subject has since received more scientific treatment at the hands of the Rev. J. B. Reade, F.R.S., who has been investigating into the private, domestic, and personal habits of these delicious "sea violets." The Rev. J. B. Reade, F.R.S., has been interviewing a large number of oysters, and has read a paper before the Microscopical Society giving the result of his researches. Oysters are proverbially reticent, but they have at last been made to reveal the secrets of their prison houses.

It may not be generally known that the question of what constitutes the food of marine animals which exist at great depths, is at the present time much mooted among naturalists. We do not take it upon us to say whether the discoveries of Mr. Reed are calculated to add to the zest with which most people swallow this prince of bivalves; but he found in the stomach of every oyster he examined "myriads of living monads, vibrios in great abundance and activity, and swarms of a conglomerate and ciliated living organism, which may be named *Volvox ostrearius*, somewhat resembling the *V. globator*, but of so extremely delicate a structure that it must be slightly charred to be rendered permanently visible."

The oyster is not therefore a vegetarian; he doubtless swallows his *Volvox ostrearius*, his vibrio, or his monad, with as great satisfaction as we humans swallow him when he lies delicately quivering on the half-shell, with the added savor of a drop or two of lemon juice. But he does not confine himself to the few plain dishes we have mentioned. Mr. Reade has been able to make out the following bill of fare:

"*Actinocyclus senarius, Ceratoneis fasciola, Coscinodiscus minor, C. patina, C. radiatus, Dictyocha aculeata, D. fibula, D. speculum, Gallionella sulcata, Navicula entomon, Tripodiscus Argus, Xanthidium furcatum, X. hirsutum, Zygoceros-rhombus, Z. Surirella*, and two new species of this genus."

Mr. Reade does not add to this attractive list that "all other delicacies will be served in their season;" but he does say, that the oyster, like creatures of a larger growth, lives on the food which is successively in season; and he finds that even a different shore is marked by a decided difference in the infusorial contents of the stomach. The "Scotch Natives" are characterized at the present time by innumerable circular forms, resembling the Coscinodiscus. Others are nearly destitute of these living rotatory disks, but they are much richer in more interesting species; and in addition to the silicious shelled infusoria which are received into their stomachs, they also occasionally furnish examples of calcareous Polythalamia adhering to the inner surface of their shells.

Who knows but that as science advances oysters may be fattened on selected food, as pork designed to be extra fine is fed on corn. Who knows but that the coming oyster may be recommended to the palates of gourmands as prime Coscinodiscus or New Jersey Volvox?

A PLEA FOR THE SOCIETY FOR THE PREVENTION OF CRUELTY TO ANIMALS.

The man who professes Christianity and belies his profession by a total want of sympathy for the mute and patient servants who, for small reward, minister to his daily wants; who can stand unmoved by compassion and see animals maimed and tortured at the caprice of wanton cruelty; who can witness such acts without his breast swelling with righteous indignation—is either a self-deluded formalist, or a consummate hypocrite.

There are many who profess Christianity in the State of New York; yet how many of these will feel a blush of shame or hurl a word of protest, at the despicable movement now on foot against the Society for the Prevention of Cruelty to Animals.

The attempt to repeal or limit the wholesome laws under which this society has been able to do so much good, is made in the interest of brutal men by brutal men representing the brutish element of our metropolitan population.

It is a burning disgrace to the State and a blot upon our

civilization, and can never succeed except through the apathy of those who should stand in solid array against such action. Every pulpit should protest, and every generous voice be raised in denunciation of this outrage.

It has been charged that the fanaticism of Mr. Bergh has led to this movement. We deny it. That gentleman has, indeed, been in earnest in his good work. He has bravely stood up against deprecation, misrepresentation, and calumny, and has succeeded in spite of the indifference of the courts, in bringing some thorough scoundrels to justice. That is what is the matter. He has compelled the horse railway companies to treat their overworked beasts a little more humanely, at the sacrifice of a very small portion of their enormous profits. That is the extent of his fanaticism. It is not Bergh, it is Beelzebub who is the source of this mischief, and let the blame rest upon him and the very large portion of his family who render this city such a pleasant abode for the order-loving and the law-abiding.

We are glad to see that the press has generally denounced the attempt to destroy this noble organization, and we do not doubt that there is still humanity enough left to sustain it in full possession of its present powers.

SYSTEMATIC THINKING.

Charles Reade and Wilkie Collins are two of the most famous and brilliant novelists of the present day. Each of these men has contributed much to the amusement and something to the instruction of mankind. Each has given to the world a special boon. Reade has invented a word, and Collins a phrase, each of which is one of the most forcible of its kind.

In a late number of "Put Yourself In His Place," now appearing serially in the *Galaxy*, Reade has given us the word "*vicaria*." Henry Little having, by a systematic course of thinking, wrought out of his inventive brain some new and valuable improvements in saw-grinding machines, applies for a patent, and is fairly crushed by what he calls the "*roundabout swindle*." He complains to his good friend, Dr. Amboyne, that by the treatment he had received "one would think an inventor an enemy of the human race," and proposes to burn his models and renounce invention altogether. His account of the matter is certainly not complimentary to the English method of transacting patent business.

To the disgusted inventor the doctor thus quaintly discourses: "That system of go-betweens, and deputy-go-betweens, and deputy-lieutenant-go-betweens, and of nobody doing his own business in matters of state, really is a national curse and a great blot upon the national intellect. It is a disease; so let us name it. We doctors are great at naming diseases; greater than at curing them:

> Let us call it Vicaria.
> This English malaria."

Vicaria is good; better than our familiar synonym, "red tape."

"When we are not occupied in making machinery," Wilkie Collins makes Mr. Franklin Blake say to Betteredge, in his novel, "The Moonstone;" "when we are not occupied in making machinery, we are (mentally speaking) the most slovenly people in the world." This was Mr. Franklin Blake's way of setting forth what he was pleased to term "the curious want of system in the English mind." We think Mr. Franklin Blake did injustice to the English mind, but the phrase "slovenly minded" is a master stroke.

People who think unsystematically are slovenly-minded people. The facts and ideas stored away in their upper chambers are all topsy-turvy. No sooner do they turn over something in the hope of finding another something than they cover up still another something, which, in its turn, will soon be wanted and rummaged after. Their heads are not well-arranged libraries, but garrets filled with rubbish. If they commence to think upon any subject, they shift it about, taking only glimpses of it here and there. They do not, like the systematic thinker, take a subject to pieces as a watchmaker does a watch, and lay the parts all in order under glass covers, but pitch them into all sorts of by places and corners, and generally getting bewildered in trying to replace them, become hopelessly muddled and give it up.

A great deal is said now-a-days about the power of modern thought; but it would be well to remember that all the thinking which bears fruit, is systematic thinking. Many a young man imagines himself to be thinking when he is merely day-dreaming. Thinking implies an active state of mind calling up images, holding them fast, and arranging them in order; not a passive condition in which troops of ideas, or shadows of ideas, flit across the mental vision like figures in a kaleidoscope.

Thinking, worthy of the name, is work—systematic, calm, and connected; and the man who has not got his mind so disciplined that he can thus command it, is not yet a thinker.

That systematic thinkers are so few, is attributable in a great degree to early bad training. Not one teacher in fifty in our primary schools deems it of importance to teach children *how to study*, and a less proportion are competent to do this if they would. The most of them think their duties are comprised in keeping an orderly school, hearing recitations, assisting pupils to do hard sums, and allotting tasks. Especially in the latter do they excel. Memorizing is with most of them a name for mummery—a thing to be done by holding the head on one hand, swinging first one foot and then the other, and forcing the lips to repeat a formula until they will run of themselves long enough to get through a recitation, by very force of momentum. And this laborious, meaningless task, they think, is study. In other words, study is to them the teaching of the lips to move from force of habit, while the mind may be wandering any where and every where.

Thus a vacant wandering habit of mind is secured with the spelling lesson, and ground in with the rules of grammar; and unless by rare good chance, the unfortunate overtasked and mentally disgusted young intellect meets in its onward progress some one who can show it the mistake, or has native genius to discover it without help, it grows into habitual slovenly-mindedness.

After all, teachers are no more to blame than parents who demand that progress shall be measured by pages of a book, rather than by power to think.

CONCERNING PATENT OFFICE MATTERS.

A correspondent of *Work and Play* gives his experience in regard to Patent Office matters, in the following practical observations, which we commend to the attention of our readers:

"The Patent Office is near the Post Office, and both about a mile from the Capitol. On the lower floors of the huge building designated as the Patent Office, are the numerous rooms occupied by the various officials, and above are immense halls filled with glass cases, in which are deposited models of inventions for which applications for patents have been made. Every person, without regard to age or sex, is equally entitled to a patent. In order to procure a patent, it is not necessary for the inventor to go to Washington; in fact, it is much better that he should not; because, not being conversant with the rules and practices of the Patent Office, he will probably make some blunders, and fail to comply with some of the red-tape requirements, and thereby make himself unnecessary trouble. There are, in the larger cities, many patent soliciters or agents, whose business it is to transact business with the Patent Office; and if they are honorable men, they can do it much better than the inventor. A man having invented a machine or piece of mechanism which he wishes to patent, first makes a miniature edition of it, which is called a model. A model for the Patent Office must not be more than one foot long or high, so that some large machines must be very much reduced. This model is taken to some patent agent or soliciter, to whom is explained its whole operation, and all the points wherein it differs from other similar machines. The agent must then make complete drawings of the model, such as to fully illustrate every part and its operation. The law requires two sets of these drawings, and, therefore, one set having been made on paper, a copy is made on tracing muslin, and, by means of letters of reference on these drawings, a very full and complete description of all the several points of the invention is written. This description is called the specification, and at the end of the specification the whole is summed up in a nutshell, and this is called the claim. When the agent has all these prepared, the inventor is obliged to make oath that he is the original and first inventor of the machine or device described, and then the model, drawings, specifications, and fifteen dollars are sent to the Commissioner of patents at Washington; but the Commissioner sees very few of the applications, for, although directed to him, they go into the hands of men called examiners.

"The applications for patents are divided into classes, thus: all inventions relating to guns, pistols, cannon, etc., are in one class; everything connected with farming in another, and so on. For each class there is a special set of examiners in a room by themselves. When an application for a patent saw-horse comes in, the models, drawings, and specifications are given to the proper examiners, and in turn the case is taken up by them and investigated. They refer to all the patents that have been granted on saw-horses, examine, if necessary, the models in those huge glass cases in the hall above, examine the reports of English and French patents, and if, after all possible search, they can not find anything similar, the patent is allowed, and the inventor is notified that if he will send twenty dollars more, his patent will be granted. But if something is found that an examiner thinks looks like the saw-horse in question, then the application is rejected, and all the fond hopes of the inventor are dashed to pieces; and that is just my condition at the present time. Ordinarily, there is so much business on hand, that cases must wait several weeks and even months, before they are examined; but when in Washington, Mr. F. saw the examiner having charge of the class into which my case would come, and he said he was so nearly up with his work, that my turn would come very soon; and a few days ago I received notice through Mr. F. that the application was rejected, because something similar had been found in some old English book. I don't think that is fair; I didn't know anything about it, and I do not believe there was ever one in this country; but the law says that I must not only be the original inventor, but also the first inventor, and of course, if some one in England has invented it before, I am not the first; but it is a bad law, and if I ever get to Congress I will have it changed."

THE LIGHTEST MACHINE.

Probably the lightest engine ever constructed was the invention of Mr. Stringfellow, that received the prize of £100 sterling from the Aeronautical Society. It is a one-horse power engine and weighs 16 lbs.; the diameter of cylinder is two inches, stroke of piston three inches; works under a pressure of 100 lbs. to the square inch, and makes 300 revolutions the minute. We are reminded, in this connection, of some curious observations that have been made on the power exerted by birds in flying. It has been calculated that a goose accomplishes the work of 400-horse power in flying, but by an arrangement of its wings is actually obliged to exert a far smaller power. According to de Lucy a mosquito weighs 460 times less than the grasshopper, and has proportionally 14 times as much surface exposed by its wings. The sparrow only weighs a tenth as much as the dove, and yet its wings have twice the surface. The sparrow weighs 330 times less than the Australian crane, and possesses wings that have seven times the surface. These curious investigations have been made in the interest of aeronautical science.

MR. RUTHERFURD'S STAR PHOTOGRAPHS.

By means of a 11-inch objective this distinguished astronomer has obtained photographs of several groups of stars. One of these groups, comprising 43 stars in the constellation of pleiades, some of them of the 9th magnitude, was obtained after an exposure of three or four minutes.

By means of a very delicate micrometer Mr. Rutherfurd has been able to measure the arc of the angle which separates the stars of this constellation. These results have been compared by Dr. Gould with those formerly obtained by Bessel, and confirm the remarkable accuracy of the latter's work. By means of photography Mr. Rutherfurd can obtain, in one night, results that cost the German astronomer the labor of ten years. Mr. Rutherfurd has also taken photographs of the solar spectrum, showing a large number of lines not mapped by other investigators. There was in this instance also a remarkable confirmation of the accuracy of Kirchhoff's chart of the spectrum, mapped from actual observation and experiment.

Materials for Telegraphic Insulators.

Ebonite insulates much better than glass, and is far less apt to become damp than even porcelain. It is the best material yet known for the insulation of electrical apparatus. Compared with porcelain or earthenware, it less easily becomes wet in mist, but more easily in rain. Rain forms detached drops upon a surface of earthenware, but covers ebonite with a continuous film. Thus the latter acts with most advantage when it forms the inner cup of a compound insulator, and is protected by earthenware from the direct action of rain.

The surface of ebonite becomes rough and spongy, so as to retain dirt, and it matters not how perfect the substance of the insulator may be if its surface is defective.

But although ebonite will not maintain a high state of insulation for a long period, it may be advantageously used in certain cases to secure freedom from accidental interruption; for it is not liable to be broken, nor does it seem to afford temptation to stone throwing.

The best material for an insulator is a really good porcelain, thoroughly vitrified, so as to insulate perfectly even when unglazed. Its value arises principally from its polished smooth surface, which resists the formation of a continuous film of moisture, does not retain dust, and is washed clean by rain.

The objection to porcelain is, that considerable skill is required to select it, and to distinguish between a good and an inferior sample. As it is a compound of several substances, it is difficult to secure uniformity of composition, and much is left to the care and honor of the manufacturer.

Though a good glaze does not deteriorate by age or exposure to the weather, it is difficult to distinguish between a good and a bad glaze by inspection or electrical test, and it is quite possible that a glaze which appears good and insulates well, may crack by age.

Brown stoneware is both excellent in quality, cheap, and durable. Its surface is not equal to that of porcelain, so that it never insulates so well as the best specimens of the latter, but the glaze never cracks. Again, it is not a compound; so that when a manufacturer possesses a suitable clay, and takes care in its preparation, the uniformity of his ware may be depended on. It is also comparatively easy to distinguish its quality, and to detect faults in its manufacture.

Small pieces of ware are more easily burned, and therefore more likely to be perfect than large ones. There is, therefore, a great advantage in forming an insulator of separate hollow pieces or cups, placed one inside the other and fastened with cement; if one is defective there is a probability the others will be sound, and if the pin or bolt be covered with an insulator (such as ebonite), insulation will not be destroyed if the earthenware be entirely useless.

All insulators should be tested before they are used. Part of the glaze should be ground off to test the body.

They should be placed in a trough of dilute sulphuric acid, or salt and water, allowed to remain several hours, and tested with 250 cells and a delicate horizontal galvanometer, to prove if the bolt is perfectly insulated from the liquid in the trough, the edge of the insulator being slightly greased to prevent the water spreading over it. The acid must be very carefully washed off after the tests. From its power of repelling water, grease greatly aids insulation in damp weather; paraffine, again, enormously improves it; so that in testing samples it is necessary to ascertain carefully that they have not been coated with these substances.

In order to learn the comparative value of different kinds of insulators, they should be fixed upon standards in sets of not less than 10, exposed to the rain equally on all sides, and tested when the weather is uniformly wet. Almost any insulater will suffice in fine weather, while that which tests best in slight rain may not give the same result in extreme wet, when the insulation is most tried.—*Handbook of Practical Telegraphy.*

The Mormon Tabernacle.

It deserves the name of wonderful. Its like does not exist in our land, if anywhere. It is an edifice two hundred and

fifty feet long inside, and one hundred and fifty feet wide. Brick columns or walls about twelve feet high, four feet thick, and some twelve feet deep, placed around the entire circumference, at intervals of about ten feet, support the walls and roof, and give free entrance and exit through wide doors on the inner side directly to the ground floor, upon which level is the great audience chamber, capable of comfortably seating fifteen thousand persons. The roof is like a monstrous half egg-shell cut through its longer diameter. It is supported on arched trusses and coned with pine, and no supporting columns break its great expanse. Its hight is over sixty feet. The pulpit occupies one end, and an organ higher than the Boston monster, almost as broad and musically excellent, is in process of construction, and nearly completed, back of the pulpit. The whole interior, pulpit and all, is white pine. The long benches are curved in seat and back in a way to make them, though uncushioned, more comfortable than those in most modern churches. At intervals curtains of thick white canvas are looped up across the ceiling, ready to let down to decrease the size of the room when small audiences are present. Here Brigham and his bishops preach Sunday afternoons, and while there are services in the morning, the chief attendance is at the ward churches, where the elders conduct the services.—*Architectural Review.*

TYNDALL ON HAZE AND DUST.

One of the most remarkable, and, perhaps, one of the most prolific discoveries of modern science, says the *Pall Mall Gazette*, was announced and described by Professor Tyndall in a lecture recently delivered at the Royal Institution. The subject of the lecture, which was illustrated by a series of very beautiful experiments or demonstrations, was the very familiar one of "Dust and Disease," and its object was to show the probability of an intimate connection between atmospheric dust and epidemic diseases. Every body knows that whenever a direct ray of sunshine crosses a shaded room its direction is made manifest by a line of apparent vapor. Looking at this vapor, it is seen to consist of innumerable particles of dust, which float in the atmosphere, and, catching and reflecting the sunshine, are rendered visible.

In the course of some beautiful experiments on the decomposition of vapors by light, Dr. Tyndall found it to be essential that he should get rid of this floating dust. He strained the air through a tube filled with bits of glass wetted with concentrated sulphuric acid, and through another tube filled with bits of marble wetted with caustic potash; he even made it bubble through the liquid acid and the potash solution, but still the dust particles remained in it. He tried various other ways of straining out this dust, but none of them succeeded. At length he passed the air on its way to the tube over the flame of a spirit lamp, and at once every particle of the dust disappeared. It was, therefore, organic matter, and the flame had burned it.

Passing the air a little more quickly over the flame, a fine blue cloud appeared in the tube—the smoke of the dust particles. The organic and combustible nature of these particles was a discovery, for they had hitherto been taken to be inorganic and incombustible. Air was then passed through a tube which contained a roll of platinum gauze; and it was found, that when the platinum was cold, the dust particles all passed through with the air, but that when it was made red-hot, the dust particles were all consumed. In this case, too, when the air was forced quickly through, a fine blue cloud of smoke appeared, just as in the experiment with the spirit lamp. An attempt was then made to burn the dust particles by the concentrated rays of a convergent mirror, but it failed; the particles flitted too quickly through the focus of the burning ray to be consumed by it.

The next experiment was to put the flame of a spirit lamp in the ray of light which was revealing the floating dust. At once the flame was seen to be surrounded by wreaths of darkness, resembling intensely black smoke. On lowering the flame beneath the beam of light, the same dark masses were seen wreathing upward. "They were, at times," said Dr. Tyndall, "blacker than the blackest smoke that I have ever seen issuing from the funnel of a steamer, and their resemblance to smoke was so perfect as to lead the most practiced observer to conclude that the apparently pure flame of the alcohol required but a beam of sufficient intensity to reveal its clouds of liberated carbon." But when a red-hot poker was placed under the beam, the same black wreaths came floating through. A hydrogen flame was next put under it, and the whirling masses of darkness wreathed upward more copiously than ever. The blackness was, therefore, nothing but air from which all dust particles had been burned out, and which, consequently, contained nothing to catch the light and reflect it to the eye, as the dust particles do.

Here, however, a difficulty came in. The same effect was produced by a copper ball not hot enough to burn the dust, and by a flask filled with hot water. In this case it was found that the air was rarefied with the warmth, and, as the dust particles were not heated to the same extent, it dropped them and floated upward without them. Other gases, even common coal gas, carefully prepared so as to exclude the dust particles, have the same black appearance when they cross a ray, which the dust-laden air renders visible, and if coal gas or hydrogen be let into the top part of a glass shade, which has been placed in a sunbeam or ray of the electric light, the line between the dust-laden air and the gas is rendered visible—where the air is, the shade will seem full of the illuminated particles; where the gas is it will appear absolutely empty. "The air of our London rooms is filled with this organic dust, nor is the country air free from its pollution. It only needs a sufficiently powerful beam to make the air appear as a semi-solid rather than a gas."

Nobody could, in the first instance, without repugnance, place the mouth at the illuminated focus of the electric beam and inhale the dirt revealed there. Yet we are inhaling it every moment, and the wonder is, that so small a portion of it should be injurious to health.

What is the portion of this ever-present and all-pervading dust which is injurious to life? Now, it was long believed that epidemic diseases were propagated by malaria, which consisted of organic matter in a state of motor-decay; that when such matter was taken into the body through the lungs or the skin, it had the power of spreading in it a similar decay—yeast was a case in point. Why should not a bit of malarious matter operate in the body as a little leaven, leavening the whole lump? But, in 1836, Cagniard de la Tour discovered the yeast plant, which, when placed in a proper medium, grows and spreads, and produces what we call fermentation. In the next year Schwann, of Berlin, discovered the plant independently. He also proved, that when a decoction of meat is effectually excluded from common air, and supplied solely with air which has been raised to high temperature, it never putrefies. Putrefaction, therefore, he said, came from the air, and could be destroyed by a sufficiently high temperature. Helmholtz and Ure repeated and confirmed his experiments; but the high authority of Gay Lussac, who ascribed putrefaction to oxygen, drove chemists back on the old notion. That notion was finally exploded by Pasteur, who proved that the true ferments are organized beings who find in what we call ferments their necessary food.

Side by side with these discoveries grew up the germ theory of epidemic disease. Kircher expressed the idea, and Linnæus favored it, that epidemic diseases are due to germs which, floating in the atmosphere, enter the body and produce disease by the development of parasitic life. Sir Henry Holland has favored this theory, which derives its strength from the perfect parallelism between the phenomena of contagious disease and those of life. As an acorn planted in the soil gives birth to an oak which produces a whole crop of acorns, each of which has power to reproduce its parent tree, and thus, from a single seed, a whole forest may spring, so a germ of disease, planted in a human body, grows and shakes abroad new germs, which, meeting in other human bodies with their proper food and temperature, finally take possession of whole populations. Thus Asiatic cholera, beginning in a small way in the delta of the Ganges, spread itself, in seventeen years, over nearly the whole habitable world.

An infinitesimal speck of small pox virus will develop a crop of pustules, each charged with the original poison. The reappearance of this scourge, as in the case of the *Dreadnought*, at Greenwich, so ably reported on by Dr. Budd and Mr. Busk, is explained by the theory which ascribes it to the lingering of germs about the infected place. Surgeons have long known the danger of admitting air to an opened abscess, and abscesses are always opened by an instrument which carefully excludes the air from contact with the wound. The instrument should, of course, be scrupulously clean; but it can be made perfectly clean in an atmosphere of dust only by being made as hot as its temper will bear. This is not done, and therefore inflammation often sets in after the first operation; rapid putrefaction accompanies it, and the pus, which at first showed no traces of animal life, is now found to be full of active little organisms called vibrios. Professor Lister, from whose letter this fact is derived, contends that this astounding development of animal life is due to the entry of germs into the abscess during the first operation, and their subsequent development by favorable circumstances. Hay fever is another case in point.

The celebrated physiologist Helmholtz suffers from the 20th of May till the end of June from a catarrh of the upper air passages, and he has found, that during this period, and at no other, his nasal secretions are peopled by these vibrios. They nestle in the cavities of the nose, and a sneeze is necessary to dislodge them. These are uncomfortable statements, but if the germ theory is found to be true, it will give definiteness to our efforts to stamp out disease; and it is only by some definite efforts under its guidance that its truth or falsehood can be established. Hence, Dr. Tyndall says he reads with sympathy such papers as those of Dr. Budd, of Bristol, on cholera, scarlet fever, and small pox. Dr. Budd's imagination may occasionally tempt him to a flight beyond his facts, but without this dynamic heat of heart the solid inertia of the Briton can never be overcome. As long as heat can warm the truth without singeing it much, as long as enthusiasm can overmatch its mistakes by unequivocal examples of success, "so long," said Dr. Tyndall, "I am disposed to give it a fair field to work in, and to wish it Godspeed."

CONCLUSION.

Returning to the dust, Dr. Tyndall drew certain practical conclusions from the survey of these two classes of facts. The dust cannot be blown away by ordinary bellows, since the air they send out is equally full of the particles. But fill the nozzle with cotton wool, not too tightly pressed, and the air is filtered, and being then blown across the beam of light, forms a clean band of darkness, like the air from the spirit lamp, or from the heated platinum wire. This was the filter Schroeder used in his experiments on spontaneous generation; it was also turned to account in the excellent researches of Pasteur. Since 1868, Professor Tyndall has constantly employed it himself.

The most interesting of all illustrations of this filtering process is furnished by the human breath. Fill the lungs with ordinary air and breathe through a warm tube—warmed to prevent the condensation of the watery particles—across the beam of light which is revealing the dust particles in the air. The particles move with the moving air, but the current from the lungs shows, at first, as many particles as the ordinary atmosphere. Gradually, however, the particles clear away from the course of the breath, and by the time you have completed your expiration, the expired air cuts a sharp black line through the motes in the sunbeam. The air has left its dirt in the lungs, and the last portions of the expired breath are free from floating dust. But empty the lungs as far as possible, and then inhale a deep breath through a handful of cotton wool, and on expiring this air in the same way, it cuts a black line in the sunbeam at once. Place the tube below the beam and blow upward, and the air rises through the dancing particles like black smoke, just as it did from the heated surfaces on which the dust was burned. The cotton wool has completely intercepted the floating matter on its way to the lungs, and, as no dust was inhaled, none is exhaled.

Here, then, is the philosophy of an instinctive habit of medical men. In a contagious atmosphere the physician puts his handkerchief to his mouth, and inhales through it: in so doing he keeps back the floating germs. If the poison were a gas, it could not be thus intercepted. Dr. Bence Jones repeated Dr. Tyndall's experiment with a silk handkerchief, with a similar but less marked result. Cotton wool is, in fact, the best and surest filter, and a physician who wants to hold back from the lungs of his patient, or from his own lungs, the germs by which contagious disease is said to be propagated, will employ a cotton wool respirator. "After the revelations of this evening," concluded Dr. Tyndall, "such respirators must, I think, come into general use as a defense against contagion. In the crowded dwellings of the London poor, where the isolation of the sick is difficult, if not impossible, the noxious air around the patient may, by this simple means, be restored to practical purity. Thus filtered, attendants may breathe the air unharmed. In all probability the protection of the lungs will be the protection of the entire system. For it is exceedingly probable that the germs which lodge in the air passages, and which, at their leisure, can work their way across the mucous membrane, are those which sow in the body epidemic disease. If this be so, then disease can certainly be warded off by filters of cotton wool. I should be most willing to test their efficacy in my own person; and time will decide, whether in lung disease, also, the woolen respirator cannot abate irritation, if not arrest decay. By its means, so far as the germs are concerned, the air of the highest Alps may be brought into the chamber of the invalid."

Fecundity of Fishes.

The fecundity of fishes is enormous. I have carefully (by weighing the whole spawn and then counting the number of eggs in an exact portion) calculated the number of eggs produced at one litter by several of our native species, as follows:

Species.	Weight of fish.	No. of eggs.
Yellow perch	3½ ounces	9,243
River smelt	2 "	25,141
Fresh-water smelt	10 "	80,000
Whitefish (Coregonus)	2 pounds	25,076
Schoodic salmon (average)	1½ pounds	about 600
Sebago salmon (full count)	2 pounds 10 ounces	2,988

Sea or river salmon (migratory) yield on the average a little less than a thousand eggs for each pound weight; and shad not less than fifty thousand per fish.

These numbers, however, fail to convey to the mind an adequate idea of the possible consequences implied in them. A simple arithmetical calculation may assist us.

Take, for instance, the salmon, whose powers of reproduction and rate of growth are better known than those of most species, remarking, however, that the salmon is among the least fecund of the larger fishes. Let us now assume that a female salmon will at the age of four years produce seven thousand eggs at one spawning (a very moderate estimate), and that all the eggs hatch, and all the young arrive at maturity, the sexes being equally divided.

Commence with a single pair. The female lays 7,000 eggs. At the end of four years the first brood has arrived at maturity, and numbers 7,000 salmon; and half of these, or 3,500, are females, and each of them produces 7,000 eggs, total, 24,500,000 eggs; and these eggs in four years more have all become full-grown fish, forming the second brood. At the end of twelve years from the start the third brood arrives at maturity, numbering 85,750,000,000. At the end of the sixteenth year the fourth brood, numbering 300,125,000,000,000—salmon enough to cover the whole State of Maine a hundred feet deep.—*Charles G. Atkins, Commissioner of Fisheries, Maine.*

Preservation of the Body of Mr. Peabody.

The preservation of the remains of the late Mr. Peabody was intrusted to the hands of Dr. Parry. The process carried out consisted in injecting the whole body through the arteries with a solution of arsenic, containing also some bichloride of mercury.

Twenty-four hours afterwards another liquid, consisting of a saturated solution of tannin acid, was thrown in, with a view of effecting the gradual conversion of the gelatinous structures into the tanno-gelatin, or the basis of leather. None of the viscera were removed or disturbed, and before the opening into the chest required for the injection, practiced through the aorta, was closed, an arsenical paste, or rather cream, consisting of arsenic, camphor, and spirits, was introduced into the thoracic cavity; also through an opening in the diaphragm into the cavity of the abdomen, and freely distributed about.

Death had taken place about two days and a half before the process was commenced, and decomposition had set in, so as to produce great distension of the abdomen; but the process was found to check all this, and, when completed, all signs of a tendency to decomposition were removed. We may add that under the silk shroud, and upon the floor of the coffin, there was placed a bed of well-burnt animal charcoal.

THE ZIRCON LIGHT.

We have lately examined this excellent improvement, as applied to the passenger car of the Beach Pneumatic Transit Co. The car, in size, is about the same as an ordinary street car, and a single zircon light illuminates its interior with brilliancy. Two small cylinders of compressed oxygen and hydrogen are carried on the car, from which pipes extend to a small burner that supports a piece of zircon, not more than ½ of an inch long and ¼ of an inch in diameter. Against this little pencil of zircon the two gases impinge, and heat it so intensely as to make it glow with a clear and steady light.

Those who fancy that underground railway riding in New York is likely to be a dark and dismal affair will receive new impressions on the subject when they enter the premises connected with the Broadway tunnel.

One of the great advantages of the zircon light is that it burns like any other light without requiring adjustment. The light carried on the car before mentioned, burns steadily for 7 hours without being touched. The zircon pencil lasts for three months, and is, in effect, the wick of the light. Information concerning the zircon light can be had of the New York Oxygen Gas Company, corner of Eleventh avenue and Forty-first street, New York city.

Action of Magnetism on Various Gases.

M. Treve has communicated to the French Academy some remarkable results of experiments upon the action of magnetism upon the various gases. When the spark from an induction coil passes through a Geissler tube filled with hydrogen the gas becomes luminous, having a blue tint, plainly violet at the extremities of the tube, and of a fine red color in a capillary prolongation. But upon placing the latter part of the apparatus between the poles of a magnet the red instantly disappeared, giving place to a perfectly white light. In like manner oxygen, which gives a milky white light in the capillary tube, became red; nitrogen deepened its blue to a still deeper blue: the brilliant white of carbonic acid became deep blue; the blue of silicium fluoride became a bluish violet. The spectra of these luminous tubes changed when the capillary portions were subjected to the action of magnetism.

Boiler Explosions.—From the report of the Manchester Steam Users' Association it appears that there were fifty-eight boiler explosions in England during 1869, by which eighty-six persons were killed and one hundred and twenty-six injured. The greatest number of explosions took place at collieries. The boilers from which most of the disasters resulted are described as plain cylindrical, egg-ended, camber-ended, and flat-ended (externally fired). The causes of the explosions are stated to be, first, malconstruction giving twenty-six cases; second, defective condition giving fifteen cases; third, over-heating giving nine cases. The nature of the remaining eight cases had not been ascertained.

Tin in California.—The Chief of the Cabinet [of Practical Geology and Mining of the United States General Land Office, has very recently written a letter, stating that additional information in reference to the discoveries of tin in San Jacincto, San Bernadino county, Cal., has been received, and specimens of the ore have arrived. The analysis of an average specimen by a competent chemist and mineralogist shows that the ore contains 13·37 per cent of pure tin. The ore is intermixed with tourmaline, containing boracic acid, and with cassiterite. This combination is reported to be unusual and highly interesting, and the yield of tin is double that of the ores at the Cornwall (England) mines.

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 advertisemets at $1·00 a line, under the head of "Business and Personal."

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

L. H., & Son., N. Y.—We know of no lacquer used for finishing sadirons. We think you can get the finish you speak of, or at least one equal to the sadiron finish thus: See that your buff wheels are well balanced after they are covered. Let the wheel be covered with thick leather before covering with the emery. Get as good a surface on the article as you can from a wheel covered with No. 70 emery. Mix flour of emery with melted beeswax and stir in till it is thick. When the mass is cool rub it on a new covered wheel with No. 80 emery. Then set the wheel running, and hold on a flint to smooth it until the surface is sufficiently fine to suit.

W. McC., of Iowa.—Under the circumstances we do not think there will be a sufficient saving between a non-condensing and a condensing engine to pay first cost of condensing apparatus, extra skill in management, and extra cost of repairs. The quantity of water required to condense, say at 60 degrees, will be 9,375 gallons per hour, but to provide for waste, say 10,000 gallons. We know of no better mode to cool the water than to expose it to the open air in a series of shallow tanks arranged like the steps of a stairway, so that the water may fall in a thin sheet from one to another.

C. M., of Mass.—You need not fear that water, in passing from a slate roof to your cistern through zinc gutters and pipes will be contaminated. You may test the presence or absence of zinc by adding to a small quantity two or three drops of hydrochloric acid, and then adding carbonate of soda in solution. If zinc be present a white precipitate will be formed.

S. T. T., of Md.—Any solid substance which will begin to sink in water, will sink, if unobstructed, to the bottom. The reason is this. Any solid now known is more compressible than water. Compressing it increases its specific gravity and renders it less buoyant than before the pressure was put upon it. As it goes down then its tendency to sink is increased rather than diminished.

V. C., of Wis.—To make a blue paint for a drum, you may use a shellac varnish and color to the tint desired.

A. B.—We have no doubt a wall made of sand, gravel, small stones, and good water lime cement, will make a good wall for a barn cellar, if good water lime is used and the work properly done.

X. Y. Z., of N. B.—The pressure per square inch of water upon the sides of vessels, is as the hight of the column, not as the diameter.

B. & W., of N. H.—You will find the information you desire in an article published in another column.

E. C., of O.—When the lime is precipitated from a solution of chloride of lime, the solution will no longer be chloride of lime. You can make a clear solution of chloride of lime by filtering.

J. A. V., of Ind.—We think you will find all the information you seek in "Practical Treatise on Heat" by Box. Published by Henry Carey Baird, 406 Walnut street, Philadelphia, Pa.

H. De L., of Pa.—A constant temperature is better for any kind of distillation than a fitful and varying one, if maintained at the proper point.

J. Slack.—To make chloride of gold, dissolve the gold in three times its weight of nitro-hydrochloric acid (aqua regia) and evaporate nearly to dryness. The salt can be made more neutral by repeated crystallizations and washings.

N. W. West.—Hand saws are made of steel plate of the right thickness. The teeth are cut in a suitable machine. We shall probably give a description of the hardening process in a subsequent issue. Your third inquiry cannot be answered in brief. You will find the subject discussed at length in works on metallurgy.

E. G. S., of N. B.—You will find a rule for computing the mean pressure in steam cylinders, in "Bacon's Richard's Steam Engine Indicator," published by D. Van Nostrand, 23 Murray street, New York. You do not give sufficient data; you have omitted to mention the clearance.

J. L. C.—For plumbing work in dwellings, except for water intended for drinking, we should prefer the seamless brass or copper tubes to any other. For pipes intended to convey water for culinary and drinking purposes, we prefer block-tin lined lead pipes.

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.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

"Winn's Portable Steam Brick Machine," makes more and better brick than any other machine in the world. Address Wright & Winn, Lock Haven, Pa.

Parallel Vise.—The most durable, labor-saving, and strongest, with the firmest hold. A. P. & M. Stephens & Co., 91 Liberty st., New York.

Perforated Zinc and Sheet Iron for separators, smut machines, grain dryers, tubular wells, malt kilns, etc. R. Aitchison & Co., Chicago.

T. F. Randolph, Steam Model Works, Cincinnati, Ohio.

Excelsior Turbine Water Wheel.—This superior water wheel has been found, by a final test, to excel, nearly one third, the best wheel in this country. For cheapness, durability, and power, it can not be equaled. Full particulars given by circular. Address Isaac S. Roland, Reading, Pa.

Foreman Wanted.—One who understands molding all kinds of heavy machinery, and a temperate man, can find constant employment by applying to Murray, Moore & Co., Portsmouth, Ohio.

Bone Mill Wanted.—Address Oil Company, Columbia, S. C.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

For the Best Upright Drill in the World, address Wm. M. Hawes & Co., Fall River, Mass.

Wanted—The address of manufacturers of power hub cupping machines, and wheel boxing machines. J. Bodley & Sons, wagon makers, Wheeling, W. Va.

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

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

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

To Rent—East River water front, stores and vacant lots suitable for manufacturing or mercantile purposes, together or separate Daniel W. Richards & Co., 92 Mangin st.

A half interest in the new and very valuable patent, Shackleton's System of Utilizing Exhaust Steam, for sale on reasonable terms. We give a few testimonials where it has been in use for some months. Moore & Sealy Brothers; Yates, Wharton & Co.; P. W. Vail & Co.; M. Gould & Son, Newark, N. J. Perth Amboy Fibre Co., 40 Broadway, N. Y. Tweedy & Co., and Randle & White, Danbury, Conn. Crane, Tubbs & Co.; A. T. Lum, and J. Y. Brokaw, Elizabeth, N. J., etc., etc., etc. The above save from 35 to 50 per cent. For particulars apply to A. Carr, 45 Cortlandt st., N. Y., or address P. O. Box 19, Elizabeth, N. J.

Portable Pumping or Hoisting Machinery to Hire for Coffer Dams, Wells, Sewers, etc. Wm. D. Andrews & Bro., 414 Water st., N. Y.

Two 60-Horse Locomotive Boilers, used 5 mos., $1,300 each. The machinery of two 500-ton iron propellers, in good order, for sale by Wm. D. Andrews & Bro., 414 Water st., New York.

American Boiler Powder—A safe, sure, and cheap remedy for scale. Send for circular to Am. B. P. Co., P. O., Box 315, Pittsburgh, Pa.

For fire brick, fire clay, furnace tile, glass pots, stove linings, sewer pipe, drain tile, garden vases, pedestals, hydraulic cement, plaster of Paris, etc. Address D. R. Ecker, No. 13 Smithfield st., Pittsburgh, Pa.

See advertisement of Thomas' Lathes in another column.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

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

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

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

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

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

U. S. Patent Office.

How to Obtain Letters Patent for NEW INVENTIONS.

Information about Caveats, Extensions, Interferences, Designs, Trade Marks; also, Foreign Patents.

For a period of nearly twenty-five years, MUNN & CO. have occupied the position of leading Solicitors of American and European Patents, and during this extended experience of nearly a quarter of a century, they have examined not less than fifty thousand alleged new inventions, and have prosecuted upward of thirty thousand applications for patents, and, in addition to this, they have made, at the Patent Office, over twenty thousand preliminary examinations into the novelty of inventions, with a careful report on the same.

The important advantages of MUNN & CO.'S Agency are, that their practice has been ten-fold greater than that of any other Agency in existence, with the additional advantage of having the assistance of the best professional skill in every department, and a Branch Office at Washington, which watches and supervises, when necessary, cases as they pass through official examination.

CONSULTATIONS AND OPINIONS FREE.

Those who have made inventions and desire a consultation are cordially invited to advise with MUNN & CO. who will be happy to see them in person at the office, or to advise them by letter. In all cases, they may expect an HONEST OPINION. For such consultations, opinion, and advice, NO CHARGE is made. A pen-and-ink sketch and a description of the invention should be sent.

TO APPLY FOR A PATENT,

A model must be furnished, not over a foot in any dimension. Send model to MUNN & CO., 37 Park Row, New York, by express, charges paid, also, a description of the improvement, and remit $16 to cover first Government fee, and revenue and postage stamps.

The model should be neatly made, of any suitable materials, strongly fastened, without glue, and neatly painted. The name of the inventor should be engraved or painted upon it. When the invention consists of an improvement upon some other machine, a full working model of the whole machine will not be necessary. But the model must be sufficiently perfect to show with clearness the nature and operation of the improvement.

PRELIMINARY EXAMINATION

Is made into the patentability of an invention by persona search at the Patent Office, among the models of the patents pertaining to the class to which the improvement relates. For this special search, and a report in writing, a fee of $5 is charged. This search is made by a corps of examiner of long experience.

Inventors who employ us are not required to incur the cost of a preliminary examination. But it is advised in doubtful cases.

COST OF APPLICATIONS.

When the model is received, and first Government fee paid, the drawings and specification are carefully prepared and forwarded to the applicant for his signature and oath, at which time the agency fee is called for. This fee is generally not over $25. The cases are exceptionally complex if a higher fee than $25 is called for, and, upon the return of the papers, they are filed at the Patent Office to await Official examination. If the case should be rejected for any cause, or objections made to a claim, the reasons are inquired into and communicated to the applicant, with sketches and explanations of the references; and should it appear that the reasons given are insufficient, the claims are prosecuted immediately, and the rejection set aside, and usually

Without Extra Charge to the Applicant.

MUNN & CO. are determined to place within the reach of those who confide to them their business, the best facilities and the highest professional skill and experience.

The only cases of this character, in which MUNN & CO. expect an extra fee, are those wherein appeals are taken from the decision of the Examiner after a second rejection; and MUNN & CO. wish to state very distinctly, that they have but few cases which can not be settled without the necessity of an appeal; and before an appeal is taken, in any case, the applicant is fully advised of all facts and charges, and no proceedings are had without his sanction; so that all inventors who employ MUNN & CO. know in advance what their applications and patents are to cost.

MUNN & CO. make no charge for prosecuting the rejected claims of their own clients before the Examiners and when their patents are granted, the invention is noticed editorially in the SCIENTIFIC AMERICAN.

REJECTED CASES.

MUNN & CO. give very special attention to the examination and prosecution of rejected cases filed by inventors and other attorneys. In such cases a fee of $5 is required for special examination and report, and in case of probable success by further prosecution, and the papers are found tolerably well prepared, MUNN & CO. will take up the case and endeavor to get it through for a reasonable fee, to be agreed upon in advance of prosecution

CAVEATS

Are desirable if an inventor is not fully prepared to apply for a Patent. A Caveat affords protection, for one year, against the issue of a patent to another for the same invention. Caveat papers should be carefully prepared.

The Government fee on filing a Caveat is $10, and MUNN & CO.'S charges for preparing the necessary papers are usually from $10 to $12.

REISSUES.

A patent when discovered to be defective, may be reissued by the surrender of the original patent, and the filing of amended papers. This proceeding should be taken with great care.

DESIGNS, TRADE MARKS, AND COMPOSITIONS

Can be patented for a term of years, also, new medicines or medical compounds, and useful mixtures of all kinds. When the invention consists of a medicine or compound, or a new article of manufacture, or a new composition, samples of the article must be furnished, neatly put up. Also, send a full statement of the ingredients, proportions, mode of preparation, uses, and merits.

PATENTS CAN BE EXTENDED.

All patents issued prior to 1861, and now in force, may be extended for a period of seven years upon the presentation of proper testimony. The extended term of a patent is frequently of much greater value than the first term; but an application for an extension, to be successful, must be carefully prepared. MUNN & CO. have had a large experience in obtaining extensions, and are prepared to give reliable advice.

INTERFERENCES

Between pending applications before the Commissioners are managed and testimony taken; also, Assignments, Agreements, and Licenses prepared. In fact, there is no branch of the Patent Business which MUNN & CO. are not fully prepared to undertake and manage with fidelity and dispatch.

FOREIGN PATENTS.

American inventors should bear in mind that five Patents—American, English, French, Belgian, and Prussian—will secure an inventor exclusive monopoly to his discovery among ONE HUNDRED AND THIRTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such, that patents can be obtained abroad by our citizens almost as easily as at home. MUNN & CO. have prepared and taken a larger number of European Patents than any other American Agency. They have Agents of great experience in London, Paris, Berlin, and other Capitals.

A Pamphlet, containing a synopsis of the Foreign Patent Laws, sent free. Address MUNN & CO., 37 Park Row, New York.

Recent American and Foreign Patents.

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

SEED PLANTER AND FERTILIZER DISTRIBUTER.—Joseph Arrington, Livingston, Ala.—This invention has for its object to furnish a simple, convenient, and effective machine, which shall be so constructed and arranged that it may be easily and conveniently adjusted for planting cotton seed or other seed, or for distributing guano, or other fine fertilizer, doing its work well and thoroughly in either capacity.

CAR COUPLING.—John Whiteford, Pond City, Kansas.—This invention has for its object to improve the construction of the ordinary car coupling so as to make it self-coupling, without diminishing its strength or reliability.

CLOTHES WASHER.—Benjamin Pine, New York city.—This invention has for its object to furnish an improved washing machine, which shall be simple in construction, easily operated, and effective in operation; washing the clothes quickly and thoroughly by pressure and without injuring the most delicate fabrics.

SOLDERING FURNACE.—John McPherson, Baltimore, Md.—This invention has for its object to economize fuel by locating the draft pipe in the lower part of the furnace, and by making use of a reversible grate, placed over the inner orifice of the draft pipe, which causes the fire to burn higher or lower, according as the draft opening in the grate is placed up or down; and to make the furnace self-cleaning by providing a chamber beneath the draft pipe, into which cinders and ashes may fall.

PLOW.—Mark Rigell, Newton, Ala.—This invention relates to the pivoting of the coulter to the beam, in such a manner that the coulter may yield readily to obstacles too powerful to be thrust aside; and to the application of a spring to the coulter, for the purpose of keeping it up to its work when not yielding to such obstacles.

SHEEP SHEARING TABLE.—J. R. Marshall, Marion, Pa.—This invention consists of a pivoted frame, provided with stocks for confining the sheep's legs, and a strap for sustaining its weight, and capable of holding the sheep in an upright position on its posterior, or in a recumbent posture on its side; and connected with a folding and cording apparatus for bundling the fleece.

MEAT CUTTER.—Wm. B. Heintzie, Williamsburgh, N. Y.—This invention relates to a new machine for cutting meat into small pieces, and consists chiefly in the employment of rotary cutters, hung upon axles that are secured in a rotary disk; and also in the use of a vertically adjustable bed or support for the meat to be cut.

INSTRUMENT FOR DRAWING GEOMETRICAL LINES.—Wm. Ritchie, Wilmington, Ill.—This invention relates to a new instrument which can be used for producing all kinds of curves, as well as straight lines, and which can be readily set and adjusted to draw with exactness the requisite curve or line. The invention consists chiefly in the arrangement of a frame, which carries a pencil or other marking instrument, and which is supported on a revolving frame or bed, wherein it can also slide. The combined sliding and revolving motion of the instrument produces the volutes, the grades of which can be regulated by the angle at which the instrument is caused to slide. The invention also consists in the general combination of devices used on the instrument with a trammel for producing ovals and volutes around the same.

COMBINED HAME AND COLLAR.—James H. Ferguson, Greenville, Ind.—This invention relates to improvements in hames and collars for horses, having for its object to provide a combination of the two devices in one, under an arrangement calculated to be cheaper in cost of construction, better adapted for service, and less rigorous to the animals.

WHIP SOCKET HOLDER.—Z. A. F. Lefébere and J. H. Davis, Plattsburg, N. Y.—This invention relates to a new and useful attachment for connecting whip sockets to the dash-boards, and holding them in a way to be readily detached; and consists of a clasp ring, made in two parts jointed together at one end, and provided with catches at the other, which spring together, one of the said parts being provided with a short outward curve to take around the iron bar of the dash-board, or with a hole for screwing or riveting to the said bar, when made of wood.

THOROUGH BRACE.—Jas. E. Requa, Sonora, Cal.—This invention relates to improvements in thorough braces for carriages, wagons, and other vehicles, and consists in making the same of steel, iron, or other metal wire, braided into thin flat strips or belts, and provided with suitable swivel or other connections.

MANUFACTURE OF WATER-PROOF FABRICS FROM REFUSE RUBBER.—Marcar Wahram Beylikgy, Constantinople, Turkey.—The object of this invention is to utilize the shavings and refuse of rubber goods, in the production of a new and useful fabric.

CORN PLANTER.—George D. Hayworth, Decatur, Ill.—This invention relates to improvements in that class of corn planters wherein the valves are worked by a knotted cord stretched across the field, secured at each end, and working over the machine as it moves back and forth to work the valves.

LOCK NUT.—Oswald S. Freeland, Newport, R. I.—This invention has for its object to furnish a simple, convenient, and effective lock nut for bolts upon machinery, and in other places where they will be exposed to jarring to prevent the said nuts from from being worked off or loose by said jarring.

STEAM WAGON.—E. P. Talcott, Blair, Neb.—This invention has for its object to furnish an improved steam wagon, which shall be so constructed and arranged that it may be conveniently used for drawing a gang of plows, or for drawing any other desired loads through fields or upon common roads.

STEAM GENERATOR.—C. J. Stolbrand, Columbia, S. C.—The object of this invention is to furnish a steam generator, which shall be cheap, safe, economical, and effective, and it consists in a double sphere, or two spherical vessels combined, the space between the two spheres being the water space, and the inner sphere being the steam chamber.

STEAM BOILER.—James Jacobs, Maysville, Ky.—This invention relates to a new and useful improvement in steam boilers, and consists in arranging within the boiler and within a drum or steam chamber connected therewith, or in a boiler without the drum, a series of shallow pans for containing water and receiving sediment, whereby the steam generating power of the boiler is greatly increased, and whereby all damage or loss occasioned by sediment in the boiler is avoided.

HARVESTER.—James McCaffery, Waterloo, Iowa.—This invention relates to new and useful improvements in machines for harvesting grain, whereby much time and labor is saved.

MEDICAL COMPOUND.—J. T. Mulkey, Walton's Ford, Ga.—This invention relates to a new and useful medical compound for the cure of burns, bruises, and cutaneous diseases.

SEAT FASTENER.—Lorenzo Brown, Odessa, N. Y.—This invention relates to a new and useful improvement in fastenings for wagon seats, sliding doors and gates.

WARPING MACHINE.—Roscoe C. Reynolds and Cyrus I. Barker, Lewistown, Me.—This invention relates to improvements in warping machines, and consists in so arranging the driving mechanism of the warping roller that it may, by the movement of a hand lever, be started and run slowly, and increased to the required motion before the belt is shifted to the fast pulley; the object being to first take up the slack of the yarn given off by the spools in consequence of being continued in motion at the time of stopping, by their momentum, longer than the roller, and to start the spools into motion again without breaking the yarn.

DITCHER.—C. F. Woodruff, Newbern, Tenn.—This invention consists in providing the front cutting bar with splitting bits, extending down from its under side, for excavating the bottom of the ditch, and with blades at its ends for forming the sides of the ditch.

TOOL HOLDER FOR GRINDSTONES.—Philip Leonard, Sharon, Pa.—This invention relates to improvements in tool holders for holding the tools or scrapers to grindstones and traversing them along the face of the stones, and adjusting them for grinding on different bevels. It consists of a slotted bed-plate arranged for attachment to the wooden frames of the stone by screws or bolts so as to be adjusted toward or from the face of the stone and provided with uprights, wherein a vertically oscillating plate is journaled at the edge next the stone, which plate serves for the support and laterally traversing bed of a tool or scraper-holder which is capable of sliding to or from the stone, and is provided with a screw for operating it.

COMBINED MOWING MACHINE AND HAY SPREADER.—J. H. Dater, Eagle Mills, N.Y.—This invention relates to an improvement in mowing machines, whereby they are made to spread and disturb the grass mowed by them. The invention consists in the combination of a hay spreader with a mowing machine, the spreader being arranged behind the frame of the mower.

CLOCK.—Michael Tromly, Cincinnati, Ohio.—This invention consists in a new escapement, the same being made up of a single pallet, provided with a wire arm, connected at its free end with a cam groove on the hub of the balance wheel, in such a manner that, at each vibration of the latter, the pallet is thrown out to allow one tooth to pass.

ORGAN AND MELODEON ACTION.—John C. Briggs, Ansonia, Conn.—This invention has for its object to so arrange the action of all reed and pipe instruments, that an extra or sub-base note of the lowest key belonging to a chord of music can be played without requiring that extra note, belonging to either of the keys of which such chord is composed, to be played; the solos, played by the left hand, can thereby be kept free of base notes, with the exception of the lowest, all the other notes being treble notes. Any independent part of any musical composition can therefore be played upon the keyboard of a reed or pipe instrument. Inversely, the same invention is applicable to the playing of an extra treble note of the highest key belonging to the chord, without playing any more treble notes of the same chord.

PLOW.—Mark Rigell, Newton, Ala.—This invention consists in the combination of a plant protector with a plow.

FASTENING FOR RUBBER SHOES.—Mrs. Helen Ekin Starrett, Lawrence, Kansas.—This invention consists in straps secured at their lower ends to the inside of an overshoe, and intended to be fastened over the top of the foot, in any suitable manner for the purpose of retaining the shoe thereupon.

TIRE SETTING AND COOLING APPARATUS.—C. B. Guy, Postville, Iowa.—This invention relates to improvements in apparatus for holding the wheels for setting wagon tire, and consists in an arrangement of the holding frame for adjusting the holding spindle or bolt toward or from one edge thereof; also, in an arrangement for tilting the frame, by means of a foot treadle, to bring the rim of the wheel thereon down into water held in a trough at the side for cooling the tire.

PLOW.—A. C. Judson, Grand Rapids, Ohio.—This invention relates to a new manner of providing a cutter on a plow by extending the landside beyond the front edge of the moldboard, and to a new method of strengthening and stiffening the moldboard by extending the standard clear forward into the plow to the junction of the landside and moldboard, or of two moldboards.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING FEB. 22, 1870.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$10
On an application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from upward, but usually at the price above-named. $1

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them ..... $1·25

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York

100,000.—SUNBONNET FOR HORSES.—John Anderson, Brooklyn, N. Y.

100,001.—SEED PLANTER AND FERTILIZER DISTRIBUTER.—Joseph Arrington, Livingston, Ala.

100,002.—PRINTING PRESS.—Henry Barth, Cincinnati, Ohio.

100,003.—PROCESS AND APPARATUS FOR THE MANUFACTURE OF IRON AND STEEL.—Henry Bessemer, London, Great Britain. Patented in England Nov. 10, 1868.

100,004.—HANGING CRANK SHAFTS.—J. M. Beugler, Williamsport, Pa.

100,005.—MANUFACTURE OF WATER-PROOF FABRICS FROM WASTE RUBBER.—M. W. Beylikgy, New York city.

100,006.—CELLAR HOIST OR ELEVATOR.—H. L. Bowers, Harrisburg, Pa.

100,007.—VEGETABLE CUTTER.—W. A. Boyden and C. J. Mann, Altoona, Pa.

100,008.—COAL SHOVEL.—J. F. Brewer (assignor to S. Stow Manufacturing Co.), Plantsville, Conn.

100,009.—ORGAN OR MELODEON ACTION.—J. C. Briggs, Ansonia, Conn.

100,010.—SEAT FASTENER.—Lorenzo Brown, Odessa, N. Y.

100,011.—RECLINING CHAIR.—W. A. Bury, Crosse Isle, Mich. Antedated Feb. 17, 1870.

100,012.—UMBRELLA.—Alonzo B. Caldwell, Syracuse, N. Y.

100,013.—WATER HEATER FOR GREEN HOUSES.—S. E. Chubbuck (assignor to himself, I. Y. Chubbuck, and S. E. Chubbuck, Jr.), Boston, Mass.

100,014.—HEAD REST.—E. P. Cook, Cartersville, Ga.

100,015.—BEEHIVE.—H. B. Cooper, Memphis, Tenn.

100,016.—GRATE BAR.—T. S. Davis, Lancaster, Pa.

100,017.—STEAM HEATER FOR BURNISHING IRONS.—J. M. De Lacy, Trenton, N. J.

100,018.—SWITCH SIGNAL.—H. A. Efner and Chas. Boynton, Marshall, Mich.

100,019.—JIB HANK FOR VESSELS.—H. K. Eldridge, Cambridge, Mass.

100,020.—DINING AND IRONING TABLE AND QUILTING FRAME.—Thomas Elkins, Albany, N. Y.

100,021.—MARINE DRAG.—John Faunce, Washington, D. C.

100,022.—COLLAR AND HAME FOR HARNESS.—J. H. Ferguson, Greenville, Ind.

100,023.—NUT LOCK.—O. S. Freeland, Newport, R. I.

100,024.—STOVE GRATE.—Geo. Froh, Philadelphia, Pa.

100,025.—CHURN.—Heman Gardiner, New York city. Antedated Feb. 5, 1870.

100,026.—DOOR KNOB.—John W. Grogan (assignor to himself and James Duffy), Brooklyn, N. Y. Antedated Feb. 12, 1870.

100,027.—APPARATUS FOR COOLING AND PURIFYING BEER, WATER, AND OTHER LIQUIDS.—J. P. Gruber, New York city.

100,028.—TIRE SETTING AND COOLING APPARATUS.—C. B. Guy, Postville, Iowa.

100,029.—CASK FOR CONTAINING FERMENTABLE BEVERAGES.—John Hamilton and Robert Paterson, Glasgow, Great Britain.

100,030.—RAILWAY RAIL.—Alonzo Hanmer and David Grim, Pittsburgh, Pa.; said Alonzo Hanmer assigns his right to P. L. Grim, Beaver county, Pa.

100,031.—HALTER.—W. M. Harris, Dixon, Ill.

100,032.—CORN PLANTER.—G. D. Hayworth, Decatur, Ill.

100,033.—GRAIN DRILL.—Martin Hayden, Dowagiac, Mich. Antedated Feb. 12, 1870.

100,034.—REFRIGERATOR.—Adam Heinz (assignor to himself, J. L. Fisher, and G. J. Munschauer), Buffalo, N. Y.

100,035.—MEAT CUTTER.—Wm. B. Heintzie, Williamsburgh, N. Y.

100,036.—REGISTERING PUNCH FOR RAILROAD CONDUCTORS.—Austin D. Hoffman (assignor to himself and Charles H. Morse), Chicago, Ill.

100,037.—TILL ALARM.—A. D. Hoffman (assignor to Chas. H. Morse), Chicago, Ill.

100,038.—ELECTROPLATING WITH ANTIMONY.—James Spooner Howard, Mansfield, assignor to himself, E. Adams, Jr., Attleborough, T. E. Grover, Mansfield, and N. Carpenter, Attleborough, Mass.

100,039.—COMPOUND FOR CURE OF COUGHS, COLDS, ETC.—William H. H. Irwin, Philadelphia, Pa. Antedated Feb 5, 1870.

100,040.—CULTIVATOR.—Nathan L. Isgrigg, Moore's Hill, Ind.

100,041.—STEAM GENERATOR.—James Jacobs, Maysville, Ky.

100,042.—PLOW.—A. C. Judson, Grand Rapids, Ohio, assignor to E. O. Judson.

100,043.—COMPOUND TO REMOVE GREASE FROM CLOTH, SILK, PAPER, ETC.—M. B. Kimm (assignor to himself and G. G. Stetcelee), Grand Rapids, Mich.

100,044.—LATCH FOR GATES.—James Kindel, Wilmington, Ohio.

100,045.—CULINARY VESSEL.—G. Landrine, Jersey City, N. J.

100,046.—CLASP FOR SECURING WHIP SOCKETS TO DASH-BOARDS.—Zephaniah A. F. Lefébere and James H. Davis, Plattsburg, N. Y.

100,047.—TOOL HOLDER FOR GRINDSTONES.—Philip Leonard, Sharon, Pa.

100,048.—TREMOLO FOR ORGANS.—John R. Lomas, New Haven, Conn.

100,049.—VEGETABLE CUTTER.—G. Lutz, J. Schultheis, and M. Florentin, Newark, N. J.

100,050.—COMMERCIAL PORTFOLIO.—S. E. Mandlebaum, St. Louis, Mo.

100,051.—HARVESTER.—Jas. McCaffery, Waterloo, Iowa.

100,052.—DUMPING WAGON.—Edward Miller, Milwaukee, Wis. Antedated Feb. 11, 1870.

100,053.—SERIES OF DIES FOR FORMING THE HEADS OF KING-BOLTS.—R. R. Miller, Plantsville, assignor to himself and J. B. Savage, Southington, Conn.

100,054.—SMUT MILL AND SEPARATOR.—John Mills and A. G. Waldo, Milwaukee, Wis.

100,055.—SPIKE FOR RAILWAYS.—James Montgomery, New York city.

100,056.—BALANCE SLIDE VALVE.—Geo. R. Moore, Philadelphia, Pa.

100,057.—OINTMENT FOR BRUISES, BURNS, ETC.—J. T. Mulkey, Walton's Ford, Ga.

100,058.—RAILWAY OIL CAR.—S. W. Murray and B. P. Lamason, Milton, Pa.

100,059.—PAPER FEEDER.—Oliver Norelius, Minneapolis, Minn.

100,060.—STAY FOR TRUNK LIDS.—D. C. O'Conner, New York city.

100,061.—WINDMILL.—Walter Peck, Rockford, Ill.

100,062.—WASHING MACHINE.—Benjamin Pine, New York city.

100,063.—TANK FOR RENDERING LARD.—David Pinger, St. Joseph, Mo.

100,064.—FRICTION CLUTCH.—F. A. Pratt (assignor to Pratt, Whitney & Co.), Hartford, Conn.

100,065.—DRAWBRIDGE.—T. W. Pratt (assignor to himself and Boston Machine Co.), Boston, Mass.

100,066.—STEELYARD.—William B. Preston, North Chelsea, Mass.

100,067.—PICTURE ENVELOPE.—Robert Price, New York city.

100,068.—THOROUGH BRACE.—James E. Requa, Sonora, Cal.

100,069.—BOOKBINDING.—George H. Reynolds, New York city.

100,070.—WARPING MACHINE.—R. C. Reynolds and Cyrus I. Barker, Lewiston, Me.

100,071.—PROCESS OF BLEACHING AND CLEANING VEGETABLE FIBERS.—E. T. Rice, New York city. Antedated February 10, 1870.

100,072.—INSTRUMENT FOR DRAWING GEOMETRICAL LINES.—Wm. Ritchie, Wilmington, Ill.

100,073.—STOVE SHELF.—John R. Robertson, Syracuse, N. Y.

100,074.—WEATHER-STRIP.—Horace A. Robison, Cleveland, Ohio.

100,075.—SASH HOLDER.—Charles W. Rockhold, Peoria, Ill.

100,076.—CHURN.—Rice Farrar Ross, Marshall county, Miss.

100,077.—TRUNK STAY.—Edward Semple, Chicago, Ill.

100,078.—HARVESTER RAKE.—D. B. Shirk, Brunersville, Pa.

100,079.—FAUCET FILTER.—Montgomery P. Simons, Philadelphia, Pa.

100,080.—PORTABLE GAS GENERATOR.—Wm. Snodgrass (assignor to himself and J. M. Browne), Macomb, Ill.

100,081.—COMPOUND TO BE USED AS AN ARTICLE OF DIET.—W. D. St. Clair, Chicago, Ill.

100,082.—LEATHER-SPLITTING MACHINE.—Caleb S. Stearns, Marlborough, Mass. Antedated Feb. 12, 1870.

100,083.—SPRING CHAIR FOR CHILDREN.—Mathias Stephan, Canton, Ohio.

100,084.—WATER RAM.—K. W. Stetson, Kingston, Mass. Antedated Feb. 18, 1870.

100,085.—STEAM GENERATOR.—C. J. Stolbrand, Columbia, S. C.

100,086.—STEAM WAGON.—E. P. Talcott, Blair, Nebraska.

100,087.—CASE FOR CURING AND TRANSPORTING TOBACCO.—G. E. Tuckett, Hamilton, Canada.

100,088.—HORSE POKE.—Myers J. Van Aken, Sturgis, Mich.

100,089.—SAW-GRINDING MACHINE.—George Walker, Middletown, N. Y.

100,090.—STEAM AND AIR ENGINE.—G. Warsop, Nottingham, Eng. Patented in England, Sept. 8, 1868.

100,091.—MALT KILN.—John G. White, Albany, N. Y. Antedated Feb. 17, 1870.

100,092.—CAR COUPLING.—John Whiteford, Pond City, Kansas.

100,093.—SAFE.—L. F. Whiting and Franklin Smith, Boston, Mass.

100,094.—BOLT FEEDER FOR MILLS.—B. A. Wing, Galesburg, Mich.

000,095.—DEOXIDIZING AND CARBONIZING IRON ORES.—C. Adams, Philadelphia, Pa.

100,096.—VULCANIZED RUBBER HOSE.—H. A. Alden, Matteawan, N. Y., assignor to the New York Rubber Co.

100,097.—HAND-MOTIVE CARRIAGE.—J. Allgaier, Philadelphia, Pa.

100,098.—WHEELBARROW.—Henry Alter, Lakeport, Cal.

100,099.—PHOTOGRAPHIC SCREEN.—J. A. Anderson, Chicago Ill.

100,100.—BROADCAST SEEDER.—William S. Archer, Dayton, Ohio.

100,101.—RAILROAD SWITCH.—Jno. L. Arms, St. Louis, Mo.

100,102.—POTATO CULTIVATOR AND DIGGER.—W. J. Avery and Tunis Laberteaux, Marshall township, Mich.

100,103.—COAL ELEVATOR.—A. S. Bailey, Chicago, Ill.

100,104.—HORSE HAY RAKE.—A. B. Barnard, Worcester, Mass.

100,105.—COTTON PRESS.—Charles J. Beasley, Petersburgh, Va.

100,106.—ALARM GUN.—C. J. Beasley, Petersburgh, Va.

100,107.—HOT-AIR FURNACE.—Oscar Bellman and John W. Garver, Hagerstown, Md.

100,108.—PAINT BRUSH.—C. S. Benjamin and Edward Story, Washington, Ill.

100,109.—MANUFACTURE OF PAPER.—E. B. Bingham, Newark, N. J.

100,110.—HEATER AND VENTILATOR.—Geo. W. Blake, New York city.

100,111.—MACHINE FOR GROOVING SHEET METAL.—C. F. Bliesenick, Providence, Pa.

100,112.—NEEDLE FOR SEWING MACHINE.—John L. Boone, San Francisco, Cal.

100,113.—Stop Cock.—Joseph Breeden, Birmingham, Eng. Patented in England, Feb. 25, 1869.
100,114.—Clothes Dryer.—Benoni S. Brown, Chicago, Ill.
100,115.—Tube Stopper.—Wm. Brown, Hoboken, N. J.
100,116.—Seat for Cars, etc.—James Casseday (assignor to himself and J. D. Holt), Philadelphia, Pa.
100,117.—Portable Furnace.—Thomas Chadwick (assignor for one half his right to F. W. Corad), Newton, Iowa.
100,118.—Blind Slat.—M. W. Clark, Worcester, Mass., assignor to R. Ball & Co.
100,119.—Altitude Instrument.—Hall Colby, New York city, assignor to himself and G. G. Colby, Washington, D. C.
100,120.—Feather Renovator.—Abel D. Cook and James Graves, New Madrid, Mo.
100,121.—Children's Carriage.—William E. Crandall, New York city.
100,122.—Wagon Spring.—J. N. Crannell, Champaign, Ill. Antedated Feb. 11, 1870.
100,123.—Bag Holder.—Leonard Crofoot, Pavilion, N. Y.
100,124.—Combined Mowing Machine and Hay Tedder.—J. H. Dater, Eagle Mills, N. Y.
100,125.—Machine for Rolling Car-Coupling Pins.—Wm. Davis and Joseph While, Cleveland, Ohio.
100,126.—Faucet.—J. M. A. Dew, Chicago, Ill. Antedated Feb. 18, 1870.
100,127.—Mode for Forming Blown Glassware.—Hiram Dillaway, Sandwich, Mass.
100,128.—Combined Cotton Chopper and Cultivator.—John D. Dunn, Griffin, Ga.
100,129.—Gate.—Charles H. Eggleston, Marshal, Mich.
100,130.—Watch Regulator.—D. W. Eldredge, Boston, Mass.
100,131.—Manufacture of Copper and in Separating other Metals Therefrom.—J. B. Elkington, Birmingham, England. Patented in England, November 8, 1865.
100,132.—Construction of Chairs.—H. H. Evarts, Chicago, Ill.
100,133.—Bedstead.—H. H. Evarts, Chicago, Ill. Antedated February 14, 1870.
100,134.—Street Pavement.—E. M. Fowler (assignor to H. G. McGonegal), New York city.
100,135.—Machine for Cutting Soap into Slabs.—Joseph Gallipo Cohoes, N. Y.
100,136.—Brick Machine.—B. M. Gard, Urbana, Ohio, and F. R. Gard, Chicago, Ill.
100,137.—Strainer for Coffeepot.—C. L. Gilpatric, Hyde Park, Mass.
100,138.—Base Burning Stove.—J. H. Goodfellow (assignor to himself and R. S. Goodfellow), Troy, N. Y.
100,139.—Sewing Machine.—Wm. O. Grover, Boston, Mass.
100,140.—Grip Pulley.—A. S. Hallidie, San Francisco, Cal.
100,141.—Steam Generator.—Joseph Harrison, Jr., Philadelphia, Pa.
100,142.—Wine Press.—C. F. Hartmann, Nazareth, Pa.
100,143.—Skylight.—George Hayes, New York city.
100,144.—Feed-Water Purifier for Steam Generators.—H. K. Hazlett, St. Louis, Mo.
100,145.—Hedge and Tree Trimmer.—C. E. Healy, New London, Ohio.
100,146.—Railway Car Coupling.—T. R. Herd, Allegheny City, Pa.
100,147.—Coupling Cars.—Thomas Hess, West Bonn, Pa.
100,148.—Metallic Roofing.—Thos. N. Hickcox, Brooklyn, N. Y.
100,149.—Rotary Steam Engine.—J. W. Hill, Jefferson, and Thomas Roberts, Panora, Iowa.
100,150.—Lock for Wagon Seat.—Edgar Hitt, Poundridge, N. Y.
100,151.—Masts of Vessels.—Edgar E. Holley, New York city.
100,152.—Quadrant and Sextant.—Frederick Holzach, New Orleans, La.
100,153.—Signal Apparatus.—A. H. Huntington, Galesburg, assignor to Wm. McKee, Neponset, Ill.
100,154.—Grain Conveyer.—Olof Johnson and C. O. Wall, Galva, Ill. Antedated February 16, 1870.
100,155.—Egg Beater.—Frank Krandelt, San Francisco, Cal.
100,156.—Steam Clothes Washer.—M. T. Lamb, Davenport, Iowa.
100,157.—Pitman Connection.—S. T. Lamb, New Albany, Ind.
100,158.—Pitman Joint for Harvesters.—S. T. Lamb, New Albany, Ind.
100,159.—Pitman Joint for Harvesters.—S. T. Lamb, New Albany, Ind.
100,160.—Soldering Machine.—Jos. Le Comte, Brooklyn, N. Y.
100,161.—Ruffling Attachment for Sewing Machine.—A. M. Leslie, Chicago, Ill., assignor to himself and Cornell, Ward, and Comings.
100,162.—Pump.—G. W. Low, Ravenna, Ohio.
100,163.—Manufacture of Fertilizers from Animal Substances.—Orazio Lugo, Baltimore, Md.
100,164.—Clamp for Stay-Log.—J. N. Lyman, New York city.
100,165.—Stone and Stump Extractor.—J. B. Lyons, Milton, Conn.
100,166.—Punch and Press.—W. Stinson Lord, Crawford, Miss.
100,167.—Roofing and Flooring.—P. N. Mackay, Virginia City, Nevada.
100,168.—Potato Digger.—O. E. Mallory (assignor for one half his right to S. B. Lusk), Batavia, N. Y.
100,169.—Fence.—Harris H. Margeson, San Francisco, Cal.
100,170.—Sheep Shearing Table.—J. R. Marshall, Marion, Pa.
100,171.—Extensible Gas Tube for Chandeliers.—H. L. McAvoy (assignor to himself and Samuel Ault, Jr.), Baltimore, Md. Antedated February 10, 1870.
100,172.—Implement for Under-Cutting Sand Cores in Flasks.—Wm. L. McDowell, Philadelphia, Pa.
100,173.—Car Coupling.—E. T. McKean, Hammonton, N. J.
100,174.—Soldering Furnace.—John McPherson, Baltimore, Md.
100,175.—Grinder for Rattler for Cleaning Castings.—George Miller, Johnston, R. I.
100,176.—Jack for Carriage Springs.—R. R. Miller, Plantsville, Conn., assignor of half interest to J. B. Savage.
100,177.—Fifth Wheel Head for Carriages.—R. R. Miller, Plantsville, Conn., assignor of half interest to J. B. Savage.
100,178.—Die for Forming Heads of King-Bolts.—F. B. Morse, Plantsville, Conn.
100,179.—Drive Well Tube.—J. M. Mott, Chicago, Ill.
100,180.—Horseshoe.—A. L. Murphy, Philadelphia, Pa.
100,181.—Harvester Dropper.—Ephraim Myers, Creagerstown, Md.
100,182.—Water Filter, Liquor Cooler, and Refrigerator.—W. F. Nickels, Philadelphia, Pa.
100,183.—Cultivator.—A. B. C. Nusbaum, Sacramento, Cal.
100,184.—Safe.—D. O. Paige, Detroit, Mich.
100,185.—Bridge.—C. H. Parker, Boston, Mass.
100,186.—Cap for Metallic Cans.—G. H. Perkins, Brooklyn, N. Y.
100,187.—Wagon.—Eli Petteys, Chestertown, N. Y.
100,188.—Subsoil Plow and Scraper Combined.—J. Reynolds, Crystal Springs, Miss.
100,189.—Eraser Attachment for Pencils, etc.—Geo. H. Richards, New York city.
100,190.—Wagon Seat.—D. H. Richardson, Henrietta, N. Y.
100,191.—Life Raft.—John Rider, New York city.
100,192.—Car Coupling.—H. S. Root, Muncy, Pa.
100,193.—Boat-Detaching Apparatus.—John Ross, San Francisco, Cal.
100,194.—Wardrobe Hook.—J. B. Sargent, New Haven, Conn.
100,195.—Lock.—Zebadiah Sargent, Rochester, N. H.
100,196.—Separator to be Used in Distilling Liquors.—George W. Shaw, Buffalo, N. Y.
100,197.—Apparatus for Towing Rafts, etc.—E. O. Shepardson, St. Louis, Mo.
100,198.—Paper-Box Machine.—Daniel Simmons, Jun., New York city.
100,199.—Ditcher and Grader.—J. G. Sisson and Lark Delana, Arcola, Ill.
100,200.—Harvester Rake.—E. W. Skinner, Madison, Wis.
100,201.—Brake and Ratchet for Elevating and Lowering Buckets.—Isaac T. Smith, Richmond, Va.
100,202.—Negative Plate for a "Smee" Battery.—Luther L. Smith, Brooklyn, N. Y.
100,203.—Steam Engine Governor.—William Smith, Philadelphia, Pa.
100,204.—Railway Car Coupling.—Elias F. Sneider, West Penn, Pa. Antedated February 16, 1870.
100,205.—Furnace.—Thomas Speakman, Camden, N. J.
100,206.—Shifting Bar for Sleighs.—A. J. Spencer, Middletown, Conn.
100,207.—Fastening for Overshoes.—Helen Ekin Starrett, Lawrence, Kansas.
100,208.—Manufacture of Gas from Petroleum.—Levi Stevens, Washington city, D. C.
100,209.—Folding Chair.—Alexander W. Stewart, Glasgow, Scotland. Antedated August 21, 1869.
100,210.—Mechanical Leech.—Frederick A. Stohlmann, Brooklyn, N. Y., and Andrew H. Smith, New York city, assignors to Frederick A. Stohlmann.
100,211.—Heating and Ventilating Apparatus.—B. F. Sturtevant, Jamaica Plain, Mass.
100,212.—Grain Drier.—B. F. Sturtevant, Jamaica Plain, Mass.
100,213.—Packing for Piston Rods.—Charles Thayer and David McPherson, Rome, N. Y.
100,214.—Washer for Screw Bolts.—Nathan Thompson, Brooklyn, N. Y.
100,215.—Corn Planter.—E. A. Thrush, New Kingston, N. Y.
100,216.—Screw Propeller.—Charles G. Toense, Jersey City, N. J.
100,217.—Escapement for Time Pieces.—Michael Tromly (assignor to himself and W. L. Hasbrouck), Cincinnati, Ohio.
100,218.—Shears.—Friedrich Ulrich, Brooklyn, E. D., N. Y.
100,219.—Fruit Ladder.—James H. Verity, Lansing, Mich.
100,220.—Automatic Latches.—Edward Voigt, Philadelphia, Pa.
100,221.—Gearing for Harvesters.—A. H. Wagner, Chicago, Ill.
100,222.—Machine for Making Horseshoes.—James T. Walker, Albany, N. Y.
100,223.—Shingle Machine.—Gustavus Walton, Minneapolis, Minn.
100,224.—Apparatus for Producing Butter from Cream.—Stanton D. Warner, and Owen W. Thomas, Richmond, Ill.
100,225.—Cancelling Stamp.—Wm. A. Wheeler, New York city.
100,226.—Hook for Harness.—Abner White, Macon, Ga.
100,227.—Revolver.—Rollin White, Lowell, Mass.
100,228.—Broom Brace.—Freeman O. Willey, Wilmette, Ill.
100,229.—Sand Paper Holder for Finishing the Soles of Boots and Shoes.—Herbert L. Willis, South Easton, Mass.
100,230.—Machine for Making Nails and Spikes.—Thomas Wood, Matteawan, N. Y.
100,231.—Ditcher.—C. F. Woodruff, Newbern, Tenn.
100,232.—Reversible Percolator.—Samuel Woolston, Vincentown, N. J., and Wm. Corfield, Philadelphia, Pa.
100,233.—Hook for Harness.—Gustav Bernd and Adolph Bernd, Macon, Ga.
100,234.—Cap for Powder Boxes Used for Domestic Purposes.—Henry A. Bartlett, Philadelphia, Pa.
100,235.—Grain Dryer.—B. F. Sturtevant, Jamaica Plain, Mass.
100,236.—Pressure Blower Wheel.—B. F. Sturtevant, Jamaica Plain, Mass.
100,237.—Pressure Blower Wheel.—B. F. Sturtevant, Jamaica Plain, Mass.
100,238.—Hot-air Blower.—B. F. Sturtevant, Jamaica Plain, Mass.
100,239.—Pressure Blower.—B. F. Sturtevant, Jamaica Plain, Mass.
100,240.—Compound Air-heater and Steam Condenser.—B. F. Sturtevant, Jamaica Plain, Mass.
100,241.—Compound Air-heater and Steam Condenser.—B. F. Sturtevant, Jamaica Plain, Mass.
100,242.—Compound Air-heater and Steam Condenser.—B. F. Sturtevant, Jamaica Plain, Mass.
100,243.—Uniting Tubes to Tube Sheets.—B. F. Sturtevant, Jamaica Plain, Mass.

REISSUES.

3,847.—Insulator.—Louis A. Cauvet, New York city.—Patent No. 49,999, dated July 25, 1865.
3,848.—Weather Strip.—F. C. Gridley, Hudson, Wis.—Patent No. 56,269, dated July 10, 1866.
3,849.—Machine for Engraving Calico Printer's Rollers.—John Hope, Thomas Hope, and Heber Le Favour, Providence county, R. I., assignees, by mesne assignments, of John Hope and Thomas Hope.—Patent No. 13,462, dated August 21, 1855.
3,850.—Machine for Bending Wood.—Wm. P. Letchworth, Buffalo, N. Y. Patent No. 81,095, dated August 18, 1868.
3,851.—Tile Machine.—F. M. Mattice, Detroit, Mich.—Patent No. 20,286, dated May 18, 1858.
3,852.—Wrench.—The Collins Company, Collinsville, Conn., assignee of Lucius Jordan and Leander E. Smith.—Patent No. 50,364, dated October 10, 1865.

DESIGNS.

3,854.—Ornamenting Glassware.—Thomas B. Atterbury, Pittsburgh, Pa., assignor to Wm. Doyle, Birmingham, Pa.
3,855.—Ornamenting Glassware.—John Bryce, Pittsburgh, Pa.
3,856.—Piano Case.—George H. Davis, Boston, Mass.
3,857.—Lamp Chimney.—Edward Foster, Boston, Mass.
3,858.—Caster.—George B. Garrett, Philadelphia, Pa.
3,859 to 3,861.—Stove Plate.—Nicholas S. Vedder, Troy, N. Y. Three patents.
3,862 to 3,866.—Stove Plate.—Nicholas S. Vedder, Troy, N. Y., and Tobias S. Helster, Lansingburg, N. Y., assignors to Nicholas S. Vedder. Five Patents.
3,867.—Stove Plate.—Nicholas S. Vedder and Francis Ritchie, Troy, N. Y., assignors to Nicholas S. Vedder.
3,868.—Pressure Gage Case.—Edwin A. Wood, Utica, N. Y.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

130.—Wooden Pavements and Cutting the Blocks therefor.—W. W. Ballard, Elmira, N. Y. January 15, 1870.
143.—Gas Burner.—Augustus Hubbell, Washington, D. C. January 18, 1870.
190.—Journal Bearings, etc.—Stuart Gwynn, New York city. January 21, 1870.
213.—Mowing and Reaping Machine.—W. N. Yost, F. W. Andrews, L. Stewart, and H. A. Hutson, Pennsylvania, U. S. January 22, 1870.
220.—Knitting Machine.—G. H. Harding, New York city, and P. Wright, Glasgow, Scotland. January 25, 1870.
221.—Anti-Friction Rollers.—W. B. Scott, New York city. January 25, 1870.
235.—Furnace Grates and Water Heaters.—C. E. Hutson, Commerce, Mo. January 26, 1870.
236.—Preparing Surfaces for Skating in all Seasons.—M. J. Bujac, New York city. January 26, 1870.
261.—Mechanism for Spinning Wool.—D. Goff and D. L. Goff, Pawtucket, R. I. January 28, 1870.
279.—Apparatus for Producing Rotary Motion.—A. G. Waterhouse San Francisco, Cal. January 31, 1870.
294.—Sewing Machine Needles and Needle Arms.—G. A. Lloyd, San Francisco, Cal. February 1, 1870.
297.—Wrench.—A. G. Coes, Worcester, Mass. February 1, 1870.

APPLICATIONS FOR EXTENSION OF PATENTS.

Lock.—William Henry Akins, Ithaca, N. Y., has applied for an extension of the above patent. Day of hearing April 27, 1870.

Continuous Sheet Metal Lathing Surface.—John B. Cornell, New York city, has petitioned for an extension of the above patent. Day of hearing April 27, 1870.

Ventilating Damper for Stoves.—John Magee, Chelsea, Mass., has petitioned for the extension of the above patent. Day of hearing May 4, 1870.

Grinding Circular Saws.—William Clemsen, Middletown, N. Y., has applied for an extension of the above patent. Day of hearing May 11, 1870.

Coupling for Vehicles.—Harvey Miner and Henry M. Stevens, New York city, and Mary Saunders, Hastings, N. Y., executrix of William H. Saunders, deceased, have petitioned for an extension of the above patent. Day of hearing May 11, 1870.

Elastic Bottoms for Chairs and other Articles.—Lysander Spooner Boston, Mass., has applied for an extension of the above patent. Day of hearing May 18, 1870.

NEW BOOKS AND PUBLICATIONS.

Metal Trades' Directory.

Symonds, Wentworth & Co., No. 19 Central street, Boston, Mass., will publish, early the ensuing spring, a directory of the iron, steel, and hardware and metal trades, and their collateral branches of business; it will embrace a complete list of the manufacturers, importers, wholesale and retail dealers, jobbers, commission merchants, and brokers of iron, steel shelf, and builder's hardware, tools, agricultural implements, machinery, stoves, castings, wire, tinman's supplies and tools, railway, steamboat, machine and carriage maker's supplies, saddlery, hardware, safes, locks, steam and gas fixtures, cabinetmaker's and undertaker's trimmings, firearms, cutlery, plumber's materials, and all goods manufactured in whole or in part from the baser metals. The publishers desire the address of the machinists, iron founders, and metal workers and dealers throughout the country.

Advertisements.

The value of the Scientific American *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2·50 per line to advertise in one of thirty thousand.*

RATES OF ADVERTISING.

Back Page - - - - $1'00 a line.
Inside Page - - - - - 75 cents a line.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

1832. SCHENCK'S PATENT WOODWORTH PLANERS 1870.
And Re-sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK & SON, Matteawan, N. Y., and 118 Liberty st., New York.

To Electro-Platers.

BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with books of instruction manufactured and sold by THOMAS HALL, Manufacturing Electrician, 19 Bromfield st., Boston, Mass. Illustrated catalogue sent free on application.

A MANUAL OF
Electro-Metallurgy:
INCLUDING the Application of the Art to Manufacturing Processes. By James Napier. Fourth American, from the Fourth London edition, revised and enlarged. Illustrated by engravings. In 1 vol. 8vo....$2.
☞ By mail, free of postage.
CONTENTS:—History of the Art, description of galvanic batteries and their respective peculiarities. Electrotype processes; Miscellaneous applications of the process of coating with copper; Bronzing; Deposition of metals upon one another; Electroplating; Electrogilding; Results of experiments on the deposition on other metals as coatings; Theoretical observations.

☞ The above or any of my Books sent by mail, free of postage, at the publication prices. My new revised and enlarged Catalogue of Practical and Scientific Books, 81 pp. 8vo, now ready, complete to Feb. 15, 1870, will be sent, free of postage, to any one who will favor me with his address.
HENRY CAREY BAIRD,
Industrial Publisher,
406 Walnut st., Philadelphia, Pa.

LATHES AND TOOLS for sale, Suitable for Brass Finishers—second-hand. Apply at 84 Beekman st. HAYDEN, GERE & CO.

Every Man his Own
PRINTER.—With one of our presses, and the material accompanying it, every man can do his own printing, thus saving much time and expense. Circulars containing full information about these Presses, prices, recommendations, etc., mailed free on application. Specimen books of types, cuts, borders, etc., etc., 10 cents.
ADAMS PRESS CO., 53 Murray st., New York.

WROUGHT-Iron Pipe for Steam, Gas, and Water; Brass Globe Valves and Stop Cocks, Iron Fittings, etc. JOHN ASHCROFT, 50 John st., N. Y.

EVERY
Merchant and Manufacturer
CAN BE HIS OWN
Stencil Cutter,
And save 75 per cent
Of the present Cost of his Stencils by the use of
Metcalf's Stencil Dies.
The Dies can be operated without any difficulty by any person of the least mechanical skill; they cut equally well brass, copper, and paper, and they are the only durable dies, of low cost, ever made. Used by the Stencil trade. L. S. METCALF,
Stencil Cutter and Manufacturer of Stencil Goods,
101 Union st., Boston, Mass.

Office of the Buffalo City Water Works,
Buffalo, Feb. 21, 1870.
Sealed Proposals
WILL BE RECEIVED at this Office until Tuesday, March 15th, 1870, at 10 o'clock, A. M., for constructing a tunnel from the Pumping House of these works, under the Erie Canal, Black Rock Harbor, and the Niagara River, for a distance of seven hundred (700) feet from said Pumping House, with an inlet pier at the termination of said tunnel in the Niagara River, opposite said Pumping House.
Plans and Specifications may be examined at this office, or Specifications will be sent by mail upon application to A. R. KETCHAM, Sup't.
ALEXANDER BRUSH,
CHANDLER J. WELLS,
JAMES RYAN, } Commissioners.

J. T. PHILLIPS, Practical Millwright and Engineer, No. 13 Adams st., Brooklyn, N. Y. Best of References Given.

Iron & Woodworking
Machinery Depot. New and Second-hand.
GEORGE L. CUMMINGS, 140 Center st., New York.

THE AMERICAN FAMILY
KNITTING MACHINE
Is presented to the public as the most Simple, Durable, Compact, and Cheap Knitting Machine ever invented. PRICE, ONLY $25.
This machine will run either backward or forward with equal facility; makes the same stitch as by hand, but far superior in every respect. Will Knit 20,000 Stitches in One Minute, and do perfect work. It will knit a pair of stockings (any size) in less than half an hour. It will knit Close or Open, Plain or Ribbed Work, with any kind of coarse or fine woolen yarn, or cotton, silk or linen. It will knit stockings with double heel and toe, drawers, hoods, sacks, smoking caps, comforts, purses, muffs, fringe, afghans, nubias, undersleeves, mittens, skating caps, lamp wicks, mats, cord, undershirts, shawls, jackets, cradle blankets, leggins, suspenders, wristers, tidies, tippets, tufted work, and, in fact, an endless variety of articles in every-day use, as well as for ornament.
FROM $5 TO $10 PER DAY can be made by any one with the American Knitting Machine, knitting stockings etc., while expert operators can even make more, knitting fancy work, which always commands a ready sale.
FARMERS can sell their wool at only forty to fifty cents per lb., but by getting the wool made into yarn at a small expense, and knitting it into socks, two or three dollars per pound can be realized. On receipt of $25 we will forward a machine as ordered.
We wish to procure active AGENTS EVERYWHERE, to whom the most liberal inducements will be offered. Address
American Knitting Machine Company,
Boston, Mass., or St. Louis, Mo.

Anti Friction Horse Power.

WE Have two styles of this power:—the UPPER GEARED and the LOWER GEARED, for driving every variety of machinery, whether for FARMING or MANUFACTURING purposes. We believe this to be the lightest running and best horse-power in use. Full descriptive and illustrated circular from our large catalogue sent on receipt of stamp, by

R. H. ALLEN & CO.
P.O. Box 376. NEW YORK.

Proprietors of the oldest and much the largest Agricultural Warehouse in New York city.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st., New York. 17 1

BAIRD'S INDUSTRIAL BOOKS.

LIST NO. 1.

Armengaud and Amouroux.—The Practical Draftsman's Book of Industrial Design, and Machinist's and Engineer's Drawing Companion: Forming a Complete Course of Mechanical Engineering and Architectural Drawing. From the French of M. Armengaud and Amouroux, C.E. Rewritten and arranged with additional matter and plates, selections from and examples of the most useful and generally employed mechanism of to-day. By Wm. Johnson, Assoc. Inst. C.E. Illustrated by 50 folio steel plates, and 50 wood cuts. A new edition. 4to.....$10

Arrowsmith. — Paper-hanger's Companion:—A Treatise in which the Practical Operations of the Trade are Systematically laid down; with Copious Directions Preparatory to Papering; Preventives against the Effect of Damp on Walls; the Various Cements and Pastes adapted to the Several Purposes of the Trade; Observations and Directions for the Paneling and Ornamenting of Rooms, etc. By Jas. Arrowsmith. 12mo, cloth.....$1 25

Baird.—The American Cotton Spinner, and Manager's and Carder's Guide:—A Practical Treatise on Cotton Spinning; giving the Dimensions and Speed of Machinery, Draft and Twist Calculations, etc.; with notices of recent Improvements: together with Rules and Examples for making changes in the sizes and numbers of Roving and Yarn. Compiled from the papers of the late Robert H. Baird. 12mo.....$1 50

Baker.—Long-Span Railway Bridges:—Comprising Investigations of the Comparative Theoretical and Practical Advantages of the various Adopted or proposed Type Systems of Construction; with numerous Formulæ and Tables. By B. Baker. 12mo.....$2

Bakewell.—A Manual of Electricity, Practical and Theoretical:—By F. C. Bakewell, Inventor of the Copying Telegraph. Second Edition. Revised and enlarged. Illustrated by numerous engravings. 12mo. Cloth.....$2

☞ The above, or any of my Books, sent by mail, free of postage, at the publication price. My new and enlarged Catalogue of PRACTICAL & SCIENTIFIC BOOKS, 81 pages, 8vo, now ready, complete to Feb. 15, 1870, will be sent, free of postage, to any one who will favor me with his address.

HENRY CAREY BAIRD.
Industrial Publisher, 406 Walnut St.
PHILADELPHIA.

WARD & STANTON, 52 John st., N. Y., manufacturers of an improved Cut-off Steam Engine, variable by the governor, simple and durable. Consumption of Fuel guaranteed. Also, Direct-acting Steam Pumps, of all sizes, and warranted perfect in their action. Send for circular.

PORTABLE STEAM ENGINES AND Boilers, Complete.

8-Horse Power		$ 700
12	" "	900
16	" "	1200
20	" "	1500
25	" "	1650

For Sale by H. B. BIGELOW & CO., New Haven, Conn.

SILICATE OF SODA, IN ITS VARIOUS forms, manufactured as a specialty, by Philadelphia Quartz Co., 783 South 2d st., Philadelphia, Pa.

THE NOVELTY IRON WORKS

Have For Sale at their Shop, foot of East 12th st., Lathes Planers, and all kinds of Machines for manufacturing Engines, Tools, etc.

PATENTEES

Who have failed in their efforts to dispose of their rights will do well to consult us, either personally or by mail, free of charge. Many valuable inventions are lying dormant for want of proper management that might realize a fortune for their owners if placed in our hands and brought to the attention of capitalists. Only those will be accepted which we feel satisfied can be sold, as our object is solely the realization of a commission. A candid opinion can therefore be relied upon. No charge for services unless successful.

References on application.
E. E. ROBERTS & CO., Consulting Engineers,
15 Wall st., New York.

OTIS' SAFETY HOISTING *Machinery.*
OTIS BROTHERS & CO.
NO. 309 BROADWAY, NEW YORK.

Niagara Steam Pump.
CHAS. B. HARDICK,
No. 9 Adams st., Brooklyn N. Y

SHINGLE AND HEADING MACHINE—Law's Patent with Trevor & Co.'s Improvements. The Simplest and Best in use. Also, Shingle, Heading, and Stave Jointers, Equalizers, Heading Turners, Planers etc. Address TREVOR & CO., Lockport, N. Y.

PLATTNER'S BLOWPIPE ANALYSIS.—A Complete Guide to Qualitative and Quantitive Examinations with the Blowpipe. Revised and enlarged by Prof. Richter, Freiberg. Translated from the latest German edition. By Henry B. Cornwall, A. M. E. M. In press and soon to be ready.

D. VAN NOSTRAND, Publisher,
23 Murray st., New York.

TODD & RAFFERTY, Manufacturers and DEALERS IN MACHINERY.
Works, Paterson, N. J.; Warerooms, 10 Barclay st., N. Y. Boilers, Steam Pumps, Machinists' Tools. Also, Flax, Hemp, Rope, and Oakum Machinery, Snow's and Judson's Governors, Wright's pat. Variable Cut-off & other engines.

Buy Barber's Bit Brace.

Industrial Literature.

BAIRD'S CATALOGUE, FEB. 15, 1870.
81 PAGES, 8vo.

This New and Enlarged Catalogue of the magnificent collection of PRACTICAL AND SCIENTIFIC BOOKS, in all departments, now published by me, will be sent FREE OF POSTAGE, to any one who will favor me with his address. No such list of Industrial Books, of his own publication, is issued by any other publisher in the United States or Great Britain.

HENRY CAREY BAIRD,
Industrial Publisher,
406 Walnut st., Philadelphia, Pa

FOR SALE.—A MANUFACTURING BUSiness, with 20-horse power engine, and boiler, shafting, pulleys, belting, drop and tilt hammers, lathes, edging machines, mills and drilling machines, etc., etc., and all the small tools suitable for manufacturing GUNS, PISTOLS, ETC. Machinery adaptable for manufacturing any kind of hardware goods; also,

FIVE YEARS' LEASE OF A LARGE, NEW 5-STORY FACTORY, with every convenience, at a very cheap rent. The above will be sold very low, and goods manufactured by the purchaser taken in part payment.

EDWARD K. TRYON, JR., & CO.
No. 19 North 6th street, Philadelphia, Pa.

GREGORY'S SEED CATALOGUE

MY ANNUAL CATALOGUE, containing a list of many novelties, besides all the standard vegetables of the garden (OVER 100 OF WHICH ARE OF MY OWN GROWING), with a choice list of Flower Seed will be forwarded GRATIS to all. I warrant my seed, shall prove as represented. I warrant it shall reach each purchaser. I warrant all money forwarded shall reach me. Send for a catalogue.

JAMES J. H. GREGORY, MARBLEHEAD, MASS.

ROBERT McCALVEY, Manufacturer of HOISTING MACHINES AND DUMB WAITERS.
602 Cherry st., Philadelphia, Pa.

P. BLAISDELL, Manufacturer of MACHINISTS' TOOLS,
Engine Lathes, Planers, Upright Drills, Traverse Drills, Boring Mills, Gear Cutters, and Hand Lathes.
Worcester, Mass.

Agents! Read This!

WE WILL PAY AGENTS A SALARY of $30 per week and expenses, or allow a large commission, to sell our new and wonderful inventions. Address M. WAGNER & CO., Marshall, Mich.

THE INVENTOR'S AND MECHANIC'S GUIDE.—A valuable book upon Mechanics, Patents, and New Inventions. Containing the U. S. Patent Laws, Rules and Directions for doing business at the Patent Office; 112 diagrams of the best mechanical movements, with descriptions; the Condensing Steam Engine, with engraving and description; How to Invent; How to Obtain Patents; Hints upon the Value of Patents; How to sell Patents; Forms for Assignments; Information upon the Rights of Inventors, Assignees and Joint Owners; Instructions as to Interferences, Reissues, Extensions Caveats, together with a great variety of useful information in regard to patents, new inventions, and scientific subjects, with scientific tables, and many illustrations 108 pages. This is a most valuable work. Price only 25 cents. Address MUNN & CO., 37 Park Row, N. Y.

WOODWORTH PLANERS—$125 & $150, and Planers and Matchers $350. Send for circular to S. C. HILLS, 12 Platt st., New York. 2 tf b

---

GALVANO PLASTIC IRON—For Bank Note Printing, Books, Engravings, etc Patent Rights for sale by

C. M. CLAY & CO.,
No. 45 Liberty st. Box 4950.

MERRICK & SONS,

PATENT
Safety Hoist
ACCIDENTS
Caused by Breaking of Hoisting Ropes, Absolutely Prevented.
Address
MERRICK & SONS,
430 Washington avenue, Philadelphia, Pa.

WANTED.—A MACHINE TO WORK either by hand or power, to cut wire from (1-16) one sixteenth to (⅝) five eighths inch in diameter, in pieces of from (¼) three quarters to (4) four inches (by gage) in length. Making a clean, smooth cut, and not bruising or jamming the wire. Address A. B. C., 420 Broad st., Providence, R. I.

Foundery Materials,

Facings, Sand, Clay, Bricks, Crucibles, Tools, Vitriol, etc. Babbit Metal Belting. VANTUYL & CO., 373 Cherry st., N.

ENGINE LATHES.—Twenty 17, 20, and 22-in. swing Thomas' Patent Lathes, nearly ready for shipment. Best Lathes in the world. Send for circular to THOMAS IRON WORKS, No. 5, Cypress st., Merrifield's Buildings, Worcester, Mass.

Andrews' Patents.

Noiseless, Friction Grooved, Portable, and Warehouse Hoisters.
Friction or Geared Mining & Quarry Hoisters.
Smoke-Burning Safety Boilers.
Oscillating Engines, Double and Single, half to 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical.
Send for Circulars.
WM. D. ANDREWS, ANDREWS & BRO., 414 Water street, New York.

AMERICAN PAVEMENT. — Rights for sale. C. W. BAILY, 545 N. 3d st., Philadelphia, Pa.

HINKLEY KNITTING MACHINE

FOR Family Use—simple, cheap, reliable. Knits everything. AGENTS WANTED. Circular and sample stocking FREE. Address HINKLEY KNITTING MACHINE CO., Bath, Me., or 170 Broadway, N.Y.

MODELS, PATTERNS, EXPERIMENTAL, and other machinery, Models for the Patent Office built to order by HOLSKE MACHINE CO., Nos. 528, 530 and 532 Water st., near Jefferson. Refer to SCIENTIFIC AMERICAN office. 14 tf

---

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK,
P. O. Box 1,057, Boston, Mass.

N. B.—This detector is covered by two U. S. patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

THE CHALMERS-SPENCE
Patent Non-Conductor

For covering Boilers, Pipes, etc. Saves fuel, is non-bustible, never deteriorates. Head Office foot of Ninth st., E. R., New York. Branch at St. Louis, Mo. Agencies Boston, Philadelphia, and New Orleans.

The Albany Iron Manufacturing Co. offer for rent

On very moderate terms, the whole or a part of their large and splendid new building, just completed, together with the steam power belonging thereto. The building is 200x70 feet, four stories high; the engine of 150-horse power. Address S. V. TALCOTT, Sec., Albany, N. Y.

WANTED—AGENTS—$75 to $200 per month, everywhere, male and female, to introduce the GENUINE IMPROVED COMMONSENSE FAMILY SEWING MACHINE. This Machine will stitch, hem, fell, tuck, quilt, cord, bind, braid, and embroider in a most superior manner. Price only $18. Fully warranted for five years. We will pay $1000 for any machine that will sew a stronger, more beautiful, or more elastic seam than ours. It makes the "Elastic Lock Stitch." Every second stitch can be cut and still the cloth cannot be pulled apart without tearing it. We pay Agents from $75 to $200 per month and expenses, or a commission from which twice that amount can be made. Address SECOMB & CO.,
Pittsburgh, Pa., Boston, Mass., or St. Louis, Mo.

CAUTION.—Beware of all Agents selling Machines under the same name as ours, unless they can show a Certificate of agency signed by us. We shall not hold ourselves responsible for worthless Machines sold by other parties, and shall prosecute all parties either selling or using Machines under this name to the full extent of the law, unless such Machines were obtained from us or our Agents. Do not be imposed upon by parties who copy our advertisement and circulars, and offer worthless Machines at a less price.

INVENTORS, AGENTS, MERCHANTS, and all Dealers in Patents or Patented Goods, should subscribe for the PATENT STAR, devoted to their Interests. Terms 50c. per year. Send stamp for sample to BENT, GOODNOW & CO., Boston, Mass.

Chas. E. Emery,

CIVIL AND MECHANICAL ENGINEER,
No. 7 Warren st., New York.
Drawings and Specifications furnished. Steam Machinery practically tested. Inventions examined for Capitalists. Refers, by permission, to Horatio Allen, Esq., Capt. John Ericsson, C. H. Delamater, Esq., Hecker & Bro., and other eminent engineers and manufacturers

---

PORTABLE STEAM ENGINES, COMBINing the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **750** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J C HOADLEY & CO Lawrence, Mass

WANTED—CIRCULARS AND INFORmation of improved Wood-work Machinery, Engines, and Foundery Fixtures, for a new establishment. Address GEORGE MUNGER, East River, Conn.

FOR THE BEST STEAM JACKET KETtles, made without Bolting or Packing for High Pressure Steam, address E. WHITELEY, Patentee, 57, 59, 61, 65 Charlestown st., Boston, Mass.

WATERPROOF PAPER FOR OUT, AND and inside of buildings. C. J. FAY, Camden, N.J.

R. BALL & CO., Worcester, Mass., Manufacturers of Woodworth's, Daniel's, and Dimension Planers; Molding, Matching, Tenoning, Mortising Shaping, and Boring Machines; Scroll Saws, Re-Sawing, Hand Boring, Wood Turning Lathes and a variety of other Machines for Working Wood. Also, the best Patent Door, Hub, and Rail Car Mortising Machines in the world. ☞ Send for our Illustrated Catalogue.
RICHARD BALL. E. P. HALSTED

HENRY W. BULKLEY, ENGINEER, Mechanical Designs, Detail Drawings, Estimates, etc., 70 Broadway, New York.

WOODBURY'S PATENT
Planing and Matching

and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, 91 Liberty street, N. Y.;
Send for Circulars. 67 Sudbury street, Boston

CIRCULAR SAW MILLS, PLANERS Matchers, etc. Prices Low. S. HEALD & SONS Barre, Mass., make the Largest and Best Planer to be found for the money. Send for circulars.

H. BOARDMAN, Lancaster, Pa.—Superior Patent Cork-cutting Machinery, Hard-laid Twine Cord, and Rope Machinery, with Pat. Stop & Condenser

---

BOILER FELTING SAVES TWENTY-five per cent of Fuel. JOHN ASHCROFT,
16 tf 50 John st. New York.

L. W. Pond's New Tools.

NEW AND IMPROVED PATTERNS—Lathes, Planers, Drills, Milling Machines, Boring Mills, Gear and Bolt Cutters Punches and Shears for Iron. Dealer in

MACHINERY.

Works at Worcester, Mass. Office, 98 Liberty st., N. Y
S. N. HARTWELL, General Agent.

COTTON AND WOOL
SHODDY PICKERS
Of the most approved English pattern, built by RICHARD KITSON.....Lowell, Mass.

CINCINNATI BRASS WORKS.—Engineers' and Steam Fitters' Brass Work. Best Quality at very Low Prices. F. LUNKENHEIMER, Prop'r.
Cincinnati, Ohio.

H. B. BIGELOW & CO., Bridge Engineers and Iron Bridge Builders, New Haven, Ct.

TRADE MARK.

SOLID EMERY WHEELS are guaranteed superior to any now in the market, and sent out on trial.
Price list upon application.
UNION STONE CO.,
32 Pemberton Square,
Boston, Mass.

BURDON IRON WORKS,—Manufacturers of Pumping Engines for Water Works, High & Low Pressure Engines, Portable Engines of all kinds, Sugar Mills, Screw, Lever, Drop & Hydraulic Presses, Machinery in general. Hubbard & Whittaker, 102 Front st., Brooklyn.

VINEGAR.—How Made from Cider, Wine, Molasses, or Sorghum in 10 hours, without using drugs. For circulars, address F. I. SAGE,
Vinegar Maker, Cromwell Conn.

AGRICULTURAL IMPLEMENTS SEEDS AND FERTILIZERS.

Special circulars of the above sent on receipt of stamp

R. H. ALLEN & CO.
P.O. Box 376. NEW YORK.

Proprietors of the Oldest and much the Largest Agricultural Warehouse in New York.

N. B.—Send your orders early, and avoid the delays usual in the busy season.

BAG MACHINES—Having the very latest improvements, and superior to all others, for sale and license, by B. S. BINNEY,
64 Kilby street, Boston, Mass.

CAMDEN
Tool and Tube Works,

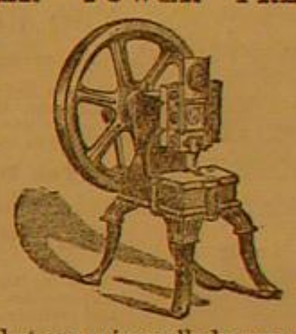
Camden, N. J. Manufacturers of Wrought Iron Tube, Brass Work and Fittings, and all the most improved TOOLS for Screwing, Cutting, and Fitting Pipe. Screwing Machines for Pipe, of five different sizes. Pipe Tongs, Common and Adjustable; Pipe Cutters, Pipe Vises, Taps, Reamers, Drills, Screwing Stocks, and Solid Dies. Peace's Patent Screwing Stocks, with dies. No. 1 Screws ¼, ⅜, ½, ¾ Pipe. Price complete, $10. No. 2 Screws, 1, 1¼, 1½ 2 Pipe, $20. No. 3 both screws and cuts off, 2¼, 3, 3½, 4 $65

WOODWORTH PLANERS a SPECIALTY—From new patterns of the most approved style and workmanship. Wood-working Machinery generally. Nos. 24 and 26 Central, corner Union street, Worcester Mass. Warerooms, 42 Cortlandt street, New York.
WITHERBY, RUGG & RICHARDSON.

STOCKS, DIES, AND SCREW PLATES Horton's and other Chucks. JOHN ASHCROFT, 50 John st., New York. 16 t

---

PARKER POWER PRESSES.



Are what are universally known as the
"FOWLER PRESS,"
improved, and *are without a rival* as regards strength and durability, combined with delicacy of adjustment of the Punch. NOTICE is hereby given that the

STILES POWER PRESS

Is a direct INFRINGEMENT OF OUR PATENT dated April 17, 1855, and reissued Aug. 24, 1869, and ALL PARTIES are hereby CAUTIONED against BUYING OR USING said presses WITHOUT OUR PERMISSION.
PARKER BROTHERS,
West Meriden, Conn.
New York office with CHAS. PARKER, 27 Beekman st.

THE BEST PUNCHING PRESSES ARE made by the Inventor and Patentee of the famous Eccentric Adjustment. Infringements upon said Patent will be severely dealt with. N. C. STILES,
Middletown, Conn.

ASHCROFT'S LOW-WATER DETECTOR will insure your Boiler against explosion. JOHN ASHCROFT, 50 John st., New York. 16 tf

---

STEAM AND WATER GAGES, STEAM Whistles, Gage Cocks, and Engineers' Supplies.
16 tf JOHN ASHCROFT, 50 John St., New York.

THE WOODWARD STEAM-PUMP MANUFACTURING COMPANY, Manufacturers of the Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Also Dealers in Wrought-iron Pipe, Boiler Tubes, etc. Hotels Churches, Factories, & Public Buildings, Heated by Steam Low Pressure. Woodward Building, 76 and 78 Center st., cor. of Worth st. (formerly of 77 Beekman st.), N.Y. All parties are hereby cautioned against infringing the Pat. Right of the above Pump. G. M. WOODWARD, Pres't

---

LATHE CHUCKS—HORTON'S PATENT—from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON Windsor Locks Conn

---

THE SCIENTIFIC AMERICAN *FOR 1870.*

A SPLENDID PREMIUM.

This Illustrated Weekly Journal of Practical Information, Art, Science, Mechanics, Invention, Chemistry, and Manufactures---Entered its Twenty-fifth Year on the 1st of January.

The SCIENTIFIC AMERICAN stands at the head of the Industrial Journals of the world in point of Circulation and Influence.

Every number has Sixteen Imperial pages, embellished with Engravings of New Inventions, Machinery, Tools for the Workshop, House, and Farm, also Public Buildings, Dwelling Houses, and Engineering Works.

The Illustrated Department of the SCIENTIFIC AMERICAN is a very striking feature, and has elicited the praise of the Press; and all articles appearing in its columns are written in a popular and instructive style.

To Inventors and Mechanics the SCIENTIFIC AMERICAN has special value and interest, from the fact that it furnishes an Official List of Patents issued, with copious notes of the principal American and European Patents.

Any one sending

10 Names for 1 year, and		$30, will receive	one	picture
20	" "	50,	"	" "
30	" "	75,	"	two pictures.
40	" "	100,	"	three "
50	" "	125,	"	four "

Competitors for the above prizes can send in names at any time and from any postoffice. For full particulars and sample copies of the SCIENTIFIC AMERICAN, address the Publishers.

Terms of the SCIENTIFIC AMERICAN: Single copies one year, $3·00; six months, $1·50; and one dollar for four months. To Clubs of ten and upward, $2·50 each per annum.

MUNN & CO.,
37 Park Row New York.

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

BALL, BLACK & CO.

Nos. 565 and 567 BROADWAY

Offer an Unequaled Assortment of

JURGENSEN, NARDINE. JACOT, SALTZMAN. NICOUD, GERARD, FRODSHAM, PEARDON, GORDING, RUGENSTEIN, HARRISON, TAYLOR.

ALSO, A FULL LINE OF AMERICAN

WATCHES,

At the Lowest Price.

Woodward's

Architecture.

Designs and hints on Building. With priced catalogue of all books on Architecture and Agriculture. Quarterly, 25 cents per annum.

Books sent postpaid on receipt of Price.

Harney's Barns, Out-buildings & Fences.

Just published, with

TWO HUNDRED

Designs and Plans of

Stables, Farm Barns, Out buildings, Gates, Gateways, Fences, Stable Fittings, and Furniture.

Ten Dollars.

Woodward's National Architect.

ONE THOUSAND

Working Designs, Plans, and Details of Country and Village, and Suburban Houses, with SPECIFICATIONS and ESTIMATES.

Twelve Dollars.

Woodward's Suburban & Country Houses.

70 Designs. **$1 50.**

WOODWARD'S Cottages and Farm Houses.

188 Designs. **$1 50.**

WOODWARD'S Country Homes.

150 Designs. **$1 50.**

GEO. E. WOODWARD, Publisher, 191 Broadway, New York.

AMATEURS.

Illustrated Catalogue of P. S. STUBS' Tools and Files, Twist Drills and Chucks, Screw Plates and Taps, Machine Screws, Emery Wheels, Foot Lathes, etc.

GOODNOW & WIGHTMAN, 23 Cornhill, Boston.

Voice from the Adirondacks.

Voice from the Northwest.

Voice from the Lowlands.

HEAR THEIR REPORT OF THE

Maynard Rifles

For Accuracy, Range, and Convenience. Descriptive Circulars, with TARGET REPRESENTATIONS, and Price List, furnished on request by letter. Address

MASS. ARMS CO., Chicopee Falls, Mass.

$732 IN 31 DAYS

Made by one Agent, selling SILVER'S PATENT ELASTIC BROOM. Over 50,000 now in use. Recommended by Hon. Horace Greeley and American Agriculturist. One county reserved for each Agent. C. A. CLEGG & CO., 28 Cortlandt st., N. Y., or 126 Washington st., Chicago, Ill.

TO LUMBERMEN.

POWERS' METALLIC ELEVATOR Belting. Patented Nov. 2th, 1869.

For conveying sawdust and refuse matter in saw mills and manufactories. This belting has been in use for two years in some of the best mills in the West, and has fully established its claim as being the best sawdust conveyor in the world. It is perfectly flexible, runs in a trough upon ordinary wooden pulleys, and is a perfect conveyor of sawdust, bark, chips, etc. It is in no way affected by mixture, does not rot, rust, or stretch, and is warranted in all cases satisfactory. It costs no more than rubber belting, and is far more durable. Descriptive circulars, with certificates, price list, etc., will be sent upon application. Address

W. P. POWERS,
North La Crosse, Wis.

A BEAUTIFUL Full-Gilt Photograph Album, holding 20 Photographs, sent free for 25c. Address J. J. HAMMOND, Holliday's Cove, W. Va.

PATENT RIGHT FOR SALE.—The Pat. Independent Keyhole Guard & Protector is offered for sale, entire, if applied for soon. The Letters Patent bear date Jan. 25, 1870. The Guard may be attached to any ordinary door lock, thus securing safety without procuring a new lock. Fair profits and moderate cost. Address FLANAGIN & ELKINTON,
Penn's Grove, N. Y.

L. L. Smith,
NICKEL PLATER,

65 CROSBY ST., NEW YORK.

LICENSES granted by the U. N. Co., 173 BROADWAY

SOMETHING NEW!

TWO MILLION COPIES of the Annual SHAKESPERIAN ALMANAC for 1870, will be given away, and, in order that the distributing may be made as rapidly as possible, I should deem it a favor to send, pre-paid, ten or fifteen copies to any person who will judiciously distribute them in his locality. One of its features are the Seven Ages of Man's Life, illustrated in a masterly manner. Address DR. O. PHELPS BROWN, No. 21 Grand st., Jersey City, N. J.

Elgin Watches

MANUFACTURED BY

The National Watch Co.,

All the Grades of the Elgin Watches,
INCLUDING THE

"LADY ELGIN,"

READY FOR

Spring Trade.

The Company also call the attention of Watch buyers to the fact that the Elgin watches now offered have several peculiar improvements over all others, and also a new

Patent Dust Excluder,

so constructed as to inclose the works, and form a protection against dust, enabling the movement to remain in order, without cleaning, double the time that a watch will ordinarily run without this protection.

The Company feel confident, after having had their Watches three years in market, and selling many thousands of them in all parts of the country, that the **Elgin Watches are the best time-keepers now offered to the American public, for either Ladies' or Gentlemen's use, Railway or other uses.**

OVER FIVE HUNDRED DEALERS,

in various parts of the land have unreservedly indorsed them. They are in use upon numerous lines of Railway, including UNION PACIFIC and the PENNSYLVANIA CENTRAL, and officers of these roads, with other prominent R. R. officials, indorse them as the best Watches for the use of R. R. employés and travelers, yet introduced.

The following are presented as specimens of these testimonials.

Union Pacific R. R., Office of Gen'l Sup't, Omaha, Dec. 16, 1869.

Hon. T. M. AVERY, President National Watch Co., Chicago, Ill.:

DEAR SIR:—During the month that I have carried one of your "B. W. Raymond" Watches, it has not failed to keep the time with so much accuracy as to leave nothing to desire in this regard. For accuracy in time-keeping, beauty of movement and finish, your Watches challenge my admiration and arouse my pride as an American, and I am confident that, in all respects, they will compete successfully in the markets of the world with similar manufacturers of older nations. They need only to be known to be appreciated. Yours, most respectfully,
C. G. HAMMOND, Gen'l Sup't.

Office of the Hudson River Rail Road, Gen'l Sup't, New York, Jan. 17, 1870.

T. M. AVERY, ESQ., President National Watch Co.

DEAR SIR:—The Watch made by your Company, which I have carried the past two months, has kept excellent time. I have carried it frequently on engines, and have been on the road with it almost daily. During this time it has run uniformly with our standard clock. Truly yours,
J. M. TOUCEY, Gen'l Sup't.

The following dealers, also, in various parts of the country, have certified that they consider the Elgin Watches to be all that the Company have advertised them, as better finished, more correct and durable, than any in market, of similar price, and that they have great confidence in recommending them to the public on account of their general merit.

Wheeler, Parsons & Co.,	N.Y.C.	Hellebush,	Cincinnati.
Warren, Spadone & Co.	"	E. Jaccard & Co.,	St. Louis.
Middleton & Bro.	"	N.E. Crittenden & Co.,	Cleve'd
T. B. Bynner,	"	M. Burt,	"
Henry Ginnel,	"	Morse, Reddin & Hamilton,	
Geo. W. Pratt & Co.,	"		Chicago.
Scott, Barrett & Co.,	Pitteb'gh	J. H. Hense,	Denver, Col.
J. R. Reed & Co.,	"	M. M. Baldwin & Co.,	San
Dahme & Co.,	Cincinnati.		Francisco, Cal.
Jenkins & Hatch,	"	Koch & Dryfus,	New Orleans.
C. Oskamp,	"	And over 400 others.	

Various grades and prices made to suit different tastes.

No movements retailed by the Company.

☞ Call on your Jeweler and ask to see the Elgin Watches.

Business Office and Salesroom National Watch Company, **159 & 161 Lake st., Chicago.**

TO MANUFACTURERS AND OTHERS.—For Sale at Gananoque, Canada, the premises known as the "Globe Works," consisting of Machine Shop, Bolt Shop, and Foundery, with the Machinery contained therein, admirably adapted for manufacturing purposes. The water-power in connection with the above is ample and unfailing. For terms apply to DR. HENDERSON, Solicitor, Kingston, Canada.

BARNES' CAST STEEL & WROUGHT Iron Self-adjustable Pipe and Stud Wrench, for Railroad Shops, Gas Fitters, Steam Engines, etc. Price $5 each. Address C. THESSELT, Fort Wayne, Ind.

NATIONAL WAGES TABLES—Showing any wages at $1, $1·25, $1·50, $1·75, $2, etc., to $7 per week, by hours, 8 days, 9 days, 8 days, days, etc., to four weeks. Half bound, 50c.; cloth, 75c.; Tuck, $1. By mail. Sold by Booksellers. Address NELSON BOW, Publisher, 20 and 30 W. Broadway.

CARVALHO'S

Steam Super-Heater,

Saves fuel, and supplies Dry Steam for Heating, Boiling etc. HENRY W. BULKLEY, Engineer, 59 Broadway, N.Y.

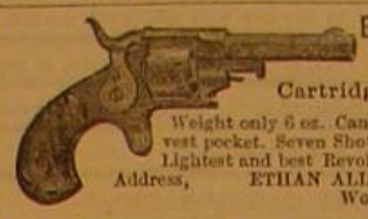
STEAM ENGINES—From 5 to 500-H. P., of superior construction, and equal in economy of fuel to the best. Apply to "The Passaic Machine Works," WATTS, CAMPBELL & CO., Proprietors, Newark, N. J.

For Sale Cheap—One 60-H. P., second-hand engine. Apply as above.

LAMB KNITTING MACHINE

"THE OLD RELIABLE."—Over 10,000 Machines in use—sold mostly by canvassing agents. The only kind that knits circular and flat work of all sizes, and narrows and widens on both. Send for circular and SAMPLE STOCKING.

LAMB MACHINE CO., Chicopee Falls, Mass.



E. Allen & Co's NEW MODEL Cartridge Revolver.

Weight only 6 oz. Can be carried in the vest pocket. Seven Shots, 22-100 calibre. Lightest and best Revolver in the world. Address, ETHAN ALLEN & CO.
WORCESTER, Mass.

J. F. WERNER, Model Maker & Machinist, 62 Center st., New York. Working Models, Experimental Machinery, Gear Cutting, & Stud & Rivet Turning

---

AMERICAN
SPIRAL SPRING BUTT CO.,

27 PARK ROW, NEW YORK.

Factory, Trenton, N. J.. ...Office, No. 2 Jacob st., N. Y.
☞ Branch Office for Pacific Coast, No. 606 Front st San Francisco, Cal.

London.....48 Cannon street.

H. KOHNSTAMM,
Manufacturer of
ULTRAMARINE,

And Importer of English, French, and German Colors, Paints, and Artists' Materials, Bronzes, and Metals. No. 100 Chambers street, between Broadway and Church st., New York.

WIRE ROPE.

Manufactured by

JOHN A. ROEBLING'S SONS,
Trenton N. J.

FOR Inclined Planes, Standing Ship Rigging Bridges, Ferries, Stays or Guys on Derricks & Cranes Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co., Leeds, Mass.

2d-Hand Machinery

FOR SALE—viz:—

50 Milling Machines, Index and Universal Milling Machines, Horizontal Milling and Drilling Machines, Drill Presses, Hand and Power Lathes, Edging Machines, Drops and Punch Presses, Screw Machines, etc., etc., 1000 feet of 1 3-16 Shafting, with Hangers and Pulleys, etc., etc., by O. F. WINCHESTER,
New Haven, Conn.

FRENCH BAND SAW MACHINES, SAWS, Taper Files, etc., Machines for Scroll, Re-sawing, and Log; Mongin & Co.'s Band Saw Blade all Sizes, on hand and made to order.

All Styles of Band Saw Machines in operation at Mahogany Mill, 10th st., E. R.

GEORGE GUEUTAL,
Sole Agent for the U. S., 39 West 4th st., N. Y.

Improved Awning.

COMMUNICATIONS concerning purchase of Rights should be addressed to J. B. ARMSTRONG, Urbana, Ohio.

It obviates the necessity for posts or supports at the front edge, provides a neat and effective shelter for the awning when rolled up, is perfectly easy to spread out or roll up, is simple in construction, and remarkably tasteful in appearance. It can be fully or partially extended to admit or exclude light without the aid of a step ladder, and in a moment's time. We consider this form of Awning as far superior to any form of canvas awning heretofore employed, combining, as it does, durability, convenience, and comeliness. On exhibition at Wilcock's, Nos. 25 and 27 Park Place, New York. See Sci. American dated Nov. 27, 1869.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of Superior Quality, on hand and finishing. For sale Low. For Description and Price, address NEW HAVEN MANUFACTURING CO., New Haven, Conn. 5 tf os

---

ROOT'S WROUGHT IRON SECTIONAL

Safety Boiler.

Composed of best Wrought Iron Tubes, tested to 500 pounds; no large sheet iron, shell or thin cast iron to explode. Absolutely safe, economical, durable, and efficient. Send for pamphlet. Also, Steam Engines, Steam Pumps, etc. ROOT STEAM ENGINE CO.,
95 and 97 Liberty st., New York.

REPEATING FIRE-ARMS

FOR SALE, viz:—

5,000	Winchester Repeating	Muskets.
5,000	"	Carbines.
5,000	"	Sporting Rifles.
2,000	Spencer "	Muskets.
20,000	" "	Carbines.
500	" "	Sporting Rifles.
2,000	Joslyn Single Breech-loading Carbines.	

Metallic Cartridges of all sizes, by
WINCHESTER REPEATING ARMS CO.,
New Haven Conn.

☞ T. V. Carpenter, Advertising Agent. Address hereafter, Box 773, New York city.

HARRISON
SAFETY
BOILER.

First-Class Medal World's Fair, London, 1862.
First-Class Medal, American Institute Fair, New York, October, 1869, for safety, economy of space, and economy of fuel.

400-H. P. AT A. T. STEWART'S.
437-H. P. AT JERSEY CITY SUGAR REFINERY, and over 1,000 boilers in other places.

Harrison Boiler Works, Philadelphia.

John A. Coleman, Ag't,

110 Broadway, N.Y., and 139 Federal st., Boston

SAWS. EVERY DESCRIPTION. Guaranteed under a forfeiture of $1000, to cut the most lumber with the least expense

Henry Disston & Son,

PHILADELPHIA. Special attention paid to our new style Circular, Belt, Cross-cut, Mill, and Hack Saws. Orders received from England, Ireland, and the Continent.

Oak Leather Belting.

Manufactured by CHAS. A. SCHIEREN, 22 Gold st., N.Y

SCHLENKER'S PATENT
BOLT CUTTER
NEW INVENTION. ADDRESS,
HOWARD IRON WORKS, BUFFALO, N.Y.

Reynolds'

Turbine Water Wheels.

No Complex, Duplex, or Triplex complications. All such are costly, perishable, easily clogged, inaccessible. Mill Gearing, Shafting, and Pulleys. Send for Illustrated Pamphlet

GEORGE TALLCOT,
96 Liberty st., New York.

UNION

Spoke Works.

SPOKES, HUBS, RIMS and Plow Handles. All goods warranted seasoned and of the best quality. JOHN G. DAVIS & SON,
Southwest cor. of Leopard and Otter sts., Philadelphia

STEAM, BLAST, AND VACUUM GAGES. Prices greatly reduced. Only reliable STANDARD Mercury Gage known. PHILIP S. JUSTICE,
14 N. 5th st, Philadelphia. 42 Cliff st., New York.

H. B. Smith's

PAT. WOOD-WORKING MACHINERY, Molding, Mortising, Tenoning, Resawing, and Planing Machines, warranted to be the best in use, and to give satisfaction or be returned within thirty days.
Address H. B. SMITH,
Smithville, Bur. Co. N. J.

GREAT ECONOMY IN

WATER POWER.

LEFFEL'S DOUBLE TURBINE WATER WHEEL.—Best Wheel in Existence.—Manufactured by

JAS. LEFFEL & CO.,

at Springfield, Ohio, and New Haven Conn.

New Illustrated Pamphlet for 1869 sent free on application. We will warrant our Wheel to give a Higher per centage of Power than any wheel tested at Lowell. os ds eow

---

HAYES' RAILROAD FAST EXPRESS WAGES COMPUTING TABLES. Computed by the day and hour, from 1 to 999 hours, and from 60c. to $5 per day. Splendidly printed and bound. Price $2 50, sent by mail. Circulars, with sample table, free. Address LESTER HAYES,
Cleveland, Ohio.

Building Paper.

This is a hard, compact paper, like an ordinary book cover, and is saturated with tar and used on the outside of frame buildings, under the clapboards, also under shingles and floors, to keep out damp and cold. It is also used on the inside, not saturated, *instead of Plastering*, and makes a warm and cheap wall. It costs only from $8 to $30 (according to size) to cover houses on the outside. ☞ Samples and descriptive circulars sent free.

Address, ROCK RIVER PAPER CO., Chicago,

Or B. E. HALE, 22 & 24 Frankfort Street, N. Y., Agent for the Eastern States.

Or, E. C. PALMER & CO., New Orleans, Gen'l Agent for Southern States.

To Hardware Dealers.

THE Tanite Co.'s OIL STONES, carefully made from Tanite and Emery, are Superior to any natural stone. Liberal discount to the trade. For circulars address

THE TANITE CO.,
Stroudsburg, Monroe Co., Pa.

THE TANITE EMERY WHEEL.

For circulars address as above.

$20 A DAY TO MALE AND FEMALE Agents to introduce the BUCKEYE $30 SHUTTLE SEWING MACHINES. Stitch alike on both sides, and is the only *LICENSED SHUTTLE MACHINE* sold in the United States for less than $40. All others are infringements, and the seller and user are liable to prosecution and imprisonment. Outfit free. Address W. A. HENDERSON & CO., Cleveland, Ohio.

Cotton Seed Oil Mills.

BUILT by Contract, or otherwise. For Estimates and Machinery apply to Oil Machinery Manufacturing Co. of N. Y. city, 96 Liberty st. P. O. Box 1188

The Combination Rule

And Lead Pencil, one of the most novel and useful articles ever offered to the public. No person should be without it. Sample pencil sent for 10c. and 2c. postage stamp. Two for 15c. Manufactured wholesale by
E. A. WHITFIELD, 62 Doane st., New York.

PRINTED with the Ink of CHAS. ENEU JOHNSON & CO., Tenth and Lombard sts., Phila 59 Gold, corner Ann st., New York.