of air, representing 11 miles in length. The two stations at the ends of the line have each two engines of twenty-five horse power, with pumps, which in ten minutes exhaust nearly 3 miles of line, and which at the same time compress in the reservoirs sufficient air to fill, at the moment required, double that length of line.

The reservoirs at each of these three stations are connected together by means of cast iron tubing, 5 inches in diameter, placed in the same excavation as the main tubes, at a depth of 2½ feet, and opposite to each relay a branch is connected with a reservoir. containing 20 cubic yards of air for the service of the relay in both directions. The relays are placed under the main tubes in a small chamber closed by a trap similar to those used for sewers. The exhaust relays are placed at two points, each one quarter of the length of the line from the end, and consequently with half the length of the line between them. The exhaust receivers are much larger than the others, and they are connected with the central establishment by means of cast iron pipes 4 inches in diameter, which contribute to regulate the action of the exhausting engine. In order to insure regularity in working, large reservoirs are also placed at each end of the line, and all the accumulators of pressure are in communication with each other. At the central station, the capacity of the pressure reservoirs is 80 cubic yards, and those at the termini half that amount. The exhaust reservoirs have a capacity of 97 cubic yards at the central station, of 60 cubic yards at each intermediary station, and of 52 cubic yards at each terminus. The last named are not in communication with the rest, and thus 5½ miles of tubing are dispensed with.

With this arrangement no obstacle can arrest the movement of the trains; the pressure in the reservoirs is an atmosphere higher than that of the ordinary air. The train is introduced through a kind of sluice gate, or chamber, closed by means of a valve at the entrance of the line, and the train is furnished with a piston fitted with leather, which has precisely the contour of the tube. When the train is in place, the valve is opened and the pressure turned on. With a pressure of one atmosphere behind, and a partial vacuum in front, the train starts with a speed of 130 feet per second, or 7,800 feet per minute; and at the moment of passing the first pressure relay, at 3,650 feet from the terminus, it opens behind it a large valve, which places the line in communication with the reservoir of 20 cubic yards placed at the foot of the relay, and this second current of air takes up the work. When the train arrives at a station, an electric bell informs the attendant at the station last past, and he closes the valve there.

In order to suspend the current of air of one relay, after the train has entered the next section, the pressure itself is made use of to set in motion a piston in the cylinder; this piston moves, of course, at the same rate as the current of air, and it is so calculated that the piston stops at the end of the section. Admission is thus cut off, but the tube is full of compressed air. When the train has passed the third and fourth sections of the line, and has arrived at the first vacuum relay, the compressed air which follows the train acts on a piston freed by the train, and this piston enters rapidly into a cylinder with a valve, which puts the up line in communication with the exhaust of 60 cubic yards at this station. The compressed air escapes rapidly through a safety valve placed above the exhaust relay. As soon as the train has passed the fourth section, the current of air of the relay presses on the exhaust valve, closing the line, and the train proceeds at the same rate as before; but by a special arrangement, the speed slackens towards the terminus to avoid any shock. The time occupies in the transit is eight minutes.

The pneumatic tube itself is formed of wrought iron tubes brazed, 4 inches interior diameter, with a thickness of ⅛ inch, and weighing about 26 lbs per meter run =8 lbs. per foot. They are joined together by means of six bolts with an india rubber washer between. In places the tube is curved, but the radius generally exceeds 19 feet.

The working of the line is regulated throughout by electric signals, and a special wire connects all the pressure relays, and tells whether they are in action or not. The carrier pistons are of iron, with an interior diameter of 3⅛ inches, and 9 inches in length; the boxes are placed in a case which is slightly conical. On the outer surface of the carrier pistons are fixed two strips of metal which are turned to 3·95 inches, and started longitudinally so as to produce rotation, this arrangement causes the wear to be equally distributed, and, should a grain of sand get into the tube, it prevents stoppage by friction. The piston is also hollow and similarly provided, and between the two strips of metal there is a series of openings into the interior to receive any dust which may arise from the wear of material. The packing leather is fixed solidly between two washers by means of a bolt at the end.

The exhaust relay consists of a piston which enters a vertical cylinder, and draws with it a disk, which closes the pneumatic line, and a valve, which opens a large rectangular orifice communicating with the reservoirs. The top of the cylinder in which the piston moves is connected by a tube with the back part of the valve above mentioned, and above the valve is a grating closed by a clack. The piston is held down by means of a bolt until the passage of the train, when the adjoining pressure relay comes into action. The piston thus released has then its upper portion in relation with the exhaust and the lower acted upon by the pressure of two atmospheres, and therefore it rises rapidly into the cylinder and closes the line, at the same time opening the lower valve by which the exhaust is effected; all the air at a pressure superior to that of the atmosphere has been expelled by the safety valve placed above, so that the aspiration only draws off air at the normal pressure. The pressure relay is the main feature of the arrangement; but should it not act, the train is only retarded, not stopped.

Each of the pressure relays is in immediate communication with its reservoir of 20 cubic yards for accumulating the pressure. These reservoirs are formed of iron plate like ordinary boilers, and are tested to about 570 lbs. per square inch; they are made cylindrical in form, the ends being closed with a single plate; they are 16 feet 6⅞ inches long and 6 feet 6¾ inches in diameter; the exhaust receivers differ from the others by having their ends concave without and convex within. The tubes which connect the relays of pressure are about 5 inches in diameter, and those of the exhaust 4 inches. The pumps make forty strokes a minute, are single action, with cylinders 3 feet 3⅜ inches in diameter, and 4 feet stroke; they draw or force nearly 1 cubic yard of air at each complete stroke of the piston.

[For the Scientific American.]

THEORIES OF THE EARTH'S INTERIOR.

It has long been known that, as we descend towards the center of the earth, the temperature rises at the rate of one degree Fah. for about 50 to 60 feet of descent. In artesian wells and other deep excavations, the increase of heat has been noted and mathematically calculated; but so many elements of error enter into the computation—among which are heat due to friction of the implements used in excavation, animal heat of those engaged in the work, and currents of air from the surface—that the results can be considered, at best, as only approximations to the truth. If the heat increased uniformly from the surface to the center, it would be sufficient, at a depth of two or three hundred miles, to melt the most refractory substances to be found at the surface. Hence the general conclusion is that the solid crust of the earth cannot be over two hundred miles in thickness. But Hopkins calculates, from data furnished by the precession of the equinoxes, that the crust of the earth has a thickness of eight or ten hundred miles, while Hennessey's investigations, in a similar way, assign six hundred miles as the maximum thickness of the crust.

Till within a few years, all below this crust has been supposed to be in a state of igneous fusion, and our earth to be, for the most part, in a liquid state. This conclusion has long been looked upon as a necessary result of the nebular hypothesis which is now so generally accepted. The fact that molten matter appears at the surface, in the form of volcanic ejections, trap dikes, and the like, and that warm, hot, or boiling springs are variously distributed over the globe, has given foundation and sufficient authority to these views. But these phenomena are not conclusive proof that the interior of the earth is in a state of fusion; for, according to Mallet—though in substance previously enunciated by others—the crushing force, due to the lateral pressure caused by shrinkage of the earth's crust, is sufficient to melt the hardest rock; and the pressure that would crush 7,200 cubic miles of rock would generate heat enough to cause all the volcanicity on the globe. According to other authorities, the melted matter of volcanic eruptions may be produced by local chemical action in the earth's crust. Again, the diversity of composition in the ejected matter would tend to the conclusion that all cannot come from a single and uniform molten mass. Many veins of rock, also, which were formerly looked upon as injected into or through the surface strata from the melted mass below, are now regarded by many eminent geologists as of aqueous origin, and formed by the percolation of heated water holding solid matter in solution through the surrounding rocks into a fissure, and its subsequent evaporation, which left the rock material to gradually fill the fissure.

Recent observations of Hopkins have shown that the melting points of various bodies, as wax, sulphur, and resin, are greatly and uniformly raised by pressure; and, from analogy, the opinion is now gaining ground that the interior portion of the earth, though heated far above the point of fusion, may be solid from the great pressure to which it is subjected. While it is now considered true that sufficient pressure on ice—which expands in freezing—will change it to water, pressure upon any substance that contracts in the process of congelation, like rock, would, on the other hand, aid in its solidification. Hence the conclusion is that the pressure existing at great depths would make solid the molten mass at a temperature at which, under a less pressure, it would have remained liquid.

There are two hypotheses based on the supposition of a solid nucleus. The first, maintained by William Hopkins, Scrope, Shaler, and others, supposes solidification to have commenced at the center of the liquid globe, and to have advanced towards the circumference. Before the whole mass was congealed, the portion near the surface became of so great a consistence as to prevent the sinking of the cooled and heavier particles, thus giving rise to a superficial crust, from which consolidation would proceed downwards. Between the nucleus and the crust is conceived to be matter still in a state of more or less perfect igneous fusion, either forming a continuous sheet of comparatively slight depth, or deposited in isolated reservoirs or subterranean lakes. It is interesting to notice, in connection with this hypothesis, that a similar one was reached from the study of terrestrial magnetism. Halley "supposed the existence of two magnetic poles situated in the earth's outer crust, and two others in an interior mass, separated from the solid envelope by a fluid medium, and revolving, by a very small degree, slower than the outer crust."

The second hypothesis is credited to Dr. T. Sterry Hunt. He accepts the first hypothesis so far as to admit a solid nucleus and a superficial crust. But he conceives it to be improbable that the cooling of the crust should have commenced at so early a period that the molten matter beneath it was too deep to become entirely solidified by subsequent refrigeration. He holds that only a thin belt of partially fluid matter exists between the solid exterior and the core, and argues, with Sir John Herschel, that this layer is not matter still unsolidified, but the under portion of the crust encroached upon by internal heat, "disintegrated and modified by chemical and mechanical agencies, impregnated with water, and in a state of igneo-aqueous fusion." Keferstein whose work, published in 1834, has been generally overlooked, considers the liquid stratum, or seat of volcanic action, as part of the sedimentary formations which have been subjected to a peculiar kind of fermentation, which crystallizes and arranges the elements in new forms with an evolution of heat as the result of chemical action. But Hunt rejects as irrational the idea of subterranean combustion or fermentation as a source of heat.

Professor Hall denies that we have any positive evidence of a former molten condition of any considerable portion of the earth, but denies it absurdly, on the lack of the visible exposure of any considerable part of the primitive crust. Sir William Thomson argues that the phenomena of precession and mutation demand greater rigidity of the earth than would be possible with a comparatively thin crust. This is opposed by Delaunay, but is again recently defended by Thomson.

The question respecting the earth's interior lies at the very foundation of the disputed theories of mountain formation, of earthquakes, and of volcanic action. S. H. T.

The Steam Yacht Hermione.

The steam screw yacht Hermione has been recently constructed for Captain W. H. Gordon, R. N., by Messrs. Edwards and Symes, yacht builders, Cubitt Town, London. She is one of the fastest of her size and construction afloat; the following are the principal dimensions: Length, 55 feet, breadth, 11·0 feet, depth 5 feet 4 inches; diameter of cylinders, 8 inches; length of stroke, 9 inches; heating surface, 325 square feet; grate surface, 13 square feet. When the engines were worked about three quarter power, the speed was 13 miles an hour, or 11·28 knots, the number of revolutions 220 per minute, and mean effective pressure in cylinders 80 lbs. per square inch. The power developed would thus be 80·4 indicated horse power, and the constant in the Admiralty formula $C=\frac{s^3 \times D^2_3}{I.H.P.}$ would be 120, an exceedingly good result for so small a yacht. From these results it is anticipated by the builders that, when the engines are worked to their full power, namely, 120 indicated horse power, at least 14½ miles or 12 58 knots will be obtained. The yacht is constructed entirely of teak and mahogany, coppered, and copper fastened, and is fore-and-aft schooner rigged, and, considering her great power and speed, has good accommodation for crew forward, while she has a neat polished mahogany cabin aft, and her fittings throughout are of a superior quality. The engines are high pressure surface-condensing, with inverted cylinders, and fitted with separate variable expansion valves, and screw reversing motion of most compact and effective construction. The condenser and pump are small, being only required to condense the steam for supplying the boiler; but when working at half speed a good vacuum is obtained, or by means of a suitable cock the exhaust can be turned into the chimney. The propeller shaft is of steel, cased in gun metal and fitted with one of Hirsch's patent propellers, which works very satisfactorily, and with little vibration. The boiler is of locomotive construction of steel with brass tubes, and has been proved to 200 lbs. per square inch. It is fitted with a superheater and has given very good results, making steam well. We may here mention that the above firm have recently constructed the beautiful little steam launch Black Angel, 33 feet keel, 5 feet 6 inches beam, built entirely of mahogany, copper fastened, for Messrs. Willans and Ward, and fitted by them with Willans' patent three cylinder engine, which worked very satisfactorily, driving the boat at a speed of 13 miles per hour. The total weight of boat and machinery was under 2 tuns. The engines are very neat, and most compact and handy. Messrs. Edwards and Symes have likewise in construction the first ferry boat for the Thames Steam Ferry Company for heavy goods traffic, plying on the Thames between Rotherhithe and Wapping.—*Engineering.*

Pictorial Tiles.

A comparatively new mode of employing tiles for the lining of rooms has been introduced by Messrs. Simpson, who have decorated the interior of several important buildings in this manner. The tiles are placed together in their unglazed state, and a picture is painted upon them in colors suitable for firing. They are then taken asunder and put into the furnace, and then subjected to great heat and glazed. If this is successfully accomplished, the tiles can now be fixed against the wall of the room and present an absolutely indestructible decoration, which can be washed as often as it is needed, though from its high glaze it is not easily apt to catch dirt.

Copying Pencils.

Pencils are now sold by stationers, the marks of which may be copied in the same manner as writing made by the pen with ordinary copying ink. The method of preparing the leads is as follows: A thick paste is made of graphite, finely pulverized kaolin, and a very concentrated solution of aniline blue, soluble in water. The mixture is pressed into cylinders of suitable size and dried, when it is ready for use Gum arabic, it is said, may be substituted for the kaolin

Useful Recipes for the Shop, the Household, and the Farm.

A permanent and handsome reddish color may be given to cherry or pear tree wood by a coat of a strong solution of permanganate of potash, left on a longer or shorter time, according to the shade required.

Chloroform, which has undergone decomposition by exposure, can be easily purified by shaking it up with a few fragments of caustic soda.

Fruit is kept in Russia by being packed in creosotized lime. The lime is slaked in water in which a little creosote has been dissolved, and is allowed to fall to powder. The latter is spread over the bottom of a deal box, to about one inch in thickness. A sheet of paper is laid above, and then the fruit. Over the fruit is another sheet of paper, then more lime, and so on until the box is full, when a little finely powdered charcoal is packed in the corners, and the lid tightly closed. Fruit thus enclosed will, it is said, remain good for a year.

Pounded alum will purify water. One teaspoonful of alum to four gallons of water will cause a precipitation of the impurities.

To estimate the quantity of shelled corn on the cobs in any given space, level them, and measure the length, breadth, and depth; then multiply these dimensions together, and the product by four. Cut off the last figure, and the result will be the number of bushels of shelled corn and the decimal of a bushel.

Bee moths can easily be killed in large numbers by setting a pan of grease, in which is a floating ignited wick, near the hives after dark. The moths will fly into the light and fall into the grease.

The best way to catch hawks or owls is to set up a high pole with a steel trap on the top. The birds often alight directly in the trap.

Pictures may be transferred to painted surfaces in the following manner: Cover the ground with an even coat of light colored carriage varnish, which should be allowed to set (nearly as dry as if for gilding). If the print to be transferred be colored, soak it in salt and water; if not colored, use water alone. Remove superfluous water by pressing between blotting pads, and then place the picture face down upon the varnish, pressing it smooth. When the varnish is dry, dampen the paper and rub it off with the finger. The picture will be found upon the varnish, and another coat of the latter should be added to bring out the effect. This process answers equally well for glass or metal surfaces.

For the protection of iron and steel tools against rust, Vogel recommends a solution of white wax in benzine. The latter, heated, will dissolve half its weight of wax. This will preserve the metal, even from the action of acid vapors. Apply with a brush.

Round steel wire rope will bear more than double the weight required to break iron rope of similar diameter.

The following rule for strength of iron pipes is based upon the fact that a 10 inch pipe, one inch thick, will stand the pressure of 100 yards head of water. The coincidence of one inch of metal to every 10 inches diameter and 100 yards pressure should be remembered. For every inch in the diameter of pipe, increase or deduct $\frac{1}{10}$ of an inch; and for every yard of pressure, increase or deduct $\frac{1}{100}$ of an inch.

In calculating the strength of iron columns, the safe plan is to find the diameter of a solid column necessary to bear the compression, and then distribute the same area of metal in tube form or a hollow column.

A mixture of peroxide of manganese and water glass is recommended to be applied to cooking stoves when they are red hot, as it is said to make a good blacking, not as liable to burn off as common black lead.

According to recent experiments of MM. Kundt and Lehmann, the velocity of sound in pipes filled with water increases with the thickness of the sides of the tubes.

To make yellow wax into white wax, the former is boiled in water, spread out into thin layers, and exposed to the light and air. This is repeated until all the color is gone.

Cuttings of many kinds of plants, not usually increased with facility by amateurs, may be rooted easily in a Wardian case in the sitting room.

An Alloy of Copper Adherent to Glass.

An alloy of copper which will adhere to glass or porcelain is made by mixing from 20 to 30 parts of copper in powder, (obtained by the reduction of the oxide by hydrogen or by the precipitation of the sulphate by zinc) with sulphuric acid and then with 7 parts of mercury. The mixture is triturated and mingled with care. The acid is removed by washing in hot water, and the mass allowed to dry. At the end of 10 or 12 hours, the latter becomes quite hard and susceptible to a fine polish. On heating it softens, but on cooling does not contract. This alloy may also be used for joining delicate objects which will not withstand very high temperatures.

Chloral as an Anæsthetic.

Hydrate of chloral, administered hypodermically, has recently been used as an anæsthetic with success in the hospital at Bordeaux, France. The operation was a resection of the internal and external nasal nerve, involving some fifteen minutes' work and, necessarily, excessive pain to the patient. The drug took effect in eight minutes, and complete insensibility on the part of the sufferer resulted.

BRICKS made in Japan, and paying 20 per cent duty, are now imported into San Francisco The quality is superior. Japanese brick makers can beat the world in the cheapness and excellence of their productions.

[American Chemist.]

Prices of Metals.

The prices of many of the dearest may be considered also as "fancy prices," and actually a whole pound of some of the metals named could hardly be obtained at even the extravagant figures annexed. In compiling the following table, we have taken the prices of the rarer metals from Trommsdorff's and Schuchardt's last price lists; we have assumed the avoirdupois pound as equal to 453 grammes, and the mark as equal to 24 cents gold.

An inspection of the table is not without interest; it is evident that the prices of the metals bear no relation to the rarity of the bodies whence they may be derived, for calcium, the third in the list, is one of the most abundant elements. Even that excessively sparingly distributed metal, indium, the most recently discovered element, stands tenth in the list, below strontium. The metals of the alkalies seem to occupy a remarkably low place in the table.

Metal.		Value in gold per lb. avoirdupois	Metal.		Value in gold per lb. avoirdupois.
Vanadium	cryst. fused,	$4792·40	Tellurium,	fused,	$ 196·20
Rubidium	wire,	3261·60	Chromium,	fused,	196·20
Calcium,	electrolytic,	2446 20	Platinum,	fused,	122·31
Tantalum,	pure,	2446·20	Manganese,	fused,	108·72
Cerium,	fused globules,	2446·20	Molybdenum,		54·31
Lithium,	globules,	2228·76	Magnesium,	wire and tape,	45·30
Lithium,	wire,	2935 44	Potassium,	globules,	22·65
Erbium,	fused,	1671·57	Silver,		18·60
Didymium,	fused,	1630·08	Aluminum,	bar,	16·30
Strontium,	electrolytic.	1576·44	Cobalt,	cubes,	12·68
Indium,	pure,	1522·08	Nickel.	cubes,	3·80
Ruthenium,		1304·64	Cadmium,		3·26
Columbium,	fused,	1215·28	Sodium,		1·26
Rhodium,		1032·84	Bismuth,	crude,	1·95
Barium,	electrolytic,	924·12	Mercury,		1·00
Thallium,		738·89	Antimony,		·36
Osmium		652·82	Tin,	recent quotations,	·25
Palladium,		498·30	Copper,	" "	·22
Iridium,		466·59	Arsenic,	" "	·15
Uranium,		434·88	Zinc,	" "	·10
Gold,		397·72	Lead,	" "	·06
Titanium,	fused,	239·80	Iron,	" "	·01½

DECISIONS OF THE COURTS.

United States Circuit Court---District of Massachusetts.

PATENT ELEVATOR.—OTIS TUFTS *et al. vs.* THE BOSTON MACHINE COMPANY.

[In equity.—Before Shepley, Cir. J.—January, 1875.]

Shepley, J.:

This is a bill in equity brought for alleged infringement of letters patent issued to Otis Tufts, dated August 9, 1859, and extended seven years, for improvements in hoisting apparatus, and adapting that apparatus for use as a passenger elevator for carrying persons to and from the different stories in hotels and other buildings; and also of letters patent dated May 28, 1861, for improvement in the mode of suspending and operating the elevator; also, for infringement of letters patent dated December 11, 1866, for improvements in the mode of adjusting the length and tension of the ropes of an elevator; and of letters patent dated December 11, 1866, for an improvement in elevator guides. All of these patents were duly assigned to complainants.

The twelfth claim in the patent of August 9, 1859, No. 25,061, is the one on which the infringement is claimed, and is as follows:

"I claim passing the shipping rods and the cord or rod that operates the friction brake through the car or platform, for the object and purposes set forth."

The shipping rods are described in the specification as passing up through the car the whole hight of the building and operating a shipper, by which the driving belt is shipped from a fast to a loose pulley when the power is to be thrown off. The cord is also described as passing down through the car or platform, so as to be accessible within the car, which operates to apply a counterpoise spring, so as to put on a friction-strap brake, its office being to check or perfectly stop the descending motion of the car at the will of any person within the car or on the gallery.

The great advantage (claimed) of running the shipping rods and the cord or rod up through the car itself is that they are thus rendered accessible to the conductor, or any person within the car, without incurring the danger of protruding the hand or arms beyond the same while in motion.

If the twelfth claim be construed broadly as a claim for passing any rod or cord, by means of which the appropriate mechanism is operated to move the car up and down, or hold it at rest, *through the car or platform*, instead of outside the car or platform, it is void for want of novelty.

George V. Hecker has, in his flour mill in Cherry street, New York, an elevator which was put in twenty years ago, and which has been in successful operation since that time. A chain passed through the roof and floor of the cage or car, which operated upon a friction clutch and a brake. The conductor or operator within the car could, by means of this chain, operate the shipping apparatus and the brake without incurring the danger of protruding the hand or arms beyond the car while in motion. This chain is connected with a brake in such a manner that the brake could be thrown off by pulling upon the chain, or put on by relaxing the pull upon the chain, a weight then causing the brake to produce friction on the friction pulley. The pull upon the chain, by raising the weight, first relieved the friction of the brake, and then threw into gear a friction clutch, and the car ascended by the force of the motor applied through the friction clutch. When it was desired to stop, the pull upon the chain was relaxed, and the weight threw the clutch out of connection and the cage stopped, held in place by the brake. When it was desired to descend, a slight pull was made upon the chain, sufficient to relax the pressure upon the brake, but not to throw the friction clutch into gear. The car then descended under control of the brake, by force of gravity, at a speed dependent upon the will of the operator who controlled the brake. Within the car was a lever with one long and two short arms, with a friction pulley on each of the short arms, which device was for the purpose of making necessary pulls upon the chain which passed through the inside of the car. The friction clutch is a well known substitute for a shaft with a fast and loose pulley, a belt, and a belt shipper.

It is manifest, therefore, that, in view of the state of the art, the twelfth claim in the patent can only be sustained by giving to it a much narrower construction than the one claimed for it, and one strictly in accordance with the language of the claim, namely:

Passing *the* shipping cords *and* the cord or rope that operates the friction brake through the car and platform, for the objects and purposes set forth.

The defendants do not infringe the twelfth claim thus construed, or any other claim of the patent of August 9, 1856.

Infringement is also alleged on the first and second claims of the patent of May 28, 1861, which are as follows:

"1. Constructing an elevator or hoisting apparatus with a series of two or more hoisting ropes or chains having independent attachments, and winding simultaneously upon the hoisting drum for greater safety, substantially as described.

2. Equalizing the strain upon the series of ropes or chains of my improved elevator or hoisting machine by automatic adjustment, substantially as described."

To construct "an elevator or hoisting apparatus with a series of two or more hoisting ropes or chains having independent attachments, and winding simultaneously upon the hoisting drum," was not new at the date of this patent. Letters patent of Great Britain to Frederick Levick and Joseph Fieldhouse, sealed January 13, 1854, describe a hoisting car or carriage with two hoisting ropes wound around the same spirally grooved drum. The ends of both of these ropes are attached to a connecting chain, which passes under a pulley attached to the top of the car. Another chain is attached to the first-described chain in such a manner that the chain surrounds the pulley. If one breaks, the other, with the chain, forms a loop around the pulley, and sustains the car. The second chain converts the attachment into an independent attachment of each rope, and, when one rope breaks, the other rope will continue to sustain the weight of the car. Mr. Renwick, the expert, correctly states that—

The ropes act precisely as if they were attached to the two ends of a horizontal lever whose center, upon which it could turn, was secured to the top of the car.

In the patent of 1861 the patentee, Tufts, says:

I do not confine myself to the precise method herein described of effecting the automatic adjustment of the strain upon the hoisting ropes, as I sometimes accomplish the same by a rocking lever, when two ropes are used.

It is plain that, in the Levick and Fieldhouse elevator, the two ropes, when intact, have equal strain upon them, and that, if one of the ropes should break, the weight of the car would be supported by the other rope. If the chain should break under the pulley the car would fall, as it would in the form last described or the Tufts elevator, if the attachment to the car at the center of the rocking lever should fail.

It is contended that the purpose of the two ropes in the Levick and Fieldhouse machine was to keep the cage in the center of the shaft, and that, therefore, the Levick and Fieldhouse patent does not anticipate the first claim in the patent of 1861. The answer to this is, first, that, whether they were placed there for the purpose of greater safety or not, they effected that result; and, secondly, that the patentees evidently contemplated that as one of the beneficial results to be attained by the use of two ropes instead of one, as there is no conceivable use for the cross chain before described, except in case of the breakage of one rope, to form a loop around the pulley, thus attaching the surviving rope to the car.

In the elevator which was placed in the mill of the Parsons Paper Company, at Holyoke, Massachusetts, in 1856, there were two hoisting ropes, having independent attachments to opposite arms of a rocking lever; they jointly and equally took the strain of the weight of the car, and each rope was sufficient to sustain the load put upon the machine. This elevator has been in constant use, and when one rope has broken the elevator has been worked several days with the remaining rope. The ropes in the Holyoke elevator did not, it is true, wind around a drum, but were passed around a series of pulleys, and the free ends of the ropes were attached to counterpoise weights, but these two means of winding up a rope to which a weight is attached are well known substitutes for each other.

Without adverting to the other patents which have been introduced in evidence, and relied upon in defence in this branch of the case, enough has been stated to show that the first claim of the patent of 1861 is void for want of novelty.

The second claim in this patent, namely, "equalizing the strain upon the series of ropes or chains of my improved elevator or hoisting machine by automatic adjustment, substantially as described," can only be construed as a claim for the described means of performing this function, and for well known substitutes for or equivalents of those described means. The means the patentee describes are three. One of those modes is by means of a rocking lever, or system of rocking levers, to the ends of which the suspensory ropes are attached. The Holyoke elevator and the Levick and Fieldhouse elevator both anticipate this claim. One had a rocking lever, and the other had a device which operated in the same way and produced the same result. If the claim is valid, defendants are not proved to have infringed it, for there is no evidence in the record tending to show that the contrivance used by the defendants—of a series of pistons fitting into a set of cylinders with connecting pipes, the cylinders being filled with an incompressible fluid—were, at the date of the patent, known substitutes for either of the means of adjustment described in the patent.

The patent of December 11, 1866, No. 60,441, so far as the second claim concerned, which is the one alleged to be infringed, relates to "mean for manipulating relative adjustment within reasonable limits of the series of ropes or chains, which are independently attached to the winding drum and to the car of the elevator, so that an equal degree, or very nearly equal degree, of tension can be had upon each rope or chain of the series, by proper attention or manipulation on the part of the party having such elevator in charge."

The patentee states in his specification that considerations of saving in the first cost of construction render it desirable in many instances to substitute for an automatic adjustment of the ropes or chains a means for adjusting them from time to time, as occasion may require; in other words, that the means of manipulatory adjustment in the patent No. 60,441 were intended as a substitute or alternative means for the automatic adjustment described in the patent of May 28, 1861, No. 32,141. The defendants have put into their elevators means of mechanical manipulatory adjustment, but they do not perform the function described by Tufts as a substitute for the automatic adjustment, because the tension on the ropes or chains cannot be varied by any manipulation of the nuts. Owing to the presence of the equalizer, the means of automatic adjustment in the defendant's elevator, the nuts or the stirrups may be screwed up or down to their fullest extent on any rope, without any variation of the tension on that or any other rope. As defendants do not infringe, it is not necessary to consider the question of novelty of this claim.

The patent of December 11, 1866, relates to means by which an elevator is so guided as to prevent the sway thereof, and the noise consequent upon contact with the ways by which the elevator is guided. The claim is as follows:

I claim combining the suspended car of an elevator with the ways or rails which confine it, by means of guides kept by springs constantly in contact with said ways or rails, when said guides are so arranged as to be capable of motion toward and from the rails.

In the provisional specification, filed April 6, 1858, in the office of the Commissioner of Patents for Great Britain, accompanying the petition of Louis Tétar Van Eiven for a patent, which did not proceed to the great seal, but which specification was printed by Eyre & Spottiswoode, is a clear and accurate description, which contains all the features of this claim. Respondents' exhibit No. 13 is a model of the device described in the Van Eiven specification. It fully anticipates every feature of this claim.

Complainant's bill dismissed.

[*James B. Robb*, for complainants.
Causten Browne, for defendants.]

Recent American and Foreign Patents.

Improved Lint Room Floor.

John N. Stitt, Sardis, Miss.—This lint floor consists of small rods arranged with spaces between, and on joists sufficiently wide to spring a little by the weight of persons walking on the floor—the object being to allow the dust which settles down to the floor to escape, and thus avoid soiling some of the cotton which comes in contact with the floor.

Improved Cultivator.

Edward Nauman, Uniontown, Ohio.—The cultivator is supported at its front end by a small wheel, whose position or angle to the frame may be changed at will by means of a rod which extends back and rests on a notched bar connecting the handles, whereby the wheel may be held locked in any desired position. This construction enables the plows to be held up to the row of plants, when plowing upon inclined ground, by the action of the wheel.

Improved Gas Generator.

James C. Mitchell, Lancaster, N. H.—This invention relates to certain improvements in the manufacture of illuminating gas, designed to utilize any kind of fuel for the production of the gas, and applicable to limited manufacture, as for private families, etc. It consists in a retort placed within a furnace, or a common stove, if desired, and having an airtight door of peculiar construction, and a communication direct with the furnace, by means of which construction the gaseous contents of the retort may be drawn into the furnace and burned when the airtight door is to be opened for drawing and recharging the retort. It also consists in the peculiar construction and arrangement of the tops of the purifiers and an airtight door to the retort, and the combination with the feed pipe to the gas holder of a ball valve to prevent back pressure.

Improved Plow.

Henry Krog, Sr., Washington, Mo.—The connecting ends of the share landside bar, and seat are welded together, while the outer ends of plates on the share and bar are riveted or bolted together.

Improved Hoop Fastening.

William Spalding, Petersburg, Mich.—This consists of a triangular plate clip, which covers the outer end of the hoop. It has points, which are passed through the hoop and clinched on the inside.

Improved Saw Setting Device.

Lewis A. Greely, Elmira, Ohio.—This is a block of steel, on the working side of which is a projecting face, a fulcrum, and a set screw, which latter passes through the gage and is turned or graduated from the back side. The screw may be turned so as to project more or less, as may be desired, according to the degree of set of the teeth. The gage is held against the saw with the hand in such a manner that the set screw rests or bears against the saw, and the fulcrum against the base of the tooth. The tooth is then bent over the fulcrum until the point touches the face, which is accomplished by means of a hammer and anvil or screw wrench.

Improved Means for Raising Water into Railroad Tanks.

Tyree Rodes, Wales Station, Tenn., assignor to himself and T. A Atchison, same place.—The invention consists of a grapple attachment, which is hinged to the cow catcher beam, and used at either side of the locomotive, the grapple taking hold of a wire rope stretched on running gear along the track, and operating thereby the tank pump, until a post near the end of running gear strikes the clamping lever and drops the wire rope.

Improved Veneer Cutting Machine.

Curtis T. Fairchild, Hartfield, N. Y., assignor to Burrell, Ives & Co.—The improvement in this machine is a presser roller, arranged for adjustment independently of the knife, but feeding along with it. It bears upon the log so far above the said knife that, before the edge of the part split off comes in contact with the knife, and is subjected to the lifting force thereof, the said presser roller will force the said piece down upon the main body of the log so hard that it will overcome the force of the knife, and be thereby prevented from being forced off.

Improved Folding Seat for Horse Cars.

Cevedra B. Sheldon, New York city.—This consists of an extra seat contrived to be carried under the main seat when not required for use, and to be readily shifted into position for use above and in front of the main seat on a jointed and folding standard, rising up so that it will project from under the main seat between the passengers sitting on it without inconvenience to them. The extra seat is so jointed to the top of the standard that it turns up edgewise at right angles to the longitudinal direction of the seat for affording the necessary freedom to the sitters on the main seat to rise up or sit down. The object is to afford seats which may be temporarily brought into use when more persons are in the car than can be seated on the ordinary seats.