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RAILROAD BUILDING ON THE BANK OF THE HUDSON.

The west shore of the Hudson River is bordered, at intervals for a great part of its length, by high, rocky bluffs which descend abruptly into the water. In many places there is no shore, the rocks extending far beneath the water and at so great an inclination that it is impossible to construct a shore either by filling in or by the use of crib work. This formation taxed the skill and ingenuity of the engineers of the New York, West Shore, and Buffalo Railway, whose line, in many places, skirts these hills at the water's edge, and to successfully overcome these obstacles was a work of great magnitude, and necessarily incurred heavy expense. The engravings show four points on the line of the road, each of which presented difficulties peculiarly its own, and called for treatment specially adapted to its own circumstances.

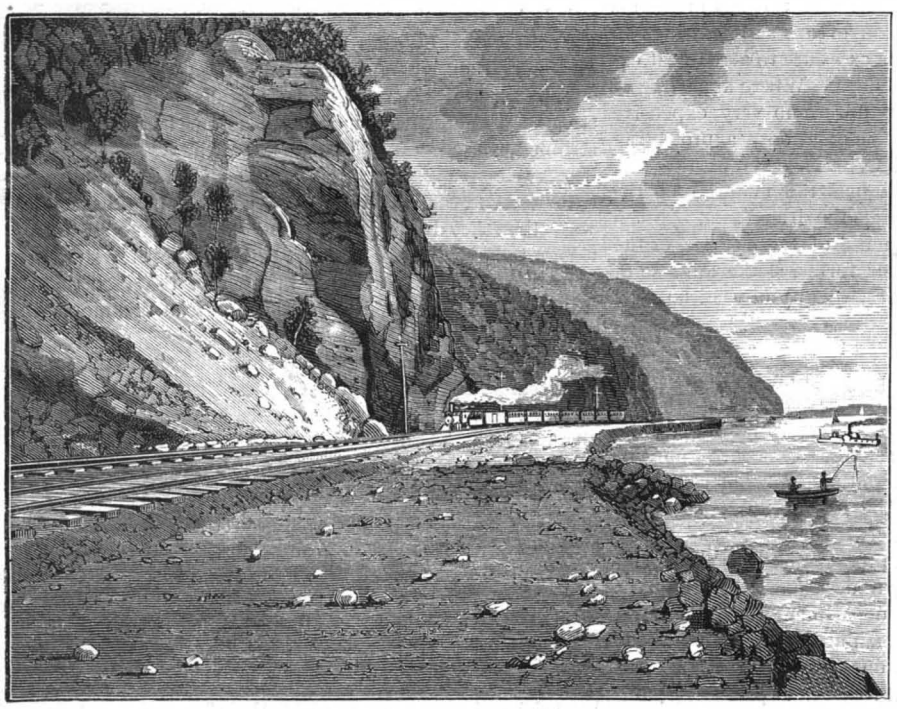
Emerging from the West Point tunnel the road passes through Target Hill, a large gravel knoll used by the cadets for target practice, and then around the base of Storm King mountain. The filling shown in the foreground was taken from the Target Hill tunnel. The telegraph pole shown in the picture, taken as having a length of thirty feet, is a good scale by which to judge of the height of the vertical cut at the inside of the track.

Dunderberg mountain is just north of Caldwell's Landing, and dips into the river in a nearly perpendicular line. Both here and at Storm King the engineers, when running their lines, were compelled to lower themselves by ropes fastened to the trees above, and in many places holes had to be cut in the rock to receive the legs of the transit, the smooth face of the cliff offering no resting place even large enough for that purpose. Men suspended in the same way drilled holes in the rock, and from the pockets thus blasted out in the side of the mountain the excavation was carried forward in either direction and downward until the grade of the road was reached. Along Dunderberg mountain the depth cut out varied from fifty to seventy-five feet, according to the line of the road and the inclination of the slope.

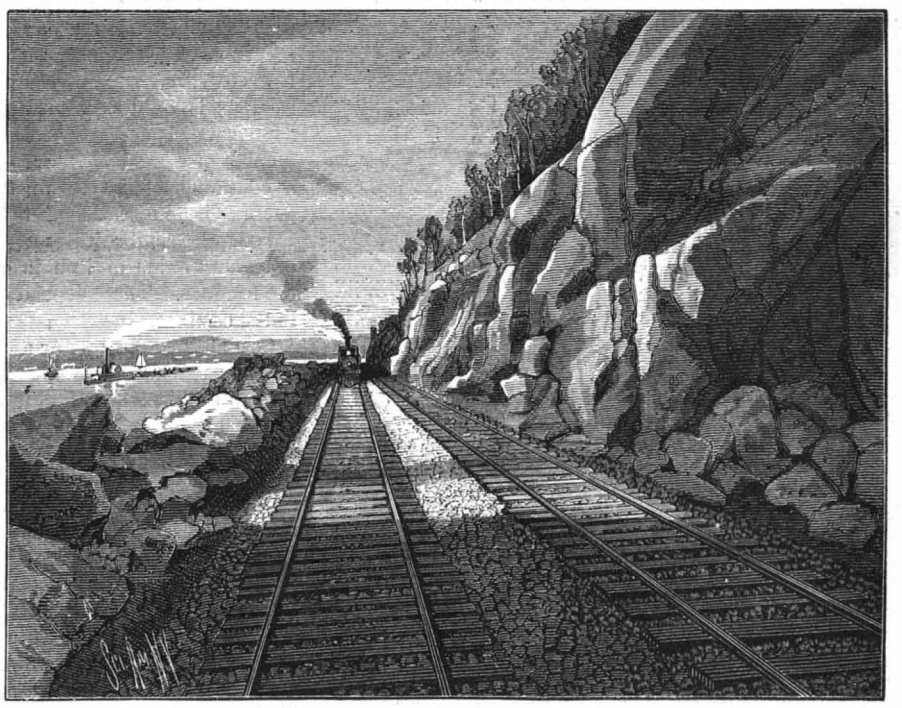
The third engraving shows a small cove located at the base of the hill upon whose summit is Cozzens' hotel. This cove, or, more properly speaking, indentation in the face of the bluff, has a steep rock bottom sloping toward the river channel and presenting no ledge near the shore that would securely hold filling. To have made the line of the road pass along the inner side of this would have necessitated the removal of great quantities of rock on each side, and rather than do this a bridge having a span of two hundred and ten feet was built.

Just below Fort Montgomery the hill falls back, making a little bay, the bottom of which is precisely similar to the one just described. The road, after passing through an open cut in a rocky nose projecting into the river—shown in the foreground of the fourth engraving—crosses this bay and enters upon a ledge excavated in the manner already described. An attempt was made to make a roadbed by filling in and also by crib work loaded with stone, but the labor was lost, as the material slid off into deep water. The bridge spanning the bay is a through truss double intersection, having a length of two hundred and ninety feet and a width of thirty feet between centers. To erect this bridge in its place in the line of the road was next to impossible, since there was no foundation for the false work. It was therefore decided to erect the bridge on a line fifteen feet back from the road line. The piers upon which the ends of the bridge were to rest were extended this distance and covered with iron plates. The bridge was then erected, there being no difficulty in finding places for the frame work across the bay. After the bridge had been finished it was moved fifteen feet into position by means of hydraulic jacks.

AN ice breakwater of striking proportions was formed in Buffalo during the recent very cold weather. On the lake shore, where the breakers run high, a train of cars was placed to protect the adjoining tracks from ice forming from the spray. The Buffalo *Express* says that "for a quarter of a mile they are a solid wall of ice. Most of the cars cannot be seen at all. On the lake side the ice is two or three feet thick. The spaces between the cars are filled solid with ice, and the space between the wheels under the entire length of the train is a miniature Mammoth Cave—a gallery of stalactites and stalagmites. Several of the cars have crushed and caved beneath the weight of the ice. It is a veritable train of ice."



STORM KING.
FOOT OF COZZENS.



DUNDERBERG MOUNTAIN.
FORT MONTGOMERY.

ROCK WORK ON NEW YORK, WEST SHORE, AND BUFFALO RAILWAY.

Scientific American.

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BILLS FOR THE NULLIFICATION OF PATENTS.

We noticed last week the introduction of three bills in the House of Representatives, the direct effect of which, if they become laws, will be in any case to largely impair, and in probably the majority of instances to utterly nullify and destroy, the rights of patentees as they exist under our present laws. The bills referred to, as also two others of similar character, will be found in full in another part of this paper. One of the latter is also from an Indiana representative, thus making three proposed laws by members from that State aimed at the nullification of the patent laws. The bill of Mr. Wood goes even further than those of his colleagues, for, besides protecting the infringer who can claim a want of knowledge of the invention, it prohibits the trial of patent cases in the United States courts where the amount in controversy does not exceed $200. This would leave the investigation of all the technicalities of invention, and the construction of the almost distinct science of patent law, with local courts and juries, and when a decision had once been reached it would not be worth anything except in a very limited section.

ANNEALING AND CASE HARDENING.

Many articles of cast iron are so hard when removed from the mould that it is impossible to use drill, file, or chisel on them. Even the softest of gray iron may turn out hard when cast in thin shapes, the sand mould chilling them as effectually as a designed cast iron chill. These castings may be made useful, instead of being relegated to the scrap heap, if properly treated. Those from gray iron may be annealed be being packed in coarse sand (quartz) in iron boxes and subjected to a red heat for forty-eight hours. A little common lime, unslaked, added to the sand may quicken the annealing, but is liable to "rot" the iron. If the castings are of "white" iron, they should be packed in cast iron boxes with powdered sal-ammoniac and forge scales in the proportion of one by weight of sal-ammoniac to twelve of forge scales. Usually twenty-four hours' heating will be sufficient to soften the most obdurate castings and render them amenable to tools. But the heat should be kept up to a generous red, a "soaking" heat, during the period of annealing. Where small castings, requiring after-treatment with tools, are an important part of the manufacture, proper ovens are ready to receive the castings. In fact this last method is that employed for the conversion of ordinary castings to malleable cast iron, only that the exposure to a red heat extends to seven, sometimes nine, days. Where annealing of castings is only occasionally required, no very expensive contrivance is necessary. In some cases only a protecting blanket of material is necessary to insure even heating and a continuous temperature; in others the material of the packing is an essential, as it affects the iron to an appreciable depth; as, for instance, the use of forge scales, or the progenous oxide of iron in other forms, as the tail slag of the foundry. These depend on the quality of the iron used in the castings.

Cast steel can be readily annealed by similar means. Usually an exposure of twenty-four hours to a red heat while packed in lime is sufficient to anneal any cast steel. Bars of fine cast steel used for hand engraving are so annealed, when the material cuts as soft as pure silver. Of course, none of these methods are necessary where the usual "black 'neal," or the heating and burying in the forge ashes, is sufficient to render castings tractable to tools.

Case hardening is so simple a process that it is surprising that machinists do not generally understand it. They ought to know enough of the smith's department to temper steel and to case harden iron. For small articles a section of gas pipe with cap thimbles screwed on the ends is a sufficient box, but for larger articles a cast-iron box is preferable; and in either case it is well to have the covers luted with fire clay. But if the heating is done in a charcoal fire the cover may be dispensed with. The packing should be either charcoal, with bits of horn, raw hide, and leather, or better, broken or ground bone. The ground bone makes a steel surface sooner than the charcoal. An exposure of two or three hours to a red heat is usually sufficient to case harden for general purposes. A quicker method, which gives a superficial coating, is that of heating the piece red hot and then covering it with a powder of prussiate of potash and sal-ammoniac in equal proportions. This flux melts immediately, when the piece should be plunged in cold water. Articles case harden best when most polished.

PROPOSED AMENDMENT OF THE COPYRIGHT LAW.

The copyright law as it stands requires the author to register his work before it is actually published; and the author is thus encouraged to produce new and original matter for the benefit of the public.

House bill 62, introduced by Mr. Rosecrans, of California, reverses all this, as it permits any person who has ever written anything, at any period of his life, after it has been published in any newspaper or periodical, no matter how long ago, to take out a copyright on any portion of his old stuff. Should this bill be passed, it looks as if it would give rise to many complications. For example, a newspaper editor would not be able to republish or make quotations from articles or items in the back numbers of his own journal without the risk of violating somebody's copyright; for although the articles may have been originally written for and paid by the editor, he has under this bill no right to reproduce the same or any part thereof. In fact, the bill is so worded that it would be dangerous for an editor to reprint the back numbers or volumes of his periodical.

The bill is evidently very crude, and requires amendment. It ought to provide that no article shall be copyrighted after having been once published, unless the words "copyright intended" shall be printed over the article at the time of first publication. Furthermore, some limit of time after publication ought to be fixed, during which a published article may be copyrighted, say sixty days.

IS OUR WATER POWER FAILING?

It is quite manifest that the streams, ponds, swamps of all this part of the country, including certainly New England and the Middle States, are most remarkably destitute of water. And this deficiency has been steadily becoming more strongly marked and more troublesome for some time past, certainly as much as three years. The complaints from the large manufacturing towns where their dependence is on water power have been great, and reasonably so, and manufacturers have been discussing seriously the question whether their trust must not be placed on steam instead of water.

The records correspond with this general impression. Taking New Haven as a fair example, the rain-fall there for the past ten years has averaged 42·9 inches, while for the last four years it has been but 36 4, and of the last two it has been 31·6. The average from 1873 to 1879 inclusive was 46·9, and Mr. Schott, in the *Smithsonian Contributions*, vol. xviii., p. 93, gives it for the years from 1804 to 1867 (though the records are incomplete) as 44·43.

It becomes for us certainly a very serious question whether this is merely a phenomenon, an aberrant affair which will be temporary and transient, or whether we are to accept the belief that a change is in progress which involves a failure of precipitation, with all the evils and the desolation which it must bring. And if so, have we at command any means of arresting the difficulty even partially?

We hear much said about the injury caused by clearing the country of its forest growth and the death and desolation which must follow from it. But while it is manifest and certain that land lying open to the sun must be subject to more evaporation than that which is densely shaded, yet the laws of vegetable growth do not permit any such fearful results as have been suspected, nor does experience show that such results have occurred. The immense quantity of exhalation from the forest leaves, placed in correlation with the evaporation by solar heat when that forest land has been cleared and cultivated, is an element not to be disregarded.

It is constantly stated that springs have dried away, and streams dwindled much in size, as our lands have been stripped of their trees. In a small way and in limited areas this may be true, and doubtless is so, but not to any great extent. And that our rivers are pouring into the sea less water than they discharged two hundred years ago, we have no reason to believe. And this we say in face of the statement quoted in commencing, and in face of the fact that the water supply throughout New England is at this moment so lamentably deficient.

We cannot regard our present condition as anything more than temporary, for several reasons. In the first place, it is merely local, for while we have been suffering from want of water here, it has been necessary to go but a moderate distance to find precisely the opposite state of things. No further than merely beyond the Alleghanies their complaint has been of excessive rains and destructive floods. And still again, we are but experiencing that which has repeatedly occurred since the founding of the colonies, a cycle of drought which after a few years will have passed away. According to the best information which we can obtain, there is no good reason for believing that our average rain-fall, taking a properly extended series of years, is any less now than it was in the times of our earliest history.

And it is certainly not possible to refer the scanty rain-fall of the last two or three years to any effect of forest clearing, for no such thing has taken place. The great tree destruction of New England and the Middle States was done and its effects experienced long ago.

We must therefore look to some other cause for our present state of drought, and it may be to a great variety of causes. And in doing so we shall encounter the question whether the average precipitation throughout the world is undergoing gradual diminution, not to be measured by human life time, perhaps scarcely by that of nations, and yet capable of being traced in human history. It is a question full of interest.

The Blind.

The last English census reveals the encouraging fact that the proportion of the blind to the population has decreased with each successive enumeration since 1851, in which year account of them was taken for the first time. The decrease in the decade ending in 1881 was much greater than in either of the preceding decennial intervals, the number of cases returned on this latter occasion being 22,832, equal to one blind person in every 1,138. This decrease is fairly attributable to the progressive improvement in the surgical treatment of affections of the eye, and to the diminished prevalence among children of small-pox.

EXHIBITION programmes for 1885 are now in order. A National Hungarian Exhibition is to open May 1, 1885, and continue to October 15. In connection therewith will be an international section for tools, machines, and motors, agricultural machines, patented inventions, etc.

BRASS FINISHING BY ACIDS.

Many articles of brass cannot readily be finished by the file or by abrading substances, owing to the intricacies of their surfaces. Especially is this true of brass castings of an ornamental character. But a most elegant finish can be obtained by means of acids, which may be protected, if desired, by means of a lacquer or varnish; the acid finish, however, is generally preferred without the addition of a varnish.

If the work to be finished is greasy, it should be cleaned by heating and dipping in acidulated water—vinegar and water, or washing soda in water—and then in clear water. The finishing bath may be either nitric acid two parts, water one part; or one part sal ammoniac, one part sulphuric acid, one part nitric acid, one part water; all by measure, and the sal-ammoniac to be dissolved in water until a saturated solution is obtained. The articles should not be allowed to remain in the acid more than ten seconds, then taken out, plunged into clear, cold water, thence into hot soapy water, and dried in hot sawdust.

Hooks and Eyes.

For more than a dozen years the manufacture of hooks and eyes for women's and children's dresses may be said to have been dead, buttons having superseded them. But there are indications that hooks and eyes are again to come into use, at least to a considerable extent. If this should prove to be the case, it will gladden the hearts of some who have preserved their machinery from the scrap heap. Thirty years ago the State of Connecticut had manufactories within her territory that produced these little articles to the value of $112,000 annually at fifteen cents a gross. Previous to 1830, or thereabout, hooks and eyes were made by hand and sold at $1.50 per gross.

The machines for making hooks and eyes are quite ingenious, those for the hooks being capable of making ninety per minute and those for the eyes one hundred and twenty per minute. That for making the hooks takes the wire from a reel through a straightener, cuts off the wire to the exact length, when a blade strikes the piece in the middle of its length, and two side blades moving simultaneously bend the wire double, laying the two halves of its length close together and parallel. Then two pins rise, one on each side of the ends of the wire, to form the eyes of the hook, and two semi-rotating pushers bend the ends round the pins, making the eyelets for sewing the hook on to the fabric. The unfinished hook is still perfectly flat, when a horizontal pin, and a vertical bender working upward, curve the double end of the hook, and a presser flattens the end to a "swan bill." The eye is formed in another machine, but by means of similar appliances. Brass wire is used for silvered hooks and eyes and iron wire for the black or japanned goods. The silver coating is made by mixing an acid precipitate of silver with common salt and the cream of tartar of commerce to produce a paste. Certain proportions of this paste and of the brass hooks and eyes are placed in a tumbling barrel, and by attrition and affinity the brass and silver unite. The articles, as they come from the tumbling barrel, are of a lusterless white, but are polished by being placed in cotton cloth bags with bar soap and rubbed with hot water under the vibrating arm of a washing machine.

A New Torpedo and Shrapnell Shell.

Under date of Constantinople, January 9, the New York *Herald* prints a dispatch which states that at the trial of torpedoes recently on the Bosphorus, Daoud Bey, a Turk, produced a torpedo, invented by himself, the motive power of which is obtained by means of rocket tubes. Daoud's weapon attains a speed of 200 yards in 20 seconds, and is declared by experts to eclipse any torpedo yet invented.

It adds to this an account of Gen. Berdan's invention, viz.: a fuse for shell projectiles that cannot possibly fail to effect explosion at the right moment. Briefly stated, the principle involved consists in utilizing the rotary motion of the projectile to ignite a fuse after the former has made a certain number of revolutions. The rifling of the gun determines the space passed over in each revolution, thus permitting the adjustment.

THE habit which the editors of some so-called practical journals have of sneering at and deprecating the use of symbols for indicating mathematical operations is a very pernicious one, and is an insult to their intelligent readers. It is almost superfluous to say that any man who does not know that + means *plus*, and − means *minus*, and that $\sqrt[3]{}$ denotes that the cube root is to be extracted, does not know enough to perform the operations indicated, even though they be expressed in the plainest English possible. Those who do know enough to add, or subtract, and extract the cube root, know the value and convenience of the symbols denoting those operations, and the only effect any attempt to decry their use can possibly have upon their minds is to create a feeling of contempt for those who ridicule their use.—*The Locomotive.*

PETROLEUM wells to the number of 2,890 were put down in 1883, against 3,260 in 1882, and 3,852 in 1881. In 1883, 245 dry holes were found, against 180 in 1882, showing that the limits of the different oil fields are now pretty well defined, and the prospector who goes outside of them has a pretty good chance to fail in "striking oil."

Tanning by Electricity.

Making leather is now essentially the same in principle as it was in the days of the Pharaohs. Improvements have been made in the methods of depilating, or removing the hair, from hides and skins, and machinery helps to forward the work in both tanning and finishing, but the aid of a vegetable astringent—tannic acid—is necessary in combination with the gelatine of the hide to make true leather. And this is a long operation, requiring, for sole leather, from four to eight months, and the lighter harness and upper leathers less in proportion. It is now claimed that this long tanning process can be shortened by electricity, and an English patent has been issued with this object. It is well known that hides being "sweated" for unhairing give off a great deal of ammonia, from the combination of the nitrogen of the gelatinous tissue with hydrogen. This process of decomposition is immediately checked when the hides go into the tan liquors, but the precise chemical reactions which take place in the vats have never been clearly understood. In heavy sole leather it is claimed that, in many cases, tannin is deposited by precipitation in the hide cells, besides that which is directly taken up by combination with the gelatine.

The new process proposes to hasten the tanning by enhancing chemical affinity by means of electrical currents, and thus making these reactions more active. The method is to pass a current of electricity through the vats containing the tannin infusion and the hides. The vat becomes simply a large voltameter, in which gases are evolved by the decomposition of water—hydrogen at the cathode and oxygen at the anode. The arrangements are such that the hydrogen alone acts upon the hides, where it rapidly combines with the nitrogen of the tissues and produces decomposition of the gelatinous matters. After a short period, according to the usual manner of changing tan liquors, the solution of tannin is replaced by a more concentrated one, and the current is reversed in direction, so that oxygen is evolved among the hides, where it oxidizes the tannin and precipitates it in the pores and intercellular spaces in the tissues.

The First Steam Fire Engine.

Along in 1864, an errand led the writer into Greenwood's foundry, at Cincinnati, and having to wait a while to see Mr. Greenwood, I was allowed the privilege, then seldom granted, to go into the work room where the inventor of the steam fire engine was at work. It was a long, high room, the walls on the east side being hung with drawings of the engine. Beneath the drawing ran a long work bench, and at this stood a very diminutive specimen of a man, short and spare, stoop-shouldered even to deformity. He had a square white paper cap on his head, and was busy measuring something while I looked at him. I saw that his head redeemed his poor body, for it was massive, and the eyes had in them the light of genius. In a moment he turned to me and asked: "Did Mr. Greenwood give you permission to come in here?"

"He did, sir; he told me to come and see how the steam fire engine was getting on, so I could report its progress to Mr. Probasco" (of the great hardware house of Tyler Davidson & Co.).

"Ah, very well," said the inventor, "very well. My name is Latta, Moses Latta, and Mr. Probasco knows me well, and, as you come from him, you shall see what few see. Can you in any way or to any extent understand drawing on the wall?" I confessed that I could not. "Well, it is very simple. Let me explain. The engine is intended to throw at any time eight streams of water—four from each side—and whenever the water can be obtained in sufficient quantity for the eight streams, there will be no trouble in supplying them to the eight lines of hose. It is intended, of course, to take the engine to the scene of the fire with horses—four horses. As the engine starts out the furnace is fired up, and ordinarily, by the time we shall arrive at the fire, steam will be up and the engine ready for service. Eight of these large streams forced out on to a fire with the pressure we shall be able to command will drown any fire; even four of them, well directed, will be of wonderful value. But," added Mr. Latta, "the trouble is that there is no certainty that this or any other steam fire engine will ever run to a fire. You are not aware, probably, how bitter the feeling of the volunteer firemen is against this engine. They say it shall never throw a stream on a fire in this city. The recent riots here show what a mob can do in our city, and I fear sometimes that I shall never live to see this grand idea brought into the service of the world. My steps are dogged; spies are continually on my track; I am worried with all sorts of anonymous communications, threatening me with all sorts of ills and evils unless I drop work on this engine and pronounce myself a failure."

The old man's eyes flashed as he said: "I'll never give it up! I'll build it, and there are men enough in this city to see that it has a fair trial, and it shall have it. When it is finished, it will be heard from at the first fire, and woe to those who stand in its way!"

With that we separated. As the time approached for the public trial of the engine, the volunteer firemen were in a ferment. It would never do to destroy the engine before it had a trial, and to destroy it after a successful exhibit of its powers was made equally useless, so it was understood that no demonstration, *pro* or *con*, would be made on it until it should come to a fire; then it was to be rendered useless, and all who had a hand in its working were to be rendered useless, too.

The public trial came off. The engine far exceeded in efficiency anything that had been claimed for it by its inventor or by his backers, and a feeling of satisfaction swept over the city at the knowledge that such a great auxiliary power was with them to fight fire. Still it was known, or believed generally, that its first appearance at a fire would be the signal for as bloody a riot as had ever disgraced the city. The volunteer fire department was there, as everywhere else, a political ring, far more efficient, under ordinary circumstances, at the polls than at a fire, and its members were to a man selected for their "influence" at the voting precincts and for their ability to make the contents of the ballot box, when it was emptied, show "by a large majority" their man ahead, no matter what kind of ballots had gone into it. Then, if this "steamer" was of any account, it would ruin and break up not only the companies, but their friends and backers, and the manufacturers who built hand engines.

One night an alarm rang out from some great warehouse on Third Street, near Main. A minute or two elapsed to the listeners on Main Street, above Fourth, and then down came the great steam fire engine, four mammoth gray horses in front of it at a gallop, the smoke streaming from its stack, the fire flashing from its grates, its ponderous wheels grinding the cobble stones into powder as they struck them, and, as the great monster went down the hill, people woke as out of a trance, and started after it.

The engine was brought in front of the block, and soon stream after stream shot from it. The warehouses were among the most valuable in the city, and were stored with costly goods. The time had come, the engine was there, four streams had been gotten on, when the cry, "The hose is cut!" rang out. Then the melee began, but the citizens were stronger than the volunteer firemen, and after a struggle the "steamer" drowned the fire and was taken home.

The next morning Moses Latta awoke to find himself famous, and the action of the appreciative citizens of Cincinnati soon put him in a position where his genius was made more available to the world. The "steamer" of today has little in it outside of the fact that it is built to effect the same purpose as was Latta's engine, but that was the germ of all those which now at the tap of the electric bell seem to hitch themselves to the horses and tear down our streets when an alarm is struck.—*Chicago Herald.*

Oiling the Waves.

Wm. J. Card, captain of the coasting schooner Turban, reports some interesting particulars of his use of oil to break the force of waves, on a voyage from North Carolina to Nova Scotia, in September last. The schooner was of 163 tons registered, with a cargo of 300 tons railroad iron, which loaded her down until her gunwales were not more than two feet above water. On the third day out the weather became boisterous, and on the following morning, soon after daybreak, the vessel ran into a gale. The wind was varying about from southeast to northeast, and blew up a heavy sea, the fury of which was increased by a cross sea, caused by the hurricane that had prevailed for some days to the southward of the vessel's position. The schooner, by reason of her deep loading, was completely at the mercy of the seas, which broke over her with terrific force.

Soon after noon Capt. Card stationed a man in the bow of the schooner—it being unsafe to venture on the jib-boom, which was in danger of being carried away by the seas—and directed him to throw over from a small oil can a little oil at the approach of every "comber." The oil was poured out through the spout of the can, and the Captain estimates the quantity thrown over each time at rather less than an ordinary tumblerful. As the supply on board was limited, it was thrown out only at the approach of very heavy seas.

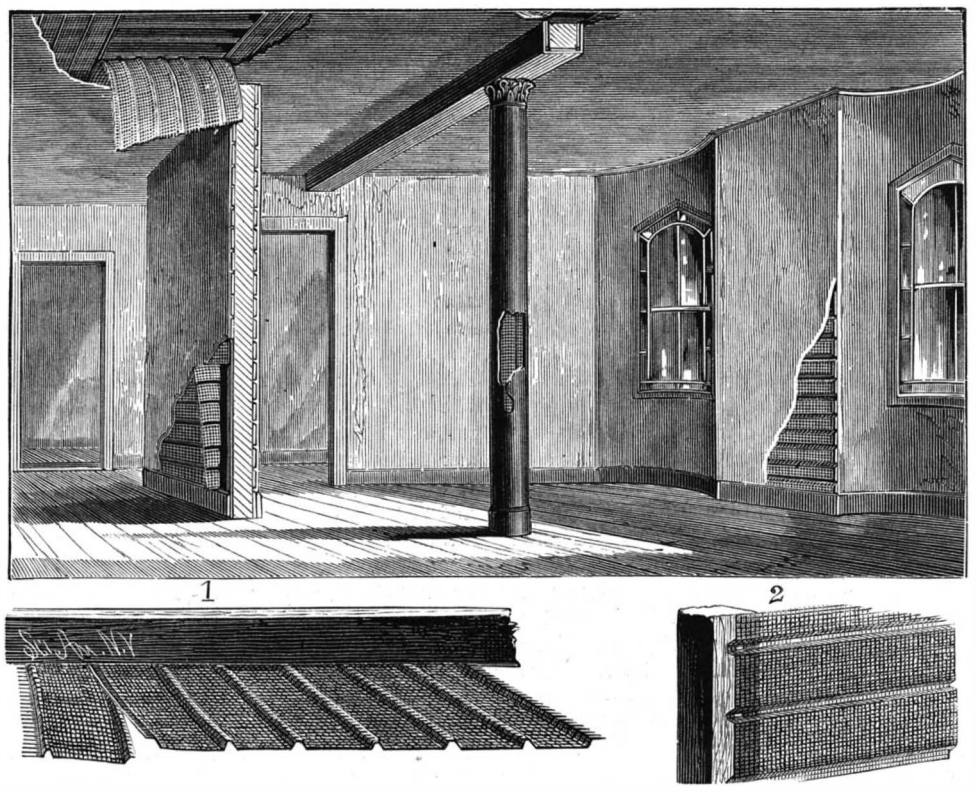
At first petroleum burning oil was used, and while this had some effect, it was not heavy enough to thoroughly break the wave, and linseed oil—some ten gallons of which had been laid in for painting purposes—was then employed. The result was in every way satisfactory, and the use of the oil was continued for about fifteen hours, by which time the supply was exhausted. The fury of the gale had, however, subsided, and the schooner reached port in safety. Capt. Card says that without the use of the oil the vessel could not have lived out the gale—the effect of the oil having been to level the comb of the wave and prevent its breaking over the vessel.

SOMETHING new in a conductor's outfit has recently been introduced on one of the Brooklyn horse car lines. In the fare-recording apparatus swung from their necks, so the passenger can see his fare noted, is fixed a watch, so the passenger can also see the time. Of this innovation a conductor lugubriously said to a reporter of one of our contemporaries: "I come pretty near getting mad sometimes, when a passenger catches hold of me and turns me around like a wooden man, to see what time it is, but as that is what the watches are for I don't know as I ought to object. I suppose at this rate they'll keep on fitting us out with things for the accommodation of the public until a man won't be considered fit for a car unless he has got a calendar stitched on to the back of his coat, a thermometer hanging from one buttonhole, and a city directory hooked to a strap around his waist."

CURE FOR CRAMP.—The simplest and best method, says the editor of the *Pacific Medical and Surgical Journal*, is a bandage applied above or below the knee, preferably the former.

METALLIC PLASTERING SURFACE.

During the last few years there has been considerable attention directed to the use of wire cloth for plastering purposes, and attempts have been made to obtain the requisite solidity of the cloth combined with strength, cheapness, and durability. By corrugating the wire cloth at intervals about six inches apart and applying it directly to the wooden beams, joist partitions, board partitions, columns, girders, etc., it is stiffened and made firmer. It is secured by staples passed through the cloth in the corrugations, which are placed in such a manner that they run transverse to the joist or studding. By this arrangement the whole body of the cloth is stiffened and for the most part it is set out away from the edges of the joists, so that when the plaster is applied it will key around and through the corrugations and close around the edges of the joists, perfectly sealing them and preventing fire from passing from joist to joist. The patentee claims that this method is cheap, since no wooden or wire furring is required, thereby saving in the cost of material and time. The increase in strength is apparent, as the ribs in reality form a series of small girders six inches apart which impart rigidity to the cloth. The durability of the plastering results from the fact that it will not crack since the foundation is free from the shrinkage accompanying the use of laths. It requires no skilled labor to put it in place, and as every beam or joist is sealed, the danger arising from fire spreading is greatly reduced. The cloth may also be used in place of deafening boards to deaden noise and also for interlathing in frame structures.



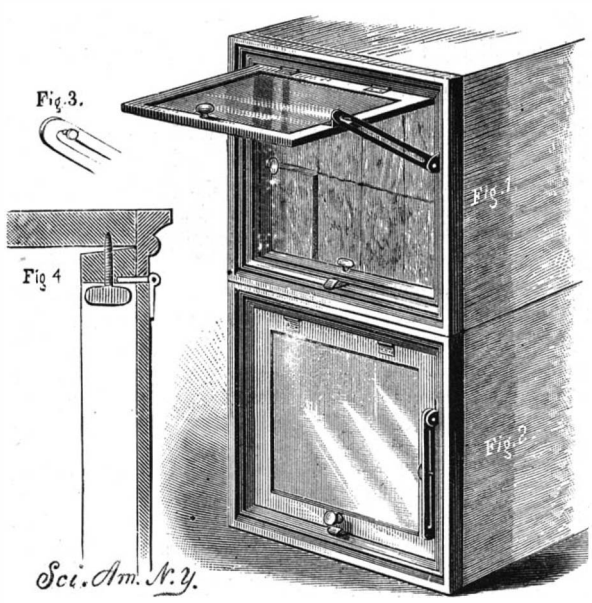
STANLEY'S METALLIC PLASTERING SURFACE.

The large engraving shows the cloth applied to partitions, walls, ceiling, columns, etc., the plastering being broken away in order to show the position of the cloth on the beams and joists. Figs. 1 and 2 clearly indicate the position of the corrugations in regard to the timbers. In the left of Fig. 1 is shown the method of uniting two pieces of cloth, the joint being formed in one of the corrugations.

This invention has been patented in this and foreign countries by Mr. James Stanley, of 114 East 83d Street, this city, who may be addressed for further particulars.

SHOW BOX COVER.

The object of an invention recently patented by Mr. John G. White, of Pensacola, Florida, is to provide a hinged cover that can be secured on tobacco boxes after the usual cover has been removed, so that the box is kept properly closed, the removal of the tobacco facilitated, and the contents of the box exposed to view. To a frame made of either plain, stained, or painted mouldings, is hinged a second frame which fits into the opening in the first, and in which is a pane of glass. On the inner sides of the large frame are fastened strips a short distance from the outer edge, so that when the frame is placed on the end of a box, the outer surfaces of the strips will rest against the inner surfaces of the



WHITE'S SHOW BOX COVER.

sides of the box, and the outer edges of the moulding will be flush with the sides of the box. Thumb screws pass through the strips and into the box to hold the frame in place, as shown in the section, Fig. 4. The inner frame has a handle knob at its swinging end, and is held shut by a spring catch. It is held open, as in Fig. 1, by a brace pivoted to the large frame and provided with a longitudinal slot, terminating in a notch at its free end as shown in Fig 3. A stud projecting from a jaw on the movable frame passes through the slot and is furnished with a head to prevent the brace sliding off. The cover prevents the entrance of dirt, and prevents the obacco from drying out or becoming too moist and mouldy.

Natural Gas Fuel.

While the use of natural gas economically and safely is still a problem in Pittsburg, according to the *Telegraph*, a company at Kittanning seems to have gone much farther toward practical success. The association was formed some months ago, and has pushed the fuel into general use. The well which supplies the gas is situated about two and a quarter miles from the town. The flow is steady and strong. The diameter of the tubing is five and three-eighths inches. The conduit pipe is three and a half inches, laid to a depth of a little over two feet, to the borough limits, where connections are made in various directions. These pipes are buried deep in the soil, to prevent injury from the effects of either heat or cold; but to make this important matter doubly secure, curved pieces of pipe are used along the line at different points, fixed in movable sockets, which allow room for all contraction or expansion of the pipes. Before the town is reached, two pipes are affixed to the main pipe from the well, a large and a small one, with two regulating valves, which are used to divide the pressure, so that one pipe may supply the iron works, grist mills, water works, and other places where a large amount of gas is consumed. The smaller pipe furnishes the gas for private houses, stores, public buildings, etc., where but a small amount of gas is needed. The pressure on both pipes is always shown at the main office by the gasometers attached to them. The high pressure pipe has a pressure of 80 pounds, and the low pressure 1½ pounds to the square inch. Small pipes connect with the main pipes, and are run into houses, stores, and all places where the gas is consumed. In all, over 100,000 feet of pipe have been laid by this company, besides that put by private parties into offices and residences; but so far, no breakage or rupture has been found in the pipes at any place in the numerous lines.

The iron workers at Kittanning say that in the puddling furnaces the fuel meets every want. Any degree of temperature needed can be obtained and kept at a fixed height. Atmospheric burners are used, by which the proportions of air and gas can be so regulated as to give the greatest or least amount of heat. The aperture through which the gas is conveyed into the burner is never more than one-eighth of an inch in diameter, and the mixed proportions of air and gas enter an iron tube about two inches in diameter and perforated with small holes, through which the gas escapes and burns. This iron tube is placed in furnaces, heaters, stoves, and grates, where the effects of the best heat are produced with little trouble.

The company is now furnishing over 800 fires in the town regularly. The cost of using the gas is moderate. Eight months in the year the rate charged is $8 per fire. Public buildings, manufactories, and hotels are given special rates. This is a great reduction on the use of coal. So far, the consumers are well satisfied, and the practicability of the new fuel seems entirely settled in Kittanning.

The Micrometer.

A "standard" micrometer has been made for the American Society of Microscopists by the United States Bureau of Weights and Measures. The scale is engraved on platiniridium, 20 per cent iridium. The examination as to the correctness of this standard was carried on through seven months of last year by Prof. Wm. A. Rogers, of Harvard College Observatory, and it has now been accepted by the society. It is to be kept in approved safe deposit vaults, and not to pass out of the hands of custodian except with the permission of the Committee, President, and Secretary of the Society, but other micrometers will be compared with the standard, and the result certified to, for a reasonable fee.

Testing Machines.

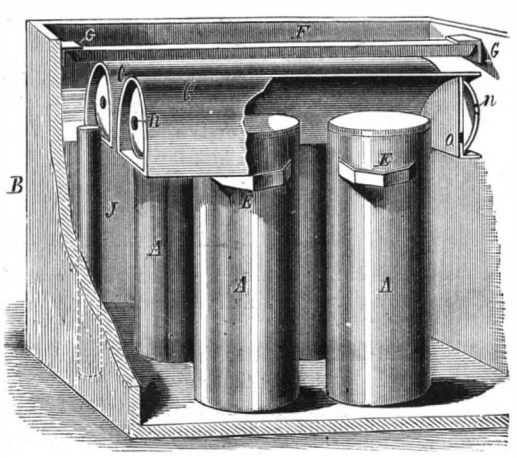
At a recent meeting of the American Society of Civil Engineers, a paper by Mr. A. V. Abbott, on "Some Improvements in Testing Machines," was read by the author, and illustrated by a stereopticon. A 200,000-pound testing machine was first described, its general construction providing for weighing the forces applied by means of platforms and levers somewhat similar to those used in ordinary scale work with special arrangements to reduce friction. To secure the direction of the pressure upon the test pieces in the axis of the machine, both ends of the piece are connected with segments of spheres moving freely in spherical sockets, which take the proper position upon the first application of the stress. Arrangements are also made by means of wedges to gripe and hold uniformly the ends of the test pieces. The machine is arranged to test in tension, compression, for transverse stress, for shearing, bulging, and torsion. In the machine illustrated, the action of applying stress is automatic, and at the same time the same power gives an autographic record of the stress applied and of any variations which may occur during the continuance of the stress, and with an instantaneous autographic record of the result at the conclusion of the test. The stresses are applied by means of weights which slide upon two parallel lever beams, the one registering up to 10,000 pounds and the other up to 200,000. By means of a remarkably ingenious electrical attachment connected with clock work, the movement of these weights is continuous and automatic, and the registering apparatus is also controlled by the same electric current. Diagrams automatically made by the machine were exhibited and described.

A number of broken pieces of steel were exhibited, and also specimens of woods which had been tested in various ways. Machines of smaller powers were also described, and a number of briquettes of cement were broken upon a small automatic machine which was exhibited.

MILK COOLER.

Two or more cans are placed side by side in a tank, and over each row is a trough-shaped cover, inverted and resting on the handles of the cans. The handles are located sufficiently below the upper ends of the cans for closing the cans by a water seal, when the tank is filled with water to about the height of the cans; and as the water rises under the covers the air therein is compressed, causing a pressure on the cream. The ends of each cover are provided with chambers, each having an outer convex wall and an inner straight wall. In both walls of the chambers are passages, *n o*, which are arranged in a vertical line. The upper passage, *n*, communicates with the open air, and the passage, *o*, is below the water line of the tank.

By this construction the ends of the cover are materially strengthened around the seal, so that the metal after constant use will not be liable to bend or twist, as is the case when a straight flange is employed. The inventor has found straight flanges uncertain, as they are liable to become bent or broken in use when not protected by a convex flange. The confined air under the cover is allowed to escape through the passages before the lower edge of the cover is raised above the water line, thereby permitting the cover to be more easily removed than if a single straight flange were employed. The covers are secured by bars, F, placed on them and under the brackets, G, attached to the inside of the tank, to prevent the covers being moved by the air pressure under them. The tank is provided with an overflow pipe, J, which keeps the water at the proper level. Any vapor arising from the cans or water will condense on the covers and flow down the sides into the water of the tank.



BRANDENBURG'S MILK COOLER.

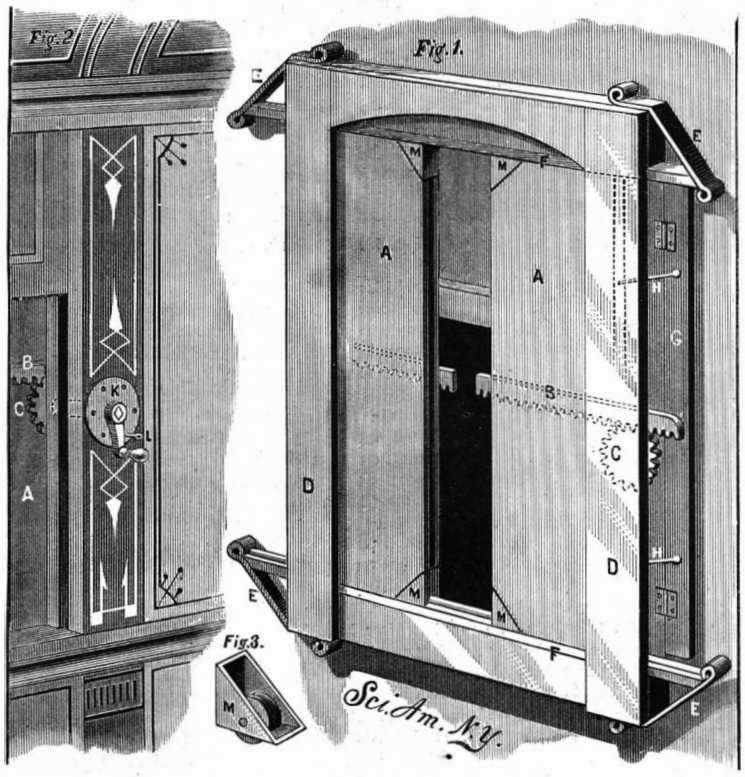
This invention has been patented by Mr. I. S. Brandenburg, of Peoria, Ill.

SLIDING WINDOW SHUTTER.

The invention herewith illustrated relates to shutters and blinds for the windows of houses, railroad cars, steam boats, etc. Fig. 1 represents the outside and Fig. 2 the inside of a window furnished with this device. The corners of the shutters are provided with corner castings, M, which serve to protect the corners and which carry friction rollers. Those on the lower corners are grooved so as to fit over a guide cleat on the lower ledge of the window, and those on the upper corners run in a groove in the top ledge. The shutters are thus held securely in place, and the lower ledge is free from any groove in which obstruction might accumulate. Shafts are journaled in the sides of the window frame, and are furnished with cranks at their inner ends by which they may be easily turned. The outer ends of the shafts carry pinions which engage rack bars secured horizontally about the center of the shutters. The bars can be extended beyond the sides of the shutter, in order to increase the distance to which they may be operated. The inner ends of the bars are secured so as to be jointed together when the shutters are closed. The bearings of the inner ends of the shafts are surrounded by plates, K, having perforations in which a pin may be inserted, thereby preventing the crank from being turned.

By this simple mechanism the shutters may be securely locked in either an open or closed position. At the outer ends of the top and bottom ledges of the window are ornamental brackets, E, connecting the ends of the ledges with the ends of the window cap and sill. These brackets form braces, and their ends project so as to form stops which prevent the shutters from sliding off the guide ledges. Plates, D, are secured to the cap and sill outside the sides of the frame, so as to partly cover the shutters and protect the operating mechanism. To the sides of the frame a hinged narrow door, G, reaching to the edges of the plates and forming guards which prevent snow and the like from being blown in. These doors are moved simultaneously with the shutters by cords connecting their outer edges with the outer edges of the shutters. As the shutters are opened the ends of the rack bars push the doors open, and when they are closed the cords draw them shut. As will be seen from the foregoing, all hinges, catches, etc., are dispensed with. The device also permits of the use of iron shutters, which have found favor because of their durability and the protection they afford.

This invention has been patented by Mr. C. T. Cochel, of Uniontown, Md.



COCHEL'S SLIDING WINDOW SHUTTER.

LAPORTE'S HYDRAULIC HAY PRESS.

We have several times taken occasion to remark on the interest that attaches to the compressing of hay and straw as regards reduction in the expense of freight and storage. The constant increase in the production, and the distance from the centers of consumption, fully justify the devising of special apparatus for treating compressible materials, like straw, hay, cotton, alfa, etc., which, instead of being delivered on the spot without profit, can thus be sent to a distance and bring a more remunerative price. Several presses that have been invented in recent years are already rendering great services to agriculture and the industries; yet there still remains a place for new apparatus, as is proved by the hydraulic press constructed by Mr. Laporte and shown in the annexed figure. This machine consists of a large case of wood and iron plate mounted upon two iron wheels and opening at the top by two leaves, while its two extremities are provided with hinged doors that are fastened by bolts, as are also the movable leaves at the top. Upon each side of the compressing case there is placed horizontally a cylinder, throughout the whole length of which there passes a long rod which carries a piston in the middle, and which terminates at cross bars fixed upon two parallel bars of I-iron. These latter have guides connected with the bottom of the cylinder, and support at each extremity two bars which enter the chest through longitudinal openings. These bars thrust the movable plate against the material to be compressed, and are fixed upon the prolongation of the parallel bars at the other end of the apparatus. Each cylinder is served by a double-acting hydraulic pump, which is arranged so as to be maneuvered by means of a double lever or by a motor which actuates a simple lever. In both cases the bearing point of the lever beam is movable in such a way as to permit of the automatic shortening of the smaller lever arm in measure as the piston advances. It follows that the stress to be exerted in order to overcome the increasing resistance of the material submitted to pressure remains nearly the same during the whole time the bale is being compressed.

Each of the pumps is surmounted with a box that contains valves which have plain seats that are made perfectly tight by means of leather washers fitted into circular grooves. On each side there are likewise leather packed cocks, which are actuated simultaneously by a single key, a turn of which, by a few degrees, to the right or left causes the machine to act in the desired direction. Finally, a small reservoir, which is connected with the corresponding pump and is arranged so as to be on a level with the valve box, communicates constantly with the suction pipe of the cylinder, and compensates, through the few liters of water that it contains, for the losses due to evaporation and to the slight leakages that may chance to occur through the packings of the rods.

To operate this press without a motor requires the services of six men, who can produce with it from 70 to 80 bales per day, or nearly one every eight minutes. It takes three minutes to compress the bale, and after this the two leaves of the compression case are opened and three of the workmen insert hoop irons. In order to facilitate this operation the extremities of each strap are pierced with holes, so that they can be brought into juxtaposition by means of a special tool, after which the two ends are united by means of an ordinary tack, which is driven into the bale. It now only remains to ungear the pumps by turning the cocks in the contrary direction, and to open the hinged doors in order to remove the finished bale.

During this operation the other workmen have filled the other side of the press, and the work thus continues from one extremity to the other without intermission.

By the action of the hydraulic pumps there may easily be obtained a power of 40,000 kilogrammes, so as to permit of furnishing cubical bales of hay weighing from 90 to 100 kilogrammes, and having a density of over 300 kilogrammes to the cubic meter.

All the parts of this apparatus are so constructed as to reduce wear and facilitate its being kept in repair. Being mounted upon two strong wheels, it can be moved to any locality by harnessing an animal to either end. The water in the pumps, being mixed with glycerine, is protected against freezing, and gives excellent results, both as regards the preservation of the parts and diminution of friction.

In cases where two of the presses are employed, the use of a special motor permits of actuating the two apparatus alternately. Each of them is then provided with a mechanism beneath for transmitting motion to the simple levers, and with a safety device for limiting the pressure exerted by the pistons.—*Revue Industrielle.*

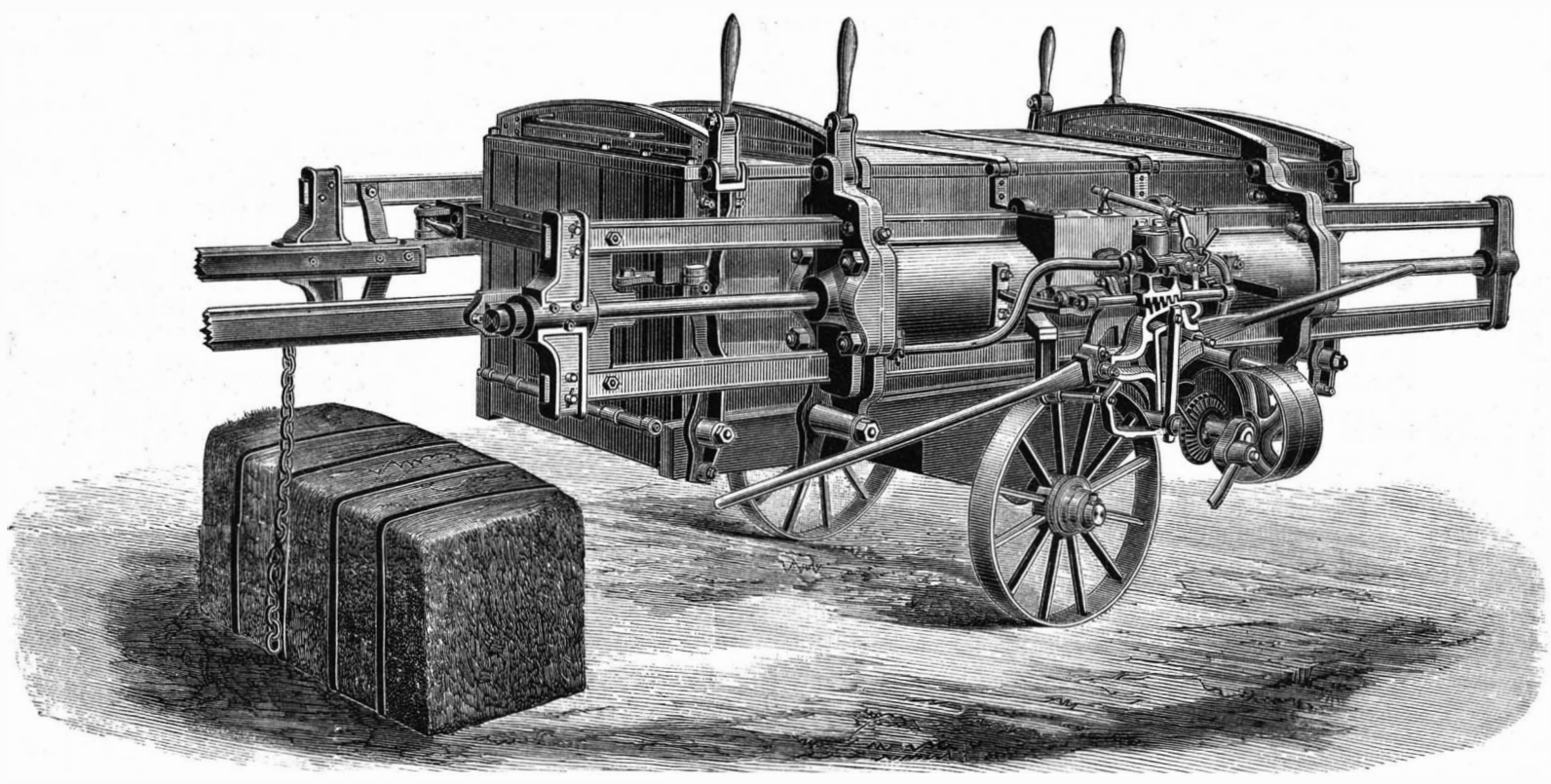
Straw and Wood Pulp.

G. Archbold macerates wood or straw, cut into suitable pieces, in dilute milk of lime, after twelve hours introduces them into a suitable digester, and saturates with sulphurous acid, the pressure amounting to four or five atmospheres.

In two hours the material is so loosened up, that after washing with water and further treatment under pressure with 3 per cent chloride of calcium and half per cent aluminum sulphate dissolved in a little water, the stuff obtained without any further operation has the appearance of cotton, and can serve for the manufacture of fine qualities of paper.

Physical Training in Schools.

Excellence in the gymnasium at Amherst counts in the student's record as does his excellence in mathematics. President Seelye says that this required physical discipline has had the happiest results. "By close statistics, carefully kept, for twenty years, it appears that the health of an Amherst College student is likely to grow better with each year of his college course. The average health of the sophomore class is better than that of the freshman, and of the junior better than that of the sophomore, and of the senior best of all. This average is shown to come from an improvement in the physical condition of the individual student, and not from the dropping out of the course of those who might be too weak to complete it."



LAPORTE'S HYDRAULIC HAY PRESS.

A Most Extraordinary Railway Accident.

One of the most terrible disasters in the history of the oil country occurred to-day in the burning and total destruction of a train that was crowded with passengers. The most remarkable thing about the accident was the wonderful escape from death by fire and wreck of all but three of the passengers.

The morning train on the Bradford, Richburg, and Cuba narrow gauge railroad left Wellesville, N. Y., at 6 o'clock A.M., on Tuesday, January 15, 1884. When about two and a half miles from Bradford the train ran through a river of oil which had coursed down the steep hillside from an overflowing tank that was being steamed preparatory to being run into the pipe lines. At this spot there is a steep grade. The oil ran down the road bed for a distance of at least 900 feet. In several places it was over the rails.

Engineer Patrick Sexton did not notice the dangerous ground his train was traversing. There was a sudden and deafening report, and in an instant the locomotive and the train, consisting of a baggage car and passenger coach, were wrapped in a sheet of flame. The gas in the oil had come in contact with the fire box of the engine, firing the oil.

The driving wheels scattered the burning fluid in every direction. Down the grade thundered the train, surrounded on all sides by walls of hissing fire. In less than a minute after the river of oil was ignited the heat was so fierce that the windows in the engine cab and passenger coach were cracked. Long tongues of flame jumped out of the dense black smoke and licked the interior woodwork of the car. The revolving wheels threw showers of burning oil upon the bottom of the cars.

Engineer Sexton retained his presence of mind, and instantly reversed his machine, which brought the train to a brief standstill in the midst of the conflagration. The burning oil jumped 400 feet ahead of the engine, licking up everything before it. There was fire on all sides. The situation was an awful one. The engineer saw that to remain in that river of fire meant death to all. He opened wide the throttle, and the locomotive shot forward at a terrible rate of apeed. The run was made through the fire, but the end was not yet.

Ahead was a sharp curve. The engineer, who was badly burned about the face, head, and hands, reversed his engine and threw himself into the deep snow bank which lined both sides of the road. Fireman Michael Walsh, who was fearfully burned, followed him. The engine left the track at the curve, and was thrown squarely upon its back. The baggage car was also derailed, as was the passenger coach, which had broken its coupling and was a rod or two behind the train. The passenger car had run down that awful grade fully a mile at a great rate of speed before it left the track. The furious speed fanned the flames to a fiercer intensity.

The train was filled with passengers. Every seat in the coach was taken. The baggage car also held several passengers. When the windows in the narrow cars began to burst, the passengers were seized with a panic. There was a rush for the doors. The platforms and tops of the cars were in flames. Those who jumped from the platforms into the snow were more or less burned. Strong men threw or forced women and children through the narrow windows, regardless of the flames that leaped up on the sides of the car.

It seemed that all the inmates of the car must meet a living death, yet, strange to say, only three persons were burned to death. The victims were women.

Bradford, January 15.

Towage by Endless Chains.

An interesting experiment in the towage of vessels by means of endless chains has been made on the Rhone by M. Dupuy de Lome. That river is troubled with rapid currents and stony shallows, hence navigation is troublesome on it, and it has not, therefore, been utilized to its utmost. The state of the bed is improving every day, however, owing to the dredging and other engineering operations now carried out; but after these are executed the Rhone will still remain too swift at several parts for ordinary sailing. Towage by means of ordinary chains is also open to several objections which do not hold in the case of towage by endless chains worked in the following manner: A tug boat is provided fore and aft on each side with an endless chain, sufficiently heavy and plunging into the water so as to rest on the bottom for a space, the part on board being sustained by pulleys. These pulleys being turned by hand or by an engine, the chain moves with them, propelling the boat against the stream. The chain on each side is actuated by a separate motor; the craft is steered by making one chain move faster or slower than the other. The chains are disposed in such a way that, for the greatest depths, the weights resting on the bottom produce an adhesion to the latter still greater than the drag of the tug and its convoy.

The experiment of M. Dupuy de Lome was made at the instance of the Minister of Marine, M. Zede, director of naval constructions in France, and took place at the Port-de-Bouc. The tug was a vessel 33 meters long by 7·50 meters wide and 2·10 meters deep. The two strong chains employed weighed 46 kilogrammes per running meter. Each was worked by an engine of 15 horse power, and the two machines were completely independent, but the valves and starting gear were under the control of one man.

The trials showed that the barge could be properly steered and propelled in this manner in varying depths. The proper length of chain for the depth was regulated by increasing or diminishing the distance between the front and rear pulleys. The depth varied from 1 to 6½ meters, and provision was made accordingly. The coefficient of friction of the chain on the bottom was found to vary with the nature of the bottom from 80 to 120 per cent of the weight of the chain in air. It was thus possible to calculate what the current should be in order that the chains should not slip on the bottom. Currents of 3 meters per second were successfully encountered and overcome, and the vessel could be properly manipulated in these rapids with a safety unknown to other methods of navigation.

The new plan of M. Dupuy de Lome is, in fact, highly interesting and ingenious, and may be useful in mounting rapid rivers in many other countries.

Proposed Patent and Copyright Legislation.

For the short time the present Congress has been in session, an unusually large number of bills affecting the rights of patentees has been introduced as follows:

H. R. 311.—Introduced by Hon. W. H. Calkins, of Indiana. To regulate practice in patent suits.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in any suit hereafter brought, in any court having jurisdiction in patent cases, for an alleged use or infringement of any patented article, device, process, invention, or discovery, where it shall appear that the defendant in such suit purchased the same in good faith for his own personal use from the manufacturer thereof, or from a person or firm engaged in the open sale or practical application thereof, and applied the same for and to his own use, and not for sale, and not in any manufacturing process, if the plaintiff shall not recover the sum of twenty dollars or over, the defendant shall recover costs, unless it shall also appear that the defendant, at the time of such purchase or practical application, had actual knowledge or notice of the existence of such patent, or unless the defendant puts in issue the plaintiff's right to recover anything in the suit: *Provided*, That nothing herein contained shall apply to articles manufactured outside of the United States.

SEC. 2. That in all suits hereafter brought as aforesaid against a defendant other than a manufacturer or seller of such patented article, device, process, invention, or discovery, the plaintiff shall, at the commencement of such suit, give a bond, to the approval of the clerk, with sufficient surety, to be conditioned that the plaintiff will pay all costs and attorneys' fees that may be adjudged against him: and if the defendant shall finally prevail in such suit, the court shall allow costs, and a reasonable sum, not exceeding fifty dollars, for counsel fees, to the defendant, which shall be recoverable by suit, in the name of the clerk, upon said bond, or by fee bill on execution. A failure by the plaintiff to give such bond shall, on motion, be ground for the dismissal of the suit.

H. R. 419.—Introduced by Hon. J. E. Lamb, of Indiana. To regulate practice in suits brought to recover damages for infringement of patents.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter in any suit brought in any court having jurisdiction in patent cases for an alleged use or infringement of any patented article, device, process, invention, or discovery, where it shall appear that the defendant in such suit purchased the same in good faith for his own personal use from the manufacturer thereof, or from a person or firm engaged in the open sale or practical application thereof, and applied the same for and to his own use, and not for sale, if the plaintiff shall recover a judgment for five dollars or less as damages, the court shall adjudge that he pay all costs of suit; and if the plaintiff shall not recover the sum of twenty dollars or over, the court shall adjudge him to pay all his own costs, unless it shall also appear that the defendant at the time of such purchase or practical application had knowledge or actual notice of the existence of such patent: *Provided*, That nothing contained herein shall apply to articles manufactured outside of the United States.

H. R. 1956.—Introduced by Hon. T. J. Wood, of Indiana. To limit the jurisdiction of United States courts and to protect innocent purchasers of patent rights.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter the United States district and circuit courts shall have no jurisdiction to hear or try any case arising from the actual use of any patent right, or its infringement by such use, by any person in or citizen of the United States or the Territories, wherein the amount in controversy does not exceed two hundred dollars against one person or citizen.

SEC. 2. That purchasers of any patent right for actual use shall not be liable to damages, royalty, or for the value of the same, or for infringing the same in any manner, who at the date of such purchase had no knowledge of the claims of any third person, or that the inventor of the same has an interest therein adverse to the seller thereof.

H. R. 1081.—Introduced by Hon. George W. Ray, of New York. To provide for the protection of *bona fide* manufacturers, purchasers, venders, and users of articles, machines, machinery, and other things for the exclusive use, manufacture, or sale of which a patent has been or hereafter may be granted.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That no person, corporation, or joint stock association who shall in good faith purchase, use, manufacture, or sell any article, machine, machinery, or other thing for the exclusive use, sale, or manufacture of which any patent has been or hereafter may be granted to any person, persons, or corporation whatever, shall be liable, in damages or otherwise, for an infringement of such patent until after written notice of the existence thereof shall have been personally served on such person or persons or corporation, as the case may be, and such infringement shall be thereafter continued.

SEC. 2. That all laws or parts of laws inconsistent herewith are hereby repealed.

SEC. 3. That nothing herein contained shall affect any pending suit or proceeding in any of the courts of the United States or in any court of any of the several States.

H. R. 3036.—Introduced by Hon. R. B. Vance, of North Carolina. To enable the courts of the United States, in the case of the improper grant of letters patent by reason of fraud and misrepresentation, to declare a patent void on application of the Attorney-General.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That whenever it shall be made to appear to the satisfaction of the Attorney-General that there is probable cause for impeaching the validity of any unexpired patent, whether original, reissued, or extended, which may have been or shall hereafter be granted, on the ground that the same has been procured by fraud and misrepresentation, it shall be his duty to take due proceedings, by a bill in equity in the United States circuit court for the district in which the said patentee resides, or in the case of his death or the assignment of his entire interest in said patent, then in the district in which his legal representatives or assigns reside, to have the said patent vacated and annulled; and the court, on notice to said adverse parties, and in pursuance of such proceedings, shall have the power to adjudge and declare said patent void in whole or in part, and to annul and vacate the same.

SEC. 2. That if the party at whose complaint the Attorney-General shall take the proceedings provided for in this act shall fail to establish the invalidity of the patent, then the costs incurred by the Attorney-General in such litigation shall be chargeable to and be collected from such party complainant; otherwise said costs shall be chargeable to and collected from the defendant.

SEC. 3. That from the judgment and decree of any court rendered in the premises appeal shall lie, at the instance of either party, to the Supreme Court of the United States, in the same manner and under the same circumstances as is now provided by law in other judgments and decrees of circuit courts in causes arising on letters patent relating to inventions.

H. R. 1134.—Introduced by Hon. R. B. Vance, of North Carolina. To amend section forty-eight hundred and eighty-seven of the Revised Statutes, in relation to patents.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section forty-eight hundred and eighty-seven of the Revised Statutes shall be, and hereby is, amended so as to read as follows:

"SEC. 4887. No person shall be debarred from receiving a patent for his invention or discovery, nor shall any patent hereafter granted be declared invalid, by reason of its having been first patented or caused to be patented in a foreign country, unless the same has been introduced into public use in the United States for more than two years prior to the application; but every patent hereafter granted for an invention which has, prior to the filing of the application for said patent, been patented in a foreign country, shall expire seventeen years from the date of the foreign patent, or if there be more than one, seventeen years from the date of the earliest foreign patent, and in no case shall it remain in force more than seventeen years; but all applications hereafter made for patents for inventions previously patented in a foreign country, upon the invention of the same person, shall be made within two years from and after the date of such foreign patent, or if there be more than one, from the date of the earliest foreign patent. No patent granted for an invention which had, prior to the grant of such patent, been first patented in a foreign country, and which has not expired at the date of the passage of this act, shall be declared to be invalid by reason of its not being so limited on its face or in its grant as to expire at the same time with the foreign patent, or if there be more than one at the same time with the one having the shortest term; but this act shall in no wise renew, revive, prolong, or extend any patent heretofore granted."

[This bill has been reported back to the House and its passage recommended by the Committee on Patents.]

H. R. 62.—Introduced by Hon. W. S. Rosecrans, of California. Giving copyright under certain conditions to journalistic articles:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter any writer, correspondent, or other contributor to the daily or periodical press who shall publish any articles, or series of articles, unprotected by a copyright, and who shall subsequently take out a copyright on the same, and republish the same under said copyright, shall thereafter possess an exclusive property in said articles, or series of articles, the same as though he had originally published the same under copyright protection: *Provided*, That he shall cause to be published six times, in the journal or periodical in which said articles originally appeared, or in some other journal or periodical issued in the same city or county, a notice that he has acquired such copyright protection, and at the time of furnishing shall notify the first publisher thereof of his intention to avail of the privilege hereby conceded.

Brazilian Pebble Eye Glasses.

The transparent and colorless rock crystal used instead of glass in eye glasses and spectacles, and which comes principally from Brazil, is held in high repute where the best glasses are wanted. It comes in rough looking lumps, but each has one section of the surface cleaned and polished so the purchaser can see what he buys. These lumps are cut up by fine rotary saws, running at a high speed, and most of such work is done in Scotland, where pebbles of this kind were first obtained and the machinery for manufacturing them contrived. A great deal of the finishing of the rough lenses, for oculists in all parts of the world, is done in Paris. They are ground down to the requisite dimensions by steel disks, and then polished by means of sand, diamond dust, and a substance called rouge; that is, the lenses for ordinary use. There are cases of defective sight where, in fitting with glass spectacles, several layers of glass have to be melted together and ground down again and again to produce the exact focus for the particular case. Lenses of that kind are very expensive, but then they are actually invaluable to the wearer, who positively could not do without them.

Any peddler of an average intelligence can sell you a pair of spectacles which, upon the first instance, would suit your eyes well; but it takes a good knowledge of the eye and its defects to fit you with a pair of glasses that will really benefit you, and, what is more, do you no harm. There is a good deal of harm done by the injudicious wearing of glasses. Then, of course, there are people who don't know what they want, or have no use for glasses, like that fellow in the old German story who could not be suited by any optician, because—he couldn't read at all.

Units for Measurements.

The metrical unit for *length* is the meter; the ten-millionth part of the distance from the earth's equator to the pole.

The unit of *bulk* is the liter; it is the cube of a decimeter side.

The unit of *weight* is the gramme; the weight of a cubic centimeter of distilled water at 40° Fahrenheit.

The unit of *force* is the kilogrammeter, being the force required to raise one kilogramme weight one meter high.

The unit of *electric resistance* is the *ohm;* it is the resistance which a current undergoes when passing through a column of mercury one meter long and one square millimeter in section at the freezing point of water.

The unit of *electromotive force* is the *volt;* it is the amount of electromotive force produced by one Daniell cell.

The unit of *electrical intensity* is the *ampere;* it is the current produced by one volt through a resistance of one ohm.

The unit of *quantity of current* is the *coulomb;* it is the quantity of electricity given by one ampere in one second.
—*Review of Telegraph and Telephone.*

Correspondence.

Plowing by Wind Power.

Rufus Porter, whom the early readers of THE SCIENTIFIC AMERICAN will remember for his quaint writings and the extraordinary results he always anticipated from his wonderful inventions, still lives, and at the age of 92 years he sends us in his own clear handwriting from New Haven, Conn., the following communication:

"The Planet wind wheel has four square sails, one of which is always square before the wind, while two others are filled obliquely on an angle of forty-five degrees with the direction of the wind, the motion being horizontal; so that the action of the wind upon the two oblique sails is equal to that on the one before the wind. The average size of the sails is twenty feet square, so that if the force of wind is equal to one pound per square foot, its force upon the sails will be 800 lb. Such a breeze travels 15 miles an hour 22 or feet per second. A breeze that travels 26 miles an hour exerts a force of 4 pounds per square foot, which would be 3,200 lb. upon the wind wheel sails. If the sails move half as fast as the wind, the force of the wind upon the sails will be only one-fourth, or 1 lb. per foot, and the sails will move only 20 feet per second. The force of 800 lb. moving 20 feet per second, or 1,200 feet per minute, works 30 horse power, equal to the common labor of 60 horses. This wind wheel may be erected upon the center of a triangular or narrow-shaped frame, 35 feet long by 30 feet wide, mounted upon three wheels, each being 5 feet in diameter, with rims 15 inches wide, the front being mounted in a circular horizontal ring or annular platform, with a tiller extending rearward, whereby the machine is steered. The other two wheels are mounted upon the two ends of a 30-foot axle. The main central shaft of the wind wheel is connected to an equalizer, from which two shafts extend to the two driving wheels, applying equal force to each, whether running in a straight line or in curves. The center post is 25 feet high, and the sails receive the wind from all directions equally; but when required to stop, the sails are all pointed to the wind by a lever, so the wind has no power on them. This machine will travel with a gang of ten plows 4 miles an hour, thus plowing four acres an hour with the attendance of only one man. It will run against the wind, but not quite so fast as before the wind; and will ascend hills wherever horses can work. It will harrow, sow, reap and mow, thrash grain, shell and grind corn, carry loads, irrigate lands at the rate of 100 acres a day, or will travel 10 miles an hour in any direction, with 20 passengers. But all these things require a good breeze. The cost of the machines of medium size will be $250, not including plows, mowers, reapers, etc.

"A larger machine will furnish 100 horse power. Small wind wheels, with sails only 4 feet square, may be made for $10 each. They are useful for raising water, washing, etc.

"The medium size will work with a very light breeze, in which they will do good service in various kinds of work. In cases in which a steady, uniform motion is required, they may be regulated by a small and cheap wooden brake-governor. The gang plows to be used are rotaries, which require less power than the common mould-board. One machine will answer for several farms."

Accompanying the above communication, we find a printed circular without date, but bearing the signature of Mr. Porter, which reads as follows:

"I have recently perfected three wonderful inventions, the first of which may be put forward to general use for fifty dollars, and in three months will produce a net income of a hundred dollars a day.

"The next will within six months produce an income of a thousand dollars a day. The third will cost two thousand dollars, and within two years will produce the immense income of twenty thousand dollars a day. These inventions have all been proved by successful operation, and have been examined and commended by many scientific men, whose certificates I now have, and no man can show a reason why they should not accomplish all that is represented; and any man who duly examines the explanation of the utility of the inventions, and the mode of managing the business, cannot fail to be convinced that a great income must accrue, and that immediately."

To the Editor of the Scientific American:

Having occasionally brazed band saws for one of our large brush factories in the village, my attention was called the other day, while visiting the factory, to a new method of joining broken saws—simply lengthening the lap a little, and soft soldering instead of brazing. The saw I examined had three mends in it—all done so; and I was told that in no case had the soldering given way. To Mr. Brooks is due all credit for the above discovery; and I send this to you for publication, if you think it will be a benefit to others, with Mr. Brooks' consent. He cautions, where soft soldier is used, not hanging the saw from nails by or where the joint is made.

Very respectfully,

LANSINBURGER.

Lansingburg, N. Y.

[Band saws are frequently joined by ordinary soldering. A scarf joint is made, and the laps brightened by a file and moistened with a saturated solution of muriatic acid and zinc. Then ordinary solder and powdered resin are applied with a soldering iron.]—ED.

Locomotive Traction.

To the Editor of the Scientific American:

In a late number of the *American Journal of Railway Appliances*, I notice a criticism of an answer you made to an inquiry concerning the tractive force of locomotives. The query was: "If there is any difference, which would start and draw the heavier load—a locomotive with seven foot drivers or one with three foot drivers, both to be of the same heft, and engines supposed to be strong enough to slip the drivers?" To this you answer, "Theoretically, no difference." To this the editor of the paper referred to says: "We think that it is hardly necessary for us to say that the first answer is wrong all the way through, as neither by theory nor in practice does the greater driving power belong to the engine having the least leverage in its power, etc." It seems to me that it is hardly necessary for the paper referred to to say anything on the subject, as what it does say shows plainly that it does not comprehend the question as asked. Your answer was right, as a few figures will show. Neglecting fractions to simplify the matter, I will suppose the engine having 36 inch drivers to have cylinders 16x24 and using 100 pounds effective steam pressure per square inch. The ordinary formula for the tractive force where D is the diameter of the cylinder in inches, S the stroke in inches, P the effective steam pressure in pounds per square inch, and W the diameter of the drivers in inches, is: Traction $= \frac{D^2 \times S \times P}{W}$; apply this to the case supposed, and we have $\frac{16^2 \times 24'' \times 100\text{ lb.}}{36''} = 17{,}066$ lb. tractive force. If it be assumed that to prevent the drivers slipping we require four times the tractive force in weight on them, we have $17{,}066 \times 4 = 68{,}264$ pounds, or a trifle over 34 tons, as the weight necessary to place on the drivers. The query now compares an engine having 7 foot drivers with the same weight on them and *powerful* enough to slip or nearly slip the drivers.

It is evident that the engine with 7 foot drivers must have proportionally larger cylinders to be powerful enough (as the query supposes) to accomplish this. Taking the area of a 16 inch cylinder as 201 square inches, and we have 36 is to 201 as 84 is to 469, the area of cylinder necessary to slip the 7 foot drivers with the same weight on them. The diameter of a cylinder whose area is 469 square inches is a little over 24·4 inches, and applying the same formulæ as before for the tractive force, we have $\frac{24{\cdot}4^2 \times 24 \times 100}{84} = 17{,}059$ lb. as the tractive force, or practically the same as the engine with 36 inch drivers, which proves your answer to be correct. It will at once be evident however, that while the tractive force of the two engines is the same, the horse power of the latter engine is much larger, and the steam generating power must be proportionately larger also, as, if we suppose each engine to be making 100 revolutions per minute, the 36 inch driver will cover 941·66 feet per minute. If the engine is exerting a force of 17,060 pounds, we have:

$$\frac{941{\cdot}66 \times 17{,}060}{33{,}000} = 486{\cdot}8$$

as the horse power, neglecting the friction of the engine. The 7 foot driver engine making 100 revolutions per minute advances 2,200 feet per minute, when if as supposed the engine is exerting the same force, we have:

$$\frac{2{,}200 \times 17{,}060}{33{,}000} = 1137{\cdot}3 \text{ H. P.}$$

If we assume each engine to be using 40 pounds of water per horse power per hour, we have 19,472 pounds for the 36 inch driver engine and 45,492 pounds for the 84 inch driver.

As to the second question, "Which would draw more—a locomotive with six drivers or one with four drivers, both to have the same amount of weight on the drivers?" you answer, "The engine with six drivers," and the *Am. Jour. of R. R. Appliances* says, "Tests show both ways." As the question puts no limits on the weight of the engine, the only correct answer under the circumstances is yours, as it is easy to suppose a weight of engine on four drivers which would destroy the rail, but which if distributed over six drivers would allow of a practical use of the engine. The friction of the six wheel engine on curves would naturally be supposed to be greater, but a test showed it to be less. The friction of an eight wheel or four driver engine pushed around a given curve at ten miles per hour was 1,963 pounds, while that of a mogul or six driver engine under the same circumstances was but 1,750 pounds.

While not connected with this subject, I want to make a few observations on Dr. Grimshaw's proposed engine to make 900 miles in 18 hours. The design of the engine is practically the same as the design patented quite recently by M. N. Forney, save the framing of the engine. Any man who has ever run a passenger engine will at once perceive the utter futility of accomplishing with any engine what the Doctor sets forth. If the road were perfectly level and straight and clear of all trains, it is a question to which even under these circumstances a practical man would say no. But as all roads have grades, curves, trains to meet and pass, coal to take as well as water, and as a stop must be made for coal and a slowing up to take water by the scoop up plan, together with the fact that owing to grades, curves, passing trains, etc., at least one-quarter of their time, a distance of over 30 miles in an hour cannot be accomplished.

This means that for every hour in which but 30 miles is made some other hour must show a distance of 70 miles; and most engineers and railroad men would be pleased to see the stretch of track and the engine with its train in which 70 miles for several hours can be covered. Performances which to a theoretical and non-practical railroad man like the Doctor appear easy, is a horse of another color to the man who finds it all he can do to pound out a continuous speed of 35 miles per hour with the best of engines.

GOTHAM.

"Brandy Bread!"

To the Editor of the Scientific American:

Your correspondent N. D., in your paper of to-day, January 12, must brush up his chemistry or he will scarcely prevent our getting "alcohol from bread." He says, "The dough should always be put into the oven before it passes through the first fermentation; the bread in that case will be good, having the sugar in it."

Perhaps so, but we trust N. D. will not invite us to partake if that is the way he bakes things. We showed in an article on "Raising Bread," October 20, that the agent in making the dough light, so that it could be palatable, spongy bread, was an elastic gas—carbonic acid—and that this gas was generated by the process of fermentation. The fermentation caused the carbon, oxygen, and hydrogen which had previously been sugar to split up into two new substances, which had not been there before—alcohol and carbonic acid—so that the sugar had disappeared and the new comers remained.

If N. D. puts his dough into the oven before the sugar has felt the fermentation, he will have a solid mass, almost like a brick; he may eat it if he chooses. But if he lets his dough "rise," his sugar will have gone and he will have alcohol, but he will have wonderfully good bread. If he objects to saving his alcohol, very well, he can let it go as it is in the habit of doing, but it is there all the same.

A.

Movement of the Magnetic Pole.

To the Editor of the Scientific American:

The note on the "Movement of the Magnetic Pole," by J. W. Van Sickle, published in your issue of January 5, 1884, seems to me likely to produce erroneous impressions. In the first place, when he affirms that the magnetic pole was due north in 1657, he does not state from what place it was due north. It is always due north from places on its own meridian, and, therefore, it is necessary to know *on what meridian* it was due north at that time.

Again, your correspondent seems to imply that the magnetic needle always points toward the magnetic pole of the earth. Observations do not show this to be the case. Neither did the last western movement of the needle begin in North America in 1657, but it commenced at Portland, Me., about the year 1765, where up to that time the movement had been to the east. The same westerly movement did not reach New York until very near 1800, and as late as 1870 on the Pacific coast the needle was still moving eastward. It has not yet reached its maximum western declination in New England, but the increase is much slower than it was thirty years ago. From the present indications we may guess that it will begin to turn eastward at Portland, Me., between 1890 and 1900, which would give a period for the swing in one direction of about one hundred and thirty years. But this is only a guess, and it will doubtless be a long time before "A. W.'s" question will be answered.

Allow me to ask who discovered the fact (?) that the magnetic pole has a movement around a circle? This should be pretty well established before we undertake to find out its period.

Respectfully,

E. T. QUIMBY.

Hanover, N. H., January 10, 1884.

Large Wheels.

When 42-inch wheels were first used in this country under passenger cars, there was a good deal of fruitless discussion about their utility as compared with that of smaller wheels. What discussion failed to make clear, however, has been determined by use and the knowledge thereby obtained. Much can now be said in favor of large wheels, showing their superiority to small ones for passenger service, that could not have been said with the same confidence a few years ago. English practice could, of course, be referred to as being conclusive, so far as the style of "carriages" on English roads was concerned. But our cars are altogether different in size, weight, and construction. Probably no road in this country has given 42-inch wheels a more thorough trial than the Boston & Albany, and we are informed that with these wheels such a thing as hot journals is practically unknown on that road, none having been reported for a long time. This is attributed to the fact that the journals revolve slower, their surface speed with the 42-inch wheels at forty miles an hour being no greater than that of journals with 33-inch wheels at thirty-one miles an hour. This is a moderate speed if the journals are well packed, and they ought therefore to run cool. It is also asserted that passengers perceive a difference in the riding of cars having the larger or smaller wheels, and that they prefer those with the large ones. This is significant if not conclusive. But there is still another thing that many observing people have noticed, and that is, that large-wheel trains appear to move at a comparatively moderate speed, when the distance covered shows a speed of forty and forty-five miles an hour.—*Nat. Car Builder.*

BRADFORD TECHNICAL SCHOOL.

In 1871 a new Mechanics' Institute, built at a cost of $162,000, was opened at Bradford, Eng., in place of one which had existed since 1839. It is in connection with this admirable institution that the new Technical School was lately opened by the Prince of Wales. In 1877 the council of the Mechanics' Institute considered the advisability of establishing a school for the purpose of giving technical instruction to those engaged in the various branches of the textile industry, of which Bradford is the center. By the co-operation of the Bradford Chamber of Commerce this scheme was carried into effect; gifts of machinery were not wanting, and in March, 1878, the Technical School was formally opened by the president, Mr. Henry Mitchell. The school became such a success that the accommodation afforded by the Mechanics' Institute was soon found to be insufficient, and the building of the magnificent establishment which is shortly to be opened was then discussed. Generous offers of aid poured in, and the result is a splendid erection, which has cost upward of $150,000, and which will provide technical education in every branch connected with the trade of Bradford.

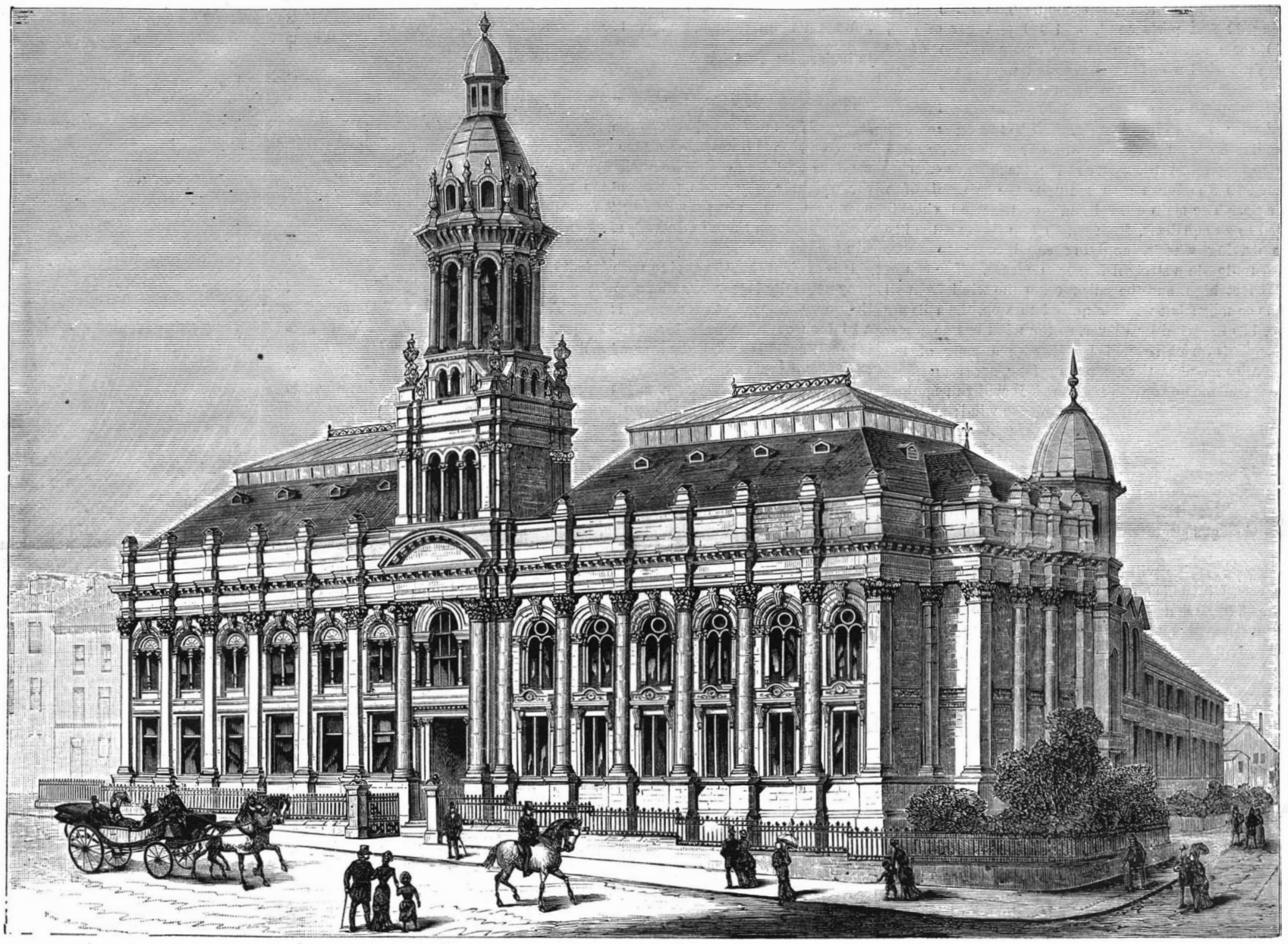
A staff of duly qualified masters will be constantly engaged in teaching day and evening classes. Among other advantages, exhibitions from the Board and other elementary schools will be provided. The sum for the carrying out of this splendid project has been provided by donations from the merchants and manufacturers of the district, and by a grant from the Clothworkers' Company.

It would require a separate article to do anything like justice to the Technical School building alone. It has a frontage of 160 feet to Great Horton Road, and a depth of 240 feet along Carlton Place. It contains a beautifully proportioned public hall (adaptable to dramatic purposes, and capable of seating 800 persons), a museum, chemical and dyeing laboratories, a science lecture hall, a council chamber, a library and reading room, a mechanics' workshop, weaving, spinning, and drawing sheds; and among others, art, painting, students', instructors', secretary's, chemical, "balance," dyeing, cloak, ante, curator's, and class rooms. Everything is on the most lavish and complete scale, and there is no modern improvement which has not been introduced.

Bradford possesses no less than four public parks, but the most fashionable of these is Lister or Manningham Park. It was purchased from Mr. S. C. Lister for a merely nominal sum, and a statue erected in honor of Mr. Lister now stands near the principal gate. The Hall was, until it became corporation property, the seat of the Listers, who are an ancient Yorkshire family. Mr. S. C. Lister, instead of leading a life of luxurious idleness, as he might have done, embarked in business pursuits at an early age, and has devoted most of his life to the invention of machinery. To him the credit of having invented the combing machine is, in a great measure, due; and, after the perfecting of that machine, he turned his attention to the utilization of "silk waste," which had previously been regarded as rubbish. With this object in view Mr. Lister spent many years of his life and over £300,000 in money before he received a single penny in return. He triumphed in the end, and at his gigantic factory vast quantities of silk, plush, and velvet are manufactured. The chimney is 83 yards in height, and absorbed 7,000 tons of material in construction. It is considered to be the sturdiest and handsomest in England, and it is a prominent feature for miles round.

Saltaire is a perfectly model town, situated on the banks of the Aire, about four miles from Bradford. It was founded by Sir Titus Salt, who discovered the use of the Alpaca wool, and erected one of the most celebrated factories in the world at Saltaire, which derives its name from its founder and the river upon which it is built. Sir Titus Salt built a handsome Congregational chapel, dwellings for about 4,000 work people, a noble club and institute, schools, infirmary, alms houses, etc., entirely at his own expense.

The foregoing particulars and the engraving are from the *Illustrated London News*. Our special object in presenting them to our readers is to call attention to the desirability of establishing numbers of such institutions in this country.



BRADFORD TECHNICAL SCHOOL.

Health and Education.

It is proposed to hold in London during the year 1884, says *Nature*, an international exhibition, which shall also illustrate certain branches of health and education, and which will occupy the buildings at South Kensington erected for the Fisheries Exhibition. The object of the exhibition will be to illustrate, as vividly and in as practical a manner as possible, food, dress, the dwelling, the school, and the workshop, as affecting the conditions of healthful life, and also to bring into public notice many of the most recent appliances for elementary school teaching and instruction in applied science, art, and handicrafts. The influence of modern sanitary knowledge and intellectual progress upon the welfare of the people of all classes and all nations will thus be practically demonstrated, and an attempt will be made to display the most valuable and recent advances which have been attained in these important subjects.

The exhibition will be divided into two main sections—I. Health; II. Education—and will be further subdivided into six principal groups. In the first group it is intended specially to illustrate the food resources of the world, and the best and most economical methods of utilizing them. For the sake of comparison, not only will specimens of food from all countries be exhibited, but the various methods of preparing, cooking, and serving food will be practically shown. The numerous processes of manufacture connected with the preparation of articles of food and drink will thus be exemplified; and, so far as the perishable nature of the articles will admit, full illustrations will be given of the various descriptions of foods themselves. In the second group, dress, chiefly in its relation to health, will be displayed. Illustrations of the clothing of the principal peoples of the world may be expected; and a part of this exhibition, which it is anticipated will be held in the galleries of the Royal Albert Hall, will be devoted to the history of costume. In the third, fourth, and fifth groups will be comprised all that pertains to the healthful construction and fitting of the dwelling, the school, and the workshop, not only as respects the needful arrangements for sanitation, but also the fittings and furniture generally in their effect on the health of the inmates. The most improved methods of school construction will be shown, and the modes of combating and preventing the evils of unhealthy trades, occupations, and processes of manufacture will form portions of the exhibition.

The sixth group will comprise all that relates to primary, technical, and art education, and will include designs and models for school buildings, apparatus and appliances for teaching, diagrams, text-books, etc. Special attention will be directed to technical and art education, to the results of industrial teaching, and to the introduction of manual and handicraft work into schools.

Cremation.

The great difficulty about cremation, and the principal obstacle to its general adoption, is so the London *Lancet* thinks, the danger of affording facilities for the commission of murder by poison. Would it not be possible to organize a system of post-mortem examinations in every case of intended cremation, so as to get rid of the difficulty? Beyond question it would be a good social policy, so far as health is concerned, to burn bodies instead of burying them; but it will not be possible to adopt cremation as a general practice until society has safeguards against the terrible danger to life which cremation undoubtedly creates. Such hideous crimes as those committed by Smethurst, Pritchard, and other notorious poisoners would never have been discovered if cremation had been in vogue.

Hydraulic Mining to be Regulated.

The farmers of California have obtained from the United States Circuit Court a perpetual injunction against hydraulic mining. Reason: the billion tons of mud washed off the hills by the miners fill up the river beds, and the rivers overflow the farms 150 and 200 miles distant from the mines. It means the suspension of all work by thousands of miners scattered over an area of territory as large as the State of New York, and who have built 12,000 miles of mining ditches.

THE DIAMOND PHEASANT.

This beautiful bird was first introduced into Europe by Lady Amherst, and hence it was called *Thaumalea Amherstiæ*, but it is generally known by the name of diamond pheasant. It is thought by many to surpass the golden pheasant in beauty.

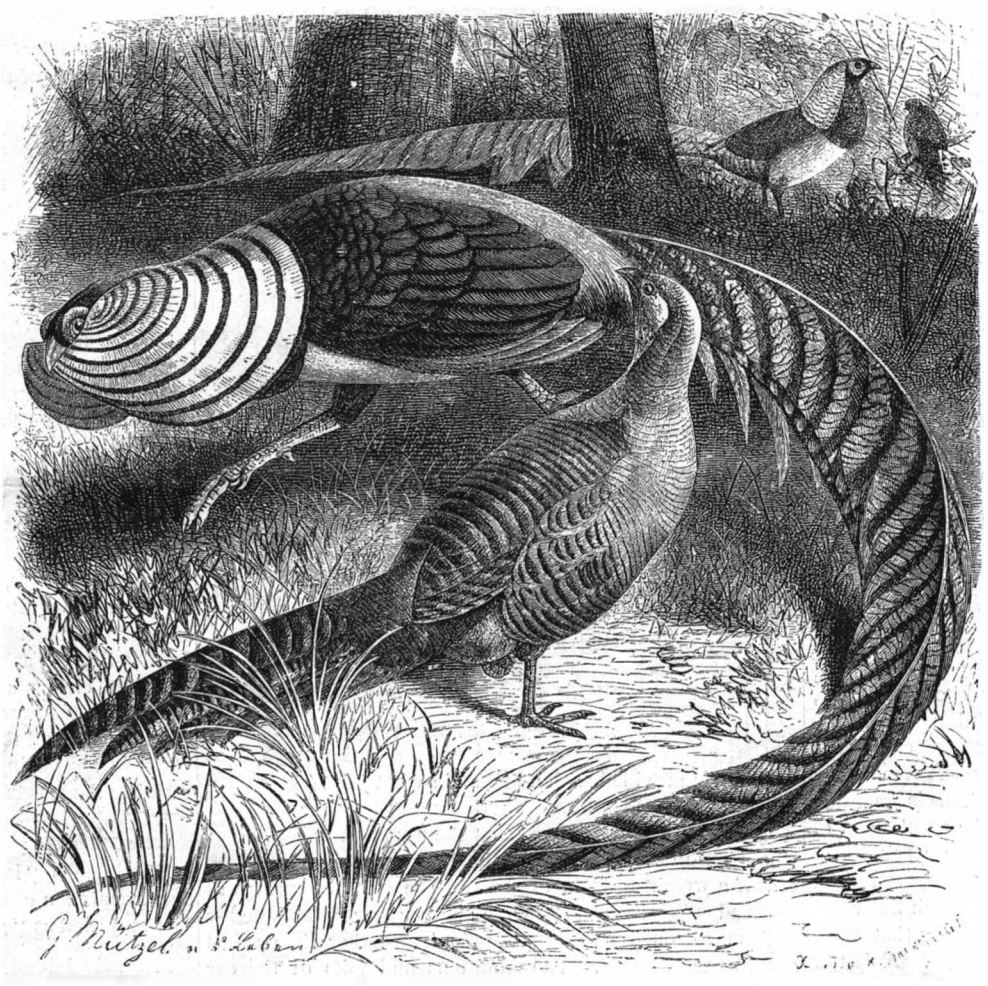
The crest is black upon the brow; the rest is red. The collar about the neck consists of silver colored feathers edged with a darker color. The feathers of the upper part of the back and the upper wing coverts are of a bright golden green, and appear like scales on account of their dark border. The under part is golden yellow shading into a darker yellow.

The upper tail coverts have black bands and spots upon a pale red ground; the under side is pure white. The wings are brownish gray edged with lighter gray. The eye is golden yellow, the bill bright yellow, the foot dark yellow. The length of the bird is one hundred and twenty-five centimeters, the length of the wings twenty-two, and of the tail ninety centimeters.

The home of the diamond pheasant is in Asia It is most frequently found in the provinces of Yunan and Kuyscho, and in eastern Thibet. It lives in the mountains about two or three thousand meters above the sea. Its motions are very graceful, and it is more agile and intelligent than other pheasants. It can make its way through the thickest branches with astonishing ease. Its voice, which is seldom heard, is a peculiar hiss. These birds are very easily tamed, and soon become accustomed to their attendant, distinguishing him with unerring certainty from strangers.

It has been generally thought that as these birds come from the warm countries of Asia, a house must be provided for them which is exposed to the rays of the sun, and all moisture avoided, but this is a mistaken idea. The dried sand which is generally placed upon the floor of their houses is not suitable for them. The floor should be partly of turf, and they should have access to a place thickly planted with bushes. Their food should be a mixture of animal and vegetable material.

They pair toward the end of April. The hen begins to lay about the first of May. She selects a well concealed place, and like other pheasants scrapes together a loose nest. She lays from eight to twelve small symmetrical eggs, which are rust color. The hen will seldom brood in a narrow inclosure, consequently the eggs are often placed under domestic hens. After twenty-three days of brooding the beautiful little chickens are hatched. For the first few days they need great care, and must be kept perfectly warm and dry, but after three or four weeks they require but little attention.—*From Brehm's Animal Life.*



THE DIAMOND PHEASANT.

The Vaccination of Pigs in France.

M. Pasteur, on the 26th of November, 1883, read before the Academy of Sciences a paper upon the vaccination of pigs with the diluted virus of a malady which has made great ravages among the flocks of that country and designated as the *rouget du porc*. M. Pasteur opened his essay by deploring the early death of Louis Thuillier, his associate in these investigations and one who executed his directions, and supplemented them with original studies.

In March, 1882, M. Thuillier began his examination of the disease in the department of Vienne, where it raged with great virulence. He soon discerned in the blood and humors of the dead pigs a new microbe which appeared to be the cause of the disease. Dr. Klein, of London, had previously indicated that a microbe was the source of the plague, but was completely mistaken in his identification of it. At the same time that M. Thuillier made this discovery, Professor Detmers of Chicago published his detection of the same parasite.

At once a proper medium for the culture of this bacterium was prepared, viz., veal soup sterilized. These culture propagations were multiplied, the successive infections of the new fluids being made with a drop from the preceding ones. The last infusion provided the matter for inoculation, which upon certain stocks of pigs reproduced the characteristic traits of the disease, and demonstrated the identity of the microbe, isolated by Thuillier as its cause. Further investigations proved that the microbe of the disease in Vienne was the same as that which in Vaucluse, Charente, Dordogne, Gironde, and in the northern provinces had originated this pestilence. The vaccination of the herds followed as a preventive for the disease, the diluted virus being used as the contrarient injection. One difficulty soon appeared in the very variable receptivity manifested by the numerous brands of pigs for the disease, but experiment did prove conclusively the possibility and efficacy of the remedy. The disease disappears upon the approach of winter and reappears in spring, and the subjects vaccinated in the autumn were kept until the following summer with flattering results.

M. Maucuer, a herder whose animals were put at the disposition of M. Pasteur, wrote to the latter one year after the vaccination had been extensively applied: "The happy effects of the vaccination become more and more evident. The plague is active at Bollene, Saint Restitut, Mondragon, and in the neighborhood of Orange, and not one vaccinated subject has succumbed. At Saint-Blaise your subjects are the only survivors. At M. De la Gardette's no news, but a great mortality exists around him; it has never been equaled. The vaccinated pigs will soon be the only living ones. The success is complete."

M. Pasteur insists that the *rouget* can be prevented by inoculation with the weakened virus of the disease; that the immunity from the disease by this means extends over a year, and that therefore one vaccination is sufficient, as the time required for fattening the pigs for market is seldom longer; that the sensitivity of the various stocks of pigs to inoculation and its consequences varies greatly and should be further examined.

He says the properties and physiological characters of the virus are highly modified by treatment, that its virulence can be weakened or heightened, and that these varying states can be fixed by culture.

A microbe is fatal when it can multiply in the subject's body, leading, in its reproduction, to disorders that terminate in death. If the microbe of a zymotic complaint has passed many times through the organisms of one species of animal, it attains a fixed and maximum development for that animal. Thus the anthrax of sheep varies but slightly in different subjects from one year to another, for the same country, attaining thus as it were a definite state. But the virulence of a virus which has not reached its maximum activity can be essentially modified by its passage through a series of individuals of the same race. Thus also the virulence of a virus can be developed to its maximum by inoculating young subjects and progressively treating older and older subjects.

But it further appears that a virus which has acquired its fixed state for a race can be modified in its virulence by passage from one race to another. Thus the microbe of hydrophobia, which proved to be very malignant for rabbits, has appeared inoffensive for adult cavias, but rapidly destroys those a few hours or days old. And in pursuing the inoculation of young cavias the virus has strengthened, and finally reached a condition where it easily killed the most aged. But the most singular change ensued. The virus which had at first been so destructive to the rabbits, after this culture in the bodies of the cavias lost its poisoning power upon the systems of the former. In fact, it induced an easily curable affection in the rabbits, and then rendered them inert to the effects of their own specific parasite.

These experiences led Pasteur and Thuillier to suspect that the virus of the *rouget* of pigs could be similarly modified, and the following results attended their inoculation of pigeons and rabbits with the porcine virus.

If the pectoral muscle of a pigeon is inoculated, the pigeon dies in six or eight days, showing the symptoms of poultry cholera; when its blood is inoculated upon a second subject and a number are successively treated with the poisoned blood of the previous subjects, the virus gains in virulence, reaches a fixed maximum of malignancy, and is then more fatal to the pig than the most deadly products of a hog killed originally by the *rouget*. On the other hand, the migration, so to speak, of the microbe of *rouget* through the rabbits has an entirely different consequence. The virus is progressively weakened, and soon the blood of the sick rabbit inoculated upon the pigs does no longer lead to death, but only to a curable sickness, after recovery from which they are invulnerable to the attacks of the plague.

Symbiosis.

Professor Hertwig, according to *Nature*, at the last meeting of German naturalists, read a paper on this subject. This term, symbiosis, first suggested by De Bary in connection with certain phenomena of the vegetable world, is here extended to the whole organic system. As distinguished from ordinary parasitism, it is explained to mean the normal fellowship or association of dissimilar organisms which dwell together in a common abode for their mutual welfare. In the case of parasites the connection is altogether one sided; one of the two organisms attaching itself to the other and flourishing at its expense, as, for instance, the mistletoe on the apple tree.

But in this newly revealed phenomenon of symbiosis, which appears to pervade the whole biological world, both associates are mutually beneficial, and in some instances even indispensable to each other. They act, so to say, like two partners in a well regulated business concern, co-operating in the work of life, taking part in all its toils and troubles, and honorably sharing the common profits. An illustration is drawn from the familiar hermit crab, one species of which, after taking possession of the first available empty shell, goes into partnership with a sea anemone (*Adamsia palliata*). This lonely creature, bright orange spotted with red, attaches itself to the roof of the common abode in such a position that its mouth and prehensile apparatus are always turned toward the head of its associate. It is thus enabled to join in all the expeditions of the restless hermit crab and conveniently share in the common plunder. In return for this service, the anemone protects his companion from his many enemies by means of the numerous long threads which it shoots out at the least alarm, and which are provided with millions of capsules charged with a stinging acid like that of the common nettle. So close is the compact entered into by the two partners, that both have become indispensable to each other, as appears from a series of experiments made at the Neapolitan Aquarium. If the crab be removed from his house, and this be stopped up so as to prevent his reentering it, he will cast about for another shell, and never stop until his old associate is also transferred to their new abode.

A still more remarkable illustration is drawn from the *imbauba*, or candle nut tree of South America, which strikes up an alliance with a species of small black ant to their mutual benefit. The whole subject of symbiosis, which naturalists are only beginning to study, is calculated to throw great light on the Darwinian theory of biological evolution. The various cases of fellowship between animals and plants of different orders, and even between members of the animal and vegetable kingdoms, show how, in the perpetual struggle for existence, the individual organism avails itself of the smallest advantage to secure a place in the household of nature. It often thus acquires marvelous habits of life, which it is afterward unable to lay aside, and in consequence of which it becomes gradually modified in its bodily form and organization. Thus *abyssus abyssum invoca*, one change superinduces another, altered conditions require fresh combinations, and the organic world resolves itself into an everlasting ebb and flow of life, in which the individual counts for nothing, the species—itself transitory—for but little, and the sum of existence alone is considered in the self-adjusting scheme of the universe. Symbiosis thus leads at once to a broader and more searching study of various branches of human knowledge.

To prosecute the subject successfully, vegetable and animal organisms must be examined, normal and morbid conditions attended to, anatomical and physiological questions investigated. For this boundless theme belongs to a border land in which zoology, botany, anatomy, physiology, and pathology meet as on common ground.

The Electric Light on Board Men of War.

The result of the use of the electric light during the recent evolutions of the German iron clad squadron have shown that, notwithstanding its employment, torpedo boats may approach vessels unperceived. In a recent number of the *Marine-Verordnungs-Blatt*, it is even stated that those who have seen the electric light used on vessels will come to the conclusion that it is disadvantageous rather that beneficial, supplying the torpedo boat with a safe aim.

Burning of a "Fireproof" Theater.

The new year opens with a number of serious fires. One of these, the account of which has a certain air of grotesque inconsistency, occurred in Cleveland, where an "absolutely fireproof" theater was completely destroyed in three-quarters of an hour, blazing with such a fury as to set fire to a "stone church" near by, which was also burned into a useless shell. The theater was a new one, having been open only a little over two months, and is said to have been constructed with all the safeguards now regarded as necessary to complete security. The stage was separated from the auditorium by a thick proscenium-wall of brick, extending six feet above the roof; and the proscenium-arch was closed by a fireproof curtain. Brick and asbestos were used in place of wood wherever possible, and all the stair cases in the building were of stone or iron. Even the dome over the auditorium was made of sheet-iron, and, in accordance with the most recent and approved practice, an immense skylight was placed in the roof of the stage, so that in case of fire the glass would break, setting in motion a current of air from the auditorium into the stage, to carry smoke away from the audience.

In addition to all these precautions, which it must be remembered are not less valuable because they have once failed of the entire effect hoped for from them, stand-pipes were provided at various places in the theater and on the stage. The cause of the fire, according to the excellent account of the Boston *Herald*, seems to have been a leakage of gas from the meter or the pipes near it. A violent explosion took place when the janitor, carrying a lamp, opened the door of the meter room, and the flames poured out of the door and kindled some light wood-work near by. The engineer was standing close at hand, and immediately ran to the pumps and set them in motion, but in a few minutes the scenery and stage apparatus caught fire, driving every one out of the building. Although an alarm was promptly sounded, the utmost efforts of the whole city department were insufficient to control the progress of the conflagration, which raged until nothing was left of the building but the front and side walls, which, being of brick, may possibly be used again in rebuilding. The church, which was simply a combustible frame with a stone shell, suffered the usual fate of such structures under similar circumstances. This occurrence is the more interesting, as it is the first trial of the new principles of theater-building which have found currency since the terrible warnings given by the catastrophes at Brooklyn, Nice, and Vienna. It is very much to be hoped that we may have later an account of the fire written by the architect of the building, or by some other equally competent expert, which will serve to show the value, in time of actual trial, of the various precautions employed. Such an account would serve a most excellent purpose, not only in pointing out the way for further improvements in theater construction, but in showing the real efficacy of the devices, which at least deserve the credit of having probably saved the lives of the few persons who happened to be in the theater—*Amer. Architect.*

Our Little World.

Some physical results of the Java disturbance help us to understand how small the world is. Take a bowl of water, agitate the fluid in the center, and the undulations you excite propagate themselves in smooth-swelling concentric rings till they lap against the sides of the bowl. There they break, and slop up in mimic tidal waves. This is an exact illustration—*magna componere parvis*—of the oscillations of the sea reported from both hemispheres this week. The tidal irregularities, as might be expected, were most violent on the northwestern seaboard of Australia, which lies right opposite the scene of the Java disturbances. On that coast the sea retreated and advanced a hundred yards. A day or two later oscillations appeared on the Atlantic seaboard of America. The particular undulation which, on the fifth day out, slopped up on the east coast of New Zealand must have come by way of Cape of Good Hope and Cape Horn, and had nearly completed the circuit of the globe. Australia lies as a breakwater between us and Java by the direct route. It gives one a new conception of the littleness of what Henry Ward Beecher calls "this fi'penny-ha'penny world," when a man can stand on the Ocean Beach at Dunedin and watch the ripples from a splash made in the Straits of Sunda.—*Otago Times.*

Gold in North Carolina.

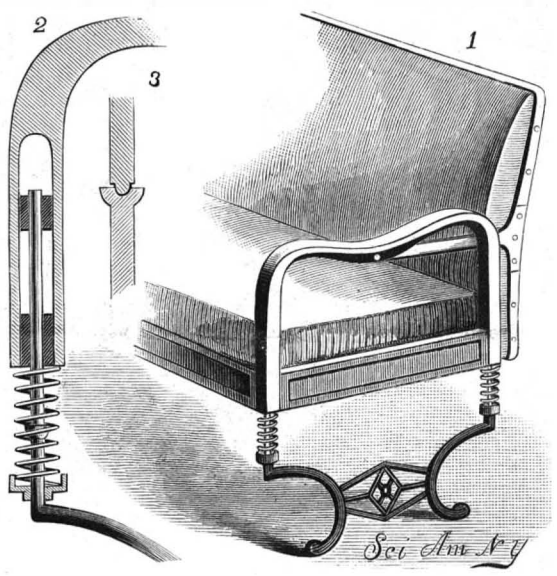
At a recent meeting of the Academy of Natural Sciences, Professor H. Carvill Lewis exhibited some remarkable gold nuggets found in Montgomery County, N. C., forty miles east of Charlotte and two miles from Yadkin River. Some of the nuggets were of great size. One of them weighed over four pounds, and contained nearly $1,000 worth of gold. It was finer than any specimen in the collection at the U. S. Mint, and was probably one of the largest nuggets ever found in eastern America. Many of the specimens exhibited were of nearly pure gold, of a crystalline structure, and of a fine golden yellow color. It was stated that in the district of North Carolina whence these nuggets were taken gold is very abundant. The larger nuggets were found in the gulleys, where they had been washed out of the decomposed rock, and it had been stated that a shovelful of dirt dug out of the hillsides anywhere in the district would pan out traces of gold. Some years ago one man took out of a hole sixteen feet square $30,000 worth of the precious metal. The quartzite containing the gold occurs in a white clay or decomposed schist.

Complimentary Words.

The *Christian Intelligencer* of this city, whose veracity has never to our knowledge been questioned, says, "The *Scientific American* is one of the first mechanical journals of the world. No paper printed anywhere," it continues, "presents a larger number of inventions or contrivances in the course of a year, describes them more clearly and luminously, illustrates them more liberally and skillfully. It is noted for the beauty and lucidity of its illustrations. We seldom take up a number which does not contain an account of some invention or contrivance suited to the outdoor or indoor wants of the farmer or gardener, described in words and in a picture that really illustrates. A long experience has carried this journal to a high pitch of perfection in such matters. Farmers generally acquire some mechanical skill, and find in such a publication innumerable valuable hints. This journal also presents constantly a variety of interesting scientific facts from every department of investigation and experiment. Such a journal also, it seems to us, gives dignity and worth to work, to mechanical pursuits, gives one broader views of their usefulness and a more exalted opinion of the grandeur of their achievements. A farmer who has a group of promising and perhaps restless boys around him would render to them, and to himself as well, a service of incalculable value by putting the *Scientific American* in their hands."

CAR SEAT.

The car seat is supported by spiral or other springs surrounding the upper parts of the seat legs, which pass into cavities in the standards of the arm rests. The legs are bent so as to form an upwardly projecting vertical part, which extends through apertures in the seat and into longitudinal openings in the standards of the arm rests. A short distance below the seat the vertical parts of the legs are each provided with a cup-shaped collar, upon which the spiral spring rests which surrounds the upper part of the leg and upon which the seat is supported. The vertical part of



ACKLEY'S CAR SEAT.

each leg is provided with a ball and socket joint (shown enlarged in Fig. 3) about midway between the collar and seat. These joints are so arranged that the upper parts of the legs can swing in the direction of the long axis of the seat, so that if a weight rests on one end of the seat the springs at that end only will be depressed and the upper part of the leg will move outward correspondingly. Other than spiral springs may be used. The vibrations and jolts of the car will be taken up by the springs and will not be transmitted to the seat. The standards of the arm rests (shown in section in Fig. 2) contain rubber sleeves, to prevent noise, and through which the upper ends of the legs pass.

This invention has been patented by Mr. William A. Ackley, of Hackettstown, New Jersey.

Gems from the Himalaya Mountains.

Professor C. U. Shepard* has called attention to the discovery of a remarkable locality for sapphire and ruby in the Himalaya Mountains. The crystals occur, with other varieties of corundum, in a schistose or slaty rock, and are associated with chlorite. The gems, which are limpid and finely colored, are also finely crystallized. The locality was discovered accidentally, but is now guarded by government troops. Professor Shepard believes that the resemblances between the mode of occurrence of these Indian gems and those found in North and South Carolina are "sufficiently important to encourage the expectation that valuable corundum gems may yet be found in the United States."

Professor Shepard is apparently not aware that a much more full account of this discovery of gems in India was published more than a year ago, by Professor F. R. Mallet, in a paper entitled "On Sapphires recently discovered in the northwest Himalaya."†

It is there stated that the correct locality is Padam, east of the village of Machel, Zanskar district, territory of Kashmir. The gems were exposed by a landslide, and occur far up on the mountain, at the limit of perpetual snow. Some of the sapphires discovered were a foot in length. A physical and crystallographic description of the crystals is given. In the center of a hexagonal prism of sapphire a cavity was found, in which were two crystals of tourmaline. Frequently the specimens are coated with a thin white mineral resembling gibbsite.

The crystals are bluish white and translucent, with transparent fine blue portions irregularly mixed. These blue portions, of course, constitute the only valuable parts of the crystals, and are carefully cut out by the lapidaries.—*Amer. Naturalist.*

Amer. Jour. Sc., Nov., 1883.

† Records Geolog. Surv. of India, vol. xv., part 2, p. 138.

Friction.

The ratio obtained by dividing the entire force of friction by the normal pressure is called the coefficient of friction, hence we may define the unit or coefficient of function to be the function due to a normal pressure of one pound :

Iron on oak	0·62
Cast iron on oak	0·49
Oak on oak, fibers parallel	0·48
" greased	0·10
Cast iron on cast iron	0·15
Wrought iron on wrought iron	0·14
Brass on iron	0·16
Brass on brass	0·20
Wrought iron on cast iron	0·19
Cast iron on elm	0·19
Soft limestone on the same	0·64
Hard limestone on the same	0·38
Leather belts on wooden pulleys	0·47
Leather belts on cast iron pulleys	0·28
Cast iron on cast iron, greased	0.10

Pivots or axes of wrought or cast iron, on brass or cast iron pillows :

First, when constantly supplied with oil	0·05
Second, when greased from time to time	0·08
Third, without any application	0·15

Electric Lighting in New York.

The novelty of the new light has worn off, and the extent to which it is being introduced as a substitute for gas is little noted except in the reports of the companies. These, however, do not always give one a full idea of the growth of the business, as so many establishments where the electric light is used generate their own electricity by dynamos worked by power on the premises. The arc light seems to have the field to itself for streets and the lighting of large areas, as the incandescent light has for shops, saloons, offices, dwellings, etc. The Edison Company are now planning two large establishments to light the field in this city, from Twenty-fourth to Fifty-ninth Street and from Eighth to Madison Avenues, to be of a capacity of 7,000 and 9,000 horse power respectively. Touching the practical effect of a heavy rain in interfering with the perfect insulation of overhead wires, an observer thus describes the appearance of the arc light at the top of the tall mast in Madison Square during a heavy storm:

"The lights danced up and down, varying with the floods of rain apparently, occasionally sinking to a dull red, and then going out altogether and leaving the wind-swept square in total darkness. Then the lights would flash out gloriously, flooding the spaces with their dazzling brilliancy and defying the elements that raved through the air. And so, up and down, the rays of the electric lights rose and fell through the tempest, and they who were fortunate enough to see the show without being exposed to the wild storm will long remember the spectacle."

The Microscope in Detecting Lard Adulterations.

The famous "lard corner" in Chicago last fall, and how the speculation came to an end and large quantities of lard were rejected as "good delivery" on account of alleged adulteration, excited a degree of interest in the public mind which has not yet subsided. If it were true, as was so strongly asserted, that an article as cheap as lard could be successfully adulterated on a large scale, people would hardly know where to stop in their suspicions of everything not strictly "home made." The principal distinguishable difference heretofore between beef tallow and lard is that the former contains rather more stearine, and this difference is so slight that there have been considerable adulterations of lard with beef fat which it has hitherto been almost impossible to determine. But on the trial of the lawsuits which grew out of this lard corner some strong and highly interesting evidence was presented as the result of nice examinations by the microscope.

In this way, by dissolving samples in ether in a test tube, which were crystallized on evaporation, and then examining them under an amplification of two hundred and ten diameters, it was found possible to detect an adulteration of lard with tallow as low as five per cent. The different forms of crystallization of lard and tallow were first discovered by Dr. P. B. Rose, of Chicago, about two years ago, but the successful application of the discovery to detect this adulteration was made by William T. Belfield, M.D., of the same city, one of the expert witnesses in the recent trial. The pure lard crystals are thin, rhomboidal plates, while those of pure tallow have curved forms somewhat like the italic letter *f*.

A BILL introduced by Mr. Vance, of North Carolina, makes it the duty of the Attorney-General to attack the validity of patents. As though enough had not already been proposed in the way of nullifying the rights of patentees, the Law Department of the Government is, by this bill, made an agent for invalidating the titles which the Interior Department, after careful examination, grants to patentees.

On the Prevention of Pneumonia.*

Every winter inflammation of the lungs destroys the lives of many persons who might have escaped if the preventive measures here advocated had been effectively practiced at the proper time.

In order to render the value of the latter more apparent, it is necessary to notice very briefly the influence of breathing on the body and on the food required for its support.

The capacity possessed by the living body to vitalize nutritive materials is perhaps its most wonderful physical endowment. Every step in this marvelous process requires the vivifying influence of oxygen. Without an abundant supply of this gas to the system through respiration, the food cannot be properly fitted to repair the wasting tissues; the body is, therefore, necessarily repaired by materials having a low degree of vitality. Again, as oxygen is the agent by which effete matters are reduced to those forms by which their complete removal from the system is facilitated, if it be not breathed in adequate amount the body becomes clogged by its own waste.

As in chemical manipulations a definite quantity of an alkali is required to saturate an acid of given volume and strength, so in the vitalization of food a definite quantity of the vital gas, oxygen, is required to enable the system to fully complete the vitalization of a given amount of food. A man of average weight requires about two pounds of solid food per diem, and very nearly the same weight of oxygen is absorbed into the blood from the respired air; therefore, we shall not be far from the truth when we assume that an atom of food requires to be acted on in the living body by an atom of oxygen in order that its vitalization may be effected.

The most important anatomical change occurring during the progress of pneumonia is the solidification of a larger or smaller part of one or both lungs by the deposit in the terminal bronchial tubes and the air cells of a substance by which the spongy lungs are rendered almost as solid and impenetrable to air as bone. The access of the respired air to the solidified part being totally prevented, life is inevitably destroyed if a sufficiently large part of the lungs be invaded. This deposit succeeds the first or congestive stage; it occurs with great rapidity: an entire lobe of the lung may be rendered perfectly solid by the exudation from the blood of fully two pounds of solid matter in the short space of twelve hours or even less. The rapidity with which the lungs become solidified accounts for the promptly fatal results that often attend attacks of acute pneumonia. If recovery takes place, the foreign matter by which the lung tissue has been solidified is perfectly absorbed, and the recently diseased portion is found to be quite uninjured.

The only natural method by which the blood can be freed from the presence of waste matter is by its oxidation, the results being carbonic acid gas that escapes by the lungs, and certain materials that are eliminated chiefly by the kidneys. But when these impurities exist in the vital fluid in unusually large quantities, or if the respiratory capacity be inadequate, the natural internal crematory operations are a partial failure.

But nature cannot long tolerate the presence of such impurities in the vital fluid; if they cannot be eliminated by natural means, they must be got rid of by means involving diseased action; therefore such material is frequently deposited in various parts of the body, the point of deposit being usually determined by some local disturbance or irritation. The liability of any person to attacks of acute pneumonia is determined chiefly by the presence or absence in his blood of the waste matter referred to and by the condition of the respiratory power. If the blood be free from any abnormal amount of such waste matter, because his respiratory capacity is up to the full requirements of the system, no cold, however severe, is competent to originate the disease. But if the blood be charged with the matter, a very moderate irritation will determine an attack.

There can be no question but that high living and sedentary habits have a strong tendency to befoul the blood. The former renders effective respiration all the more necessary for the removal from the system of whatever nutritive matter has been taken beyond the needs of the physical necessities, while the latter inevitably reduces the respiratory motions to the lowest point consistent with physical comfort.

These conditions are the active predisposing causes of acute pneumonia.

The disease is more fatal in the very young and in the aged. The mortality from acute pneumonia seems to bear a direct ratio to the respiratory capacity; in young subjects the breathing powers have not been fully developed, while in the aged the respiratory volume has been diminished by the stiffening of the chest walls and of the lungs themselves by the senile changes incident to the decline of life. Therefore we assert that the most preventive measure that can be adopted against attacks of acute pneumonia is to keep the breathing up to the full requirements of the system—a precaution specially necessary to the ease loving, high living, middle aged gentlemen who are especially liable to its attacks. The effectiveness of other preventive hygienic measures depends largely on the care expended in this direction.

A few minutes spent each day in simple but effective exercises adapted to expand the chest will in the course of a few weeks render the lungs much more permeable to air. The volume of each respiration may thus be readily increased by two or even three cubic inches of air; but if we assume that the gain is but one cubic inch, the aggregate increase in the volume of air breathed in the course of twenty-four hours would amount to about as many cubic feet. An augmentation of respiratory volume to that extent would quickly clear the blood of effete matter and notably diminish, if not entirely abolish, the liability to attacks of acute pneumonia in any one who practices such effective preventive measures.

* By Dr. David Wark in the *Evening Post*, January 8, 1884.

Inharmonious Doctors and Apothecaries.

According to a contribution of Dr. A. J. Howe, of Cincinnati, to one of our medical journal contemporaries, the doctors and druggists of that city have been having some differences. The past season has been "too healthy," and people have been "going to the drug stores for the treatment of minor ills, calling for castor oil, cathartic pills, quinine, cough lozenges, and even for salves to cure an eruption. This habit made physicians jealous of the practice druggists are doing, and they called the latter to give an account of their doings, each party choosing a committee to hold a conference in regard to the issue. The druggists claim the right to sell 'little things' over the counter, and denounce the impertinence of the doctors' interference.

"The most important thing in the whole matter is in regard to the refilling of prescriptions. Instances were cited of a recipe having been renewed thirty, forty, and fifty times, yet the writer thereof never saw the patient but once—that being at the time the prescription was written, and for which a fee of only one dollar was paid. Now, this is rather hard on the doctor, and a 'fat thing' for the apothecary, yet all things cannot be equable in this world. But if a doctor be located near a good drug store, and he send his office prescriptions there, the apothecary will, in turn, direct people inquiring for a good physician to go to the one who favors his business interests.

"It has been decided in some of the higher courts that a patient who obtains a prescription from a doctor, and pays for it, secures ownership in the recipe, and can demand it of the druggist at the time it is filled or afterward. This means that the patient owns the prescription and can have it refilled as often and at as many different places as he pleases.

"It is customary for druggists to keep the original prescription on file, and to give a copy, if called for, to the one having it filled, but this is not in keeping with the letter of the law. He should, when the prescription is demanded, put a copy on file and deliver the original to the party having it filled."

Diphtheria Cured by Blue Gum Steam.

Dr. Murray Gibbes reports thirty-seven cases of diphtheria claimed to have been cured by saturating the atmosphere of the room in which the patient was placed with the vapor of the eucalyptus globulus. The atmosphere must be constantly loaded with steam, and the vapor of the eucalyptus is obtained by pouring boiling water on the dried leaves. To assist nature in throwing off the membrane, Dr. Gibbes uses a solution of steel and glycerine, with which he brushes the throat when the membrane is loose enough to come away easily. Dr. Mosler, in 1879, spoke strongly of the value of eucalyptus inhalations in severe cases of diphtheria. —*London Medical Record.*

Yellow Fever by Mosquitoes.

Dr. Carlos Finlay, of Havana, maintains that it may be communicated from one individual to another through the agency of mosquitoes. He has seen under the microscope spores and filaments of a particular nature on the sting of one of these insects that had just bitten a patient suffering from yellow fever, and thinks that the germs may undoubtedly be introduced into a healthy individual by the bite of a mosquito. He recalls the fact that these insects were remarkably numerous in Philadelphia at the time of the great yellow fever epidemic in 1797, and states also that the same conditions of temperature are necessary for the life of the mosquito as for the existence and spread of yellow fever.

How to Stop a Stye.

Dr. Louis Fitzpatrick writes to the *Lancet* that he has never seen a single instance in which the stye continued to develop after the following treatment had been resorted to: The lids should be held apart by the thumb and index finger of the left hand, or a lid retractor, if such be at hand, while the tincture of iodine is painted over the inflamed papilla with a fine camel's hair pencil. The lids should not be allowed to come in contact until the part touched is dry. A few such applications in the twenty-four hours are sufficient.

"FEED a cold and starve a fever" is an old adage, and one which most people still believe in. Dr. C. E. Page, however, writes in the *Popular Science Monthly* of an opposite method. He speaks of achieving great success by confining himself to two light meals, or even one meal a day, for the prevention and cure of colds, and has tried it himself in some most remarkable ways, such as "rising from bed on a cold, rainy morning, and sitting naked for an hour, writing, and then put on shirt and trousers only, the shirt almost saturated with rain and the trousers quite damp, from hanging by the window—these and similar experiments I have tried repeatedly, but without catching cold; I become cold and become warm again, that is all." This may be fun for the Doctor, but we hardly think the amusement of a character likely to become popular. What an enthusiast can do to demonstrate a theory had an even more remarkable exemplification in Dr. Tanner's fasting forty days

Cheap and Good Food.

T. R. Allinson, writing to the London *Times*, says: Allow me to bring under the notice of your readers some experiments I have just concluded to solve the difficulty of feeding our poor in London and elsewhere. The cry is that food is so dear that the poor can scarcely live. This cry is true if they want to live on luxuries, but if they will live on wholesome, but plain and healthy fare, they can do so for very little. A little over a month ago I determined to give up all expensive articles of food and live almost as cheaply as possible. Having left off flesh foods for nearly two years, and lecturing frequently on the question of food, I knew what to select. Looking over my food accounts I found milk, butter, eggs, and cheese, with tea and coffee, were fairly expensive articles, and none of them necessary, so I gave them up for a time to see results. On October 19 I began my experiment; my weight was then 9 stone 8 ounces. I continued this purely vegetarian diet for a month, when my weight was 9 stone 3 pounds 12 ounces, or a gain of 3¼ pounds. My friends said I looked well; I felt well, and did my usual work the same as ever. I walked from 10 to 15 miles daily, seeing patients or taking exercise. Here is an account of my dietary, which cost me little more than sixpence a day, and I could easily live for less without luxuries: Breakfast consisted of a basin of porridge, made from a mixture of oatmeal and wheatmeal, which I found more palatable than either singly. This I usually ate with bread to insure thorough insalivation. Then came bread fried in refined cotton seed oil, or fried vegetable haggis. For drink I had a cup of cocoa or fruit sirup, with warm water and sugar. The cocoa used was an ordinary one with plenty of starch in it, which makes a thick drink, and no milk is then required. Dinner consisted of a thick vegetable soup and bread, potato pie, savory pie, vegetarian pie, vegetable stew, stewed rice and tomatoes, etc. For a second course I had bread plum pudding, stewed rice and fruit, baked sago, tapioca and apples, stewed prunes, figs, raisins, and bread. Tea meal consisted of bread and jam, stewed fruit, or some green stuff, as watercress, celery, tomatoes, etc. I had only three meals a day, and frequently, when very busy, I had only two, and a cup of cocoa and a biscuit for supper. I always use the whole-meal bread, as it is laxative and contains a good deal of nitrogen, which is thrown away with the bran. The cotton seed oil is a cheap and good cooking oil, and is impossible to detect. This diet I continued for a month, and now I only take the animal products when out, not having them at my table.

Now compare this diet with one of flesh or a mixed one. The latest analysis shows flesh to contain from 70 to 74 per cent of water, the dry residue being very rich in nitrogen, and it contains a little carbonaceous or fatty matter. Hence, to live on meat alone, as much as 8 pounds a day is necessary. Then there are to be considered the diseases of animals, which are communicable to man if that flesh be not thoroughly cooked all through; and as very few of our animals live a perfectly natural life, most of them are more or less diseased, especially the fat ones. The excess of nitrogen taken into the system in eating flesh meat has to be got rid of by the liver, kidneys, and lungs; hence, these organs are overtaxed, and much disease is the consequence. In fact, were it not for flesh food we doctors should have very little to do. Man living in towns cannot afford to eat much flesh, because he does not get sufficient exercise and oxygen to burn up the excess of nitrogen. If he does eat this flesh, and if he eat much, then he must suffer from many complaints, such as indigestion, bilious attacks, congested liver, hæmorrhoids, gastric catarrh, and other gastric troubles. If the habit be continued in, gall stones or urinary calculi may follow, or rheumatism and gout. Then the kidneys become diseased, and more work is thrown on the heart, which becomes also diseased; the end is death by one of the lingering diseases which shows a diseased organ somewhere. Even epilepsy and many nervous diseases are aggravated by flesh. Cancer is on the increase, and, from some observations I have made, it may be indirectly traced to flesh. Consumption has only a remote connection with flesh, it being due chiefly to want of fresh air. Vegetable food is cheap, contains an abundant supply of nutriment at first cost, and our systems are so formed as to use it with least expenditure of vital force. We use no cruelty in obtaining our food, and can easily see if it be wholesome or in a rotten state.

By means of our diet much disease is prevented, and even most chronic cases of present disease can be alleviated by it. If we want a cheap dietary we have the following foods to choose from: Wheat, oats, barley, maize, rice, sago, tapioca, semolina, hominy, peas, beans, lentils, etc., which are all concentrated foods and very rich in nutriment. Potatoes, parsnips, beets, carrots, turnips, onions, cabbage, sprouts, etc., give variety, bulk, and flavor; to these may be added the sweet herbs for making savory dishes. Apples, pears, currants, gooseberries, plums, strawberries, rasps, blackberries, and other fruits, with melons, peaches, grapes, etc., are high priced but wholesome fruits. The dried fruits, as dates, figs, apple rings, currants, raisins, etc., are cheap and good. To these may be added tinned goods. Thus one can see the immense variety of tasty things we have, and these to suit all purses. We can add to these milk, butter, cheese, eggs, and honey, which are got without killing animals. But if we take animal food, then fish is least injurious, then beef and mutton, while veal, pork, game, etc., are very indigestible, and ought to be avoided. —*Knowledge.*

ENGINEERING INVENTIONS.

A friction coupling for shafts, toothed wheels, and pulleys has been patented by Mr. Franz Braun, of Berlin, Germany. The invention provides a novel construction and arrangement of parts, whereby shafts can be coupled and uncoupled very easily and rapidly, without causing stoppage of work or lateral pressure on bearings.

A noiseless steam nozzle has been patented by Mr. Carleton W. Nason, of Montclair, N. J. It has a slotted tube surrounded by a perforated casing packed with asbestos fiber, filling the intermediate space, so the steam must go through this fiber in passing into water, whereby all noises or water hammering is prevented.

A railway signal has been patented by Mr. William Hadden, of Brooklyn, N. Y. The invention makes a novel arrangement of the circuit in the "block" system by which the signals are operated on a closed circuit, and worked with equal facility from either end of the section automatically, or from any part of the line, by means of a switch of peculiar construction.

A car coupling has been patented by Mr. John C. Bryan, of Holly Springs, Ark. It combines, in connection with the drawhead, and a frame carrying the coupling pin, an arrangement of levers and retaining spring, making a novel mechanism for car coupling, automatic in its operation, and that may be actuated from the top or either side of the car.

A railroad switch stand has been patented by Mr. Charles H. Talmage, of Atchison, Kas. It is an improvement for what is known as the "three throw split switch," and there are gears connecting the two switch shafts with the shaft of an operating lever by a partly toothed wheel, so the two switches may be operated by the same hand lever, thus simplifying the apparatus and lessening the cost.

MECHANICAL INVENTIONS.

A machine for making wire or other solder has been patented by Messrs. Edmund L. Young and Lucius Dyer, of Millbridge, Me. In running or casting wire solder, the molten solder, by this invention, is run into grooves on a revolving mould and cooler, and is picked up therefrom and afterward reeled or otherwise delivered either as coiled wire, sticks, or as desired.

A machine for making coiled wire ferrules has been patented by Mr. Joseph Crowfoot, of Bridgeport, Conn. It has a mandrel revolved by suitable mechanism within a stationary band having an inclined upper edge to raise the wire as it is coiled and form a space for the next coil, with a jacket for supplying solder, and novel arrangement and construction to keep the mandrel cool and do rapid and efficient work.

AGRICULTURAL INVENTIONS.

A cultivator has been patented by Mr. Frederick L. Hilsabeck, of Shelbyville, Ill. This invention is designed to improve cultivators used for working on both sides of a row of plants, and has a runner device on which the cultivator may ride to carry the plows above ground.

A cotton seed planter and fertilizer distributer has been patented by Mr. Ge Hu Port, of Seventh District, Coweta County, Ga. It has a peculiar arrangement and construction of parts, so that the drive wheel rocks a feed wheel, and the bottom of the feed box is loose, so that a smaller or larger discharge may be arranged for as desired.

A straw stacker has been patented by Mr. Thomas Major, of Jackson Township, Clinton County, Ind. The object of the invention is to facilitate the adjusting, controlling, and moving of straw stackers, and promote efficiency in their working, the straw being received from the thrasher or separator upon the lower part of the carrier and discharged from the upper end upon the stack, the carrier being conveniently arranged for the increasing height of the stack, and the stacker turning laterally through nearly the arc of a semicircle.

MISCELLANEOUS INVENTIONS.

An improved swamp and grab hook has been patented by Mr. Albert M. Millard, of Wausau, Wis. It is a special form of hook for rolling logs on to crotches in the forests, and for grabbing and pulling chains, skids, and other objects.

A game register and trump indicator has been patented by Mr. George W. Hyatt, of New York city. This invention provides a convenient means of keeping the score in games, and the points of each game, while at the same time indicating the trump of the game in progress.

An improved harness has been patented by Mr. Green Thompson, of New Salem, Ind. The object is specially to improve harness for working hay carriers and hoisting gear, and a rigid bar trace is provided which, with the other parts, wholly does away with the falling of the whiffletree.

An improved apparatus for utilizing wave power has been patented by Mr. Thomas Mayes, of Albany, N. Y. It is strong and simple, consisting of a dashboard suspended in a frame, and having a connecting rod for imparting motion either directly or by a crank to connected machinery.

A receiving telephone has been patented by Mr. Lyman W. Sutton, Jr., of Newton, N. J. The invention covers a magneto electric telephone consisting of the combination of a resonant magnetic tube, open at both ends, a magnet, and a helix, all in inductive relation to each other.

A folding baby carriage has been patented by Mr. Harry A. Jackson, of Brooklyn, N. Y. It is of special construction, whereby it may be folded compactly when not in use, and has a canopy attachment, or improved device for holding a sunshade in any desired position.

An improved bilge water alarm has been patented by Mr. George W. Gilmore, of Webster, Pa. The invention consists principally of a float and attached weight and screw for moving a drop weight or other object, to give an alarm when the water in the hull rises above a certain level.

An improved fire escape has been patented by Messrs. Otis G. Moore and Morris H. Marcus, of Edinburgh, Pa. It provides for a chute of flexible material extending from a window to the ground, down which persons slide in escaping from fire, and the chute is made in sections to give it rather a zigzag shape.

An improved crutch has been patented by Mr. William H. D. Ludlow, of La Porte City, Iowa. This invention provides for an extensible prod connected to the hand hold, so that, by a rotary adjustment there, the prod may be projected as a safeguard against slipping, or withdrawn when it is no longer required.

A folding egg case has been patented by Mr. Jesse J. De Berry, of Smithville, Mo. It occupies but little space when not in use, or when being returned to the shipper, as it can be compactly folded, but by the use of hinged side and end boards, and folding partitions, a practical case for shipping eggs and other articles to market is readily set up.

A screw driving mechanism for baling presses and other uses has been patented by Mr. Patrick Slattery, of Charleston, S. C. It is made with a box through which passes a screw with two nuts connected by two sets of gear wheels with an intermediate gear wheel, to which power is applied by a ratchet pawl lever.

A composition of matter for moulding fruits, fancy topped tables, birds, etc., has been patented by Elmina Brady, of Portlandville, N. Y. It consists of hard stone, common sand, slate stone, white sand, clam shells, common brick, charcoal, blue clay, water, and linseed oil, in certain proportions, prepared after a specific manner.

A road cart has been patented by Mr. Henry Hortop, of Rutherford, Cal. It has springs above and below the forward ends of the side bars, kept in place by staples attached to the thills, guide eyes on the side bars and yokes, so the unpleasant motion of the cart is prevented, and the cart can be readily adjusted for a large or small horse.

A button fly clamp has been patented by Mr. Isidor Felber, of Nyack, N. Y. It facilitates the labor of scalloping shoe button laps or flies, and avoids the necessity of making nail holes in the stock, there being a clamp and plate swiveled to an operating screw with pins for guiding the plate, cushions for protecting the pattern, etc.

An improved artificial stone has been patented by Mr. William Howell, of Philadelphia, Pa. The stone is adapted to be used for building, pavements, drain pipe, or plastering, and other uses, and is composed of a special preparation and combinations of muriatic acid, flour of sulphur, molasses, iron scale, sand, and cement.

A machine for stretching and removing fence wires has been patented by Mr. John N. Killough, of Aurora, Texas. It is a cheaply made and durable contrivance, affording material advantages for stretching wires along the fence posts, straining them taut while being fastened, and also for removing or changing them in resetting the fence.

A machine for cutting out garments has been patented by Mr. Solomon Rich, of Joplin, Mo. In combination with a cutting table is an endless flexible knife belt, against which belt cutter the material is advanced as it is cut, under a pressing roller to keep the material free from wrinkles or plaits, so that several patterns may be cut at once.

A watch regulator has been patented by Messrs. Ernest J. Roux and Louis U. Fatio, of Geneva, Switzerland. It is an improved device for adjusting the hair spring regulator very finely and accurately, for by turning a wheel the distance of one tooth the pointer is moved a distance so minute that it could not be similarly adjusted by hand.

A saw back has been patented by Mr. Thomas Beard, of Kokomo, Ind. The invention relates to improvements in constructing the common saw bucks to hold the wood firmly; plates are provided with coarse saw-shaped teeth secured to the saw buck, in combination with a toothed lever pivoted thereto, provided with springs and a foot treadle.

A permutation lock has been patented by Messrs. William B. Atkinson and John H. Foster, of Franklin, Ky. This invention relates to an improvement on a part of a lock patented by Mr. Atkinson in May, 1883, and consists in special means for adjusting the tumbler to throw it in and out of engagement with the ward wheels.

A dinner pail has been patented by Mr. William H. Carbaugh, of Columbus, O. The invention covers a particular construction and arrangement of parts, by which coffee may be kept in a tight pot, in an unobjectionable position, or can be removed for heating without leaving the pail uncovered; there is also a pan that may be used to hold or for heating food.

A fire escape and alarm has been patented by Mr. William S. French, of Jackson, Mich. A drum or roll is to be arranged in the cornice brackets for winding up a chain or similar ladder, the drum being held by a wheel and pawl, from which cords or wires extend to the different rooms, to be pulled from any one in case of fire, when an alarm will be sounded and the ladder let down.

An improved trunk has been patented by Mr. August Kroesing, of Berlin, Germany, assignor for Mr. E. Gustav Eschenhorn, 17 Neu Kolm, the same city. It is waterproof, and has buoyant wings to increase its buoyancy and stability, with eyes or rings for fastening ropes or holding signals, packing strips in the joints, and angle plates overlapping the cover and secured to the sides and ends of the bottom section.

A cut-out for telephones has been patented by Messrs. Austin Williams and Joseph M. Gannon, of Negaunee, Mich. It provides for a swinging board or strip with a series of metal strips connected with the line wires, the board so adjustable that its metal strips close the circuit between the line wires, or between those and the ground wires, so all lines may be cut out and grounded simultaneously.

A coal cleaner has been patented by Mr. William H. Shepherd, of Pittston, Pa. It is designed to separate slate from coal as the latter passes down the chutes from the grading screens, for which purpose stationary grate bars are placed in an opening in the chute body, alternated with movable grate bars, connected by cross bars with sliding rods, also connected with a rock shaft driven from a rotary crank shaft.

An improvement in rubber clothing has been patented by Mr. George Platt, of Butte, Montana Ter. The object is to provide a complete suit that can be easily put on and off, and fit neatly and keep out the wet. The boots and trousers are combined, the latter having inner and outer flies, while the coat also has two sets of flies, with properly arranged buckles and straps, the trousers being suspended from the coat.

A process of making sirup and sugar from sorghum cane has been patented by Mr. Andrew J. Adamsom, of Sabetha, Kas. It consists in first roasting the cane to help eliminate green vegetable matter, then expressing the juice and filtering and boiling, thus getting a much purer sirup than by the usual method, one that will not sour so readily, and free from rank sorghum taste.

A carriage spring has been patented by Mr. Benjamin P. Morrison, of Abingdon, Va. The spring is very simple in construction, and can mostly be made in an ordinary blacksmith's shop, its design being such that the effect of a load on either of the supporting bars will depress the body alike from end to end, or the bars may be so connected that a load on any part will depress the whole bed equally.

A combined shovel and shield has been patented by Mr. John J. Holland, of New Orleans, La. The blade is detachable for use as a shield, the handle is formed in hollow sections, adapting it for the reception of small implements, a sling pouch is also provided for carrying the dismembered sections, and the whole is capable of quick and interchangeable adjustments for various uses.

An improved pipe coupling or joint has been patented by Mr. Robert M. Reilly, of Baltimore, Md. It provides for horseshoe pieces, each with lug and pins, inserted between collars opposite each other on the male portion of the pipe, and secured to the female portion by bolts through a flange, the whole to facilitate the turning of the pipe, for branch connection or pitch, without impairing the joints.

A single cable track railway has been patented by Mr. Joseph J. Clisham, of San Diego, Cal. It provides for a single wire, loosely hung between posts, and the wire passing once around the axis of a spool; cords from the ends of the axis connect with a cord attached to a balloon or kite, which the wind moves along, the basket or parcels to be carried to be attached to the spool.

A press for moulding glass has been patented by Messrs. Adrien A. and Leon A. Appert, of Paris, France. It is intended to use compressed air, or other suitable means, the system giving as strong a pressure as desired, acting rapidly or slowly as desired, giving regular pressure with shock, doing the work rapidly, and not calling for more than one workman, whatever the pressure and size of the piece.

A compressor for compressing bran and other substances into packages has been patented by Mr. Geury A. Chapman, of Strawberry Point, Iowa. By this invention bran may be compressed so its weight will be greater than that of an equal cubic measure of grain, but the strain in compression in no way comes on the sides or bottom of the sack, and the cover may be made fast while the bran is under compression.

An improved calf weaner has been patented by Mr. Max J. Ahlgrim, of Rose Lawn, Ind. The invention consists of a half muzzle, made of wire or other light material, which is hung over the calf's nose on pivots fastened in a halter at the cheeks. There are arms connected with the muzzle which extend down below the jaw, and these carry a weight which a little overbalances the muzzle above. The weaner is automatic, for when the calf lowers its head to feed, the muzzle will swing above its nose and so not interfere with its feeding, but when the calf raises its head up to suck its nose will move in the muzzle, which is also armed with barbs, thereby interfering with its getting hold of the teat. It is attached and detached by simply unbuckling the halter.

NEW BOOKS AND PUBLICATIONS.

The "ART AGE," is the title of a handsomely gotten up and beautifully printed monthly publication, issued by Arthur B. Turnure, 132 Nassau Street, New York city. It is designed to place before the trade and people of educated tastes generally, something in advance of what has yet been done in the way of artistic printing and book binding. As a contemporary says of it, *Art Age* is designed to become the organ of new and advanced ideas of art, as applied in all forms of printing and bookmaking.

SUGGESTIONS TO CHINA PAINTERS. By Miss M. Louise McLaughlin. Robert Clark & Co., Cincinnati.

The chapters on "Colors," "Preparing gold and silver for the decoration of porcelain," and "The use of metallic paints" are especially worth attention as giving a good deal of information in but few words. The book is illustrated with simple and artistic designs for plaques, vases, cups, etc., drawn by the author, accompanied by instructions as to colors to be used, treatment, etc.

A "RETAIL DRUGGIST'S DIARY AND WANT BOOK," published by Frederick Stearns & Company, manufacturing pharmacists, of Detroit, Mich., contains a great deal of information in very convenient form for daily use in the drug store. It has also, besides diary pages, a pharmaceutical catalogue of over 14,000 items, and an extended list of non-secret medicines.

A "CHEMISTS' AND DRUGGISTS' DIARY," published by the *Chemist and Druggist*, of London, contains a large amount of interesting matter for those in that business, besides being a convenient diary for use in the store.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their indentification.

(1) G. E. asks: Can I cast a zinc plate 8 x 8 in., $\frac{3}{16}$ in. thick, in a plaster of Paris mould? How can sputtering of the metal, when poured in the mould, be prevented, and how can I get a smooth casting? Could a small furnace, say 4 in. inside diameter, 8 in. high, be made of fire brick, to produce sufficient heat for smelting small quantities of brass, lead, copper, or even iron, to be heated with small hard coal and a blast from bellows? A. You may possibly make a zinc casting in a plaster mould smooth by oiling the mould with linseed oil. A better way is to cast in moulding sand, such as brass foundries use. You may melt a few ounces of brass or copper in a small crucible in a furnace of the size you mention.

(2) C. E. B. writes: 1. I want to know the best way to make a small steam engine, one rating from one-half to one horse power? A. The inverted vertical engine is as good as any. For plans, dimensions, etc., consult the works on steam engineering. 2. Is the inclosed rough sketch for connecting the piston to the crank on a good and mechanical principle, and will it do its work as easily as the common slide (pillow) block connection? A. It cannot be used as sketched; there must be a guide on the outer end of rod. The "yoke," as it is called, will have more friction than a crank pin box, and unless the yoke and connections are very stiff, will have a tendency to spring when in operation. A connecting rod is preferable. 3. What is the cause of the vibration of the armature on a telegraph instrument when it is connected by a wire to the base of the key? Is there any appliance which I can put on the instrument to obtain any power? A. An intermittent contact of the wire with the base. A small motor might be made to work on a similar principle, but there are better ways of obtaining power from electricity.

(3) J. C., Jr., asks: 1. Where is the castor oil bean most extensively raised? A. The castor bean is largely grown in Illinois, Missouri, and California, where it is made into oil. Large oil works in Jersey City, N. J., are purchasers of the beans from all parts. The bean is, as we understand, largely cultivated in Texas. If the large seed is used which is best suited to Southern soil, a hundred bushels to the acre may be produced. 2. By what means is it gathered—hand or machinery? A. Hand picking is usual. 3. How many gallons of oil does it yield per acre? A. We do not know the yield of oil per bushel or acre. 4. Does it take expensive machinery to extract the oil? A. It requires a mill and a press. The price is suited to the quantity of work to be done. Four hundred dollars to eight hundred dollars would probably set up a small oil works.

(4) A. W. H.—Most of the so-called bear's grease is prepared as follows: Take of washed hog's lard (dry) 1¼ lb. avoirdupois; melt it by the heat of a water bath, add of balsam of Peru 2 drachms; flowers of benzoin and palm oil (bright), of each, 1 drachm; stir vigorously for a few minutes to promote solution. Then remove the pan from the bath, and after repose for a short time, pour off the clear portion from the sediment, and stir the liquid mass until it begins to cool. 2. For article on imitation coral see Parkesine, Celluloid, page 3617, SCIENTIFIC AMERICAN SUPPLEMENT, No. 227.

(5) J. F. A.—Your question is so indefinite that we cannot give you any satisfactory answer. The values of the different grades cannot be determined from cost of the trees, but from the differences in quality of the different gums, these being quite arbitrary.

(6) G. A. H.—For removing printer's ink from paper use a solution of chlorinated soda, called by some chemists Larabeges solution. Use as directed on label.

(7) A. and E. ask for directions for tempering coiled springs the best way, so as to get the most power out of a given size of spring? A. The tempering of coiled springs requires much judgment, based upon experience with the particular kind of spring that you wish to temper. A coiled spring does not give us the faintest idea of its form, size, length, thickness, kind of steel, or whether it is a clock spring or car spring, all of which must be considered in the method of treatment. As a general rule, springs that are slender and liable to lose shape in a common fire, should be heated in an oven or muffle, and hardened in water or oil. The temper should be drawn in boiling linseed oil. Springs that have stiffness, like car springs, may be heated in a *covered* forge fire to good advantage, and hardened in lard oil. The temper can be drawn by burning off.

(8) W. C. J. asks: 1. What are the physical causes of yawning? A. Yawning is supposed to arise from a reflex action of the nerves, caused by weariness, and is kindred to many other kinds of involuntary motions, that are probably derived from the nerve centers. 2. What is the chemical reason that bicarbonate of soda relieves a burn? A. We presume that it is by neutralizing the acid products of decomposition arising from the burn. 3. What is the distinction between a fruit and a vegetable? A. There is no absolute distinction between fruit and vegetable, fruit being that part of the vegetable kingdom found growing upon stalks or trees, and containing the seeds and sometimes being the seed itself. Whereas all organic nature not animal is said to be vegetable. In common parlance our soil grown products for culinary use are called vegetables, and some that are really fruit are also called vegetables. The terms overlap so much by customary nomenclature that distinctions become difficult. 4. Can you instance an artesian well where the water is perfectly soft? A. We know of no artesian wells that produce water as soft as rain water.

(9) G. R. P. asks: 1. Is it advantageous to shellac the plates of a Holtz electrical machine? A. Yes. It prevents the accumulation of moisture. 2. Why are two carbons used in the Grenet potassium bichromate battery? A. The quantity of current is somewhat increased by the additional carbon plate. 3. How may I distinguish gutta-percha articles, as buttons, from those made of horn, vulcanite, etc.? A. By the odor developed by heat or friction.

(10) H. M. D. writes: 1. Should I have a return wire on a telephone line three hundred feet long? A. You may use either a return wire or a ground connection. 2. Can I have as many turns as I wish on the line? A. Yes. 3. Can I use two gravity batteries (one at each end) to work two bells, and what size wire should I use? A. Yes. Use No. 12 iron wire or No. 16 copper wire.

(11) W. S. G. writes: I am desirous of becoming an electrician. What books would be the best for me to study on the subject to learn it thoroughly? A. Begin with Ganot's "Physics," then study Gordon's "Electricity and Magnetism," Prescott's "Electricity and the Electric Telegraph," "Electric Batteries," by Niaudet, "Electric Illumination," by James Dredge. As you continue your study, other works will suggest themselves.

(12) W. W. R. asks: Will you please explain the phenomenon of electrical currents as employed in telegraphic circuits—whether by the application of ground wires at the termini a direct current is formed, or that the circuit is completed by the attaching of ground wires, which communicates the electricity generated in the batteries to a general body of fluid which is supposed to permeate the earth? A. It has been demonstrated by the experiments of Wheatstone, Caselli, and others, that the earth is a great reservoir of electricity, and that currents flowing to the earth are dissipated.

(13) R. W. R. asks: Will you please inform me how to make the induction coil, as described in SUPPLEMENT, No. 160, vol. vii., Jan. 25, 1879, so that I can regulate the current to give strong or weak shocks? A. Make the bundle of iron wires forming the core of the coil movable, so that it may be pushed into or withdrawn from the coil.

(14) W. P. B. writes: Referring to SUPPLEMENT, No. 159, Jan. 18, 1879, in article on batteries, it is stated that in the porous cup of the "Marie Davy" quicksilver battery, protosulphate of mercury should be used in the form of a paste. I would like to know: 1. What substance is used with the mercury to form the paste, and in what proportions, respectively? A. Water. 2. Is protosulphate of mercury the same as the sulphate of mercury sold by dealers in chemicals? No. 3. Will such a battery be suitable for silver plating in a small way? A. It can be used in that way, but a Bunsen or Daniell is better.

(15) J. A. B. asks: What would take the scale off polished cast iron, the scale being caused by continuous heat for several hours? A. Use, by volume, one part sulphuric acid, one part nitric acid, two parts water, applied warm—either the acid or cast iron. Better, by far, remove the scale by simple polishing or abrading substances.

(16) G. W. D. sends us the following remedy for stopping the singing in bass violin strings caused by shrinkage of the gut. Release the string somewhat and place some olive oil on a woolen cloth, rub it up and down the length of the string; the oil will penetrate through the wire spaces and on to the gut, and will in a short time cause the gut to swell to its original size, and thus stop the singing.

(17) W. J. asks: Would you please inform me through your paper what would be the best form of battery for making copper electrotypes of any desired thickness? I wish a constant battery, which would require no attention for a couple of months. A. Daniell's or the gravity battery would probably answer your purpose. 2. Also if you could give directions for making nickel electrotypes of any desired thickness? A. We know of no method of making nickel electrotypes. You can make copper electrotypes and afterward nickel them.

(18) A. W. H. writes: in your SCIENTIFIC AMERICAN SUPPLEMENT, you published a description of a small electric light to work with a 3 cell bichromate battery. We would like to know if a 5 cell gravity battery would do, or if a gravity battery would do at all? A. No. It would require a large number of gravity cells to do the same work. 2. Can you send us prices of the gas carbons and could they be sent by mail? A. Carbon plates are not very expensive. The price depends upon the size. Any of our dealers in electrical supplies can furnish them by mail. See our advertising columns.

(19) F. W. D. asks for a good varnish to apply to designs printed in fine gold bronze on thin leather, something which will protect the bronze without coloring the leather and will dry quickly? A. Pale shellac, 5 oz.; borax, 1 oz.; water, 1 pint; digest at nearly the boiling point, until dissolved, then strain. Equal to the more costly spirit varnish for many purposes; it is an excellent vehicle for water colors, inks, etc.; when dry it is waterproof.

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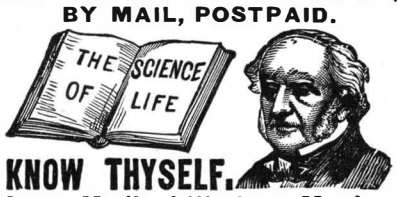

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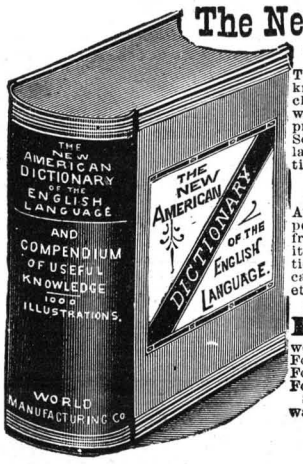

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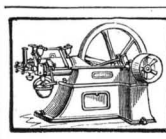

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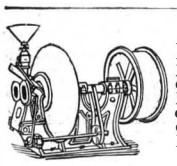

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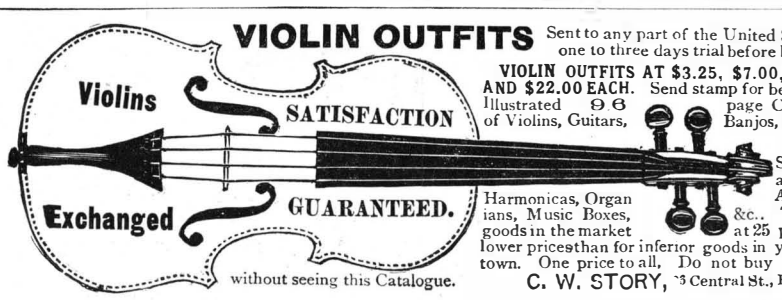

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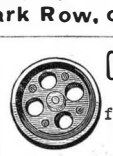

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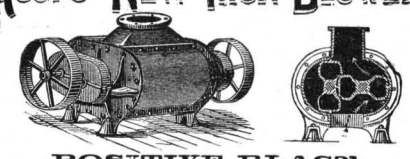

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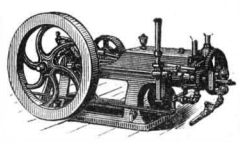

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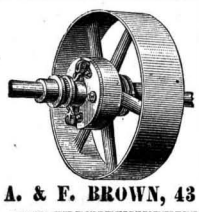

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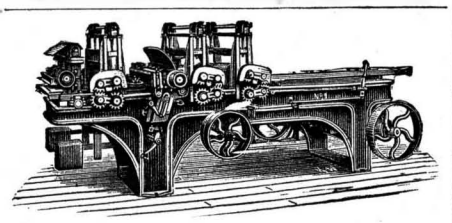

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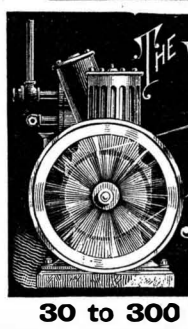

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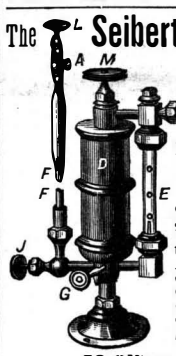

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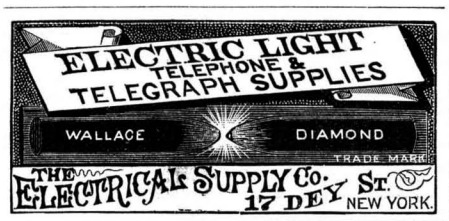

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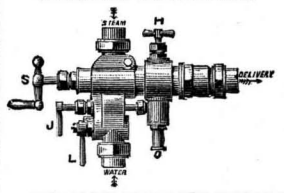

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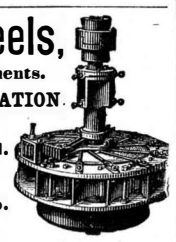

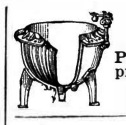

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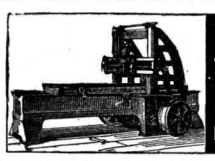

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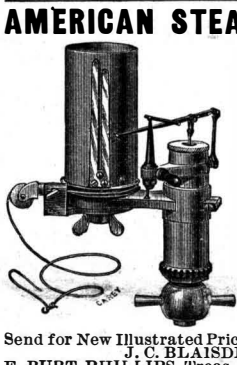

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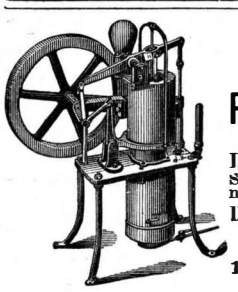

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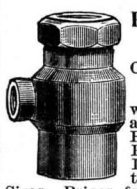

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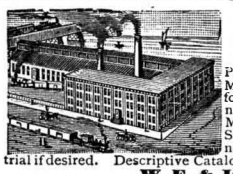

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