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NEW ACOUSTIC APPARATUS.

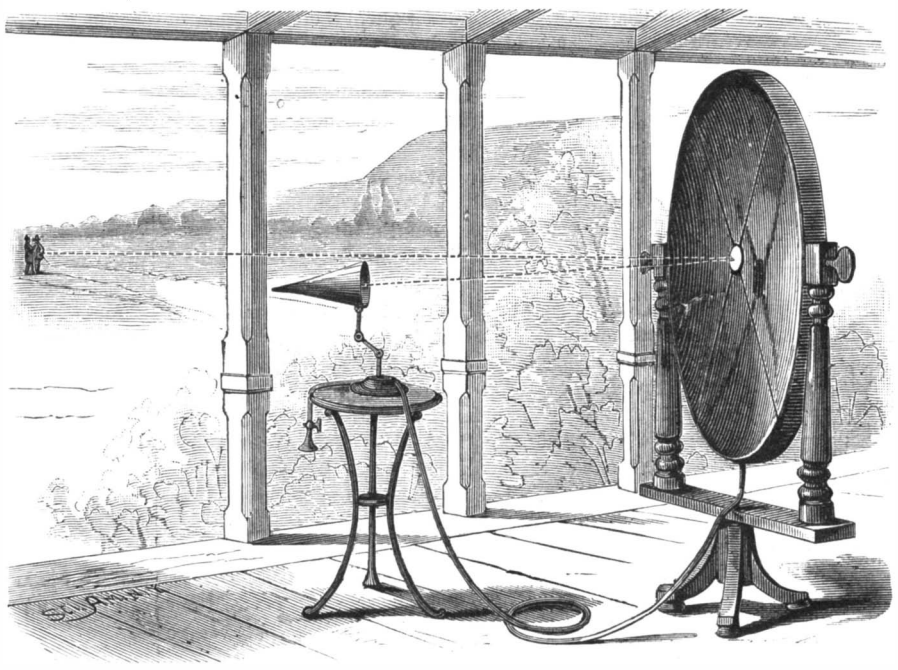
BY GEO. M. HOPKINS.

The analogy between sound and light is in many respects remarkable; they are both wave motions, governed by similar laws, and may be illustrated in the same way. Both may be reflected, refracted, condensed, or diffused by similar means. The particular action of sound to be dealt with here is that of reflection, examples of which are presented in every echo; and whispering galleries are but the exhibition of the same thing, although more rare. A few of them have a world-wide reputation.

In his article on sound in the "Encyclopædia Metropolitana," Sir John Herschel mentions the abbey church of St. Albans, where the tick of a watch may be heard from one end of the edifice to the other. In Gloucester Cathedral a gallery, of octagonal form conveys a whisper 75 feet across the nave. In the whispering gallery of St. Paul's the faintest sound is conveyed from one side of the dome to the other, but is not heard at any intermediate point. The dome of the capitol at Washington is an excellent whispering gallery. These effects are due to an accidental arrangement of the walls.

Sails of ships are sometimes inflated by the wind so that they act as concentrating reflectors of sound. Arnott says that in coasting off Brazil he heard the bells of San Salvador from a distance of 110 miles, by standing before the mainsail, which happened at the time to assume the form of a concave reflector, focusing at his ear.

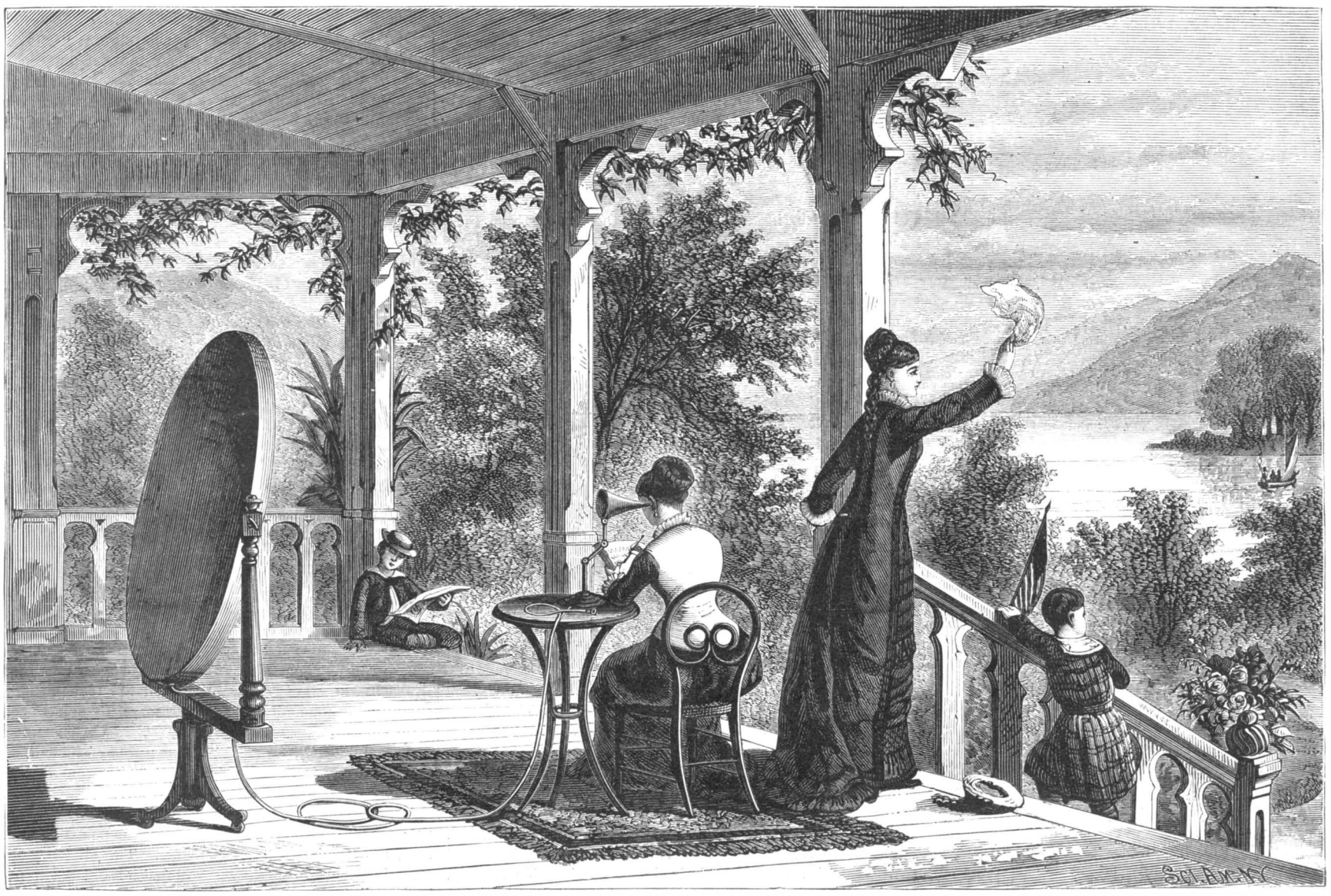
Sounds may be received and conveyed by means of metallic parabolic reflectors, so that many times the volume of sound that naturally strikes the ear will be concentrated, rendering audible sounds that might otherwise be too distant or too faint to be heard. Such reflectors of necessity have a fixed focus, and are available under certain conditions only. The accompanying engravings represent a form of sound reflector that may be focused as readily and directed as easily as a telescope. It is, in fact, a portable and adjustable whispering gallery, having many useful applications. These will be hinted at further on. The instrument is very simple, consisting essentially of an airtight drum, one head of which is rigid, the other elastic. This drum, or, more properly, reflector, is mounted on pivots in a swiveled support, and is provided with a flexible tube having a mouthpiece and stop cock at its free end. Two wires are stretched across the face of the reflector at right angles to each other, and support at their intersection a small plane mirror, the office of which is to determine the position of the reflector in relation to the direction of the sound. A small ear trumpet or funnel, which is shown on the table, is used in connection with the reflector, to increase its effect by gathering a portion of the sound that might escape the unaided ear.



ACOUSTIC APPARATUS. Fig. 2.

The reflector is adjusted by looking through the ear trumpet toward the small plane mirror, and moving the sound reflector until the source of sound is seen in the mirror. The reflector is then focused by exhausting the air from behind the flexible head until the required degree of concavity is reached, which will be when sounds are distinctly heard in the ear trumpet. The air is readily exhausted from the reflector by applying the mouth to the mouthpiece.

The details of the construction of the apparatus will be seen in Fig. 2. The larger engraving clearly shows the manner of using. The lady sitting at the table hears in the trumpet what is said in the boat on the lake in the distance, and it is not impossible that the voyagers may hear from the sails of their boat what is said on the porch. Of course the operation of the instrument may be reversed—that is, sounds made at the focus of the reflector may be projected in parallel lines over long distances, but in practice a speaking trumpet is found to be better for this purpose. The engraving shows but one of the applications of the reflector. It would be a simple matter to provide for a deaf person an instrument on this principle. It could hang on the walls of the parlor unnoticed, as it might take the form of a richly framed picture, and would concentrate a great volume of sound at a single point. The same device may also be applied to an auditorium to project the voice of the speaker in any required direction.



NEW INSTRUMENT FOR CONCENTRATING AND PROJECTING SOUNDS.

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VOL. XL., No. 14. [NEW SERIES.] *Thirty-fifth Year.*

NEW YORK, SATURDAY, APRIL 5, 1879.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 170.
For the Week ending April 5, 1879.

Price 10 cents. For sale by all newsdealers.

LABOR AND THE COST OF LIVING.

Notice was taken last summer of the encouraging results obtained by the Massachusetts Labor Bureau in the inquiry as to the numbers of employed and unemployed men and women in that State. It will be remembered that the number of people seeking work was then about 28,500. The tenth annual report of the Bureau, just published, gives the result of another canvass, made in November, from which it appears that only 23,000 people in Massachusetts were then in want of work and could not get it. If the industrial condition of Massachusetts may be taken as an index of the industrial condition of the whole country, we arrive at the encouraging conclusion that not more than one per cent of the population of the United States began the winter unemployed. This, notwithstanding the fact that the relative proportion of those seeking employment and depending on it for support was probably much greater than ever before. Multitudes who had retired from business in flush times, had been driven to seek work again in consequence of failing investments; and for similar reasons many young people and dependents upon wealthy parents and relatives had been set adrift to crowd the labor market.

That the reduction of wages consequent thereupon, and the return of prices to a gold basis, had not brought the working people of Massachusetts, as regards work and wages, relatively below their position when gold began to go up, is shown by statistics, which we believe to be worthy of the utmost confidence.

"The following is the per centum of increase of wages in 1878 over 1860 in the several trades: Agricultural laborers, per day 33 per centum, per month 15; manufacture of arms, 19; artisans' tools, 38; blacksmiths', 47; bookbinding, 14 to 17; boots and shoes, 2·6; boxes, 13 to 38; bakers, 13 to 38; brickmakers, 9; building trades, 16; cabinet making, 6 to 16; carpet making, 23; carriages, 30; clothing, 8; dressmaking, 19; leather making, 28; linen and jute manufacture, 20 to 28; machinery manufacture, 27; metallic fine work and jewelry, 25; millinery, 23; musical instruments, 8; paints, 28; paper, 41; printing, 30; silk manufacture, 45; soap and candles, 13; stone working, 8; manufacture of woolen goods, 33; worsted goods, 22. The following are the occupations and the percentage of decrease of wages: Bleaching, dyeing, and printing of cloths, 3 per centum; preserving meats, pickles, etc., 2; envelope making, 11; shipbuilding, 32.

"The returns from 63,515 employes in the occupations considered, in the cities and towns visited, show that average weekly wages, on a gold basis, were twenty-four and four tenths per centum higher in 1878 than they were in 1860.

"It is found that the prices of groceries has advanced over 1860, 7 per centum; provisions, 28; fuel, 5; boots, 18; rents, 25; board, 49; while drygoods have fallen 9 per centum. On all the items entering into the cost of living the average price was 14½ per centum higher in 1878 than it was in 1860. The following figures show the per centum which the prices of the following articles in 1872 exceed the same in 1878: Groceries, 43; provisions, 17; fuel, 44; drygoods, 40; boots, 21; rents, 105; board, 37. On all of the above items the average per centum of cost in 1872 above the same in 1878 was 54 per centum.

"The results of the investigation relative to wages and prices are as follows: Wages have advanced, compared with 1860, 24·4 per centum, and the cost of living 14·5 per centum, which on its face shows a pecuniary advantage to the workingmen of 9 9-10 per centum.

"Careful inquiry was made by the officers of the bureau of 345 retail dealers in ten cities and towns containing a population of 530,000, to ascertain the amount, quality of goods purchased now compared with the same several years since, together with the ability to pay for the same. From these inquiries the following conclusions are reached: That the workingmen of Massachusetts, in the majority of cases, have the best quality of food, though not in so great quantity and variety as in previous years; that they are practicing a rigid economy in purchases of clothing, drygoods, boots and shoes, house-furnishing goods, and fuel; and that the majority continue to pay their bills promptly.

"Comparing this state of affairs with the previously ascertained relations of wages and prices, which shows in 1878 an advance over 1860 of 24 4-10 per centum in average weekly wages, and an average advance in cost of living of 14½ per centum, which means a pecuniary betterment of 10 per centum in the general condition of the workingman in Massachusetts in 1878 as compared with 1860, no account being made of the decrease in hours of labor in many industries—it would seem almost like stating an axiom to prophesy that, with a revival in business, a gradual decline in the prices of provisions, etc., and no cut down in wages, the condition of the workingman in this State, within a comparatively short period, will be better, considering all circumstances, than it ever has been since the foundation of our Commonwealth."

What is true of Massachusetts in this respect, there is ample reason for believing to be true of the whole country.

DANGERS OF LEAD POISONING FROM THE USE OF TINNED WARE.

According to recent investigations made, both in England and this country, it seems that we would do well hereafter to examine very carefully the tin employed in coating utensils that are used for cooking or preserving food of any kind. Since tin has fallen in price it is not very uncommon to meet with samples which contain lead to a considerable amount, evidently added to the more expensive metal with a view of adulterating it and thus avoiding loss on the price at which it is necessary to sell it. The results of this, of course, may prove serious. Dr. R. C. Kedzie, President of the State Board of Health of Michigan, in a recent report on this subject says: "I have examined a large number of specimens of tin plate, of vessels made of tinned iron, of tin spoons, and iron spoons coated with tin, both teaspoons and tablespoons, and find in almost every instance that the tin is alloyed with lead; in almost every case the lead was present in some quantity, and often in very large quantity. Nor is the lead confined to the poorer qualities of tin, but some of the highest priced and 'first quality of tin plate' contains a large quantity of lead. It is an astonishing fact that a large proportion of the tinned wares in the market are unfit to use because of the large quantity of lead with which the tin is alloyed."

The dangers that are likely to ensue from the use of articles tinned with such an alloy are these: The alloy of tin and lead will tarnish, or, more properly speaking, oxidize much more readily than pure tin; and the oxide of lead thus formed. is very soluble in acetic acid or vinegar (forming "sugar of lead"), and also in lactic acid or the acid of sour milk; it will form, too, salts with malic and citric acids which exist in our common fruits, such as apples, cherries, strawberries, currants, etc. Indeed, as Dr. Kedzie very truly observes, any of our acid fruits when cooked in vessels containing any lead, or even when left in such vessels for some time, are very liable to take up some of the poisonous metal, and to become thereby unfit for food, inasmuch as all salts of lead are poisonous; and the danger is the greater because lead compounds are cumulative poisons. "A person may not be poisoned by one or two small doses, but even if a very minute dose is taken for a long time, the person may be broken in health or even lose his life."

Fortunately the test for lead is a very simple and easy one, and almost everybody has it in his power to make the application of it and determine satisfactorily whether his tinware contains any of the poisonous metal in sensible quantity. For this purpose Dr. Kedzie recommends that a drop of strong nitric acid be placed on the tinned surface by means of a glass rod or splinter of wood, and that the acid be rubbed over a space as large as a dime, warmed gently until dry, and that two drops of a solution of potassium iodide be then dropped on the spot. If the tin contains lead a bright yellow iodide of lead will form on the spot. The test is one that can be very rapidly applied, and the results are decisive.

GARY'S ALLEGED NEUTRAL LINE.

Mr. G. T. Milliken, in a letter to the Editor of the SCIENTIFIC AMERICAN, dated March 13, 1879, maintains that the explanation of the behavior of the nail, contained in the issue of the SCIENTIFIC AMERICAN, March 8, page 144, is not correct. That explanation was as follows: "At a certain point the nail leaves the sheet iron and falls to the ground, simply because, by reason of its approach to the attracting pole, it tends to fly to it, but in leaving the piece of sheet iron, the force of gravitation acts more strongly than the force of attraction, and the nail consequently falls to the ground."

Mr. Milliken's explanation is as follows: "The sheet iron armature, being polarized by the magnet, in turn polarizes the nail which is suspended from it, and this polarity (of the nail) is necessarily reversed when brought within the direct control of the magnet, or sufficiently near thereto to be more powerfully affected by it than by the sheet iron, the power of which to increase its ability to control the nail, as they both approach the magnet, depends upon its thickness and area." Mr. Milliken's explanation is essentially the same as that which he criticises. The lines of force from a magnet, it is well known, radiate from the poles and diverge as the distance from the pole increases. This can be noticed in the ordinary experiment of the action of iron filings near a magnetic pole.

The particles of the sheet iron armature of Mr. Gary are in the condition of the iron filings. Each one would separate from its neighboring particle and tend to fly to the attracting magnet if it were not held to the neighboring particles by the forces of cohesion and elasticity. The nail, however, is in the condition of a detached particle of the armature; its reversed polarity prevents its remaining attached to the last particles of the armature, and it falls, if it is not near enough to be attracted to the magnet. The lines of force of the magnet, however, act upon it just as they would upon a small iron filing and draw one end of it toward the magnet while the other end is repelled. When the armature and nail are very near the magnet, the nail is strongly attracted to the magnet, just as iron filings are strongly gathered about the pole. When the nail is at a suitable distance it is less strongly attracted to the pole, just as an iron filing is less strongly attracted to the pole at a little distance. In other words, a chain of magnetic nails, hanging together vertically by their mutual attractions end to end and suddenly submitted to the action of a strong magnetic pole placed at right angles to the chain, will separate and behave like iron filings, and also like Mr. Gary's armature and its nail. The explanation of Mr. Milliken does not differ from that given in the issue of the SCIENTIFIC AMERICAN, March 8. In short, every particle of the armature tends to fly to the magnet; the nail, which for the time being is part of the armature, also tends to fly to the magnet. This tendency necessarily implies opposite polarities in the ends of any two neighboring particles which move in converging lines of force to the magnet.

A CONTRAST BETWEEN AMERICAN AND ENGLISH ARTISANS.

One secret of the ready adoption of mechanical and other improvements in this country lies in the willingness of American workmen to receive and welcome new labor-saving inventions. Nine out of every ten of them either are or hope to be successful inventors; and all have learned to look upon invention as one of the surest means not only of improving the inventor's condition, but also that of those called upon to build or operate the new machine. In countries where the patent laws do less to foster invention and to create a kindly feeling toward improvements on the part of all workmen, the case is very different. There the prejudice against labor-saving devices is often so strong that workmen will see an industry driven out of their country,and themselves left without employment, rather than change their mode of working. Such suicidal foolishness would be impossible among artisans educated by a liberal patent law to appreciate the ultimate benefit of labor-saving devices.

One of the largest machinists in England recently purchased a valuable invention for making railway carriage and other springs by machinery, but his workmen positively refused to avail themselves of it. It ended in his sending the contrivance to Belgium, together with suitable material, and the springs are actually made there and returned to England.

THE SECURITY OF THE EAST RIVER BRIDGE.

At a meeting of a sub-committee of the New York Assembly Committee on Finance and Navigation, to investigate the charge against the Brooklyn Bridge, some very interesting testimony was taken.

The charges were that the bridge when completed will impede the free and common navigation of the East River; be a serious obstruction to the commerce of New York, and to the growth and prosperity of the port; will not adequately provide a certain and safe mode of travel between the two cities; will not be of any substantial benefit to either, while it will reduce largely the value of property on the East River in both cities; and that it will be an insecure structure, on account of its great length, and cannot be properly stayed and protected at its great height against strong winds.

Mr. Philip B. Low, a practical ship-rigger, said that he had made measurements of ships' masts and estimates from draughts, and according to these, in his opinion, all ships not exceeding 875 tons burden, with possibly here and there an exception, could pass light and unladen under the bridge at any point where it was 134 feet above the river at half tide; that in his opinion, with the exception of a very few of the largest steamships that always discharge in the North River, and the large pleasure yachts, there were no barks, brigs, or schooners, except the two schooners, the Matilda Cranz and the Frederick, that could not readily pass under the bridge at half tide, and very few which could not do so at full tide; and he thought that there were not more than two ships arriving in this port in a year which would require the housing of topmasts.

Col. William H. Paine, Assistant Engineer of the bridge, testified that the weight of the New York tower masonry was 93,000 tons. The pressure at the bottom of the caisson, on the bed rock, was four and a half tons to the square foot; at the base of the stone work eight tons, and at the base of the center column, between the roadways, and on a level with them, the pressure was twenty-nine and a half tons to the square foot. That was the greatest weight. Stone of a similar character to that of which the tower was built had stood a pressure of 5,000 tons to the square foot.

With regard to the settling of the towers, Col. Paine said that in building the caisson of the New York tower a number of timbers had been bolted together. In this operation there was a gain of 2½ inches, the timbers not coming together. He had expected that the tower would settle at least that much. Careful observations had been made. As the stone work arose above the water, spikes were put in the masonry and careful levels taken. The result was that the tower had settled only 1¼ inch, one half of what had been expected. This settling had been very evenly distributed over the whole surface of the tower.

Touching the strength of the bridge, Col. Paine said that the elements of strength were the towers, the anchorages, and the cables. The anchorages served to hold the cables. There were first four large bed plates of iron. To these were secured chains. There were 60,000 tons of masonry in each anchorage, and of the 60,000 there were 6,639 tons over each bed plate. The strain on each plate would be 1,769 tons. The bars had a strength of 12,875 tons. In every particular there had been an effort to make every part of the bridge stronger than the estimates in the original plan of Mr. Roebling. The strength of the cables was 12,000 tons each. The stays are to assist in sustaining the load. They would pass from the towers down, and be secured to the trusses at various distances. They controlled the weight, so that the bridge would not act; that is, one part sink and another rise. No part of the bridge could sink without a corresponding elevation in another part. The stays prevented this. They sustained a strain of 1,439 tons each, on each side of the bridge. They were the great feature of Mr. Roebling's plan, and made the bridge superior to all others, which were made only with suspenders. These stays prevented the wind under the bridge from lifting it. They also prevented swinging, for they were on an angle, being nine feet further in at the bridge than at the towers. They converged. The force of the wind would bring all the stays and two cables to resist it. There was also a system of heavy stays running from the towers to the opposite side of the bridge. This was an improvement on the Niagara bridge, where the storm stays were attached to distant objects. There they worked against each other, and were more affected by heat and cold.

Being asked to give the strength of the bridge in detail, Col. Paine said that when the bridge was filled with cars, teams, and passengers there would be a distributed strain of 30 pounds per square foot. The bridge was able to stand a strain of 89-100 ton to the lineal foot. It had been calculated that 7,200 teams could pass in an hour, at the rate of 200 feet in a minute; 80 cars could be allowed on the bridge at once, allowing six minutes for crossing; each car would hold 100 passengers. Thus 80,000 passengers could cross in an hour, besides those on foot. The strain on the anchorage was about four times less than the margin of safety; that on the suspenders eight times less. The safe distributed load of the bridge was 1,311 tons. This it could carry safely, and it had a margin of safety of five; that is, when the bridge was filled to its full capacity, it was then able to carry a weight five times greater. The weight of the bridge itself was 5,976 tons.

THE NEUTRAL LINE.—A NOTE FROM MR. GARY.

To the Editor of the Scientific American:

Having read an article on "Gary's Alleged Neutral Line," on page 177, of March 22, and also on page 144, of March 8, I feel assured you will allow me a limited space to present the other side of the question.

It is well known that a bar of iron held with one end near the pole of a magnet becomes magnetized or polarized by induction; that the end of the bar nearest to the pole of the magnet is of opposite polarity to the pole of the magnet, while the other end of the iron is of like polarity. Now, if the end of the iron nearest the magnet is brought in contact with the pole of the magnet, the iron changes its polarity and becomes of the same polarity as the magnet. This is a well known law of magnetism.

We will now suppose the end of the bar of iron is held above the north pole of a horseshoe magnet, the iron will become polarized, the end above the north pole of the magnet will be a south pole, the end farther away will be a north pole. Now, if the north pole of iron is moved around above the south pole of the magnet, it will still be a north pole, and both ends of the iron will be polarized and of opposite polarity to poles of the magnet beneath them. If the iron is now brought in contact with the poles of the magnet beneath it, its polarity is changed; each end of the iron is of the same polarity as the pole of the magnet with which it is in contact.

If a thick piece of iron is used it will absorb or neutralize the magnetic waves when in contact, and show less polarity than when not in contact.

What I claim as my discovery is: *that the iron, if of proper proportions, will change its polarity before it comes in contact with the magnet.* As a proof of this, take a horseshoe magnet of contact power of seven to ten pounds; take a bar of iron from one eighth to one fourth inch thick, long enough when placed across and above the poles for the ends to project out over the poles three or four inches; raise the iron one or two inches above the magnet; put several thicknesses of paper across the poles of the magnet, to keep the iron from contact when lowered down toward the magnet. Now take a common box compass, or any other; hold it level near the end of the iron; lower the iron evenly down to the paper; keep the iron as near as possible between the compass and magnet; do not place the compass too near the iron, as it will or may change the polarity of the needle as the iron changes its polarity. The needle will reverse as it passes the neutral line; or place the needle on the iron, raise the iron and lower it; it will dip one end and then the other as it passes the line and stand level while on it. Or try any experiment by which the old law of the change of polarity is proved in one end of the iron, as it comes in contact, and it will prove, that under the conditions I have named, the polarity changes before it comes in contact.

In regard to the experiment with the nail, the writer, on page 144, says: "It (the nail) falls to the ground simply because, by reason of its approach to the attracting force, it tends to fly to it and it falls to the ground."

Why did not the writer have the fairness to state that the nail, when still nearer the attracting force than the point where it drops off, will cling to it again, and before the iron comes in contact, the point of the nail turning outward, thus showing a change of polarity in the iron?

The writer, on page 177, of March 22, says: "The sheet iron armature being polarized it polarizes the nail which is suspended from it, and that this polarity of the nail is reversed when brought within direct control of the magnet. The nail drops of course without any change of polarity of the sheet iron or the existence of any so-called neutral line."

Does not the writer know that when a nail is in contact with an induced magnet, or any other magnet, it has the same polarity, and is a part of the same? Now, as it clings to the iron, and both move together toward the magnet,why are we to suppose one changes its polarity without the other changing also? The fact is they both change. At the point where they change they are both neutral, and will not cling together, but above and below they are polarized, and will cling together; if it is not so, then I have discovered that opposite poles repel and like poles attract each other.

We cannot destroy old laws or old facts, but may we not discover new laws and new facts without "a feeling of utter contempt for scientific men," as the writer remarks on page 144? The law of gravitation was not discovered in a laboratory, nor was the power of steam, nor electricity. I believe the world expects our learned professors to teach us what has been discovered, and not that there is nothing more worth knowing; and I believe the discovery of a new law is of as much value to the world, if discovered by Franklin with his kite, Newton with an apple, Faraday with his magnets, iron filings, and paper, a lumberman with a ten-penny nail, as if discovered by a learned professor in his laboratory.

W. W. GARY.

Huntingdon, Pa., March 17, 1879.

[REMARKS.—None of the experiments here mentioned by Mr. Gary are new; there is no neutral line in any such sense as he asserts; what he above specially claims as his discovery is simply a very old, well known phenomenon imperfectly and erroneously alluded to in his italics.

Everybody will agree with what our correspondent says about laboratory discoveries, Newton and the apple, Franklin and the kite string; but it does not necessarily follow that Gary has discovered anything with a ten-penny nail. All he appears to have done is to revive a few time-honored experiments and trot out before the public an ancient perpetual motion delusion.]

MISS HOSMER'S MOTOR.

Miss Hosmer, who announced the discovery by herself of a magnetic perpetual motion machine before Mr. Gary, has found out by trial that the thing will not operate, and has abandoned the field. Her application for patent in England was given up after the provisional patent was obtained.

HEINRICH GEISSLER.

The world of science has lost a distinguished follower in Dr. Heinrich Geissler, who died at Bonn on the 24th of January. He was born in the village of Igelshieb, Germany, in the year 1814. Having early in life mastered the art of glass blowing, he, after many years of wandering, settled at length permanently at Bonn, finding here constant employment in the preparation of articles requisite for scientific research—a kind of work which had peculiar attractions for him. He was a master of his art, and in his hands the treatment of glass by the blowpipe attained a perfection that had been before unknown.

He planned and manufactured apparatus of the most delicate construction and of the greatest accuracy, and for the last thirty years there has been issuing from his workshop a constant succession of the most novel and ingenious devices for the furtherance of scientific discovery. He was the inventor, among other things, of the mercury air pump, the vaporimeter, the normal thermometer, and the normal aerometer. But the apparatus with which his name is most closely identified in the popular mind is that of the "tubes" which bear his name, and which were designed for the exhibition and study of the phenomena that accompany the discharges of electricity in various gases and vapors. One of the earliest investigations of Dr. Geissler was undertaken jointly with the celebrated physicist, Plücker, in 1852. They made, at this time, a series of observations on the expansion of water, and established the maximum of density at 3·8°; this was effected by means of a very delicate contrivance, in which the expansion of the water was exactly compensated by the introduction of mercury. In 1869 Geissler and Vogelsang together, having decomposed quartz and topaz by means of a galvanic current and collected the resulting gases in a vacuum, demonstrated the presence in the cavities of these minerals of liquid carbonic acid, the presence of the carbonic dioxide being shown in the vacuum by the electric arc. Not long after this Geissler succeeded in changing, by the action of the electric current, ordinary phosphorus into the amorphous state,

In very many respects the career of Dr. Geissler was similar to that of Ruhmkorff, whose death we chronicled a year ago. Both arose to positions of honor, and to a certain degree of fame, in the scientific world, from the lower walks of life; and both gave, by means of their familiarity with scientific facts and principles, and their constructive ability, an impulse to the march of original physical investigation.

In announcing his death to the Berlin Chemical Society, the President, Dr. Hoffmann, said that Dr. Geissler could be best described in the English words "a self-made man."

Mr. Barnum Calls for a New Invention.

To the Editor of the Scientific American:

Cannot all our boasted Yankee ingenuity devise a cheap means of rendering cotton and linen canvas waterproof? All of my show tents are made of "Methuen duck," and I am obliged at much expense to send it to France to get it waterproofed. Any person in this country who can accomplish the same thing effectually can make considerable money by it.

P. T. BARNUM.

Bridgeport, Ct., March 15, 1879 .

Meat Canning by Machinery.

We are happy to be informed that the assertion of the *British Farmers' Gazette* (cited in our issue of February 22, page 116), to the effect that by means of newly invented machinery the meat canners of Melbourne could fill twenty-four cans in the same time that one is filled in Chicago, is not strictly true. At any rate, Melbourne is not that far ahead of St. Louis. A correspondent in the latter city writes that the St. Louis Beef Canning Co. can all their meats by machinery, and are confident that its process is not surpassed anywhere.

THE HERRESHOFF TORPEDO LAUNCH.

A short time since we noticed this remarkable little vessel; we now present engravings of it, for which we are indebted to the London *Graphic* and *Engineering*. This launch, as will be remembered, was built in Bristol, R. I., for the English Government. It arrived in the Thames on New Year's Day, having crossed the Atlantic on the deck of the National Line steamer Denmark.

The boat, which is shown in section in Fig. 2, is 59 feet 6 inches long, by 7 feet 6 inches beam and 5 feet 6 inches deep, with 1 foot 3 inches draught of water, there thus being 4 feet 3 inches of freeboard. Her working draught, however, is 4 feet 6 inches, as the screw and rudder are both placed below the keel. The vessel is constructed with five watertight bulkheads, and her hull is of composite construction below the water line, having a steel framing covered with wood planking. The upper part of the hull is wholly of steel, the plates being one sixteenth inch thick, the top sides sloping inward, and the upper work forming a protective superstructure for the crew and machinery. She is propelled by a screw, which is placed beneath the vessel in a central position, and which is driven by a direct-acting condensing engine placed in the forward part of the boat.

The diameters of the steam cylinders are 10½ inches and 6 inches respectively, with a 10 inch stroke, and they are of 100 horse power estimated. There is an independent feed pump and air pump. The stoke hole is inclosed, and is supplied with air by a Sturtevant blower, which is driven by an independent engine of 2½ horse power. The propeller is a two bladed screw, 38 inches in diameter and 5 feet pitch, the screw shaft being 23 feet in length. The vessel is steered by means of a balanced rudder placed a short distance from the stern and under the ship, the helmsman being located in a stern cabin with a protected look-out raised just above the deck. The hull and machinery together weigh 6 tons, but with the working crew of four men, and fuel, stores, and two torpedoes on board, the boat weighs about 7½ tons.

Steam is supplied by a Herreshoff coil boiler, which constitutes another novelty in this boat. The boiler, which is shown in section in Fig. 3, consists of a circular combustion chamber, which in the present instance is 4 feet in diameter internally, and within which is a coil of about 300 feet of 2 inch pipe, coiled to nearly the diameter of the chamber. This coil is continued at the top so as to form a kind of dome under the cover of the combustion chamber. By the side of the boiler is a separator, into which the steam passes before it goes to the engine. The water from the feed pump is admitted at the top of the coil, and during its course to the bottom the greater portion of it becomes converted into steam. Having passed through the entire length of the coil, the steam and water are discharged together into the separator, in such a manner that the water is entirely separated from the steam, and can be blown off as required. The steam is taken from the top of the separator, and returns through a short coil placed inside the combustion chamber, where it becomes superheated, and is led thence to the engines. It is claimed for this boiler that it cannot explode destructively, inasmuch as there is but a very small quantity of water in it at any time, and that it is distributed along the entire length of the coil. A rupture at any point would only be attended by a moderate blowing off of steam. The rapid circulation of the water is found to prevent the deposit of salts, the surplus water not converted into steam carrying with it all impurities.

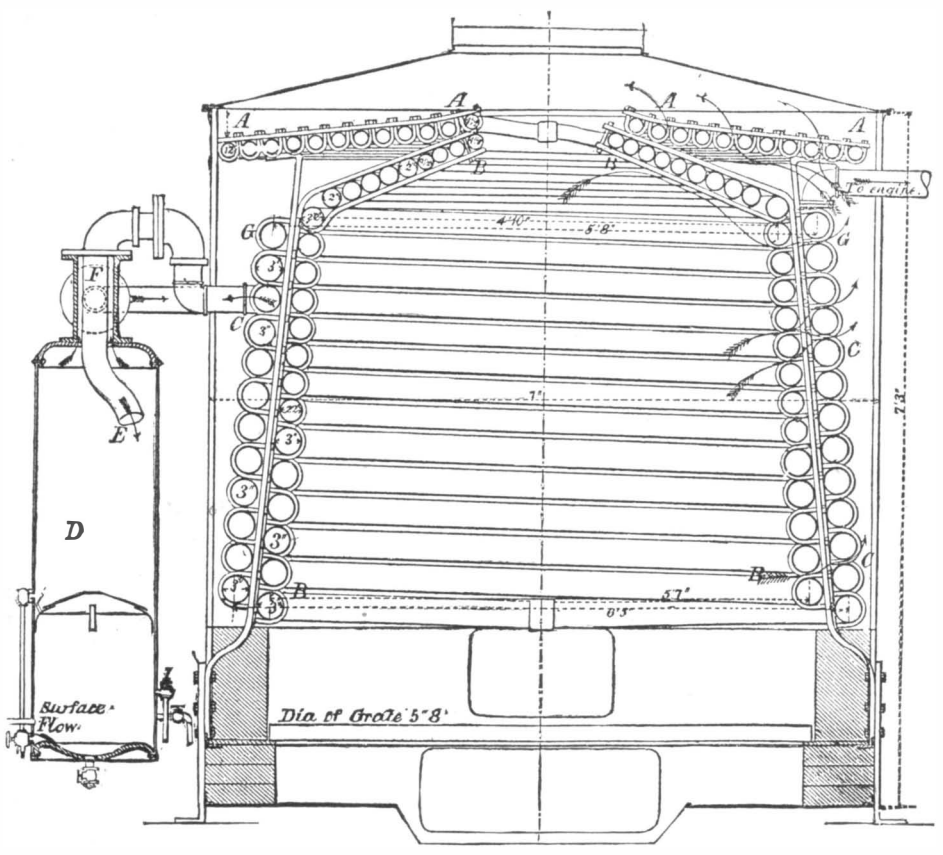


Fig. 3.—HERRESHOFF STEAM GENERATOR.

One condition of the contract was that the hull should be strong enough to be slung from a ship's davits without bending or "springing," and the larger engraving represents the vessel being lifted by the big crane at the Victualing Yard, Deptford, fully manned and equipped, her weight in that condition being about eight tons. The First Lord of the Admiralty was present, accompanied by Admirals Hood, Wellesley, and Sir Houston Stewart, the Controller of the Navy, and Mr. Barnaby, the Chief Constructor.

The vessel was then lowered into the water, and steam got up in five minutes after lighting the fire. The great handiness of the boat, and her powers of rapid stopping, starting, and turning, were next shown. She was stopped from full speed in a distance of one third her length, and immediately went astern at a rate nearly equal to her forward speed. She then, at full speed, turned in complete circles of a diameter of three times her length, and this either going ahead or astern. Her guaranteed speed is sixteen knots an hour, and this, it is stated, she attained, with two tons of coal on board, on the occasion of her official trial over the two knot course in Long Reach. Altogether the Herreshoff torpedo launch promises, from its powers of maneuvering and the great rapidity with which it can be got ready for sea, to form an important addition to our naval resources, while its numerous special features give it particular interest from a mechanical point of view.

Fig. 1.

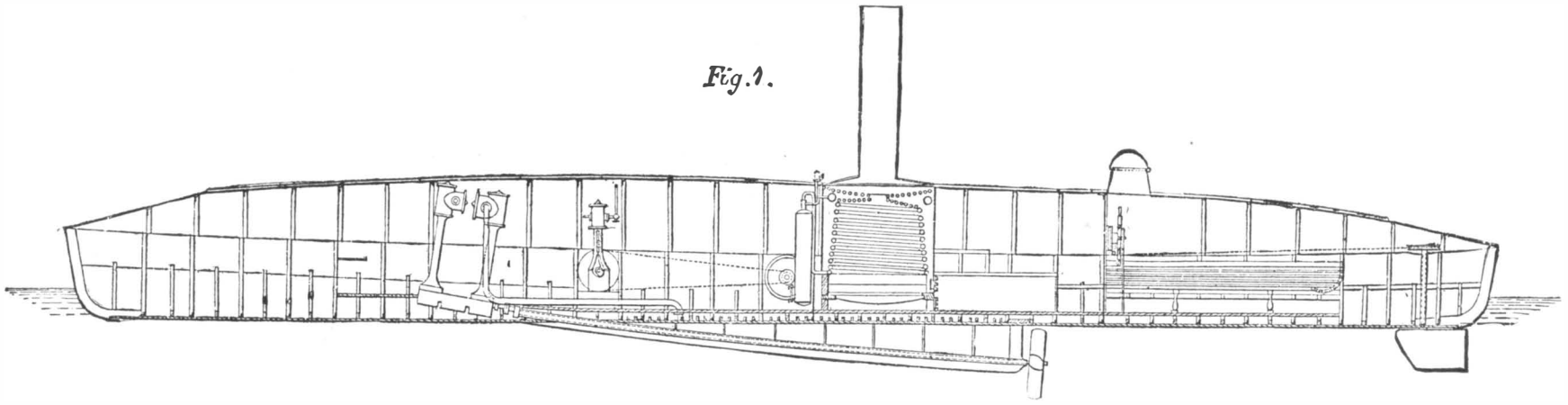
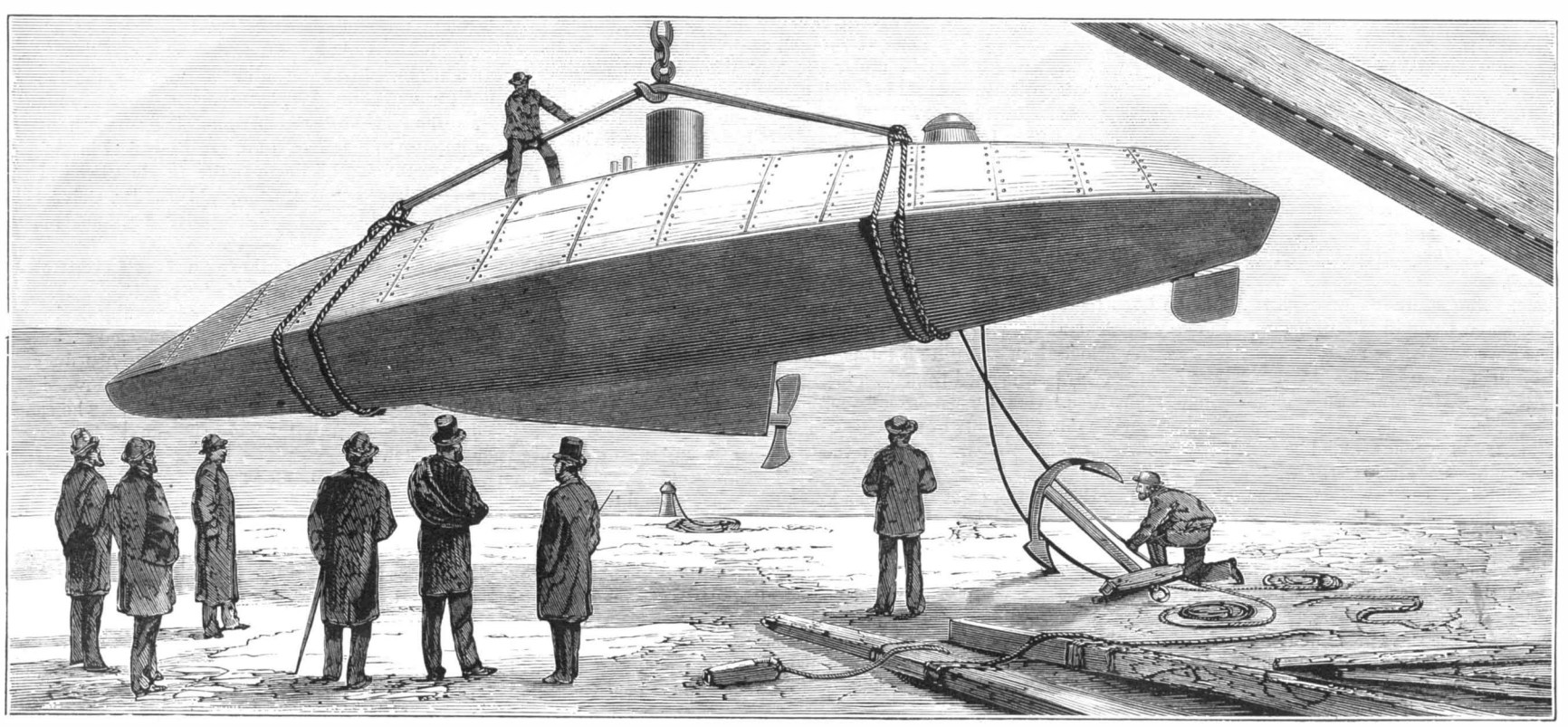


Fig. 2.—MACHINERY OF HERRESHOFF TORPEDO LAUNCH.

Dr. H. Briem proves that plants grow luxuriantly when their earliest stages are accelerated by heat.



THE HERRESHOFF TORPEDO LAUNCH, RECENTLY BUILT AT BRISTOL, R. I., FOR THE BRITISH GOVERNMENT.

Dangers to Railroad Brakemen.

Before the February meeting of the Car Builders' Association, Mr. D. A. Hopkins, one of the veteran railroad men of the country, related his experience as a freight train brakeman during his younger days, and described the perils to which this class of railway employes are exposed, especially in winter. They must run upon wet and icy running boards, and jump from one car to another in the darkness—a distance of from three to four feet. A single slip or a false step sends him to a horrible death. Statistics gathered as long ago as in 1852 showed that the proportion of men killed in this vocation on certain roads was greater than that of soldiers killed in ordinary warfare; and if railroad officers would give as much care to the protection of these men as they do the safety of passengers and freight, two thirds of the accidents that now occur might be avoided. As one means of prevention, the cars should be brought closer together. Another was by providing an iron upright guard around which a man might throw his arm while applying the brake, so that in case of the breaking of the chain, or slipping of the wheel, he could have something to hold on to.

According to the *National Car Builder*, Mr. Hopkins strongly urged the importance of well constructed cars. To secure this it was necessary that railroad companies should pay better prices for cars, so that builders could afford to use better material and workmanship. Contract cars, he contends, are apt to contain poor iron, cross grained wood, knotty sills, and other imperfections, which enhance the risks and dangers of train men; and in the matter of cost was poor economy after all.

A Victory for the Millers.

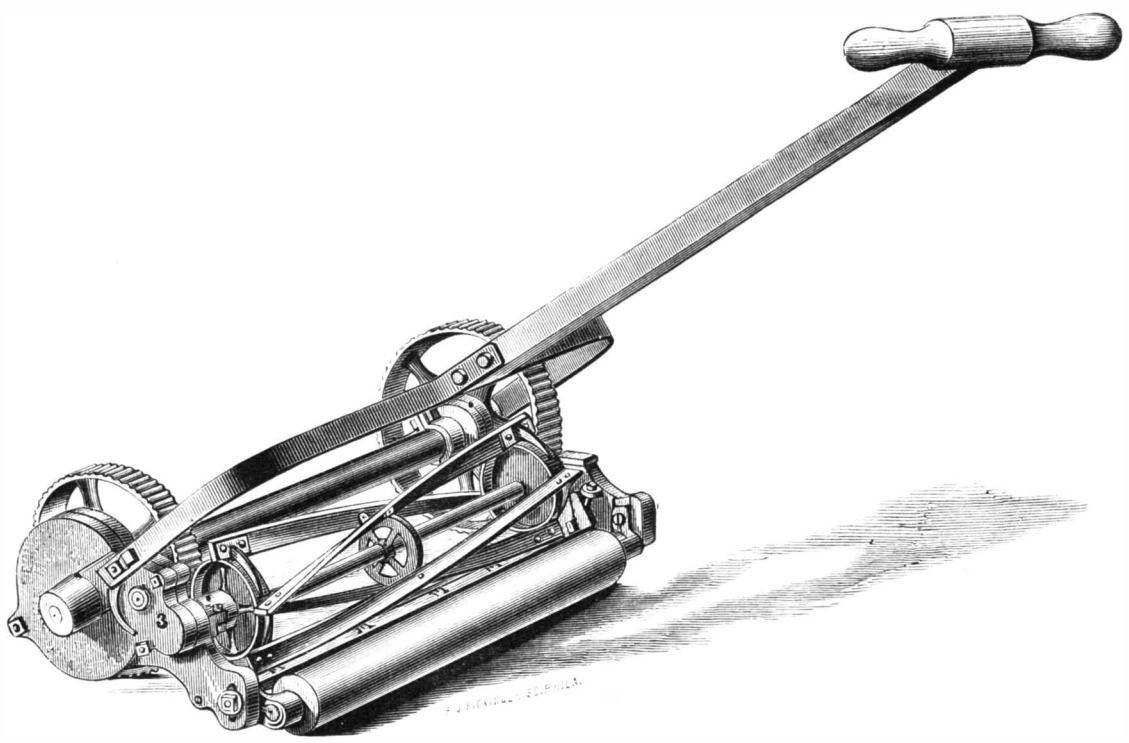
The United States Circuit Court decided the cases of the American Middlings Purifier Company against the millers of St. Louis, March 12, in favor of the defendants, on the ground that the reissued patent does not conform to the original, and is therefore invalid. The Minnesota cases follow the St. Louis cases. The plaintiffs will probably appeal to the United States Supreme Court.

AN IMPROVED LAWN MOWER.

The lawn mower, like many other machines, has passed through successive stages of improvement until it is now quite complete, besides being made at a reasonable price.

The accompanying engraving represents one of the improved machines made by Messrs. Lloyd, Supplee & Walton, of 625 Market street, Philadelphia, Pa. The points of difference between this and other machines of its class may be seen at a glance, and as it embodies some radical changes we will refer briefly to such as are considered improvements. Two independent driving wheels of large diameter are used, having as narrow faces as is consistent with the requisite power for operating the cutters. Each revolves independently of the other, on the same shaft, which also carries the driving gears. The wheels are connected with the shaft by means of a ratchet, so that the speed of the cutters is always governed by that of the wheel making the greater number of revolutions, which occurs in turning from the straight course, either in the return cut, or in avoiding obstacles. The machine is capable of cutting close to stumps or shrubbery without danger of damaging the cutters.

As will be seen by reference to the engraving, the cutting cylinder being of skeleton form is very light. The three wheels, having the necessary lugs for holding the cutters are made of malleable iron, the cutters being all steel, and bent and tempered in dies under hydraulic pressure, which gives them a uniform curve. A very simple adjusting device is applied to the cylinder, by means of which each end may be set separately to the cutter bar, and when once adjusted, is firmly secured in position. The cutters, as in other machines, are self-sharpening. A roller of small diameter follows the cutters, and receives sufficient pressure from the propelling power applied, to smooth the turf after the cut. The machine seems to be durable throughout. The independent wheels and the lightness of the moving parts render necessary but a very moderate expenditure of force in operating, and it is claimed by the makers to be the lightest mowing machine in use. Seven sizes are made, giving width of cut ranging from ten to eighteen inches.



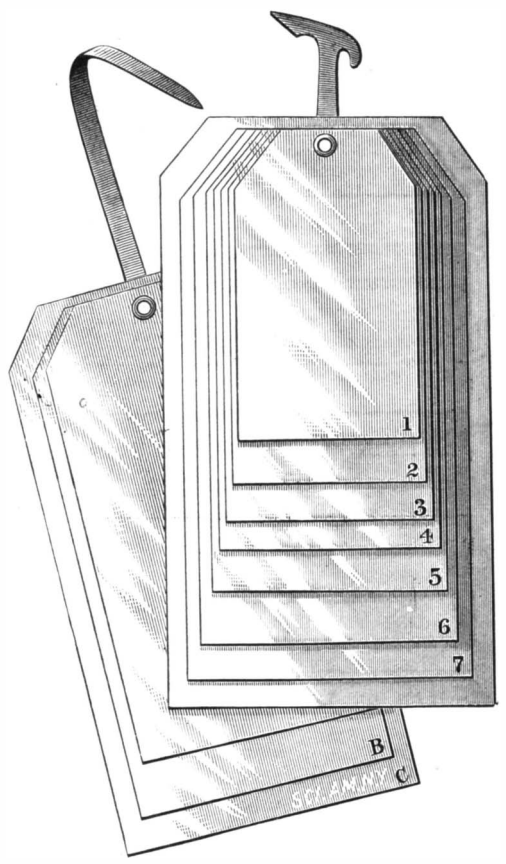
PENNSYLVANIA LAWN MOWER.

A Large Ocean Steamship.

The new Guion steamship, the Arizona, which was launched at Glasgow March 10, is the largest merchant vessel in the world with the exception of the Great Eastern. Her length is not equal to that of the Inman steamship City of Berlin, but her carrying capacity is greater. She carries four masts, rigged like those of the Germanic and Britannic of the White Star Line, and two smoke funnels; has first and second cabins, each capable of accommodating 125 passengers, and registers between 5,000 and 6,000 tons.

A NEW SHIPPING TAG.

The accompanying engraving represents two forms of shipping tags, patented by Mr. John M. Goodridge, of Norfolk, Va. One form is provided with a metallic barbed hook, and is designed especially for baled goods, such as cotton, bagging, hay, etc., and is said to be very popular in the South. The barbed hook is made of four cross tin, giving it ample strength to be thrust into the bale covers, and not break when doubled over the wire in the case of baled hay.



GOODRIDGE'S PATENT SHIPPING TAG.

The long hook, or Universal Tag, as its name implies, is capable of universal application; the long tongue of tin may be readily wrapped about some portion of the article to be tagged, and is also in general use for marking phosphates and other goods in bags.

A purchaser is wanted for this patent and the entire machinery used in the manufacture of these tags. For full particulars apply to Robert Baldwin, attorney at law, corner Fayette and Calvert streets, Baltimore, Md.

Rare Old Books at Auction.

The late Mr. George Brinley, of Hartford, Conn., a man of wealth and literary taste, spent many years and a large amount of money collecting rare books relating to the early history and literature of America. In some departments the collection was without an equal; and as a whole the library was the most important and valuable ever offered for sale in this country. The first third of the collection comprised 2,619 lots, sixty-seven of which sold for more than $100 each, and twenty-four for more than $200 each. The part sold brought in all $48,830, nearly one fourth of which went for the twenty-four works just mentioned. Among the more valuable of these were Captain John Smith's "Historie of Virginia, etc.," which went to the Lenox Library for $1,800; a perfect copy of the first book published in America, "The Whole Booke of Psalmes," which brought $1,200; the first edition of Eliot's Indian Bible, $1,000; John Brereton's "Relation of the Discoverie of the North Part of Virginia," $800; and other copies of rare and valuable books, which brought from $700 down to $200 each. To a very large extent the more valuable works of the collection were bought for public and society libraries, where they are likely to remain permanently.

A Wisconsin Cranberry Marsh.

One of the largest cranberry farms in the world is known as Sackett's Marsh, near Berlin, Wisconsin. It comprises 750 acres of marsh, about one fourth of which is under cultivation. The yield has sometimes reached the enormous total of 35,000 bushels. According to a correspondent of the *Tribune*, this marsh is admirably fitted by nature for its present use, and its advantages of location could not have been improved upon by the experienced cranberry culturist. It is necessary to flood the entire surface during the winter, and this is rendered easy by the fact that the marsh is a basin lying in a wooded tableland, with an outlet at the lower end, across which has been constructed a dam 225 yards long and 4½ feet high, with double flood gates for regulating the height of the overflow. As soon as the crop is gathered the gates are dropped, and the marsh gradually becomes submerged by the autumn rains, the melting snows, and the drainage from the higher ground until it becomes a lake. This often freezes to a considerable thickness, furnishing a skating rink that puts to blush the contracted affairs of that name found in cities. In this manner the soil receives its only cultivation, and the tender plants are protected from the rigors of a Wisconsin winter. It is not uncommon for the marsh to be flooded eight or nine months in the year, the water not being drawn off until June.

The picking begins in October, when the inhabitants of the surrounding country turn out in a body for the work, not less than 3,000 pickers being employed at a time. The marsh is so wet and yielding as to preclude the possibility of driving teams across except on a corduroy road leading to the buildings in the center, where the gathered berries are cleaned and packed for market, and where the pickers from a distance are lodged and fed.

A movable wooden railroad track runs from the warehouse to the center of operations, and a car is loaded with the boxes of berries, each person picking into a pan, which is then emptied into his box of a bushel capacity. The pickers receive a ticket for every bushel loaded on the car, and on reporting to the superintendent at the close of the day, receive credit for the whole. The price paid is 75 cents a bushel, and the average day's work is not more than two or three bushels, although it is not uncommon to pick five bushels, and a few experts have been known to pick seven bushels in a single day. The picking being often hurried on account of threatened approach of frost, a second picking is sometimes necessary, for which about a dollar a bushel is paid. The car, on being loaded with the filled boxes, is drawn by a team of horses to the warehouse, where the berries are hoisted on an elevator to the upper stories, and disposed of in such manner as to secure the best ventilation. The floors are covered with tier upon tier of boxes of berries, there being sometimes 20,000 bushels under the roof at one time. On the ground floor, large fanning mills are in motion, into which the berries are running from hoppers in the upper stories, and all leaves and other impurities are blown out, after which they are put in barrels and hauled to Berlin, and from there shipped to the Milwaukee and Chicago markets. A coopering establishment on the property manufactures the many thousand barrels which are annually required.

Mute Cattle.

M. Paul Bert, in a recent lecture at the Sorbonne, on the late Claude Bernard, narrated a singular stratagem which was invented by the latter during the last Franco-German war, and which might be utilized without difficulty under the same or even under different, circumstances. It was

proposed to revictual Paris, which was strictly blockaded by the German forces. A large number of cattle had been collected, waiting for an opportunity to cross the German lines. But a difficulty was to silence these animals, as their cries would attract the attention of the enemy. Claude Bernard proposed to practice upon them the section of the nerve which enables them to emit their usual cries. The operation is so easy that it could be executed in a few seconds by an ordinary butcher. None of the animals appeared to suffer in any way by the mutilation which made them mute. Unfortunately, however, the military movement proved a failure, and for other causes the revictualing could not take place.

It would be greatly to the relief of the public if this same method could be applied to cats, which make night hideous with their caterwaulings.

SOME RECENT AMERICAN PATENTS.

An improved cranberry picker, invented by L. & Z. Hall and W. Crowell, of Dennis, Mass., is shown in Fig. 1. It consists of a hinged back, provided with closingsprings and handles for operating it, and having on the side opposite the handles a series of inclined wire fingers for pulling the berries from the vines. The picker is operated by opening the jaws and inserting them under and over the vines, and drawing the implement from the vines, which escape, while the berries are retained by the fingers.

A new grafting implement is shown in perspective in Fig. 2; in detail in Fig. 3; and Figs. 4, 5, and 6, show three different forms of grafting that may be done with the implement. To one of the jaws are fitted angular knives, as shown in Fig. 3. The opposite jaw is simply a flat bearing surface which supports the stock or scion while it is cut. This tool is the invention of Mr. William H. Gray, of Lama City, Iowa.

The novel picket pin, shown in Fig. 7, is the invention of Mr. P. J. Tweed, of Blair, Neb. It has a spiral corkscrew-like shank and a hollow head, containing a washer for receiving the end of the tedder rope. With a pin of this kind the tedder rope cannot become twisted nor will it wind around the pin.

An improved induction apparatus, for lighting by electricity, invented by the late J. B. Fuller, of Brooklyn, N. Y., is shown in perspective in Fig. 8, and in section in Fig. 17. The inventor's aim in the construction of this apparatus is to operate along the main electric circuit a large number of small lights, each being placed in a local circuit, whose currents are induced by the currents of the main circuit. Two magnet cores are arranged parallel with each other, and connected magnetically at the ends, as shown in Fig. 17. Around the center of each of these cores is a soft iron head, and at a short distance from each side of this is a head of insulating material. The outer ends of the cores are coiled with insulated copper wire, and so connected together and to the electric generator as to produce, when in action, two consequent opposite magnetic poles, at N and S. A, B, C, D, and E, represent the connections of these coils. Between the iron heads and these coils are wound smaller coils of insulated wire, the fineness of which depends upon the tension of the current required.

There is an iron arm hinged to one of the iron heads, so as to swing over upon the seat connecting magnetically the poles, N and S, as shown in Fig. 8. Now, if electric currents be sent through the main circuit, flowing around the large coils, and rapidly changing, in alternately opposite directions, the magnet cores will as rapidly change polarity, and these changes will induce in the small coils electric currents of greater or less tension, according to the fineness of the wire composing the small coils.

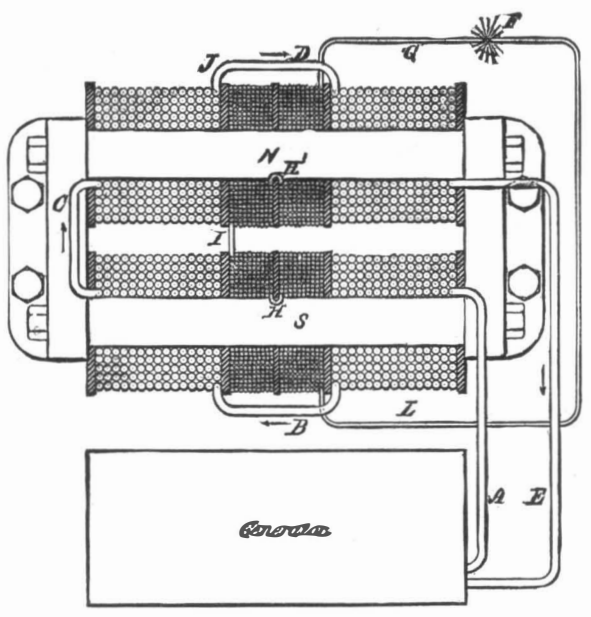


Fig. 17.—PLAN OF THE FULLER ELECTRIC LIGHT.

In the circuit of each of the small coils may be placed a lamp, F, of minimum illuminating capacity. Two small coils may be connected together, parallel or in series, for producing a light of medium capacity; or four small coils may be connected, for producing one light of maximum capacity, as shown in Fig. 17.

These connections for producing any changes in the circuits are made by means of ordinary switches, plugs, or keys. The arm which extends across the face of the coil in Fig. 8, acts as a governor of the light, by strengthening or weakening the magnetic poles, and thereby varying the strength of the current.

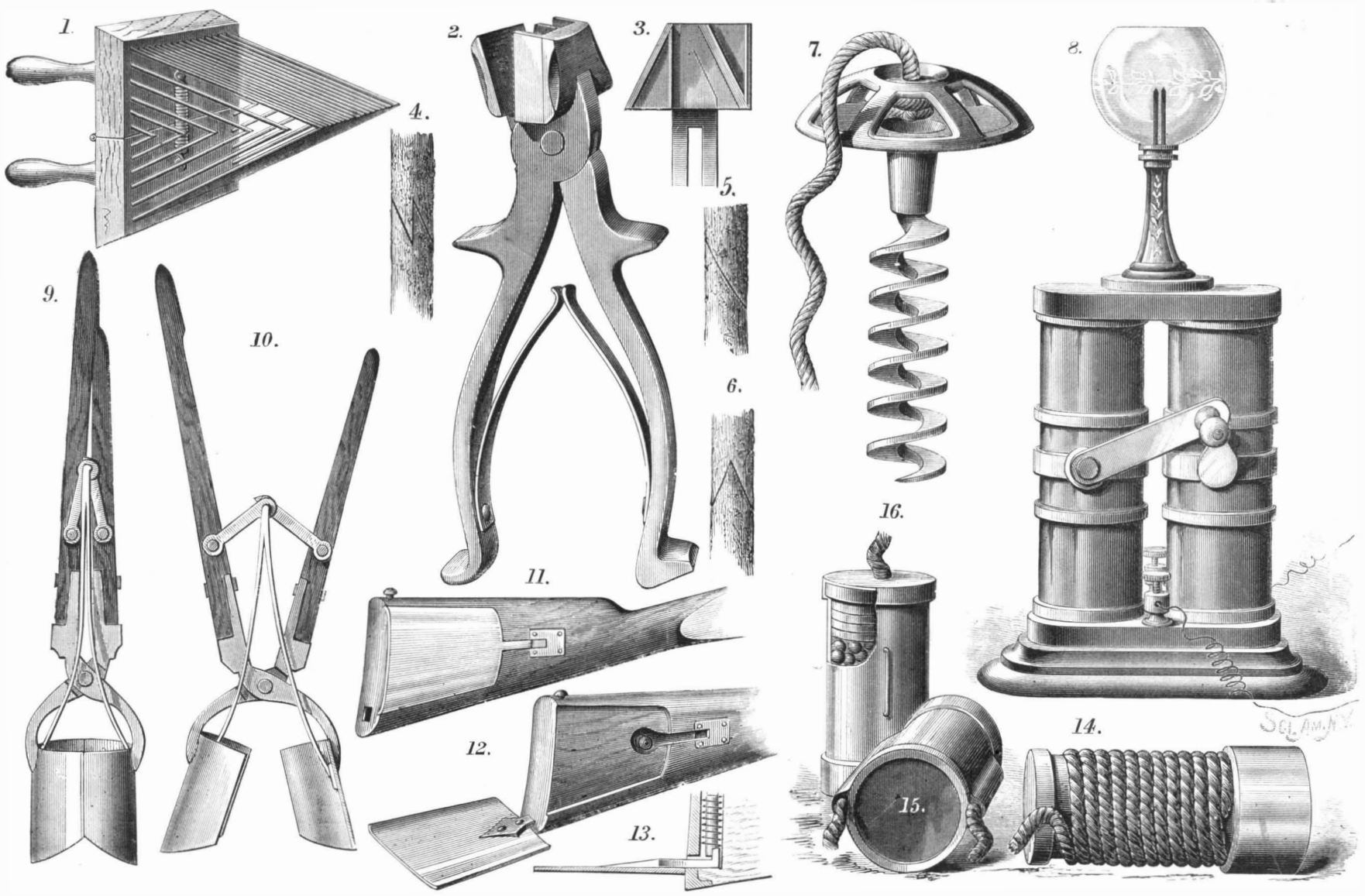
Any number of such apparatus which the electro-motive force of the generator will supply may be arranged along the line of a conductor, the large coils being included in the circuit, and, by means of a switch in the local circuits, each or any lamp may be lighted or extinguished independently from the others.

An improved post hole digger, patented by Mr. W. H. Ryan, of Moline, Ill., is represented in Figs. 9 and 10. The invention consists chiefly in a cleaning device which descends when the handles of the implement are opened. The transplanter is forced into the soil in the usual way, and when withdrawn it brings up a clod of earth between the shovels. When the handles are spread to drop the clod the toggle which connects the handles is wholly or partly straightened out, thrusting the scrapers down inside of the shovels, expelling the clod and scraping from them any adherent clay or earth.

It is very well known that by throwing up an earthwork of a very few inches in height, and especially by excavating in the earth ditches of just sufficient depth to allow the men to lie on their faces or backs, and not be above the level of the ground in which the ditches are dug, troops may remain a long time exposed to the enemy's fire without serious loss, as the shot will be thrown over them, or striking the earth in front, ricochet over them. These earthworks may be thrown up or the ditches dug in a very few minutes—in less time than will be required by the enemy to get the range of the troops—if each man has his musket or rifle provided with a spade or intrenching tool. Figs. 11, 12, and 13 illustrate a novel tool of this description, invented by Mr. James L. Buskett, of St. Louis, Mo. The spade when not in use fits a recess in the side of the gun stock, as shown in Fig. 11, but when it is required it may be quickly placed in the position shown in Figs. 12 and 13.

Figs. 14, 15, and 16 represent an improved shot cartridge for sporting purposes, invented by Mr. H. H Schleber, of Rochester, N. Y. In this cartridge the shot are confined within a separable case, which is provided, either outside or inside, with a time fuse, which operates, when ignited and consumed, to release the case, and to allow the shot to spread at a distance from the gun. The case is held together during the earlier part of the flight of the cartridge by the fuse itself, which, in this construction, is wound spirally about the case, or by a wrapper or other suitable fastening of combustible material, which is burned in two by the fuse, the combustion of the fuse in either case operating to destroy the fastenings which hold the case together, and to allow it to fall away from the shot. The rear end of the fuse cartridge is filled with wadding, to lighten it to prevent it from turning sidewise during its flight through the air. The engraving shows three forms of this cartridge.

AT a meeting of the Royal Society, Edinburgh, Professor Tait gave some account of experiments he is conducting with the view of determining the connection between the rate of speed and the electro-motive force of a Gramme magneto-electric machine. He is not yet through with this investigation, but thus far the results have appeared to him to show that the electro-motive force varies approximately in the duplicate ratio of the rate of turning.



A FEW RECENTLY PATENTED NOVELTIES.

The Leadville Mining District.

The first house was built in Leadville, Colorado, in 1877; now it is said to have a population of 10,000. It is needless to add that it is an extremely lively town.

In 1864, Mr. Wm. H. Stevens, the founder of Leadville, went to Colorado from Lake Superior. He was a practical miner, and pursued his calling in Park and Gilpin counties until 1871, when he discovered the mines on Mount Bross and Mount Lincoln. In 1873 he prospected the tract about California Gulch, now so famous for silver; but he was looking for gold, and did not at first dream of the value of the carbonate ore that was so abundant about him. Ultimately he discovered its nature, and while ostensibly carrying on unprofitable placer mining operations, much to the derision of his neighbors, he discovered and defined the remarkable outcrop of silver-bearing ore that takes in the Adelaide, Camp Bird, Iron, Bull's Eye, Limestone, and Rock mines. The first placer claim was located by Mr. Stevens in 1874.

The limitation act of Congress took effect June, 1875, and soon after Mr. Stevens began to survey for patents. Then he told his neighbors that he was after silver, not gold; and the wonderful development of the Leadville district began. In the fall of 1876, Walls and Powell discovered the Adelaide, and shortly after the Gallaghers discovered Camp Bird. In the summer of 1877 Mr. Stevens began to work the Iron mine, which had been located by H. B. Woods in 1876, and conveyed to Stevens and Leiter.

The Fryer Hill deposits were discovered in the spring of 1878, suggested by Cooper's discovery in 1877 of the Carbonate mine on an outcrop lower than the line of the Iron mine outcrops. In that spring Stevens and Fryer made surveys for the prolongation, decided on a point to sink, and there, in the present plat of the New Discovery mine, the first ore was struck in Fryer Hill. Then Rische, Hook, and Tabor opened the Little Pittsburg, and the excitement that supervened carried a host armed with pick and shovel over to the attack of that mammoth deposit.

The situation and geology of this new mining district have been described by Francis L. Vinton, in the *Engineering and Mining Journal*, as follows:

"Nearly in the center of the State of Colorado, the crest line of the Rocky Mountains breaks abruptly to the direct east for twenty miles, departing from and then resuming a general course that closely approaches north. At this point are the headwaters of the Arkansas River, that flows thence southerly seventy miles in a beautifully timbered valley, between the main range on the west and the Park range on the east, a lateral elevation fifteen miles from the axis, beginning at the break and prolonging itself south into the Greenhorn and Wet Mountain ranges, a hundred miles below.

"About twenty miles from the head of this Arkansas valley is Leadville, situated near the river and within the general *débouchure* of several gulches—the Evans, Stray Horse, California, Iowa, and Empire, that have been cut in the western flank of the Park range by their torrents, exposing a uniform geological section throughout, and a series of faults and slips or throws, whose effect has been to arrange lines of similar outcrops, one above the other, like terraces.

"The upper sedimentary rock is limestone. This is underlain by quartzite and schists to gneiss, and covered above by a thick, solid formation of trachytic porphyry. In the vicinity of Leadville there is found often between the lime and porphyry a metallic deposit sometimes as regular as a true lode, consisting of iron oxides carrying a sort of pay vein of silver ore and some gold. This silver ore is characteristically argentiferous galena; but the lead is to a great extent modified into carbonate, and this, when disintegrated to sand, mingled with equally loose iron ore, has given origin to many peculiar belts so easy to mine, and of ore so adapted to smelting, that though their grade may be nothing extraordinary for first-class mineral, yet their economic value is remarkable. Moreover, in certain localities, a confused but immense volume, washed from the outcrops of this deposit, has accumulated in inchoate bodies, whose vertical dimension is anything from ten to fifty feet, whose title in silver is pretty regular, and whose almost only cost to work is for timbering.

"The porphyry that overlies Fryer Hill seems, by common admission of experts and miners, to differ structurally from that on the Iron Hill. It resembles a drift of porphyry bowlders, pebbles, and breccia, lightly cemented, and is described by the miners as gravel. The porphyry on the Iron Hill is massive, hard, compact, and homogeneous, a continuous formation back to the summit of the range, and containing well defined fissures of magnitude, bearing ore like true lodes; for example, the Printer Boy, a well known gold mine, a gash vein, and numerous silver mines, such as the Tiger, Nelly, and Last Chance, in the first of which, considerably exposed by shaft and drift, are two continuous veins of argentiferous galena from four to eight inches wide, in a crevice carrying iron oxide and pyrites for vein filling and gangue. The ore runs from thirty to eighty ounces of silver, and thirty to eighty per cent of lead; these fissures carry no carbonates, though, from late discoveries on the same horizon beyond Little Evans Gulch to the N. E., it may be supposed that they lead through porphyry to lime, and may merge into deposits identical with those below. The limestone that underlies the porphyry seems to pervade the entire country; it is believed to be the same as that at the Moose mine, and on the east of the Park range in Buckskin, and as developed also in the main range and across to the Gunnison, as well as south to Silver Cliff and Saguache. Silurian fossils are found in it; the color is drab, and the quality often silicious. In contact with the iron veins it becomes deeply impregnated with rust; these veins are brown and red hematites, sometimes carrying magnetite and manganese oxide enveloping the lodes of argentiferous galena, carbonate of lead, chlorides of silver, and the native metal. Generally the carbonates and chlorides affect association with iron oxide; where that is deficient, the ore is galena.

"The Iron mine of Stevens & Leiter is a belt or zone or vein of hematite, about the color of brick to burned brick, from four to eight feet thick, lying on a downward dip to the east of 15°, between porphyry and lime, both well defined, but the whitish porphyry especially showing a line of contact unbrokenly continuous and everywhere sharply marked, not stained, with impregnations from the vein. The walls are undulating but not parallel, more resembling the expansions and contractions of vein walls, nor is there any appearance of stratification in the deposit, or of concordant regularity in the pay vein. At places the vein is disintegrated to sand, but it is mostly to be worked with powder. The carbonate of lead is sometimes found as cerusite, purely white and in clusters of long crystals; again, it is massive and pinkish, with a certain metallic aspect; or, again, compact and blue drab, not unlike limestone. It sometimes penetrates, sometimes surrounds, bunches of galena, which ore is often found in large pockets, and not to be distinguished from the similar ore of Clear Creek and Bowlder counties. The slide on the Iron mine is fifteen feet thick, but the outcrop of the vein at the surface of the rock in place is mathematically plane. This outcrop continues on the plats already mentioned; but above and below it are two other lines of distinct exposure, but underlain by the same series of rock, so that no observer can but imagine they all were once united."

The extremely slight dip of the Leadville veins has led to no little litigation, with decidedly conflicting decisions. In the case of Stevens & Leiter against Williams, the court decided that the deposits of Leadville came under the same law as fissure veins, the oldest claim holding the vein through all its dips and spurs and angles wherever it may go, so long as it does not go beyond the produced end lines of the claim. A later decision, in the case of the New Discovery lode against the Little Chief, denies that these deposits are veins or lodes, and lays down the rule that the miner cannot follow them beyond the limits of his surface location. If the first decision is sustained the vast wealth of the Leadville deposits will fall to a lucky few; if the latter, a multitude of men will share the spoil.

The Domestication of the Buffalo.

Col. Ezra Miller, of Mahwah, N. J., has been making some experiments which have led him to the conclusion that it will pay to breed buffaloes, both pure blood and crossed with our domestic cattle. Relating his experience with these animals lately, the Colonel said: "I have proved to my own satisfaction several points. First, that buffaloes can be tamed. Second, that it doesn't cost one half as much to keep a buffalo as to keep an ordinary cow. Third, they can be fattened as quickly as ordinary beeves, and on half the food, and their meat is just as good. Fourth, they are as good milkers as our Alderneys; and fifth, they are as good butter makers. The milk of the buffalo is a little yellower then that of the Alderney, but very sweet and rich, and there is more cream than in the Alderney milk. As to the quantity of milk given by buffalo cows, they will average with the average milker. The udder of the buffalo cow is very small indeed, but the milk veins are immense. This is a provision whereby nature enables them to run faster than if cumbered by a large udder. I am of the opinion that the most desirable cross is with the big Dutch cattle that have such big udders. I think that crossing them with our short-horns will give remarkably good beef. But the beef from our buffaloes more than met my expectations. It was sweet and juicy and tender, not at all like the meat of the buffalo of the plains.

"Now, in drawing the balance between the buffalo and the ordinary cow, I find these facts: The buffalo can be kept at one half the cost of the cow: that's one point for the buffalo. We will assume, to give the cow a fair show, that she yields more milk and butter. That balances the account so far. The buffalo is fully equal to our stock in the quality of meat. So they are still on even terms; but its hide is worth four times as much, so it comes out far ahead in the last heat, as horsemen say. The hide from my bull was a beautiful specimen. It was better than a $25 robe I bought to compare with it. The fur was longer and finer, the result of good feed, I think."

The buffaloes herded with the other cattle on the best of terms. What surprised the Colonel most was their weakness. He supposed they were very powerful; but they are not. He has seen a yearling Alderney bull push a three year old buffalo bull uphill. They are fast, but they are not strong. They are also very cowardly, very playful, and very cunning.

AN eminent French coachmaker says: "I never build two carriages exactly alike, not because I do not build each one as well as I know how, but in building that I learn how to make the next one better. When I placed these carriages of mine in the Exhibition building, I thought them perfect, but now that I have spent three months looking over the carriages of other builders, I see that they are not so." Here is an illustration of the value of these shows to intelligent tradesmen.

WESTERN IOWA COAL FIELDS.

The Western Iowa coal basin lies at the foot of the "Middle Terrace" of the State Geological Survey. The newly opened fields are situated on the North Raccoon River, Green county, and are traversed east and west by the Iowa division of the Chicago and Northwestern Railroad, and north and south by the Des Moines and Fort Dodge Railroad. Mr. E. J. Couch, of Grand Junction, asserts that in these beds an abundance of fine bituminous coal is found at a depth of from 80 to 100 feet. Two strata, the upper and the lower, are each from 3½ to 4 feet in thickness, with other lesser strata.

The abundance of assured fuel, at cheap rates, is inviting the attention of seekers for new homes and those who desire to open new industries in a rapidly growing and prosperously rising new country. Coal of the best grades is sold at the banks at $2 and $2.50 a ton, while engine coal, slack, is sold at so low a rate that an ordinary manufacturing engine can be run at 25 cents a day. The lands are as yet mostly broken prairie; probably not one fourth is taken up in farms, and is held at from $5 to $10 an acre. The prairie is of as rich and fertile a quality as can be found in the West, and the elevation above the sea being 1,500 feet, gives the locality a salubrity of climate unsurpassed. Large numbers of cattle graze the free range, which, with hay costing only the labor of putting up, gives this locality advantages for stock purposes. Grand Junction promises to become an important manufacturing center. It has permanent water for steam, and the coal basin comes to the very limits of the town.

A New Ohio Coal Field.

Mr. Andrew Roy reports, in the *Coal Trade Journal*, the development of a new coal field in Ohio. The coal is known as the Hill or Wellston coal. The coal is remarkably pure and easy of access, and promises to play an important part in the history of coal mining in Ohio. Like some other rare coals, notably the block coals of the Shenango Valley of Pennsylvania, and the Mahanoy Valley of Ohio, the Wellston coal appears to be of limited area. So far as the search for it by boring and opening has gone, 75,000,000 to 100,000,000 tons have been developed. It does not, however, appear to be all equally good, some mines showing a larger percentage of ash than others; on its western limit also it falls below two feet six inches of height; eastward it rises to four feet six inches. Two narrow gauge railroads, the Springfield, Jackson, and Pomeroy, and the Dayton and Southeastern, will, when completed, run through the heart of this new coal field.

The Advantages of Silence.

Ishael P. Inman, who died in Utica recently, had uttered scarcely a word for more than half a century. He was not dumb; he could talk well enough; but he became convinced at an early stage of his life that more harm than good was wrought by speech, and remained true to his principles ever after. When his first child was born he rode seven miles in quest of a physician. He carried slate and pencil, wrote a statement of the situation, returned with the medicine man, and received the announcement of his paternal responsibilities in silence. His wife, who survives him, says no woman ever had a kinder husband. The relations between the couple were always pleasant, and Mrs. Inman has remarked to her neighbors: "If Ishael talked as much as I do, the Lord knows what might happen." Some of his written replies to the questions of acquaintances who were curious to know why he preferred silence to speech are worthy of mention. One retort was: "A good listener is to be preferred to a poor talker." Another was: "I want to prove that a man can be happy and hold his tongue." Another: "I am trying to think of something good enough to say out loud." A clergyman once asked Inman whether he didn't think the Lord gave him his tongue to be used. The penciled reply was: "The Lord gave me a mind that tells me when to use my tongue."

In 1842, while he was traveling with his wife in a stage between Syracuse and Rochester, the vehicle was halted in front of a country tavern. A child was sleeping on the porch. Inman, looking out, saw a large black snake crawl to the side of the infant. Grasping his wife's arm, he shouted, "See!" and, pointing to the snake, sprang from the stage, pursued the reptile some distance, and finally killed it. He left a snug fortune, which his son inherits. His last written massage was: "Silence is golden." His oft-penciled admonition to his son was: "Keep your mouth shut."—*Syracuse Standard.*

Chloride of Lime as an Insecticide.

Le Cultivateur remarks that rats, mice, and insects will at once desert ground on which a little chloride of lime has been sprinkled. Plants may be protected from insect plagues by brushing their stems with a solution of it. It has often been noticed that a patch of land which has been treated in this way remains religiously respected by grubs, while the unprotected beds round about are literally devastated. Fruit trees may be guarded from the attacks of grubs by attaching to their trunks pieces of tow smeared with a mixture of chloride of lime and hog's lard, and ants and grubs already in possession will rapidly vacate their position.

WHENEVER a new and startling fact is brought to light in science, people first say "It is not true," then that "it is contrary to religion," and, lastly, that "everybody knew it before."—*Agassiz.*

Why so Depressing?

During the early spring months it is common to hear persons speak of their feelings in the manner the London *Lancet* describes, as follows:

"Unwonted depression and uneasiness, accompanied with loss of appetite and inability to sleep, are the prevalent causes of complaint just now among the 'tolerably well' section of the community; and, with a large measure of accuracy, the condition, modified as it is by individual peculiarities of state and idiosyncrasies, is attributed to the weather. The relations which subsist between such mental depression as constitutes melancholia and the defective discharge of its functions by the skin may help to explain the phenomenon. The connection of cause and effect may not be clearly made out, and the part which the nerve-centers play in the production of the result may be as obscure as that which they exercise in the control of occasional pigmentary deposits; but the broad fact remains. When the skin does not act freely, when its functions are seriously impeded or arrested, melancholy broods over the mind, just as in the case of a subject of melancholia, as a formulated disease, the skin becomes dense and inactive. It is not a random conjecture, therefore, that the intense and prolonged, albeit unaccustomed and unexpected, cold and damp work their depressing influences mainly through the skin. This is a trite remark, but it is one that may with advantage be made just now, because, in the interests of health-preservation, especial pains need to be taken to secure the freest possible action of the great surface system of excretory glands and the transuding apparatus generally. Warmer clothing, especially at night, frequent ablutions, with sufficient friction, and the promotion of skin activity by every legitimate form of exercise, are obvious measures of health which everybody ought to understand and all should practice."

AN IMPROVED PRESS.

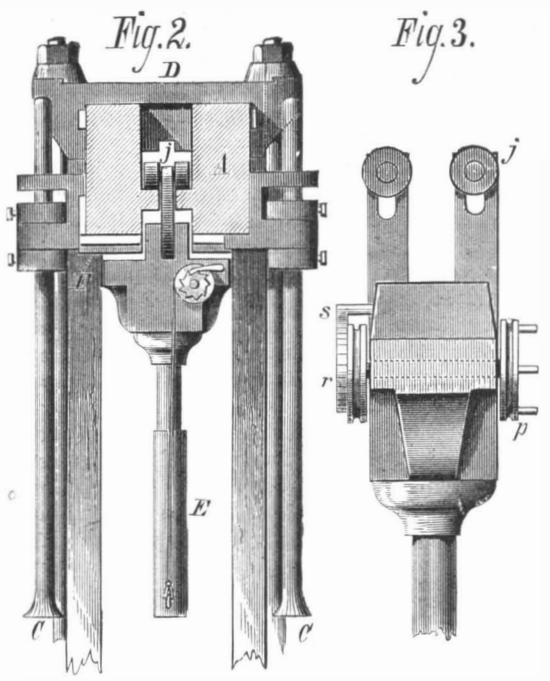
The press shown in the accompanying engraving is designed more particularly for pressing tobacco in hogsheads, but it is equally applicable to pressing other bulky substances. The chief novelty of the invention consists in a suspended hydraulic jack, which may be readily moved from one hogshead to another, avoiding the necessity of a duplication of jacks and greatly facilitating the operation of pressing.

A general idea of the construction and the manner of working the press may be gained from the larger engraving Details are shown in Figs. 2 and 3 which do not appear in the larger engraving. Two heavy beams, A, which are separated at their upper edges by a series of blocks, are clamped together by bolts and supported by standards that rest on two corresponding beams below, and are connected by iron rods, that are provided with a novel device which admits of easily removing the rods should occasion require. The lower timbers of the press are placed below the floor of the packing room to afford a smooth floor surface.

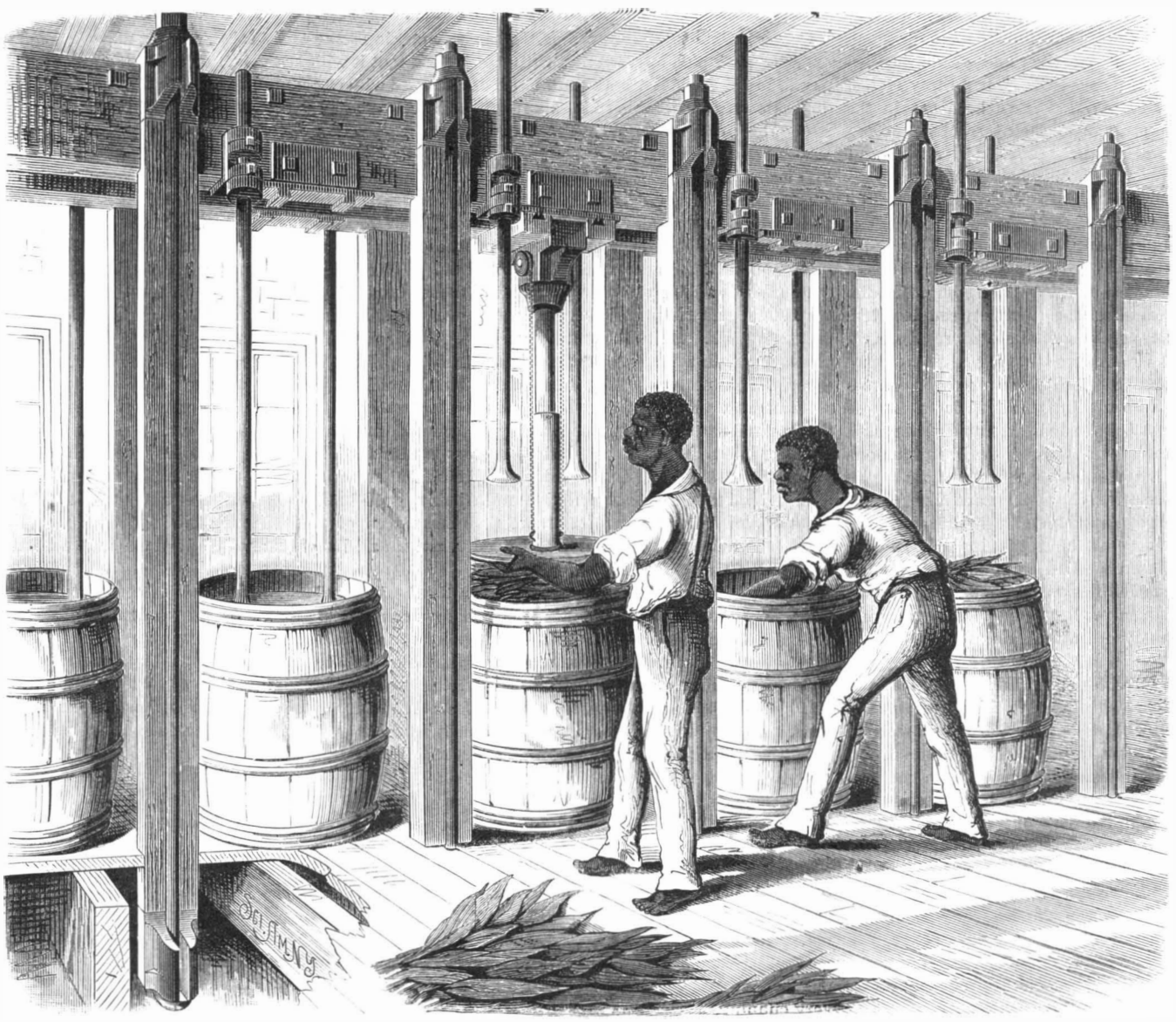
The timbers, A, are provided with iron or steel plates, F, on the underside, and rails, *f*, extend along their adjacent faces. From these rails the horizontal jack, E, is suspended by the slotted straps, *h*, and the rollers, *j*, the slots admitting of the free movement of the jack along the track when it is not in operation, and allowing the shoulders of the jack to come into contact with the plates, F, when pressure is exerted, without injury to the rollers. The jack, E, after having compressed the contents of one package is moved to the next; but before this can be done the retaining bars, C, must be brought down upon the boards above the tobacco, and clamped by the collars and set screws at the top of the press. This prevents the tobacco from expanding as the jack is removed. When the cylinder of the jack is raised it is sometimes desirable to retain it in that position. For this purpose two chains are attached to its lower end and connected with a sort of diminutive windlass at the head of the jack, which is provided with the ratchet, *r*, and pawl, *s*.

The inventor says that with this press one man can do the pressing for nine packers, and that its capacity is about four times that of an ordinary screw press. The power of the press is limited only by the strength of the timbers and the power of the jack; it may vary from one ton to one hundred tons. It is very compact, and is so simple that any ordinary wood worker may construct it.

Further particulars may be obtained from the inventor, Mr. Francis B. Deane, Lynchburg, Va.



DEANE'S HYDRAULIC TOBACCO PACKING PRESS.



DEANE'S HYDRAULIC TOBACCO PACKING PRESS.

The Netherlands Open to American Tools.

The Department of State is in receipt of a dispatch from the American Consul at Amsterdam, drawing attention to a ministerial resolution effecting an important change in the tariff of the Netherlands, and one which the Consul thinks is not generally known among American exporters. The following is a translation of the decree referred to:

"Tools of wood, iron, copper, steel, and other metals, as agricultural implements and sewing machines, are free of import duties; and it is stipulated that in this exemption are comprised all finished tools which serve mechanics as an aid in their work. Further, parts of tools, such as hammers, spades, chisels, etc., without handles, and augers without piercers, etc., provided they are in the condition in which they are bought by mechanics in the stores and afterward fitted for use by putting on the handles, piercers, etc. Tools of spelter or zinc remain dutiable, likewise mathematical, surgical, chirurgical, optical, and musical instruments."

RECENT AMERICAN PATENTS.

An improved mill for grinding bones, phosphates, and similar articles, has been patented by Mr. T. O. Cutler, of Jersey City, N. J. It consists of a stationary top section, having notched concentric ridges, and a revolving runner, provided with a series of beaters and a notched circular ridge, running between the ridges of the stationary portion.

Mr. Henry Groth, of New York city, has devised a motor for moving dancing figures and other mechanical toys. It consists of a heavy flywheel, which is impelled by unwinding a cord from a sleeve connected by a clutch with its shaft. A spring drum rewinds the cord, so that it may be unwound several times in succession to secure the required speed.

An improved matt for cotton-seed oil presses has been patented by Messrs. J. L. Perkins and G. O. Baker, of Selma, Ala. It consists of two plates of wood fitted to the press box, connected together by a canvas hinge, and provided with sheet metal linings and with an intermediate hinged sheet metal leaf.

A tool for rolling or expanding boiler flues or tubes has been patented by Mr. John H. McGraw, of Oswego, N. Y. It consists in a segmental head having grooves, in which are placed rollers. A central wedge pin is provided for expanding the head.

Mr. John Birks, of Ogdensburg, N. Y., has patented a measuring scoop, which will indicate both the weight and bulk of its contents. It has the usual marks of a liquid measure to indicate the quantity of an article, and it has attached to its handle a spring balance for weighing its contents.

An improved bird-seed reservoir has been patented by Mr. Owen W. Taft, of New York city. It consists in a reservoir pivoted in a frame which supports the cage. It may be arranged as a standard, or it may be provided with means for suspending the bird cage while it is itself suspended by a chain or cord.

An improvement in bed bottoms, patented by Mr. W. H. Leininger, of Salem, Oregon, consists in forming the bottom of wires, which pass around pins set at the ends of the bed frame and over rubber strips. This arrangement gives elasticity to the bed bottom, and prevents the formation of sharp bends in the wire.

An improvement in the construction of buildings, which consists in sheathing the inside of the studding instead of the outside, and applying vertical strips to the sheathing to which the lathing is nailed, has been patented by Mr. H. R. Crane, of Crawfordsville, Ind.

Mr. William P. Silvernail, of Pittsfield, Mass., has patented an improved hose pipe supporter, by means of which the pipe may be easily directed and controlled under any practicable head of water.

An improved bridle bit, which may be used either with a hard-mouthed or a tender-mouthed horse by simply reversing it, has been patented by Messrs. A. W. Holland and Edgar N. McKimm, of Lathrop, Miss.

Mr. J. R. Spencer, of Avilla, Mo., has devised an animal trap, in which there are two pivoted platforms whose free ends meet and are held by the same device, so that the platform on which the animal first steps will remain firm and unyielding until the weight comes upon the other.

In an improved motor, patented by Mr. Joseph Plattenburg, of Allegheny, Pa., an elastic rubber belt is wound by hand power in a stretched condition upon a drum. The power of the belt is utilized by ingenious mechanism for driving light machinery, pumping, etc.

An improved sash fastener, patented by Levi P. Treadwell, of Danbury, Conn., consists of a slotted curved bolt which slides on a screw in the meeting rail of the lower sash, and is capable of entering notches in the stops and in the upper sash.

A sewing machine invention—which improves the feed and enables the operator to simultaneously slacken the thread and raise the presser foot—has been patented by Mr. Thomas Shanks, of Baltimore, Md.

THE BOBAC.

The bobac, or Poland marmot, is one of the true marmots, and is a native of parts of Northern Europe and Asia. It measures twenty inches from the nose to the end of the tail, and is covered by a thick reddish-brown fur, somewhat darker on the back. The throat and a part of the belly are grayish white, and the tip of the tail is nearly black.

The bobac is a gregarious animal, living in small bands of thirty or forty. It inhabits the plains and stony undulating sections, avoiding forests and sandy soil. Like the prairie dog, it is a very social animal; grassy moist sections of land are frequently found covered with numerous hillocks, formed of earth thrown out in excavating their spacious subterranean dwellings.

In the bobac settlement a very industrious and restless life prevails through the summer. The young, which are born in April or May, are then nearly grown up and have acquired a fondness for play. At sunrise they leave the burrow and quench their thirst by licking the dew from the leaves of the surrounding plants. The forenoon is spent playing and grazing, the afternoon in sleeping in their burrows. Toward evening they appear again and graze previous to retiring for the night,

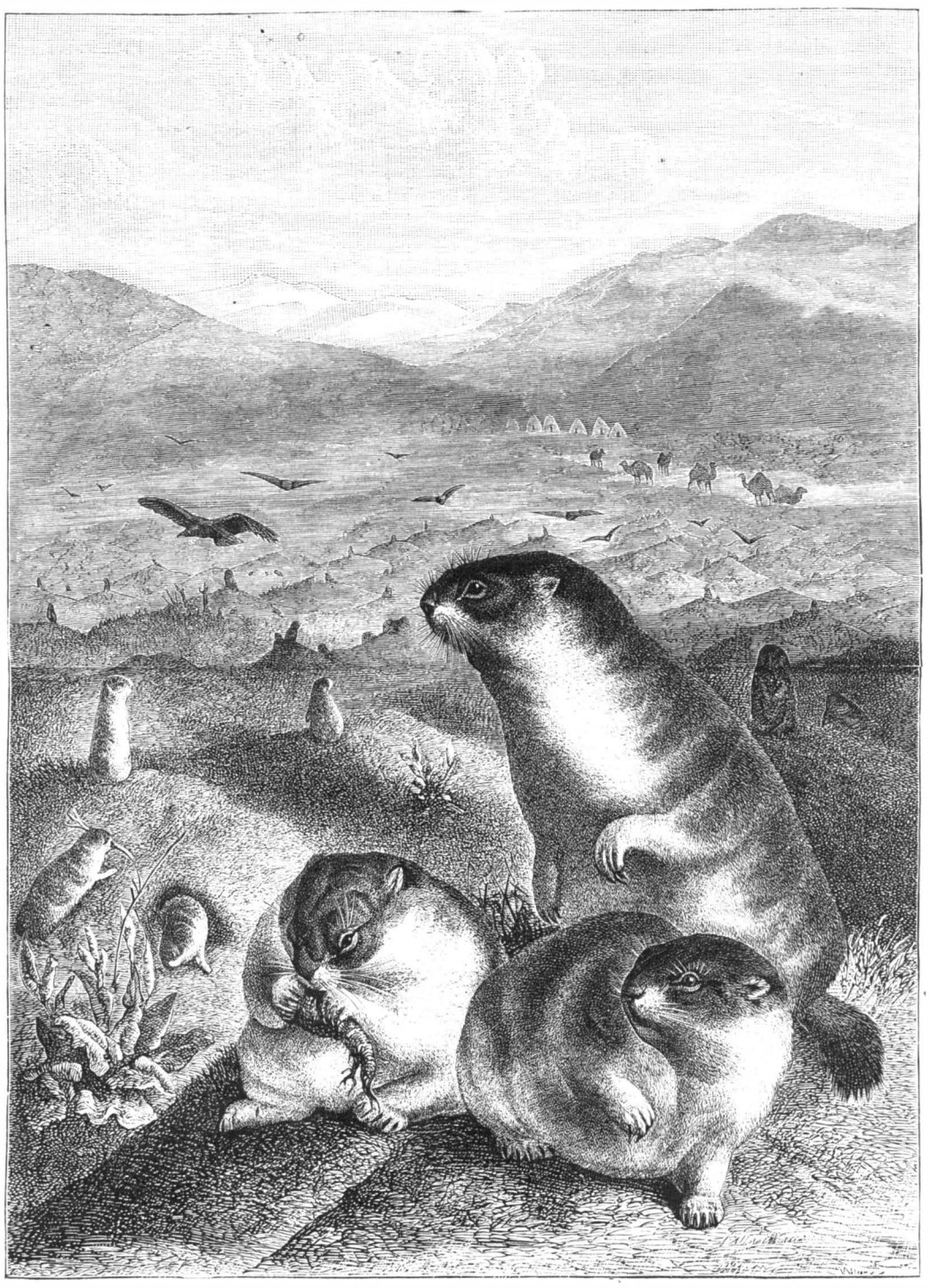
They seldom deprive the immediate surroundings of their homes of vegetation; welltrodden paths lead to a feeding ground situated generally at a distance of several hundred feet; further than this they dare not go.

In June they commence to gather their winter provisions, consisting of hay, roots, etc. As soon as the weather becomes cool in the fall they become sleepy and very slow in their motions. During the latter part of August they may be seen after a cool night coming out of their burrows, falling on one side and then on the other as if intoxicated, and they lose their playfulness.

During the month of September they retire for hibernation, and close the entrances to their burrows with stones, sand, grass, and their own excrements. From this time until winter sets in they lead a sort of automaton life.

The burrows are very extensive, and are generally most spacious where the ground is quite hard. According to Radde the distance between the mouth of the burrow and the nest is from fifteen to twenty feet, rarely more than forty-two feet. The principal passages branch off about six feet below the surface, in several directions; some of the branches are blinds, all of the others lead to the nest.

The nest is especially prepared for hibernation, being made larger and softer. During winter the temperature in the burrow never falls below the freezing point. In December the bobacs fall into a death-like sleep, in which condition they remain until March, when they awake. During the first week or so after awakening they are very logy, and suffer for want of food, there being no grass; nettle and rhubarb stalks are their only nourishment. As soon as the first grass appears it is eagerly devoured, but it acts as a strong cathartic and frequently destroys large numbers of the animals.



THE BOBAC.—(*Arctomys Bobac.*)

AT the general meeting of the British Royal Astronomical Society, February 14, the gold medal of the Society was presented to Prof. Asaph Hall, of the Naval Observatory, Washington, "for his discovery and observations of the satellites of Mars."

The Shell Heaps of the Aleutian Islands.

In a volume of ethnological papers—recently issued by the government as part of the series recording the progress and researches of the Geological and Geographical Survey—is recorded, among other matters of interest, Mr. Dall's examination of the shell heaps of the Aleutian Islands. These shell heaps, extending over tracts of many acres in extent, exhibit three layers. The lowermost consists principally of shell and spines of an *Echinus*, such as is still eaten raw by the natives. Considering that there is but little to eat of these animals, it can be easily imagined how great a number it takes to feed even a single family; yet so vast is the accumulation of their remains that Mr. Dall reckons 2,000 years for the duration of the earliest period of inhabitation of the islands by wandering coast-folk of very low culture; this he calls the "littoral period." Immediately over this deposit lies a layer in which fish bones predominate, showing a change of life, or the arrival of new tribes subsisting on fishing, but probably eating their fish raw, a habit indeed which largely prevailed till lately, for the old men ascribe the diseases which have afflicted modern generations to the pernicious practice of cooking food. It is remarkable, however, that Mr. Dall finds no trace whatever of the use of fire till the close of this second, or "fishing period," as he names it. Improvements in weapons, etc., took place, as the specimens show, and in the uppermost or mammalian layer the remains found, with their harpoon heads, skin dressers, ivory tags for skin boats, lip ornaments, etc., indicate the condition of a population of hunters and fishers up to the highest level of the Esquimau or Innuit race, to which the Aleuts are supposed to belong. Mr. Dall's conclusions, if sound, have an important bearing on the development of civilization, so that his evidence from the Aleutian shell heaps deserves careful sifting. In another paper he discusses the origin of this Esquimau or Innuit race, which he agrees with Dr. Rink in considering as the outermost wave of population driven up to the northern coasts from the more hospitable central regions of North America. Here he joins issue with Mr. Markham's theory of their migration from Asia, at the same time pointing out that his question is that of whence the Innuit last came, not the remote problem of the absolute origin of the American races, probably from the Old World.

Working Monkeys.

It is one of the curious things in nature that the animals nearest to man in the order of development are of little or no use to him industrially. There has never been a time when strong races of men have not compelled their weaker brothers to work for them. But, barring the showman and the organ grinder, the meanest of men have not been able to subjugate or inslave their simian relatives. An ancient Arabic proverb accounts for the freedom of apes by the fact that they shrewdly refuse to talk: "well they know that were they to speak they would be made to work; so they wisely hold their tongues."

The proverbial prudence of the monkey appears to fail in a measure, however, in the land of the white elephant. An Austrian resident at the Court of Siam reports that in that country the monkey is trained to fish for crabs with his tail, as comical a pursuit as can well be imagined, except, perhaps, for the worthy and intelligent ape engaged in it, who sometimes gets a "bite" from a monster crab that he is totally unable to land, and falls a victim to the superior weight of his Cancer Ferox, who drags him into the water, drowns, and finally devours him. The Siamese ape is also stated to be in great request among native merchants as a cashier in their counting houses. Vast quantities of base coin obtain circulation in Siam, and the faculty of discrimination between good money and bad would appear to be possessed by these gifted monkeys in such an extraordinary degree of development that no mere human being, however carefully trained, can compete with them. The cashier ape meditatively puts into his mouth each coin presented to him in business payments, and tests it with grave deliberation. If it be genuine he hands it over to his master. If it be counterfeit, he sets it down on the counter before him with a solemn grimace of displeasure. His method of testing is regarded in commercial circles as infallible; and, as a matter of fact, his decision is uniformly accepted by all parties interested in the transaction. But, though a true and invaluable servant to his own particular master, it seems that his moral character is not altogether irreproachable. His deplorable passion for fruit renders him the terror of Siamese market gardeners, who find brute force inadequate to restrain him from visiting their orchards, and therefore have recourse to divers and sundry stratagems, one of which is reported to be as successful as it is certainly ingenious. A specially active and enterprising ape is captured and carefully sewed up in the skin of a tiger cat. He is then turned loose in the orchard of his predilection, and straightway clambers, as well as he may, incumbered by an unfamiliar garment, into the branches of a fruit tree among his unclothed fellows. Scarcely do these latter set eyes upon him with all his feline terrors thick upon him, when a dreadful panic strikes them, and they scramble away with piercing screeches and agonized chatterings. Never more do they return to an orchard which they believe to be infested by the deadliest enemy of their race. The startling intelligence is rapidly disseminated throughout the monkey society of the neighborhood, and the wily gardener enjoys an absolute immunity from depredation forever afterward, for the very thought of a tiger cat appals the simian soul, and doubtless the tale of "the awful apparition in Ting-tse's orchard" is handed down in quadrumanous families from generation to generation.

A TABLE of wages and the cost of living, with the price of staple articles of commerce, going back as far as the year 1200, has been published lately. It shows that wages during the thirteenth century were about 50 cents a week. In the next century they advanced some 15 cents, and continued to advance slowly until, in the last century, they had reached $1.87. The average for farm labor in the same countries at present is $3.80 per week.

Wheat in the thirteenth century averaged 71 cents, or eight and a half days' labor, a bushel. Now wheat is worth, wholesale, in Europe, about $1.46 a bushel, or two and a half days' labor. In six centuries meat has nearly trebled in price; but wages have increased more than sevenfold.

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although only approximate, they will enable the ordinary observer to find the planets.

M. M.

POSITIONS OF THE PLANETS FOR APRIL, 1879.

Mercury.

Mercury can be found in the first week of April by its nearness to Venus. It sets at 8 P.M. on the 1st, a little south of the point at which Venus sets. Mercury is stationary, referred to the stars, on April 6; it then has a retrograde motion until the 29th. As the motion of Venus is direct, the two planets separate rapidly, and on the 30th Mercury sets at 5h. 10m. P. M.

Venus.

Venus is coming nearer to us, and setting later. On April 1 Venus rises at 6h. 55m. A.M., and sets at 8h. 43m. P.M., more than two hours after the sun. On April 30 Venus rises at 6h. 44m. A.M., and sets at 9h. 52m. P.M. An ordinary glass will show that the disk of Venus is not wholly illuminated, and the change of phase can be watched from night to night. The bright star some degrees south of Venus on April 25, is Aldebaran.

Mars.

Mars is not likely to be seen by the ordinary observer. It rises on April 1 at 3h. 24m. A.M., about two hours before the sun, and sets at 1h. 3m. P.M., on the 30th. Mars rises after the sun and sets at noon; it is not possibly seen.

Jupiter.

Jupiter, the largest, and perhaps the most interesting, of the planets, is now coming into view in the morning. On April 1 Jupiter rises at 4h. 19m. A.M., and sets at 2h. 54m. P.M. On April 30 Jupiter rises at 2h. 39m. A.M., and sets at 1h. 28m. P.M. Although Jupiter is nearly 10° south of the celestial equator, on April 30 it rises more than two hours before the sun, and can be easily recognized.

Saturn.

On April 1 Saturn rises nearly with the sun, and sets before the sun at 5h. 49m. P.M. On the 30th Saturn rises at 4h. A.M., nearly 2° north of the celestial equator, and can perhaps be seen before the sun rises.

Uranus.

Uranus is the only planet, more distant from the sun than the earth is, which can be found in the evening.

On April 1 Uranus rises at 2h. 48m. P.M., comes to the meridian at 9h. 32m. P.M., and sets at 4h. 15m. A.M. of the next day. On April 30 Uranus rises at 0h. 51m. P.M., comes to the meridian at 7h. 32m. P.M., and sets at 2h. 20m. the next morning.

Uranus is south of the bright star Regulus on April 30, 23′, and 2° east of the star.

It may be found, when on the meridian, by looking east of Regulus, and as far from the star as four diameters of the moon.

Brorsen's Comet.

Brorsen's comet, which was first seen in 1846, and was perceived to have a period of five and a half years, has returned this year, having been seen by the director of the observatory at Arcetri, Florence.

An ephemeris of the comet, published in the *Astronomische Nachrichten*, gives its place on March 21, as nearly that of the star *Xi Ceti*. The comet should be looked for in March among the stars of *Aries*, but its apparent motion northward is very rapid, and in April it should be looked for among the stars of *Perseus*.

Brorsen's comet is not yet visible to the eye, but can be readily found with an ordinary telescope.

It appears as a hazy star of the seventh magnitude, throwing off a short train. It is increasing in brightness and coming into better position, as it sets later in the evening.

Although at this time near Venus, its motion among the stars is so much more rapid than that of the planet that it will soon be much further north. Following the ephemeris of Schulze, the comet will be more than 7° north of Venus April 1st, and on April 15th about 20° north of the planet and among the stars of Perseus.

MISCELLANEOUS INVENTIONS.

Mr. Jotham W. Wakeman, of Jersey City, N. J., has devised a school writing book, with sliding or adjustable copy slips, which may be moved downward as the writing progresses, the copy thereby being kept before the scholar's eye.

An improved tablet for blank paper, letter heads, bill heads, sheet music, letters, etc., has been patented by Mr. Bredell C. Murray, of Denison, Texas. Tubes are arranged across the covers where they join the back, and are provided with springs connected by cords, which draw the tubes together so as to clasp the edges of the papers.

A band bracelet, made of a single thickness of metal, having at its edges raised ornamental work and projecting flanges, which are made higher than the ornamental work to protect it, has been patented by Mr. Charles Hein, of Corona, N. Y.

Mr. John G. Klett, of Brooklyn, N. Y., has invented an improved pocketbook, the back of which consists of a channeled flange or rim, whose ends are pivoted to the sides of the frame thus dispensing with hinges at the back and giving great strength and durability to the book.

Mr. Aaron C. Vaughan, of Shane's Crossing, O., has patented a nut lock, consisting of a longitudinally grooved bolt and a nut having one or more radial grooves in its face, and a groove or locking seat about its edge, and a wire key arranged in the longitudinal groove of the bolt and bent twice at right angles.

An improved machine for cutting off the projecting ends of the pegs of boots has been patented by Mr. R. T. Ellifrit, of Platte City, Mo. The inventor employs a revolving circular saw, whose mandrel turns in bearings in a guard casing that is pivoted to the upper end of an upright hollow standard or stock.

An improved trap for preventing the escape of sewer gas into houses, has been patented by Mr. J. T. Bladen, of Brooklyn, N. Y. It consists of a cover of novel construction, which may be closed so as to thoroughly seal the drain pipe, or it may be opened to permit of the escape of water from the sink. It may be easily applied to any sink, basin, or bath tub.

Mr. Hermann H. Heiser, of Denver, Col., has patented an improved girth iron for ladders, in which the metal loop is provided with strengthening bars, which are arranged with reference to the lacing bar so as to prevent the lacing strap from getting out of position.

An improved lath-sawing machine, patented by Mr. James Little, of Evansville, Ind., is designed to cut, at one operation, a bolt from a slab or plank and saw the bolt into lath of a uniform size. The machine has a series of saws on a vertical mandrel and a corresponding series of spreaders and gauges, and it has a horizontal mandrel carrying a saw which separates the lath from the edge of the bolt.

Messrs. J. J. Christie and J. Overton, of Henderson, Tenn., have patented an improved wrench and crimper for nut washers, which consists of a hooked arm which is pivoted to a wrench. The hook is placed under the edge of a washer, and the wrench being placed on an adjacent nut and turned, binds the washer.

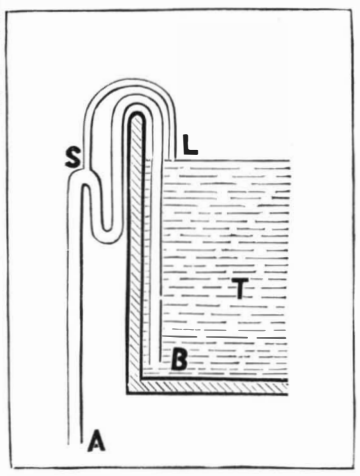
An improved type-writing machine, patented by Antonio Michela, of Turin, Italy, may be used to print stenographic or phonetic signs. It is also capable of recording syllables. The machine cannot well be described without engravings.

Mr. Pedro F. Fernandez, of San Juan, Porto Rico, has invented an attachment for sewing machines for soaping or waxing the thread as it passes to the needle. The invention consists in a clamp for holding a small cylinder of wax or soap, and having a binding screw for securing it to the needle arm or bar.

NEW AUTOMATIC SIPHON.

In a communication to the Edinburgh Photographic Society Dr. William Taylor gives the following description of an apparatus designed to serve as an overflow pipe to tanks or other vessels not already fitted with means to that end, and without in any way altering such vessels. It is specially applicable to tanks with a fluctuating supply of water, in which it is necessary to maintain a constant level.

As its name implies, it is self-acting, and while at once carrying off any sudden influx of water, it will not bring the level below a certain fixed line. The excess of water is carried from the bottom of the tank.



Into the tank, T, is passed the waste pipe, A B, of a diameter greater than the feed to tank. This waste pipe is bent into the form shown, with the shoulder, S, about half an inch lower than the level of water required in the tank. On the upper surface of this shoulder, at S, a small hole is made, over which a small tube is fixed. This small tube, S L, is then led over the side of the tank to the constant level required.

Now, when the waste pipe is put into action as a siphon it rapidly carries off the water to the level, L. When it reaches this air is admitted by the small pipe through the orifice at L, and the waste pipe ceases to be a perfect siphon. If, now, a small stream of water flow into the tank the same quantity passes through the partial siphon, A B; but should a rush of water into the tank take place, bringing the water above the level, L, the waste pipe is at once converted into a true siphon, and rapidly brings the level back again.

In the sketch the pipes have been drawn projecting from the tank. This has been done for simplicity; but, of course, in practice these pipes are laid close to the side of the tank.

The Lawn.

The man who puts on a frequent little sprinkling of salt or bone dust or superphosphate, or any fertilizer that will add an additional rich green tint to the turf, is always recompensed by securing the most conspicuous grass plat in the neighborhood. The best lawn we ever saw, says an agricultural writer, was occasionally treated to a sprinkling of diluted blood from a slaughter house, just previous to a shower. When the soil is soft, run the roller over; it helps the appearance greatly. The application of a little ground gypsum will also freshen up the grass. But above all, never neglect to run the mowing machine over frequently. Once a week is none too often during a wet season.

Another writer on the treatment of lawns suggests the use of oil of vitriol touched to the heart of the plantain. He says it will kill more surely than digging it out. And if it will exterminate the weed to an inconsiderable extent, it is certainly better than digging it out, which we have tried with discouraging success. We have dug over a lawn till nearly every vestige of green was gone, determined to get rid of the plantain at all hazards, but it invariably got the best of the grass in returning, and it seemed rather to thrive the better for the cultivation it had received by our exterminating process.

Colored Pencils for Glass.

The following formulas for the composition of pencils for sketching on glass, porcelain, etc., are those used at the factory of A. W. Faber, of Stein, near Nürnberg, Germany:

1.—BLACK.

Lampblack	10 parts.
White wax	40 "
Tallow	10 "

2.—WHITE.

Zinc white	40 parts.
White wax	20 "
Tallow	10 "

3.—LIGHT BLUE.

Prussian blue	10 parts.
White wax	20 "
Tallow	10 "

4.—DARK BLUE.

Prussian blue	15 parts.
Gum arabic	5 "
Tallow	10 "

5.—YELLOW.

Chrome yellow	10 parts.
Wax	20 "
Tallow	10 "

The colors are mixed with the fats in warmed vessels, levigated with the same, and are then allowed to cool until they have acquired the proper consistency for being transferred to the presses. In these the mass is treated and shaped similarly as the graphite in the presses for ordinary pencils.—*Deutsche Gewerbe Zeitung.*

SUPREME COURT DECISION.

OWNERSHIP OF THE SECOND TERM OF AN EXTENDED PATENT.

In the appeal of George Hendrie *vs.* Thomas Sayles the decree of the court below was confirmed for the following reasons: From the papers in this case it appears that prior to the granting of the patent the inventors conveyed and set over all the right, title, and interest whatever which they had, or by letters patent would be entitled to have and possess, in the described *invention*, to an assignee, who subsequently, after the patent was granted, assigned to the complainant "all his right, title, interest, and claim whatsoever which he then had or may have in and to said invention and patent, and any extension thereof that may hereafter be granted," with certain specific exceptions not material to this investigation. Before the term of the original patent expired application was made for an extension, which was granted in due form for seven years.

Controversy having arisen between these parties, the complainant instituted the present suit against the respondent for infringing his right under the extended term. Service having been made, respondent demurred that the complainant had not in and by his bill of complaint made any such title in himself to the extended term of the patent as would entitle him to relief. Hearing was had, and the court overruled the demurrer and entered a decree in favor of the complainant, the respondent electing to stand upon his demurrer. Prompt appeal was taken to the Supreme Court by the respondent, who maintains, as in the court below, that the bill of complaint showed no legal title to the extended term in the complainant.

The Supreme Court holds that, "when the patentee assigns the *patent* to a purchaser, the assignee acquires only the exclusive right during the term for which the patent was granted, unless the assignment contains words showing that the parties intended that the instrument should be more comprehensive, and include the extended term in case an extension should be granted. During the term for which the patent is granted the assignee of all the right of the patentee in the same may assign and convey the patent for the residue of the term granted, or he may continue to make, use, and vend the patented improvement, but his title to the invention terminates when the term of the patent expires. . . .

"Apt words are, therefore, required where the conveyance is of an existing *patent* to show that the conveyance includes more than the term specified in the patent; but where the conveyance is of the *invention*, whether before or after the patent is obtained, the rule is otherwise, unless there is something in the invention to indicate a different intention, the rule being that a conveyance of a described invention carries with it all the incidents, and all the authorities concur in the inchoate right to obtain a renewal or extension of the patent is as much an incident of the invention as the inchoate right to obtain the original patent; and if so, it follows that both are included in the instrument which conveys the described invention, without limitation or qualification. Emmons *vs.* Sladden, 9 Off. Gaz., 354; Gayler *vs.* Wilder, 10 How., 493; Clum *vs.* Brewer, 2 Cart. C. C., 520; Carnan *vs.* Bowles, 2 Brown Ch., 84.

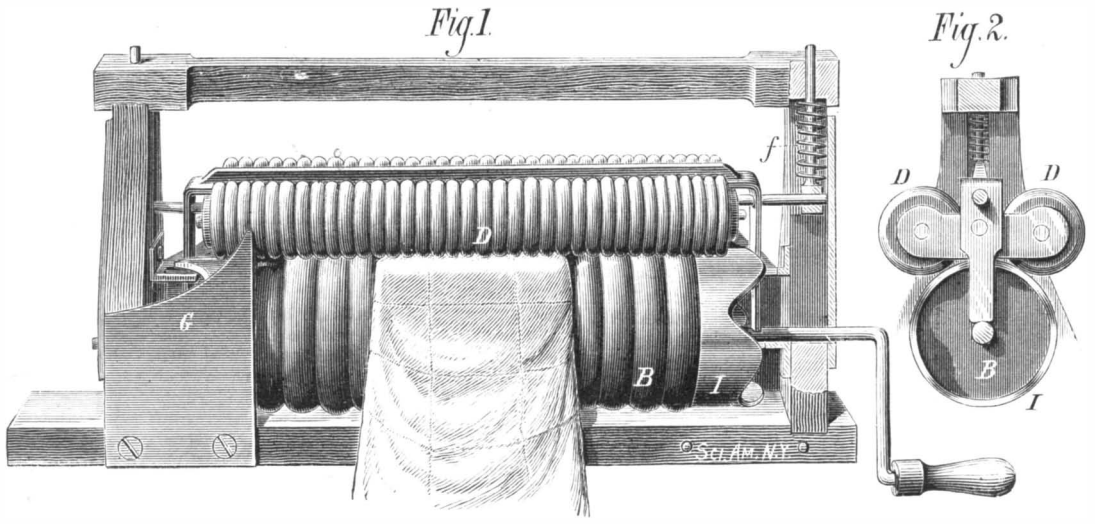
"Viewed in the light of these suggestions, the court is of

opinion that the entire interest in the invention passed from the inventors to the assignor of the complainant by the instrument of assignment which they executed to him before the patent was granted, and that the patent was properly issued in the name of their assignee. They, the inventors, do not controvert the exclusive right of the complainant, nor does the respondent deny that the terms of the assignment from the assignee of the inventors to the complainant are amply sufficient to convey to him all that he claims if his assignor at the time held the title to obtain the extended term; and the court being of opinion that the assignor of the complainant did hold that right, it follows that there is no error in the record."

AN IMPROVED WASHING MACHINE.

The accompanying engraving represents an improved washing machine recently patented by Mr. Erasmus L. Keys, of Muncie, Ind. It has been the aim of the inventor, in devising this machine, to imitate as nearly as possible the operation of rubbing the clothes by hand on an ordinary washboard. This is done by passing the clothes between ribbed or corrugated rollers, B D, under pressure given to the two upper rollers by the spring, *f*, and at the same time giving the upper rollers a longitudinal motion by means of cams, I, at the ends of the larger roller, B. The relative position of the three rollers is clearly shown in Fig. 2. A guard, G, at each end of the machine prevents the clothes from coming into contact with the metallic parts of the machine.

The upper rollers yield to accommodate clothes of varying thickness without interfering with this longitudinal motion. The machine, although very simple, appears to be made on the right principle.



KEY'S WASHING MACHINE.

DE KAY'S SNAKE.

BY C. FEW SEISS.

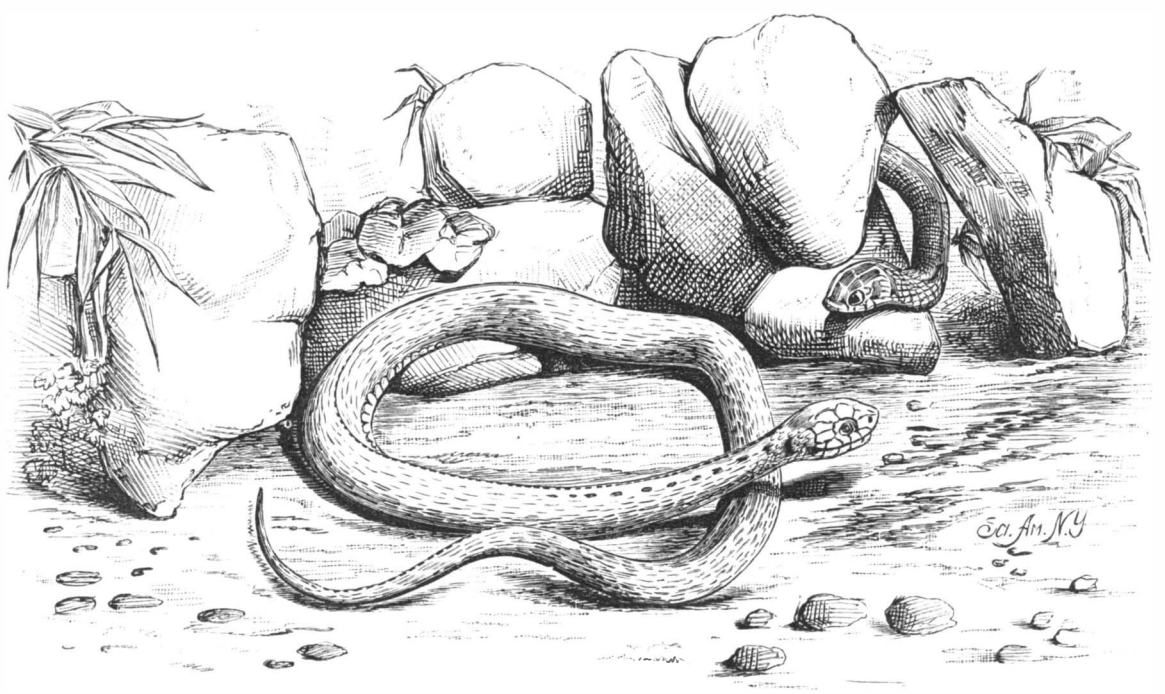
It is impossible to write the true life history of an animal from only a lifeless specimen. Buffon attempted it, but how often has he committed grave errors by so doing! Thus, in one instance, he says, while examining the skin and head of a black skimmer (*Rhynchops nigra*): "We see from its bill that life was to such a formed bird a burden, and that capturing and devouring food was difficult, if not painful." On the contrary, its bill is admirably fitted for its mode of life. Dr. Holbrook, in his "North American Herpetology," says: The De Kay snake "feeds on various insects, as crickets, grasshoppers, etc." Now it is probable, he, in examining his specimen, saw it was almost too small to capture and swallow a mammal, bird, frog, or toad, and as it was not a water snake, tadpoles and fishes were out of consideration, and hence came then to the conclusion that it must be insectivorous. My observations have proved this assertion to be an error. I have had many of these snakes in captivity, from a month to over a year. I never saw one of them even attempt to catch or eat a grasshopper, beetle, bug, fly, moth, frog, or toad, but from the first time until now I never saw one refuse to seize and swallow an earthworm (*Lumbricus*), unless the snake was sick and blind, previous to casting its skin. This was not only the case with individuals taken in Pennsylvania, but a living specimen sent to me from Massachusetts had the same vermivorous habits, and refused to eat all insects placed in its cage. If the worm seized happened to be small, the snake would double the worm, and swallow both parts at the same time. If the worm was large, the snake worked and maneuvered until he could seize it by the head or tail. When the worm was swallowed head foremost, the snake had little to do but permit the worm to creep down the ophidian gullet, of its own free will. And this it could do more rapidly than the snake could have done in the usual manner of drawing it in by the backward and forward motion of its jaws. Instinct seemed to tell the worm that the snake's gullet was a pleasant hole for retreat; but alas for *Lumbricus!* he little dreamed it would be the hole he should occupy—his grave.

I have discovered that young garter snakes (*Eutænia*) feed entirely upon earthworms, and not upon insects, as some have asserted. I have seen *Eutænias* the day after birth voraciously attack and devour earthworms, and I am of the opinion that many other species of our land serpents while immature feed wholly upon these common annelids.

De Kay's snake is generally crepuscular in habits, and rarely quits its retreat during midday, unless the weather be cloudy or rainy, when it moves about in search of worms. In captivity, however, I have, on cold days, several times seen it leave its hiding place to bask for hours at a time in the sunshine. At such times it would throw itself into a coil, and bury its head either under the pebbles or beneath the folds of its body, to shield its eyes from the rays of the sun, which seemed unpleasant. The *Storeria Dekayi* is of a pale brown color above, with a yellowish white or clay colored dorsal band, bordered by a dotted line on each side; beneath, flesh-color, or soiled yellowish-white. Its ordinary length is about one foot.

The other species of the genus, the *S. occipitomaculata*, is salmon red (in life) beneath, and has the head generally marked with three pale spots, hence its name.

Some have considered these serpents to be merely immature striped snakes (*Eutænias*), but let it be distinctly understood that the majority of serpents come into the world marked and colored like their parents.



DE KAY'S SNAKE.

Trout and Bass Farming.

The addition of our popular food supply during recent years, by the restocking of exhausted streams and lakes, has been of great public advantage. There still remain countless small brooks and ponds capable of being made useful and profitable with very little trouble. In a paper read before the New York Farmers' Club, by Mr. Robert B. Roosevelt, one of the State Fish Commissioners, emphasis was laid upon the fact that in many places inland, and not accessible to the sea, that great storehouse of fish food, there is difficulty in obtaining even the commonest sorts of fish. If the farmer can add to his usual crops a crop of fish he will be benefiting his neighbors as well as himself. To do so may seem to many at first glance a difficult operation, but not half as much so as making the broad acres laugh with a harvest" seems to the inexperienced. Fish farming has its rules and limits, precisely as land farming has, but is simpler and far more productive. Once hatched the fish provide for themselves; they need no food or care, they convert worthless insects or waste water grasses into human food. The trout or bass from a farmer's pond costs him nothing but the trouble of catching, and compares in excellence on his table with his best poultry, to say nothing of pork that has been fed twice a day for months. The only loss of time or labor is in the catching, and to reduce that it is only necessary to make the fish abundant.

Mr. Roosevelt did not advise farmers, except in rare cases where they have unusual facilities, to undertake the artificial hatching of fish, but he urged them to utilize such ponds and streams as they can without labor or expense. This might not yield the greatest possible profit, but it would bring fair returns, and in no wise interfere with other occupations.

"It would be irksome," he said, "for the farmer to watch over the incubation of trout eggs, which require months to produce the young; nor is it necessary, so long as the States take this labor upon themselves and furnish, to all who need them, trout fry already hatched. If gentlemen owning suitable streams or ponds desire to stock them with trout they have only to apply at the State hatching-house, and, where a number combine, the expense to each is trifling. After the trout fry are placed in their proper element—and it must not be forgotten that only cold spring-water is suited to them—they will take care of themselves. In the course of a year or two they will have attained an edible size and can then be caught. Nothing is simpler than this, and yet how many streams and fine fresh brooks there are that perhaps once abounded with trout which are now wholly depopulated. There is, however, another kind of fish known as the fresh-water bass, which is possibly even more valuable than the trout for the farmer's use. It is not so exacting in the character of the water in which it will live, and will grow more rapidly; more important still, it needs no culture or care whatever, or any time.

"The parents, which are fairly prolific, lay their eggs in a sort of nest and watch over them till they are hatched. Bass have never failed to increase rapidly where they have been introduced, and they are suited to almost any pond. These are especially the fish to be used where water farming is to be combined with land farming in the simplest and easiest way. Nothing is required but to place a few pair of mature fish, which can be easily transported in any water they are expected to populate, and they will attend to the rest themselves. They can hold their own with any other species, even against the dreaded pickerel; they increase rapidly and grow quickly, and as human food they are excellent."

The Poison of Serpents.

Some interesting observations have recently been made on the poison of serpents by M. Lacerda, in the physiological laboratory of the National Museum, at Rio Janeiro, and which have led the experimenter to conclude that, in some cases at least, the venom contains an organized ferment, presenting some analogies to bacteria. M. Lacerda states that a drop of poison removed from a rattlesnake under the influence of chloroform, and examined with the aid of the microscope, appears as "a species of filamentous protoplasmic matter, consisting of a cellular aggregation disposed in arborescent form resembling certainly copods."

These cells are fully described in a paper read before the French Academy of Sciences. Similar phenomena were observed in the blood of animals that had been bitten by a rattlesnake, and it was found that such blood was capable of setting up the same change in the blood of other animals when injected hypodermically, and that this change was always followed by the death of the animal.

The Directorship of the National Surveys.

It was announced, March 11, that the Directorship of the National Surveys is to be given to Clarence King. The appointment will give general satisfaction. Mr. King is not only a most capable man for the place, but his relations to other laborers in the same field hitherto have been such as to give promise of harmonious action in every part of the consolidated surveys.

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.

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.

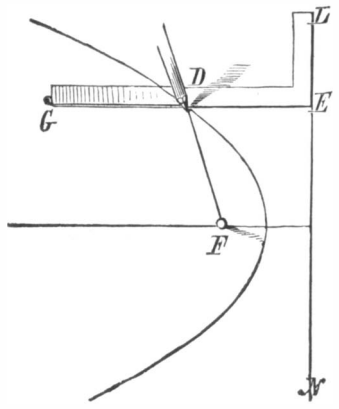
Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) J. E., Jr., writes: I have a bichromate battery composed of 12 cells; after 2 weeks I find that the carbon plates are covered with crystals; they interfere with the working of the battery. My belief is that I saturated the solution with too great an amount of bichromate. The battery is constructed after the form published in SCIENTIFIC AMERICAN, No. 146, consisting of porous cup, zinc, and carbon; the solutions are salt and sulphuric acid. A. They are crystals of potassio-chromium alum ($K_2Cr_2(SO_4)_4$ 24 Aq). They invariably form after a time in the bichromate battery when the acid bichromate solution becomes partially exhausted and concentrated by evaporation. The bichromate solution should be more frequently renewed.

(2) L. B. asks: How many horse power is a boiler, 10 feet long, 42 inches diameter, with 36 3-inch tubes, or an engine, 8 inch cylinder, 12 inch stroke, making 150 revolutions a minute, at 60 lbs. pressure? A. Boiler, 16 horse power nominally. Engine, 20 horse power.

(3) C. N. M. asks how the preparation is made now used by manufacturers of colored, glazed, and plated papers, to render the article partly waterproof, or to resist, in a measure, the rubbing away of the color when slightly moistened. A. The paper is heavily sized with a prepared glue size, and the printed colors protected by the subsequent application of a thin, colorless spirit varnish.

(4) A. G. asks how to describe a parabola by mechanical means. A. Place a straight edge to the directrix, E N, and apply to it a square, L E G; fasten



at G one end of a cord equal in length to E G; fix the other end to the focus, F; slide the square steadily along the straight edge, holding the cord taut against the edge of the square by a pencil, D, and it will describe the curve.

(5) W. B. M. asks: 1. Could a double dynamo-electric machine be made after the plans in SCIENTIFIC AMERICAN SUPPLEMENT No. 161, by placing two similar machines together end to end, and connecting the two armatures so as to form a continuous shaft, with the commutators at the outside end; and so winding the magnets as to bring dissimilar poles into juxtaposition? A. It might be done, but a single large magnet would be better, using an armature made in two sections, one shorter than the other, the shorter one being used to excite the magnet. 2. Could the current from one machine, arranged to work either with or without a battery, be used to excite the magnets of the other machine, and thus, as it were, multiply one machine by the other? A. This has been done in several different machines. 3. Could a dynamo-electric machine made with permanent magnets be coupled on to one of the other kind in a manner similar to the above, with a great advantage in the way of power of current produced from the second machine? A. Yes; Wilde's machine is arranged in this way.

(6) R. A. G. asks: Can copper be so refined by removing the sulphur that it will not tarnish more than tin or nickel? If so how refined so that it will tarnish the least? A. No; chemically pure copper quickly tarnishes in the air unless protected by a lacquer.

(7) B. R. J. asks: What is the cause of the drumming noise in some furnaces when the door of the boiler is closed tightly? I am now running a boiler which shakes the building to the foundation when the door is closed tightly. A. It is generally due to uneven firing, holes being formed through which the air rushes with great velocity. The noise can generally be stopped by the judicious application of a little coal.

(8) J. S. B. asks: 1. Has the State of New York awarded the prize offered for best method of obtaining rapid canal navigation without injury to the canal? A. Yes. 2. Was this prize offered simply for best method of preventing the washing away of the banks by the waves from the canal boat? A. No; it was found by experience that this washing was not caused by any of the boats that were tried, at the slow speed that they developed.

(9) G. G. asks: Can the telephone be worked by using a small creek in place of the second or return wire? A. Yes.

(10) D. E. J. asks where to find out how to make a small stationary engine. A. Consult the back numbers of the SCIENTIFIC AMERICAN and SUPPLEMENT.

(11) C. M. P. asks: Why will a locomotive having an air pump, pump more pressure of air into the air drum than there is steam pressure on the boiler? I have also noticed that a steam fire engine will also show more pressure of water in the hose than there is steam pressure in boiler. A. The pressure which an air pump will deliver against, will depend on the diameter of the pump and power applied.

(12) J. R. F. asks if refined petroleum has ever been tried in marine boilers as a preventive of priming, and if considered safe to use with steam at 50 or 60 lbs. pressure, and if so what has been the general results. A. We are not aware of the use of petroleum for checking foaming in boilers, but from the well known effect of the use of other oils in such cases, should expect beneficial results. We would advise introducing it in small quantities at first, and that its effect be closely watched.

(13) A. E. W. asks: 1. Has the phonograph been perfected so that a speech, sermon, or a musical piece may be registered by having the speaker a few feet from the instrument, say 15 or 20 feet? A. We think not. 2. Has there ever been a telephone invented in which a diaphragm and artificial magnet are placed in the circuit of a common electrical battery? A. Yes.

(14) W. H. C. asks: Can you inform me if there is a cheap residuum of the distillation of petroleum of which can be made a cheap black varnish, and if so what solvent is used? A. The pitchlike residue remaining in the stills, where the distillation is not forced at the last, is sometimes sold as an artificial asphalt. It is soluble for the most part in oil of turpentine, benzine, or benzole.

(15) A. B. H. asks: 1. How to make a first class aniline black ink, something that will flow easy, be black when first written, and will not get thick when left standing a long time. A. Triturate ¼ ounce of commercial soluble nigrosine and 1 drachm of alum, with about ¼ pint of hot water, and digest for an hour in the water bath at 212° Fah., strain the resulting solution through a piece of fine cotton cloth, and dilute with a little hot water, if necessary, for use. It is well to add a few drops of clove oil to prevent alteration. 2. How to make a good blue ink. David's blue ink is just the color I want, but the trouble with it is, it wont flow when it gets a little old. I would prefer an aniline ink if there is any that will give a rich deep blue. A. Use Nicholson's soluble aniline blue in place of nigrosine as above. 3. How to make an aniline red. A. Warm gently 3 drachms of Porrier's soluble scarlet or red scarlet with about ½ ounce of water, and add a few crystals of tin salt (stannous chloride), or use a strong slightly ammoniacal aqueous solution of aurine or coralline. Address the chemists who advertise in these columns. 4. Would it be practicable to produce an electric light, the machinery to be driven by a weight? How large a weight would it take to produce electricity enough to light a room 15x20 feet with as much light as 3 or 4 gas burners would make the weight to fall 10 feet in five hours? A. With the Werdermann or Sawyer-Man lamps we think it would require the fall of about a ton weight through from 6 to 8 feet a minute.

(16) J. J. C. asks: If a rifle be shot off perpendicularly on a moving railroad car, where will the ball fall? A. By "perpendicular" we suppose you mean "vertical"; if so, when leaving the rifle the ball would have the same progressive velocity as the car, but the moment it leaves the rifle, its progressive speed (as well as its vertical velocity) is gradually reduced, and its path will be a curved one; the ball striking the ground in advance of the point from which it was fired and in rear of the position of the rifle at the instant of the ball striking the ground, as the latter has continued to advance with the train and with velocity unretarded.

(17) H. J. L.—We give below 19 patented fillings for safes: No. 1. Residuum of soda water manufacture. No. 2. Soapstone. No. 3. Tiles, alum and clay. No. 4. Alumina and ammonium alum. No. 5. Copperas and gypsum. No. 6. Starch, water, gypsum. No. 7. Alum in small pieces embedded in gypsum. No. 8. Epsom salt and gypsum. No. 9. Cement, lime, sawdust, and silicious mortar. No. 10. Paper pulp and alum. No. 11. Steam and water vessels. No. 12. Removable water vessels between the casings. No. 13. Moistened sponge and powder. No. 14. A system of fusible pipes with water. No. 15. Sulphuric acid in bottles with fusible plugs, and sodium carbonate to liberate carbonic dioxide on contact with the acid. No. 16. Paper pulp and alum. No. 17. Raw cotton, sawdust, and whiting. No. 18. Asbestos, plaster cement, chemical salts, and alum. No. 19. Asbestos, marble dust, pipe clay, gypsum, glycerine, mucilage, magnesium and sodium sulphates, borax, alum, sal soda, and paraffine.

(18) C. W. C. asks (1) if a tank lined with sheet lead would have any poisonous or injurious effect upon the water in case it was used as a cistern for rain water. A. Water stored in such a reservoir would not be fit to drink. 2. Can you inform me of any paint that can be used to paint the inside of a rain water tank so that water may be kept in it? A. Several well dried coats of good asphaltum varnish may be applied; but it would be better and safer to collect the water in clean wooden hogsheads or cemented cisterns.

(19) R. H. H. writes: A French burr millstone has come apart just between the face and the plastering. Can I cement it together with plaster of Paris without taking it all apart? A. A good cement can be made of alum and powdered burrstone. Plaster of Paris is generally used to cover the stone after making the joints with the cement.

(20) D. & C. write: 1. We run our mills with a Leffell wheel. The wheel is situated 60 feet from mill shaft and connected by a shaft 60 feet long. Will we gain any power by putting water house and wheel nearer, and how much? A. The gain will be very slight, and will hardly justify the expense of moving. 2. Please tell us how to bend rims, buggy shafts, plow handles, etc., cheaply, without the use of a steam boiler. Can they be bent by simply boiling? A. They can be softened by boiling, but the operation is more tedious than when a steam box is used. 3. How can we mix up Portland cement mortar to resist the action of water? A. You can make a mixture of 1 measure cement and 2 measures of sand.

(21) W. S. writes: To try a proposed experiment, I will need a bi- or tri-chloride of sodium. Can this be obtained, or made cheaply, and what process? A. Sodium is a monad metal, and combines with but one equivalent of chlorine. You will not succeed in procuring a di- or tri-chloride.

(22) H. writes: 1. I want to build a steam launch 47 feet long, 10½ feet beam, slanting at sides 8 inches each side, and in front about 10 feet of bottom flat; will a 6 horse power boiler and engine propel it in the swift water of our Western rivers, the Ohio and Wabash, say a fair rate of speed 5 or 6 miles up stream? The boat will be built light, one deck, boiler and engine 1,400 lbs. empty. The boat will not draw light with boiler and engine in place more than 6 inches. A. No, a 6 horse power (actual) would not drive it more than 5 or 6 miles per hour in smooth water. 2. What position of wheel would be most advantageous, on sides or at stern? A. Stern. 3. Would belt gearing answer as well as cogwheel? A. Belting would not do as well as gearing; it would become wet and slack, and slip. 4. Could wire belting be made available? A. No.

(23) W. H. W.—The plant is the evergreen or pyracanth thorn (*Cratægus pyracantha*), a native of the south of Europe, distributed several years ago in the United States as a hedge plant. It is excellent for the latter purpose, in a climate no more severe than that of Virginia. An accidental variety with white berries has proved hardy near New York in the most severe winters. The plant is propagated by cuttings, although dealers in shrubs and trees might possibly have seeds for sale.

(24) F. J. writes: Our newspapers state that a "peculiar explosion took place on the Ottawa river; about one hundred feet square of ice, twenty inches thick, was thrown up into the air, followed by a loud report; it is supposed to have been caused by the gas from a deposit of sawdust in the bed of the river." I wish to ask: What kind of gas was generated; also what was the action of the gas, and why did it explode? A. We cannot explain the occurrence on the hypothesis that it was primarily caused by sawdust. We have known such explosions to occur through the sudden yielding of thick ice at its weakest point to the stress of air confined and condensed by an unusually strong or obstructed current below.

(25) J. A. L. asks: 1. What is the resistance per mile in copper wire, No. 17 and No. 25 American gauge? A. Approximately 20 and 168 ohms respectively. 2. What temper is best for strong and constant magnets? A. A straw color. 3. What is the best method of magnetization, by currents or by friction, on a permanent or electro-magnet? A. By contact with a strong electro-magnet or by inclosing them in a helix traversed by a strong electric current. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 142. 4. What should be the lifting power of a horseshoe magnet, weight half a pound? I made one which will lift nine times its weight: is that a good one? A. Your magnet does very well. 5. Can I obtain from you back numbers of the SCIENTIFIC AMERICAN or the SUPPLEMENT, giving directions for making telephones, microphones, or phonographs? A. Telephones, No. 142. Microphones, No. 163. Phonographs, No. 133. 6. What kind of carbon will do for Edison's telephone, and how can it be made? A. The carbon used in Edison's telephones is deposited from burning kerosene oil. Mr. Edison's method is to set a lamp smoking, collect the carbon, and form it into buttons under strong pressure.

(26) Bolckow asks: 1. Will two steam engines, size 2 inch bore and 4 inch stroke, with cranks at right angles, give more or less power than one engine 2x4, using a flywheel to overcome the dead center, with a steam pressure of 100 lbs. per square inch in the boiler? A. More. 2. Did Congress ever pass a law prohibiting the running of traction engines over public roads? A friend of mine claims Congress did enact such a law, while I claim that it did not; that the roads are open to all, and that the driver of an unruly horse runs his own risk. Who is right? A. You are right.

(27) C. S. asks: Does using the flywheel as a driving pulley detract from its efficiency as a flywheel. Does the use of a pulley larger than a flywheel on the flywheel shaft affect the efficiency of the flywheel? A. No, in either case; but the effect would be better if the flywheel were larger than the pulley.

(28) M. P. asks: How can I conveniently straighten brass or iron wire without a wire straightener? A. It cannot be done without a straightener of some kind. Probably the simplest straightener is three steel pins driven into a plank. If the pins are properly arranged and the wire is drawn over the first, under the second, and over the third, it may be straightened well enough for some purposes.

(29) B. A. M. asks whether the greater bearing is on the upper or lower side of the crosshead when the engine is running back. A. On the upper side.

(30) C. E. A. asks: 1. What is the power of an engine with 4 inch stroke, 2½ inch bore, running 600 revolutions per minute, with 120 lbs. of steam? A. If worked without cut-off, 5 horse power. 2. What are the dimensions of an upright boiler which would run such an engine? A. You would require a vertical tubular boiler of 95 feet heating surface. 3. Can a boiler be made from coils of gas pipe? If so, how is the best way to coil the pipe, and how much pipe will it take, and what will it cost for a boiler for the above engine? A. A boiler of coiled pipes can be made. Apply to iron pipe workers.

(31) X. Y. Z. writes: 1. I have an electric engine; the magnets are wound with No. 17 cotton covered wire (Stubs' gauge). I want to use Daniell's battery with porous cups 4 inches high and 1⅝ diameter. What quantity and intensity shall I use to get the most power? A. It depends altogether on the construction of the engine. You can easily determine by experiment which method of connecting up the batteries is best. 2. How many of the above cells will it take to make an electric light to light a room 12 feet square? A. 50. 3. How can I loosen the binding screws, that are corroded in carbon plates? A. It is possible that soaking them in hot water may be of some benefit.

(32) R. B. N.—Prices for yacht engines: 3 inch cylinder x 5 inch stroke, $640; 3½ inch cylinder x 5 inch stroke, $720; 4 inch cylinder x 6 inch stroke, $800, including boiler, propeller, and appurtenances. For maker's address, see our advertising columns, or insert an advertisement in the Business and Personal column.

(33) A. F. B. asks: What is the length of 1 lb. of No. 28 copper wire? Also of 1 lb. of No. 24 copper wire? A. By Birmingham W. G., of No. 28 there would be 1686·34 feet; of No. 24, 683 feet. By American W. G., of No. 28 there would be about 1955 feet; of No. 24, there would be about 827 feet.

(34) M. F. S. asks: Will a fish placed in a pail of water increase the weight? The pail is supposed to be brimful. A. If the pail is so full that the water displaced by the fish runs over, the pail will weigh the same as before, as the specific gravity of the fish is the same as that of water.

(35) J. V. A. asks: What are the proper dimensions for making a compound bar magnet capable of sustaining a weight of 20 lbs.? A. Jamin by arranging together several thin plates magnetized to saturation succeeded in making bar magnets which support 15 times their own weight. The dimensions of a magnet to support a given weight will vary greatly with the quality of the steel from which it is made and the treatment it receives.

(36) J. G. S. asks: What is the cause of foaming in boilers, and what is the remedy? My boiler is horizontal. A. There are several causes of foaming in boilers, namely, impure water, deficient circulation, or small steam capacity. The remedy to be applied would depend upon which of these causes operated. The introduction of oil with the feed water in small quantities will frequently check foaming for a time.

(37) H. C. P writes: I am making a drawing camera from "Aids to Drawing" in SUPPLEMENT, No. 158, and have two double convex lenses about one inch in diameter, and I would like to know how to use them, and at what distance from the lenses to place the ground glass, and about what size box it would require for the camera so as to bring the rays to a focus and make the image appear plain on the glass. A. You will need but one lens, which may be either single or double convex. For practical purposes you may get its focal length by holding it remote from a window in front of a white surface, and moving it back and forth until a clear image is seen on the white surface. The distance between the lens and the surface is the same as that which should separate the lens from the ground glass. The size of the ground glass and of the box will of course be controlled by the size of the image which the lens is capable of forming.

(38) W. H. R. writes: 1. The saw mill here contains a circular saw driven by a direct belt from the pulley on the shaft of the turbine water wheel, the belt running over guide pulleys up to the saw. It is now desired to use the power without running the saw and for other purposes, and not wishing to go to the expense of putting in a bevel gear, as that in this case would be rather an expensive job, we wish to know if a quarter twist belt from the water wheel to a line shaft is practicable for the heavy work of driving a 46 inch circular saw. A. A quarter turn belt would not do well for so heavy work, and would wear very rapidly. 2. The center of the pulley on the saw shaft is at right angles with a line drawn through the center of the driving pulley. What is the correct position for the driving pulley on the line shafting so as not to use a guide pulley? A. For ascertaining position of pulleys, see p. 27. (5), current volume of the SCIENTIFIC AMERICAN. 3. Is it a good method of stopping and starting the saw to use a belt tightener? A. We see no objection to this plan.

(39) B. F. M. writes: It takes from 10 to 18 barrels of water per day to run a grain separator with an agricultural engine. I propose to make a tin pipe, 1 foot diameter, 6 feet high, terminating below in a 20 gallon tank, from which an extra pump is to elevate a continuous stream in at top of pipe, running over shelves to the bottom, the exhaust all discharging into bottom of said pipe. How much water can I probably save? Would it not be more economical to dispense with nozzle and consequent back pressure, and use small fan to create draught? A. By changing the exhaust as proposed, you could probably effect a saving of between 15 and 20 per cent.

(40) D. L. D. asks: In discharging a rifle does the recoil occur at the moment of explosion or after the ball leaves the muzzle? A. It commences at the instant of explosion, and continues until the pressure is relieved by the exit of the ball.

(41) W. E. F. writes: I use a large iron tank, in which I boil a vegetable fiber under 60 lbs. steam pressure. The fiber contains tannic and other acids and iron. I am told that the iron and acids in the fiber combine with the iron of the boiler, forming a kind of ink which dyes the fiber, making it hard to get white; but that if I can use a boiler in which the iron plates alternate with zinc plates (if practicable) this will establish a galvanic or electric condition that will prevent the formation of this black ink or dye; or that if I secure a few zinc plates to the inside of the boiler, the same happy result will be obtained. Is this the case? A. The arrangement of a few plates of zinc, in good contact with the iron within the tank, as suggested, would doubtless protect the iron and fiber, but you will probably find that the addition of a few ounces of carbonate of soda introduced with each charge will prove as effectual and more economical.

(42) T. J. B. asks: What effect would vitriol have on the skin, and what is it used for? A. If you refer to undiluted oil of vitriol (sulphuric acid), it would quickly disorganize or char the skin. The acid diluted with from 10 to 30 parts of water is sometimes administered in very small quantities as a refrigerant, to check profuse perspiration, in skin diseases to relieve the itching, and in dyspepsia, etc.

(43) C. E. S. asks for the process so generally used for coating malleable or gray iron castings with copper. I can deposit the copper all right, but cannot get the luster or polish. Castings are very small, will average about 1 oz. each and easily handled. A. Rub the clean iron, or tumble it in a barrel for a few minutes with bran, sand, or saw dust, moistened with a solution of 3½ ounces of copper sulphate and 3½ ounces of sulphuric acid in about 3 gallons of water, rinse in running water, and dry in sawdust. The iron should not be allowed to remain too long in contact with the copper solution or absorbent materials containing it.

(44) T. T. P. asks: Could a siphon be made to turn a water wheel with sufficient force to pump the spent water back and up to the proper elevation to again supply the siphon, thus causing the wheel to be kept in motion by the same water? If not, why not? A. No, because it would require a creation of power.

(45) L. W. Y. asks: How many gallons of fluid will 400 feet of 2 inch (inside diameter) pipe hold? A. About sixty-five and one third United States gallons.

(46) E. L. asks (1) how to ascertain the speed of belting. A. Multiply the diameter of the pulley in feet by 3·1416 times the number of revolutions per minute. 2. Could you tell me the necessity of having the lever and ball attachment to the valve stem of a governor save for the purpose of changing the speed? A. The object is to render the governor more sensitive. See SCIENTIFIC AMERICAN, vol. 31, p. 389. 3. In your opinion is it a detrimental practice for firemen to admit cold water on the hot ashes in the furnace to avoid dust when cleaning fire? A. Yes.

(47) J. J. L. asks: 1. How long will magnetized steel, with constant use, retain its magnetism? A. It depends upon how it is used. If submitted to jars or shocks, or if the armature is applied and removed many times in succession, the magnet will be injured. 2. Does it lose its magnetism from non-use? A. If provided with an armature it may improve. 3. Does the quality make any difference? A. Yes. 4. I have flat bar steel ¼x¾. Can I have that size magnetized to lift from 4 to 8 lbs.? A. It may sustain the weight mentioned, but it probably will not lift it.

(48) H. M. R. writes: We have a 6 foot wheel and 2 inch rope for hoisting purposes. The groove in the wheel and the rope have both worn very smooth, so the rope slips with a heavy load. Can anything be done to the wheel to make the rope hold better? A. Wind the wheel tightly in the bottom of the groove with small tarred rope.

(49) E. H. asks for a receipt for making a cement to stick rubber to iron. A. Fuse together equal parts of gutta percha and pitch. For cement receipts see SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(50) O. H. P. asks for directions for making alcoholic shellac varnish. A. Place a quantity of gum shellac in a bottle; pour over it enough 95 per cent alcohol to cover it. Allow it to stand for 24 hours, shaking it occasionally.

(51) T. C. writes: I wish to propel a Sharpie boat, with paddle wheels, at the speed of 12 miles per hour. The boat is fifty feet long with 8 feet beam, and draws 8 to 10 inches water. 1. What should be size and power of boiler and engine? A. We would not advise the use of paddle wheels in so small a boat; you can hardly attain the speed you want, except by the use of feathering wheels. The power required could not well be determined without knowing the model of the boat. 2. Would two cylinders be better than one? A. For maneuvering, yes; otherwise, no. 3. Would I gain anything by gearing up with cog wheels to increase revolutions? A. No.

(52) E. G. A. asks: Through what chemical process is the paper passed that is used in recording telegraphic messages, a blue mark being produced each time a current of electricity is passed through it? A. The paper is saturated with one of the following solutions: 1. Nitrate ammonia, 2 lb.; muriate ammonia, 2 lb.; ferricyanide of potassium, 1 oz.; water, 1 gallon. 2. Iodide potassium, ½ lb.; bromide potassium, 2 lb.; dextrine or starch, 1 oz.; distilled water, 1 gallon.

(53) C. B. asks: 1. Does it make any difference whether the screw end of a phonograph shaft rests in a Babbitt metal bearing instead of a steel one? A. No. 2. What is meant by elastic tubing in description of phonograph in SUPPLEMENT No. 133: does it mean small rubber hose, and which way should they be placed, end ways or flat, and how many pieces? A. Small rubber tubing placed flatwise; it requires 4 or 5 pieces.

(54) S. B. G. asks how the pier was put in the rapids of Niagara river for the bridge to Goat Island. It is a mystery to me, and doubtless is to many others who have seen the rapids. A. Mr. P. A. Porter, one of the owners of Goat Island, furnishes the following account of this piece of engineering: First, a large and strong bulkhead was built in the shallow water near the shore; a solid backing was put in behind this, and the whole well floored over with plank. On this platform, and parallel with the river, several strong rollers were securely fastened. Large oak trees were felled and hewed "tapering" so that when finished they were about 18 inches square at the butt, 15 inches square at the top, and about 80 feet long. Large auger holes were then bored through the smaller ends of these. Two of these timbers, laid parallel and 6 feet apart, were placed at right angles to the river, the smaller ends lying on the rollers and projecting over the water, and the shore ends heavily weighted down. Levers were then applied, and these timbers were run out until their front ends reached an eddy in the water. Two men, each provided with a strong iron-pointed pike staff (through the holes in the upper ends of which some 10 feet of new rope was drawn), walking out to the ends of these timbers, drove their pikes down among the stones, and tied the timbers to them. Around these pikes the first pier was built and filled with stone. Other timbers were then run out, all were planked over, and the first span was finished. The other spans were completed in the same way.

(55) B. B. S. asks: Which will require the least battery, a double telegraph line two hundred yards in length, or a single line with ground wire same length? A. The double line.

(56) F. G. & S. write: We have an upright boiler, 9 feet high by 4 feet diameter, 124 2-inch flues, which leaks very bad at times. When there is a hot fire in the boiler the flues scarcely leak at all, but as soon as we throw in fresh coal and deaden the fire it commences to leak. The flues are rolled; if the flues were beaded, would it stop them from leaking? A. Your leakage must be due to unequal expansion and contraction. Beading the tubes would probably remedy the trouble in a measure. How is your feed water introduced? Does not the starting or stopping of the feed affect the leakage?

(57) G. W. & S. ask: Is a belt in a half twist liable to slip as much as one running straight? A. If by half twist you mean running shafts at right angles to each other, the twist belt is more liable to slip, as it has less surface of contact with the pulleys.

(58) F. C.—In experimenting with a magnetic motor I am at a loss for a non-conducting material. The magnetism penetrates all substances I have been able to find. Do you know of any non-conductor that is likely to answer my purpose? A. No.

(59) M. F. asks: Which of two engines has the most power according to steam consumed: one with an 8 inch diameter cylinder and 10 inch stroke, or one with a 7 inch diameter and 12 inch stroke? A. 8 inch cylinder and 10 inch stroke.

(60) O. B. H. writes: In No. 8, Vol. XL. of the SCIENTIFIC AMERICAN, in the description of an "Electric Pen," you say toward the end of the article referred to: "The pen may readily be made far more rapid in its action than the costly instrument alluded to." Will you be so kind and inform the writer of this in "Notes and Queries:" 1. How to accomplish a more rapid action of the pen? A. By using a stiff spring in the interrupter, and adjusting it carefully, the sparks may be made more rapid than the revolutions of the wheel of the electric pen. 2. Whether a one cup Grenet battery with induction coil, as commonly used in medical practice, will answer in connection with the pen? A. A medical coil is not suitable for the purpose. 3. How many cups of a Grenet battery without induction coil it would require to furnish a current strong enough to perforate common note paper? A. It cannot be done by the batteries alone.

(61) C. N., Jr., asks (1) for the best mixture for polishing tortoise shell. A. Tortoise shell is usually finished by filing, scraping, and the application by a buff wheel of powdered pumice stone and water, putty powder and water, and lastly by means of rotten stone in water. 2. What can I do with a gunstock that has had a very severe wetting so that it has raised the grain of the wood and made it rough? A. File it, scrape it, and polish it, by applying to it with a woolen cloth, alcoholic shellac varnish, 2 parts, boiled linseed oil, 1 part, well shaken together before each application. The polish must be rubbed briskly after each application until the surface is smooth and dry.

(62) E. L. asks: What is the horse power value of a jet of steam through a one inch pipe 50 feet from the boiler, at a pressure of 50, 75, and 100 lb. per square inch respectively? A. There is no definite relation between the discharge of steam through a pipe and the horse power at 50 lb. pressure per square inch (total); the weight of steam discharged would be 34·6 lb. per minute; at 75 lb. pressure, 51·39 lb. per minute; and at 100 lb. pressure, 67·8 lb. per minute; but the horse power these several pressures of steam are equal to will depend upon the manner of its use, whether in condensing or non-condensing engines, simple or compound, and to what extent it is used expansively.

(63) C. M. S. asks how to clean lace. A. Lace may be restored to its original whiteness by first ironing it slightly, then folding it and sewing it into a clean linen bag, which is placed for 24 hours in pure olive oil. Afterwards the bag is to be boiled in a strong solution of soap and water for 15 minutes, then well rinsed in lukewarm water, and finally dipped into water containing a slight proportion of starch. The lace is then to be taken from the bag and stretched on pins to dry. —(*Spon.*)

(64) T. A. M. asks: Is there any remedy for air holes in plaster of Paris casts for moulding rubber stamps? A. By properly mixing the plaster air holes may be avoided. Take about the quantity of water required for mixing the batter, sprinkle into it the plaster, allow it to settle to the bottom, pour off the surplus water, stir it carefully, and pour. After pouring, it is well to jar the type to liberate any air bubbles that may adhere to the face of the type.

(65) J. J. M. asks: Do you know anything better than borax for welding steel? A. The following has been suggested, but we cannot vouch for it: "Heat the pieces to be joined together, roll them in marble dust, and join them promptly, subjecting them to a good hammering." Should any of our correspondents find this a practicable method we should be pleased to hear from them.

(66) C. G. writes: I have some cider which is boiled down; one quart of it may be diluted with 4 quarts of water and taste good. When I mix water with it and let it stand for a few weeks, it spoils. How can I remedy it? A. Add a small quantity of calcium sulphite to the cider, and keep it from the air in bottles or sealed jars.

(67) O. A. S. asks: 1. What is the average cost of quicksilver by the cwt. or ton? A. Mercury is quoted at 55 cents per lb.; the cost varies considerably with the market. 2. Does the supply exceed the demand? A. No. 3. If by a new discovery it should become useful in large quantities generally over the United States, for mechanical purposes (I mean in addition to its present uses), what would be the prospect of procuring it? A. Quicksilver mines are few in number. An increased demand for the metal would, for a time at least, proportionately increase its market value.

(68) P. J. N. asks if unleached wood ashes and Peruvian guano, say about half and half of each, may be mixed together for fertilizing purposes; or whether there are chemical properties in one which would neutralize the chemical properties in the other, and thus deteriorate their fertilizing value? I propose using this combination in the cultivation of the potato. A. The addition of a small quantity of the ashes to the manure used at the time of planting will prove advantageous; the quantity mentioned would be excessive. Consult Johnston's "Agricultural Chemistry," and "Chemistry of the Potato," Bliss.

(69) B. A. M. asks: 1. By what means is glue maintained in the liquid state? A. Use strong acetic acid. 2. How is slating fluid or slating silica made? A. Dissolve water glass in boiling water to a thin syrup, and form into a paste with a mixture of equal parts of dry plaster of Paris and fine calcined clay passed through an 80 inch sieve. 3. What are the principal uses of silicate of soda, and how can it be made sufficiently fluid to flow easily? A. It is used extensively in the manufacture of artificial stone, in mortars, cements, and lutes, as a vehicle for pigments in fireproof paints and varnishes, in stereochromy, in soaps, and certain laundry preparations, in metallurgy as a flux, and in various laboratory operations. It may be dissolved and diluted with boiling water.

(70) E. F. F. & H. S. P. write: In making the cakes of powdered carbon, peroxide of manganese, and gum lac, as expressed in SCIENTIFIC AMERICAN SUPPLEMENT, No. 159, page 2528, Fig. 48, how is the gum lac made to mix freely with the other ingredients? A. Gum shellac powdered is mixed with the peroxide of manganese and carbon in a dry state. The whole is made to cohere by heating the mixture until the shellac is melted.

(71) W. S. writes: I have a breech loading shot gun which has had the browning taken off by salt water. I would like to ask how to stain gun barrels a rich brown such as seen on our best guns. A. 1. Mix chloride of antimony to a thin cream with olive oil, and apply this uniformly to the warm iron. It should be left undisturbed until the requisite degree of color is developed. A few drops of nitric acid is sometimes added to the paste to hasten the operation. 2. Nitric acid, ½ oz.; sweet spirits of niter, ½ oz.; spirits of wine, 1 oz.; cupric sulphate (blue vitriol), 2 oz.; chloride of iron tincture, 1 oz.; water, 40 oz.; warm the water, dissolve in it the powdered copper salt, cool and add the other materials. Use the burnisher and scratch brush to produce the markings. For polishing a piece of hard wood is used. Finish while warm with rather thin pale shellac varnish (colored with dragon's blood if desired), polished after drying with the hard wood polisher. The time required to properly brown the iron is about 24 hours. The iron should be scoured or cleaned with moistened lime before applying the browning composition.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

A. C. O.—No. 1. A serpentine rock. No. 2. Contains quartz, orthoclase, magnetic pyrites, and traces of copper glance. No. 3. Serpentine rock containing much iron sulphide. No 4. Quartzite and ferruginous earth or ocher.—G. H. P.—The silicious limestone (not shale) containing bituminous matters offers no positive indications that petroleum exists in the locality in paying quantities; on the contrary, thousands of dollars have been lost by oil seekers in this rock. See chapters on petroleum in Professor Winchel's "Sketches of Creation."—J. S. F.—It appears to be a wax of the paraffine series (ozocerite or hatchettite). If found in large quantities, of some value. Larger specimens are desirable to settle the question.

COMMUNICATIONS RECEIVED.

On Perpetual Motion. By J. K.

On the Gary Motor. By W. W. G.

On the Analysis of some Ancient Pieces of Metal. By E. H. S. B.

A Simple Ellipsograph. By S. W. B.

On the Telephone. By F. F. P.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

February 25, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Amalgamating ores, apparatus for, C. E. Ball 212,644
Ammonia, muriate of, W. Gentles 212,596
Axle box, car, G. J. & S. J. Shimer 212,631
Axle box, car, J. N. Smith 212,755, 212,756
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Basket, S. Friend 212,679
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Burial casket, J. R. Nelson 212,565
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Hame, harness, W. B. Hayden 212,691
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Hose for street washers, C. Gumlich, Jr 212,599
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Lamp chimney or globe protector, C. E. Willis 212,776
Lamp globe cap, Nichols & Alexander 212,619
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Peg float, R. T. Ellifrit 212,668
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Pocketbook fastening, J. M. Riley 212,624
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Sketching rack, C. C. Shepherd 212,629
Soldering clamp, W. H. B. Flender 212,675
Speculum and syringe, W. Harz 212,600
Spinning machinery, T. Wrigley 212,779
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Tackle block, J. W. Norcross 212,566
Thermostat and manual circuit closer, A. D. Blodgett 212,586
Thrasher and cleaner for peas, etc., J. J. Sweatt 212,763
Thrashing machine band cutter and feeder, W. H. Bassett 212,583
Testing machine, T. Olsen 212,734
Time lock, Kook & Hall 212,610
Toy, bell, J. Brunner 212,537
Toy railway, C. C. Shepherd 212,630
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Vapor burner, T. Johnson 212,705
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Vehicle spring, B. S. Porter 212,742
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Ventilator cap, P. J. Belford 212,647
Vessel, ice breaking, F. M. Mahan 212,715
Wagons, chute for coal, G. W. Rodenhausen 212,746
Water closet, etc., valve, A. E. Jennings 212,704
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Water wheel, J. L. Beers 212,646
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Wind engine, L. King 212,709
Wire cage, M. Grebner (r) 8,594
Wrench, L. S. Starrett 212,760
Wrench and crimper for nut washers, Christie & Overton 212,659
Yoke, neck, C. Hauff 212,689

TRADE MARKS.

Canned goods, A. Stephani & Co 7,049
Catarrh remedy, A. De Voe 7,053
Cigars, J. Elbling 7,048
Cigars, cigarettes, and smoking and chewing tobacco, S. Jacoby & Co 7,047
Flour, E. F. Jackson 7,046
Grain cradles, scythe snaths, etc., Semple & Birge Manufacturing Company 7,051
Preparations for filling, covering, and preserving wood, Bridgeport Wood Finishing Company 7,050
Shirts, collars, cuffs, etc., O. S. Baldwin 7,044
Smoking and chewing tobacco, cigars and cigarettes, Goodwin & Co 7,045
Toilet preparations, Coudray & Fils 7,052

DESIGNS.

Carpet, J. Campbell 11,037, 11,038
Font of printing types, R. Smith 11,039
Handkerchief, A. Tilt 11,033
Knitted fabric, D. Briggs 11,030
Knitted fabric, C. Jackson 11,031, 11,035
Knitted fabric, H. A. Truitt 11,032, 11,036
Match boxes, H. Rosenberg 11,040
Padlocks, C. H. Beebe 11,041
Pistol handles, H. H. Hopkins 11,034
Pocketbook fasteners, L. B. Prahar 11,042

English Patents Issued to Americans.

From February 25 to February 28, inclusive.

Bolts, machinery for packing.—C. D. Rogers, Providence, R. I.

Card setting machines.—J. Russell *et al.*, Springfield, Mass.

Files, process for sharpening.—D. W. Watson, Malden, Mass.

Lanterns.—E. B. Requa *et al.*, Jersey City, N. J.

Motors.—E. Molera *et al.*, San Francisco, Cal.

Mowing machines.—P. Mast *et al.*, Springfield, Ohio.

Paper for covering silver.—J. Torrey, New York city.

Piston rod packing.—T. Tripp, Boston, Mass.

Quoins.—R. F. Gillin, Brooklyn, N. Y.

Revolvers.—W. C. Dodge, Washington, D. C.

Sifting apparatus.—J. T. Parlour, Brooklyn, N. Y.

Staples, machine for clinching.—G. W. McGill, N.Y. city.