SCIENTIFIC AMERICAN

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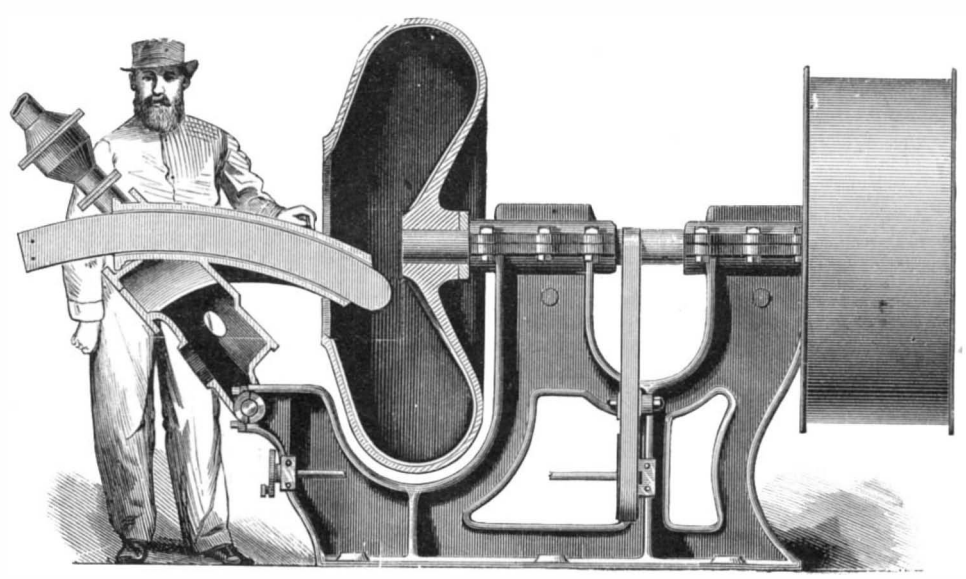
Preserving Fence Posts.

A correspondent at Benton Harbor, Mich., sends us the following statement by Parker Earle (a widely known horticulturist), in the Chicago *Times*, and requests our opinion of his mode for preserving fence posts. In answer it may be stated that no single experiment, or no single series of experiments under like circumstances, can be adopted as a rule for unlike conditions. Our own observations and experiments have led uniformly to the opinion that coal tar (applied warm to dry wood) is a good preservative for timber underground, or exposed to wet and shade, but does more harm than good if exposed to the action of the sun and weather. But varying circumstances may vary the rule. The character of the soil may have a controlling influence, and experiments should be repeated in different places and on different kinds of wood.

The experiments of Mr. Earle are a valuable contribution to such a series of trials. For general application, we would recommend first impregnating the whole of the post with crude petroleum as a general preservative, and when dry apply hot tar to the portion going into the ground, but none above. The petroleum will penetrate the pores, and the tar coating will hold it there. The following is Mr. Earle's statement:

In building a fence around our young orchard, several years ago, we tried many plans for preserving the posts. Having occasion to remove the fence this winter, we noted the condition of the posts as follows: Those set with no preparation were decayed an inch or more in thickness; those coated with a thick wash of lime were better preserved, but were quite seriously attacked by worms; those posts coated with hot tar were perfectly sound as when first put in the ground; those painted with petroleum and kerosene were equally sound and as good as new. In future we shall treat all posts in the following manner before setting: Let the posts get thoroughly dry, and then, with a pan of cheap kerosene and a whitewash brush, give the lower third of the post, the part to go into the ground, two or three good applications of the oil, letting it soak in well each time. Posts so treated will not be troubled by worms or insects of any kind, but will resist decay to a remarkable degree. This we find to be the simplest, easiest, cheapest, and best method of preservation.—*Country Gentleman.*

ALUMINUM SILVER is made by melting together 1 part of silver with 3 or 4 of aluminum, and is very valuable for articles in which one of the main objects is to obtain lightness, such as the instruments used for marine observations. Octants and sextants of this alloy have been received with great favor by practical navigators. Those parts of such instruments which, if made with other metal, would weigh 4 lb., will, when made of the above alloy, only weigh 1 lb. Mechanics like to work this alloy, as it can be turned and filed away, which is not the case with the pure aluminum, which is too soft, and, as no doubt all know who have worked this interesting metal, it has the objectionable property of sticking to the file.



VERTICAL SECTION OF DUC'S MECHANICAL ATOMIZER.

DUC'S PATENT MECHANICAL ATOMIZER.

One of the most successful of the many machines recently brought to the notice of milling people is the Duc mechanical atomizer, which we represent on the title page of the current issue. It is the invention of Mr. Henry A. Duc, Jr., of Charleston, S. C., and was designed to meet a necessity long felt by the large fertilizing interest of the State of South Carolina.

Heretofore, and at the present time, in fact, the immense quantities of phosphate rock mined in the neighborhood of Charleston have been ground for the purpose of manufacture into fertilizing material by means of the ordinary burrstones, a slow and expensive method. Owing to the hardness of the rock, the wear on the stones is excessive, necessitating frequent dressing, and consequently a renewal of the stones at very short intervals, entailing not only the cost of new stones, but a loss of time in placing them in position, which is of no small importance in a busy season. As overcoming the many objections which belong to the use of burrstones for this purpose, the Duc atomizer is certainly worthy of notice, and will undoubtedly fill a long-felt want.

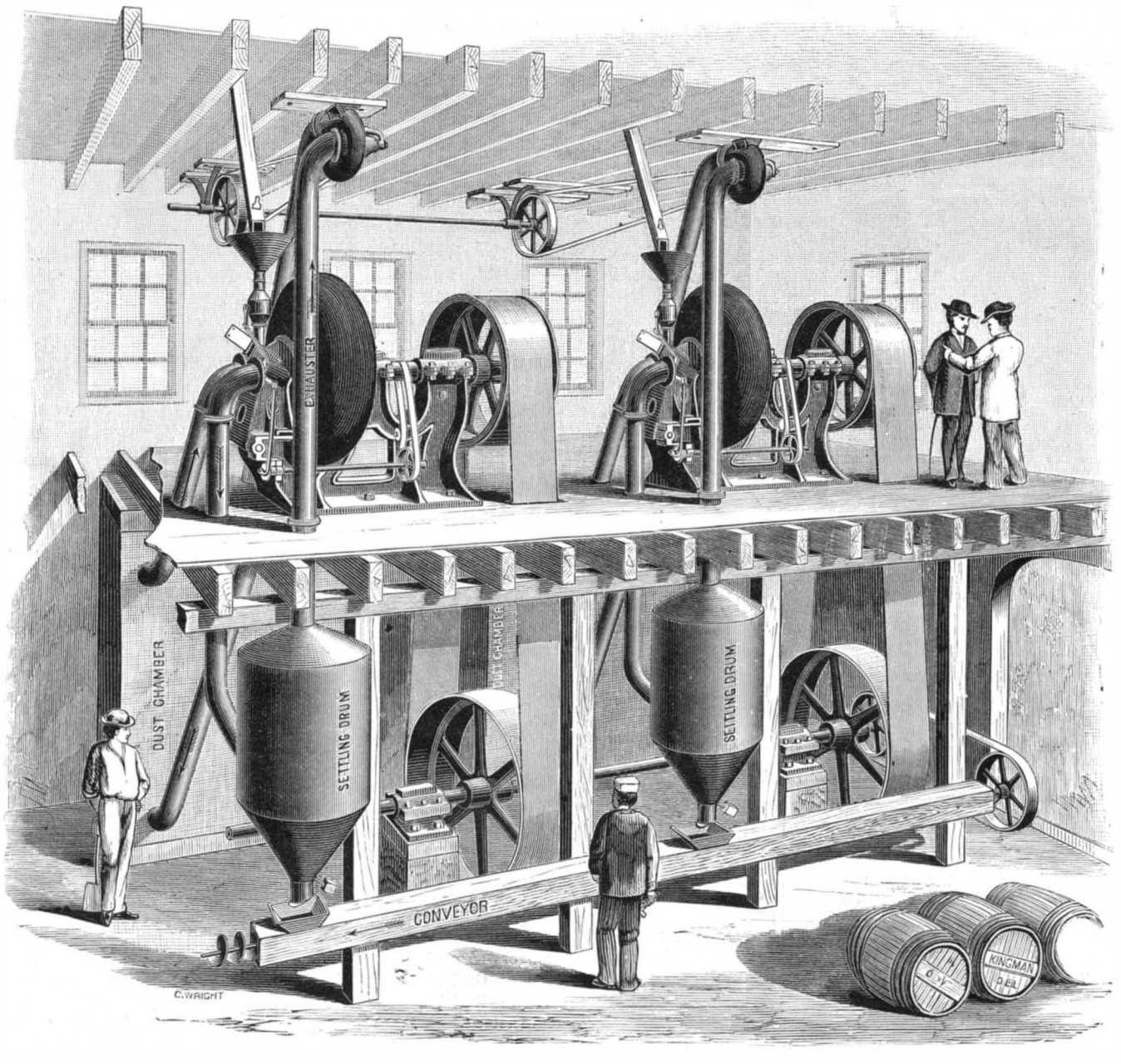
It is purely an "attrition mill," that is, one in which the material grinds itself, thereby relieving the machine from all excessive wear, a great detriment to most of the mills designed for this class of work, in which the machine itself must take half the wear, and the material to be ground the other half.

The action of the machine may be best understood by reference to the illustrations.

The material to be ground is broken to about the size of chestnuts, dried, and then fed into the mill from the storage bins, the amount of feed being regulated by means of a variable feed movement, the same as would be necessary for burrstones.

The broken rock enters the cast iron shell (which is revolved at about one hundred and fifty turns per minute) and is acted upon by centrifugal force, which causes it to form a ring or belt of rock, adhering to the inner surface of the shell, and revolving with it. This belt is allowed to accumulate to the thickness of an inch and a half, and is prevented from becoming any thicker by the plow bar (a segmental bar of chilled iron) which extends into the shell, and to within about an inch and a half of its inner periphery. This bar is stationary and of the hardest material, to prevent undue wear of its lower extremity in

[*Continued on page 147.*]



DUC'S MECHANICAL ATOMIZER—MADE AT THE CONTINENTAL WORKS, BROOKLYN N. Y.

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NEW YORK, SATURDAY, MARCH 11, 1882.

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INVALIDATION OF PATENTS BY PUBLIC USE.

In nearly all foreign countries, if an invention is brought into public use before the application for a patent is filed, the patent will be rendered invalid. In this country the same rule holds, except that no invalidation of the patent will take place unless the invention was in public use for more than two years prior to the application for a patent. This law is inexorable, and the Supreme Court of the United States has held that a single instance of such public use, two years prior to the application for patent, is enough to defeat the patent.

The law applicable to the case is section 24 of the act of July 8, 1870, now embodied in the Revised Statutes as section 4,886, which declares:

"Any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the fees required by law, and other due proceedings had, obtain a patent therefor."

An interesting case that came under this section of the law was that of Worley *vs.* the Loker Tobacco Company, lately decided by the United States Supreme Court. A patent was granted to Worley & McCabe, August 22, 1876, for a mode of finishing plug tobacco. The invention consisted in heating the plugs of tobacco up to 140°, while they were between metal plates in a press, subject to heavy pressure. The pressing between plates and the heating had been previously done, but separately.

It appeared from the testimony that Worley made the invention for his employer, McCabe, who was the owner of a tobacco factory in St. Louis; and that the invention was there in public use for more than two years before any application was made for the patent. The court said:

"It has been repeatedly held by this court that a single instance of public use of his invention by a patentee for more than two years before the date of his application for his patent will be fatal to the validity of the patent when issued. (*McClurg vs. Kingsland*, 1 How., 202; *Consolidated Fruit Jar Company vs. Wright*, 94 U. S., 92; and *Egbert vs. Lippman*, decided at the present term.) We think the testimony of the appellants themselves shows such a public use of the process covered by Worley's patent as to render it invalid. This evidence brings the case clearly within the terms of the decision of *McClurg vs. Kingsland* (1 How., *ubi supra*), where it was declared that if a person employed in the manufactory of another, while receiving wages, makes experiments at the expense and in the manufactory of the employer, has his wages increased in consequence of the useful results of the experiments, makes the article invented, and permits his employer to use it, no compensation for its use being paid or demanded, and then obtains a patent for it, the patent is invalid and void. The inventor cannot relieve himself of the consequences of the prior public use of his patented invention by assigning an interest in his invention or patent to the person by whom the invention was thus used."

The decree of the Circuit Court, which held the patent to be invalid, was therefore affirmed.

THE PROPAGATION OF CODFISH.

The successful propagation of codfish by the United States Fish Commission, at Gloucester and Wood's Holl, Mass., has been followed by a very promising attempt to make this city a center for the distribution of impregnated eggs for restocking our more southern waters.

This important enterprise is largely due to the intelligence of Mr. E. G. Blackford, of Fulton Market. Seeing that large numbers of live cod, many of them ripe for spawning, are brought to this market every season in the wells of fishing smacks, Mr. Blackford suggested to Professor Baird, United States Fish Commissioner, that an almost unlimited quantity of artificially impregnated eggs might be obtained here at small cost. The suggestion was acted upon about six weeks ago, and two of the experts of the commission who had conducted the cod-hatching operations at Gloucester and Wood's Holl were detailed to take charge of the work here. About the middle of February a number of fish taken off Fire Island were stripped, yielding, it was estimated, about 4,000,000 eggs, which were properly impregnated and sent to Washington for batching there. Owing to faulty packing for transportation the eggs spoiled on the journey. A few days later another large lot of eggs was shipped in jars, kept cool by packing in ice, and arrived in fine condition; and since then several shipments of impregnated eggs have been made, all successful.

Though the operations were begun somewhat late in the season the results seem to show that an abundant supply of cod eggs can be readily obtained here. By beginning the work in the fall it is believed that as many as 100,000,000 impregnated eggs can be secured in a season, with little trouble and at small cost.

The officers of the Fishmongers' Association have placed their rooms at the disposition of the Fish Commission for their work, and the captains of the fishing smacks have been extremely liberal in allowing their fish to be examined by the experts, and in furnishing without charge the fish found suitable for stripping.

The range of the cod along the coast is from the polar regions on the north to Cape Hatteras on the south. It is found all the year round on the rocky spots, also frequently on sand and clay, but seldom, if ever, on muddy bottoms. Codfish are gregarious in their habits, going in schools of greater or less size, and are governed in their movements by the presence or absence of food, the spawning instinct, and the temperature of the water. In schooling both sexes are always found together. They sometimes make long journeys from one bank to another. They live at a depth varying from a few feet to over a hundred fathoms. The cod seems to have but few enemies, its principal foe being the dogfish. Evidence shows that the cod spawn every year. During the first of the season examination discovered no mature fish; again, later in the season, no spent fish were seen with any eggs remaining. The first ripe females are found in September at Gloucester, and later along the Long Island coasts. The cod deposits its eggs gradually during a long period. When the female becomes ripe she remains near the bottom, while the male often swims higher up. When the sea is smooth the eggs float near the surface of the water; then the chances of impregnation are more favorable. The following numbers of eggs have been known to have been taken from various sized fish: From one weighing 70 to 75 pounds, 9,100,000 eggs; from a 51-pound fish, 8,989,094; from a 30-pound fish, 3,715,687; from a 27-pound fish, 4,095,000; from one of 22¾ pounds, 3,229,388; and from a 21-pound fish, 2,732,237.

Mr. Blackford, whose labors in promoting fish culture are so well known, has rented a large room in the new Fulton Market building, and will fit it up and furnish it for the gratuitous use of students of fish culture. There will not only be room for such work as the United States Fish Commission may wish to carry on, but all those interested in zoological and biological research will be welcome. For active research in the marine fauna, New York, with its adjacent waters, presents many advantages, and with the use of such a room, together with the specimens which Mr. Blackford will gladly furnish, the cause of science cannot fail to be notably benefited.

In this connection it is proper to add that the annual trout exhibition will begin in Fulton Market April 1, and the annual meeting of the American Fish Cultural Association will follow on the 3d and 4th. Papers are promised by Mr. G. Browne Goode, of the Smithsonian Institution, Washington, D. C.; Professor Bean, Professor Ryder, of Philadelphia; Professor Atwater, and Messrs. F. Mather, Barnett Phillips, and E. G. Blackford.

THE SMOKE NUISANCE.—PROBLEMS FOR INVENTORS.

An exhibition of appliances for the abatement of smoke has been running for some weeks at South Kensington, England, and its success has been so great that its promoters are talking of holding in London a thoroughly international exhibition of the same character.

Meantime the Common Council of the City of Cincinnati, O., have taken hold of the problem in a vigorous way by passing an ordinance making it an offense punishable by fines to maintain a furnace which needlessly pollutes the air with smoke. The ordinance provides that all furnaces used for purposes of trade or manufacture within the city limits shall be so constructed as to effectually, or in the best possible manner, consume or burn their own smoke. No specific device or mode of furnace construction is demanded; but merely that the best obtainable construction of furnace shall be used and so carefully attended to that there shall be no avoidable discharge of smoke into the air. An inspector of smoke is appointed to see that the provisions of the ordinance are properly executed.

We are informed that a visiting committee from Cincinnati have been to England, where the smoke nuisance has longest been experienced, to study the devices on exhibition at South Kensington, and on record in the British Patent Office, but have returned without finding any adequate remedy for the evil. The means that have been devised for mitigating the smoke nuisance are numerous and ingenious; but there appeared to be nothing entirely satisfactory.

It is unreasonable to suppose that the problem is incapable of solution. The products of the perfect combustion of the smokiest coal are solid ashes, which remain in the crucible or furnace, and colorless gases, which make no visible addition to the atmosphere. The presence of smoke is always proof of imperfect and wasteful burning.

It is the business of our inventors to accomplish, under the varying and often unfavorable conditions of metallurgical and manufacturing processes, as perfect a combustion of the fuel used as is possible in the laboratory; either primarily in the furnace or by the subsequent reburning and washing of the sooty and volatile products which so largely pollute the air of our Western cities and manufacturing towns.

The demand for such inventions is wide and urgent. The action of the City Council of Cincinnati is likely to be generally imitated, certainly if it has the effect of materially abating the nuisance complained of there; and the scope for successful effort in invention in this field is as wide as the demand for an abatement of the smoke nuisance and the almost infinite variety of industrial operations employing soft coal as fuel.

Original Research in Australia.

The Royal Society of New South Wales has undertaken to encourage original research by offering eight prizes of £25 ($125) each for the best communication containing the results of original study or observation on as many specified subjects. Four of these—"On the Aborigines of New South

Wales," "On the Treatment of Auriferous Pyrites," "On the Forage Plants Indigenous to New South Wales," and "On the Influence of Australian Climates and Pastures on the Growth of Wool"—are to be sent in before the 30th of September next. The other four—"On the Chemistry of Australian Gums and Resins," "On the Water Supply of the Interior of New South Wales," "On the Embryology and Development of the Marsupials," and "On the Infusoria Peculiar to Australia"—must be submitted before August 31, 1883. The competition is unrestricted, and as some of the subjects may be investigated outside of Australia, the contest may be of interest to students in this country. The office of the society is in Sydney, N. S. W.

STEAM BOILER NOTES.

The late boiler explosion at Jewell's Flour Mill in Brooklyn, N. Y., a short notice of which was given in the last number of the SCIENTIFIC AMERICAN, has drawn attention in a special manner to a State law relating to boiler insurance and local official inspection of boilers. It is alleged that the passage of the law was much influenced if not entirely procured by the agents of boiler insurance companies, both native and foreign to this State. The following is the clause of the law that is quoted by the Brooklyn *Eagle* as applying to that city, which was passed in 1874. It has been repealed or amended since the Jewell explosion:

"SECTION 1.—All steam users, manufacturers, or corporations possessing the guaranteed certificates, unrevoked and in full life, of any fire insurance company now incorporated, or hereafter incorporated, or of any company organized or hereafter organized, for the purpose of making guaranteed steam boiler inspections, and which have complied with the insurance laws of the State of New York, having duly filed a statement with the Superintendent of Insurance or other authorized officer, of its conditions, and duly paid license fees and taxes, shall be exempt from any further inspections, and from the pains and penalties of the above-named acts."

It appears to have been applicable to insurance companies making boiler insurance a part or the whole of their business. In some cities and States, notably in the State of Connecticut, the certificates of such companies only as make boiler inspection and insurance an exclusive business are sufficient to exempt boiler owners from official inspection and control.

In other localities, the city of Philadelphia, for example, all boilers that are insured must be tested annually by hydrostatic pressure according to law, and the city inspector, who is independent of the police, but under the direction of and appointed by the mayor, may disapprove of any boiler for a given pressure, notwithstanding the boiler has been approved and insured at that pressure.

It seems, however, that none of these laws that leave the matter of limiting the pressure at the discretion of a single person, the chief inspector of an insurance company or the local inspector, as the case may be, are sufficient to prevent either interest or prejudice from becoming an element in the problem of how much pressure may or may not be allowed in a given case. There being no rule or law except the judgment of the inspector, too much latitude as well as too much risk is often assumed by even the most competent inspector. And as a rule they are generally arrogant and conceited in inverse ratio to their fund of practical science.

In the Jewell explosion investigation, which was begun before the coroner on the evening of February 27, it came out that the two exploded boilers were twenty-one years old, seven feet diameter, composed of iron "a full quarter" of an inch thick, and that the owners, having increased their machinery, required more steam than thirty pounds, which they had previously carried, and which was ample for their purposes at that time. Whether or not this increase of pressure was denied them by the city inspector did not appear, but the Hartford Steam Boiler Inspection and Insurance Company were ready to take the risk at fifty pounds, after having ordered a number of soft patches to be put on defective seams on the bottoms of the shells. They were then inspected, testing with a hammer, and proved by personal examination internally and externally. They were accepted for insurance, and a $10,000 risk was assumed by the Hartford Company at 1¼ per cent premium, the policy taking effect some twenty months before the explosion took place. They were again duly inspected at the end of the year—the hydrostatic pressure was not applied on this latter occasion—and the policy was renewed, and a certificate for fifty pounds of steam issued on the 14th of June, 1881, which was to expire on the 14th of June, 1882.

It would seem that a competent State commissioner ought to be appointed to establish a rule for the limitation of steam pressures. The rule may be very simple, something on the model of the Manchester Board of Trade rule, which is simply to determine by one process of multiplication what thickness of good fair iron is required for a given pressure on a cylindrical shell. For example: On a seven foot shell to carry fifty pounds of steam, required the thickness of the plates, single riveted? Rule: Multiply the diameter in inches by the pressure in pounds, and point off all the figures in the product as decimals, which will be the thickness in decimals of an inch; thus $84 \times 50 = 0{\cdot}4200$, nearly seven-sixteenths of an inch.

Calling the Jewell boilers 0·3 of an inch thick, and all other parts equally strong. 35 pounds of steam would have been allowed and no more under this rule. On the other hand, if 50 pounds pressure must be had, the boilers being still the same diameter, their shells would require to be about seven-sixteenths of an inch thick, with all other parts fully as strong. It is more than probable that, under this rule, the boilers having been well cared for, the defects from which the explosion arose would not have been developed to a dangerous degree and no explosion would have taken place.

COTTON PICKING BY MACHINERY.

BY PROF. C. V. RILEY.

In perusing the article on "Cotton and its Future—An Opportunity for Invention," as appearing in the SCIENTIFIC AMERICAN SUPPLEMENT of February 11, 1882, one acquainted with the cotton country and the actual work of harvesting the crop, cannot but be struck with the impracticable nature of most of the notions presented. That the devices described and the ideas advanced are chiefly those of men unfamiliar with the requirements which they have attempted to meet is easily seen. It is surprising to notice that most of the cotton-picking inventions, as shown, are the product of Northern minds, and this may account for their being so foreign to the work which they were designed to perform.

Three principles have been employed. One is that of raking off the cotton by points which are coarse or fine, and grouped comb-like or brush-like; the second is that of applying spindles on which the fiber is to adhere and wind into rolls; while the third is that of suction by an exhaust apparatus.

These principles, as applied in hand-pickers for taking one boll at a time, are inferior to the bare hand alone, and only offer superfluous complications and expense.

As used in large machines to be hauled over the rows, all so far contrived seem better calculated to injure and waste cotton than to gather and save it. The inventors do not seem to have taken into consideration the fact that the crop does not all open at once, and that it must be gathered by a series of successive pickings, at each of which only a portion of the entire crop is open.

They appear to proceed on the erroneous idea that the whole crop matures and opens at the same time, so that it can be gathered all at once, while the plants may be dealt with, injured, or destroyed as though they were of no further value.

No planter will admit to his field a machine to pick the first crop that will damage the second, or to gather the second if it will impair the "top-crop." Hence planters have no use whatever for such contrivances as have so far been patented.

Where the raking principle is introduced in large machines the plants are sacrificed and torn in a manner not allowable, while spindles which scratch or drag through the plants must similarly break off the branches, leaves, and unopened bolls.

If those machines which employ the suction principle have been made to do less injury than the others to the after-crop, they do the work little better and possess in the highest degree a fault common to all, which is that of taking up with the fiber fragments of the foliage and bolls, besides dirt, etc., thus greatly impairing the market value of the cotton.

The fact is the question of harvesting cotton by machinery is a most difficult one, which, like that of gathering the great corn crop of the North by similar means, has baffled the best genius of our country, and, unless some other principles than those in the machines thus far patented can be introduced, the problem must remain unsolved. Let those who wish to exercise their ingenuity in this direction not forget that cotton harvesting extends over a period of two or three months in any given field; that the cotton when gathered is valuable in proportion as it is clean, *i. e.*, free from leaf, dirt, trash, etc., and that no machinery in which these considerations are ignored stands any chance of superseding the nimble fingers of a young darky.

American versus English Nailmakers.

Discussing the prospects of the nail trade the Birmingham correspondent of the London *Ironmonger* says:

Foreign competition in this branch is relaxed by the action of the American nailmakers, who have advanced prices from 15c. to 20c. per keg. These advanced rates, which are much above those demanded by Englisb makers, have of course greatly improved the chances of English nails in Canada, Australia, and other neutral markets, though many even of our own colonists appear to be strongly biased still in favor of the American article, owing to its greater uniformity of quality. It is not denied that English manufacturers can produce as good or even a better nail than the Americans, but they do not always do so; and the merchants who conduct the trade are apt, in buying, to sacrifice higher considerations to cheapness. The Americans are wiser in their generation, and, frankly recognizing the impossibility of competing with English makers in cheapness, they strive to excel in quality, uniformity, and excellence of patterns. On the whole, these tactics have been of great service to them, and have given them a footing in many markets from which it will be no easy matter to dislodge them.

REMEDY FOR SIMPLE CONTINUED FEVER.—Acid. hydrobrom., 1 dr.; Syr. simplicis, 2 dr.; Aq. ad 1 oz. M. Sig.—Every hour.—*Fothergill.*

Dr. Fothergill, in speaking of the above formula, says it will probably constitute *par excellence* the fever mixture of the future. It is especially indicated where there is cerebral disturbances.

About Fires.

To the Editor of the Scientific American:

It appears to me that all the methods proposed deal with the fire from the outside, whereas the fire is in the inside of the building, and it is upon the inside that the remedy should be applied.

It is idle to talk about fire-escapes, fire-engines, and such appliances, with buildings so high that no stream of water will reach the top, and no ladder is long enough to be of service. During the late fire several people were burned up before the fire department even got there. What is wanted is instant application of water from the inside the moment a fire occurs.

At my works I have a device which is simple and effective. Having to deal constantly with fires, I require something that is instantaneous in its action. My device is a railroad tank, at the bottom of which is a large pipe, closed by a valve. From this pipe perforated pipes lead to every point in the factory where fires are expected. The short end of a lever at the top of the tank is connected by a chain with the valve at the bottom. When a fire occurs, the long end of the lever is pulled down, by which the valve is opened, and every point desired to be reached is treated, as it were, to an instant shower bath. This same device could be applied to any of our large buildings and to our theaters, by which arrangement the whole stage could be treated to an instant shower bath. Perforated pipes could be led over the top of the stage and over all the combustible scenery. In buildings, I would suggest two large tanks near the roof, from which perforated pipes should lead over the elevators, all the hallways, stairs, and such rooms where combustible material is stored or being manufactured. The connection with the lever of the tank or tanks should be so arranged that the valve could be pulled from every hallway.

I feel satisfied that with the above device no loss of life and no serious loss of property could occur, and I confidently recommend it after an experience of twelve years, during which time it has never failed me.

PAUL A. OLIVER.

Wilkesbarre, Feb. 21, 1882.

Daniel F. Beatty's New Organ Factory.

Last fall, as our readers will remember, the extensive organ factory of Mr. Daniel F. Beatty, at Washington, N. J., was entirely destroyed by fire. The work of reconstruction was begun at once with the owner's characteristic energy, and within five months a new establishment, larger and more admirably furnished than the old one, was ready for operation. It is now turning out thirty organs and pianos a day; an output which the proprietor says can be doubled in thirty days and trebled in ninety days.

Mr. Beatty's splendid success as a manufacturer of musical instruments is due very largely to his plan of reaching his customers without the intervention of middlemen. In this way the buyer gets his piano or organ free from intermediate charges; and Mr. Beatty's rare executive ability and capacity for organizing labor reduce the single profit—the manufacturer's—to the lowest figure.

Spontaneous Combustion of Bengal Lights.

The author shows that the spontaneous explosion of mixtures containing potassium chlorate along with sulphur is generally due to a trace of sulphuric acid present as impurity in the latter substance, and he agrees with M. Du Moncel in rejecting the theory which ascribes such accidents to electric action.—*J. Clouet, in Journal de Pharmacie.*

Plugging Diamond-Drilled Hole.

It is no easy matter to plug up a diamond-drill hole from which there is a strong flow of water, frequently under great pressure. When a hole is to be plugged there are forced into it small bags of beans and flaxseed. The plug—made of dry pine and from 10 to 15 feet in length—is driven in after these bags and forces them forward in the drill hole. Also, a hole is sometimes bored into the end of the plug, which hole is filled with flaxseed. The flaxseed and beans are caused to swell to such an extent by the hot water that the hole is as compactly filled as though closed with molten lead.—*Virginia Enterprise.*

A Curious Ceremony.

That enthusiastic student of Zunis life and religion, Mr. F. H. Cushing, of the Ethnological Bureau of the Smithsonian Institution, has brought to the East from New Mexico six chiefs of the Zunis tribe of Pueblo Indians, to enable them to perform at the sea-side an ancient ceremony which has been handed down in its minutest details from a period so remote that tradition is unable to say when it was last performed. The ceremony is proof that the ancestors of the Zunis once lived on the shore of an ocean, but what ocean and at what point are problems for science to work out.

Patent Cases in the Court of Claims.

The House Committee on Patents agreed, February 23, to report favorably Mr. Stephens' bill providing that the jurisdiction of the Court of Claims shall include all claims against the United States for the use of patented inventions employed in the public service. The need of this extension of the jurisdiction of the Court of Claims was discussed in these columns in the article on the "Relation of the Government to Patentees," in the issue of February 18.

M. CARPENTIER'S MELOGRAPH.

M. Carpentier describes, in *La Nature*, a small apparatus for reproducing music, which he devised and constructed some years ago, and which was made in the following manner: A small rectangular box was inclosed on all sides; in the interior there were thirty small harmonium reeds in juxtaposition, very delicate, taking up but little space, and fastened in the usual manner. These reeds were inserted in mortises in the sounding-board. At the bottom of each mortise there was a small orifice leading to the outside of the box. On one side of the box was a tube for supplying air from any suitable blower. By means of a crank and cylinder a large band of paper was drawn over the perforated face of the box in a direction perpendicular to the line of the orifices. The paper was pierced with long and short slots, and in its progression the band of paper carried these slots over the mouths of the various pipes, giving escape to the wind through the reeds, when the melophone would play automatically the piece thus inscribed.

After the invention of this apparatus M. Carpentier heard of a similar instrument in America. He now turned his attention to the construction of the perforated bands, which were similar to those used in the Jacquard looms. He combined with the melophonea melograph, intended to record stenographically the pieces played upon an instrument with keys, but employing the characters adapted to the melophone. The melophone was modified and arranged to operate on larger bands suitable to an organ or piano.

This apparatus was exhibited at the International Exposition of Electricity at Paris.

This new instrument is capable of repeating automatically any piece, and not only reproduces the manner of the player, but even any false notes which may be struck. By passing the band through a printing apparatus the piece, instead of being played, is written in ordinary characters. This musical press is not an experiment, but will prove to be of great practical value.

In describing the apparatus the harmonium should be considered as one part, and the melograph as another part. Fifty wires concealed beneath the floor put the two instruments in communication; they are about five meters distant from each other. Fifty of the keys of the harmonium are provided with such devices that their fall throws an electric current into the corresponding wires. These currents, which are controlled by the melograph, operate a series of perforators, which inscribe upon a band of paper the movements of the key which sends it. This band is carried along in the apparatus with a uniform movement. In a second unrolling of the band which has been rewound, fifty small brushes of silver wire placed in the instrument make contact through the holes with a metallic crosspiece, against which they press the paper. When one hole permits the brush to touch the crosspiece a current circulates in one wire of the line, and puts in operation the opening mechanism of the corresponding key, and determines the emission of sound, sustaining the sound as long as the crosspiece remains in contact with the bar.

This general explanation having established the relation which exists between the different parts of the apparatus, M. Carpentier describes separately the principal organs which are represented in Figs. 2 and 3. Above each key there is a spring, *a* (Fig. 2), which is capable of touching a band of silver, *b*, reaching the length of the crosspiece, *c*, which covers the posterior part of the keys. A guide, *d*, attached to the key and moving easily in a hole in the crosspiece, *c*, keeps the spring raised when the key is in a position of repose. When the key is depressed the guide is carried with it, and the spring, *a*, is released and makes contact with the strip, *b*. Two regulating screws allow variations of the current and the tension of the spring. The current sent by the key is directed over a line wire in passing by a commutator, *e*.

The currents transmitted by the harmonium and received in the melograph, produce the movement of the parts through the agency of electro-magnets, *a* (Fig. 3), of special form. The movement of the armature, *b*, is transmitted by the rod, *c*, to the angled levers, *d*. At the extremity of the horizontal arm of each lever is found an embossing point, which rests upon the paper and marks there the trace of the pressure which the musician exercises upon the keys of the harmonium. This point, in marking the paper, pushes it up into one of the mortises in the plate, *f*, under which the band circulates, and it approaches thus to a rotary cutter having two teeth and revolving rapidly. The part of the paper which is thus presented to the action of this tool will be instantly cut, and the markings converted into perforations.

In order to avoid the double danger of piercing the paper imperfectly or of causing the collision of the embossing point with the teeth of the cutter, two bands of paper are superposed; the first is completely cut away, and the cutter enters only into the surface of the second one.

In reading the bands the melograph transmits the currents and the harmonium receives them. The commutator, *e*, may be turned so as to cause the melophone to transmit or receive currents. For each key of the harmonium there is an electro-magnet, *f*, similar to those of the melograph. Below the keyboard there is suspended to each key by flexible bands a small wooden shoe. These shoes are received by grooves in the cylinder, *h*, which turns with a continuous and rapid motion. When the electro-magnets are traversed by a current the armature presses the shoe against the cylinder, *h*, and the friction of the shoe against the cylinder draws down the key and permits the note to sound.

M. Carpentier says that the melograph is constructed with great precision, and that the movement of the parts is regulated to the hundredth part of a millimeter.—*La Nature.*

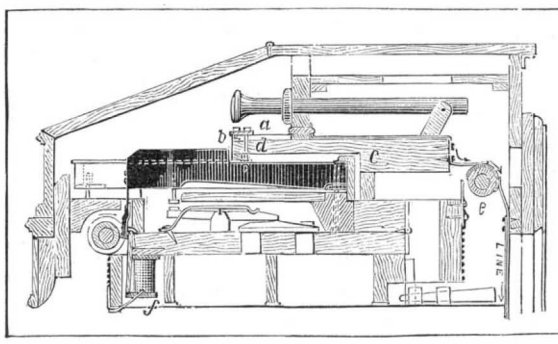


Fig. 2.—DIAGRAM OF HARMONIUM.

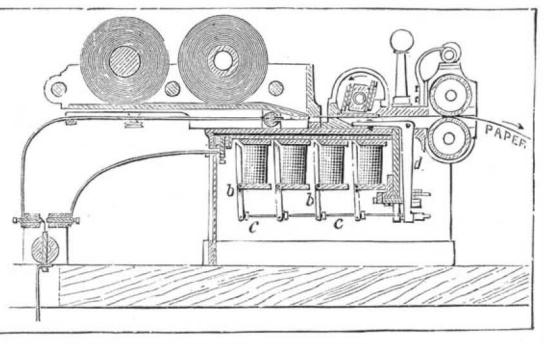


Fig. 3.—DIAGRAM OF THE MELOGRAPH.

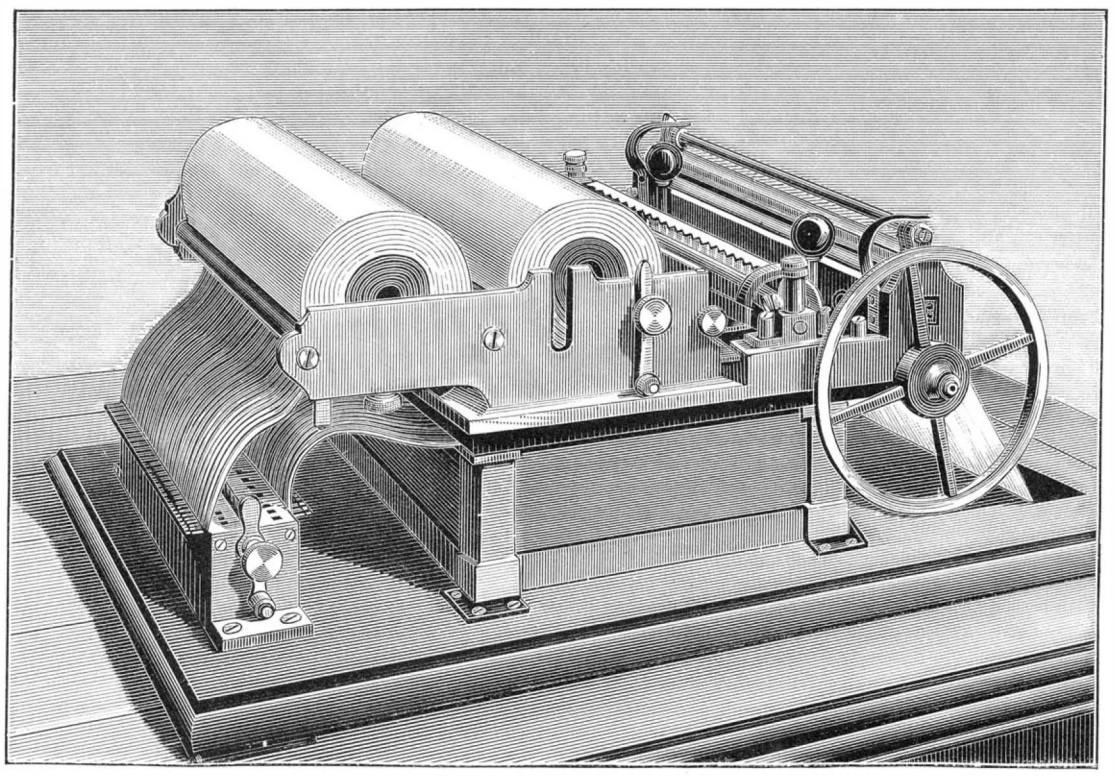


Fig. 1.—M. CARPENTIER'S MELOGRAPH FOR REGISTERING AND REPRODUCING MUSIC.

New Cattle Cars and Momentum Brakes.

A large number of cattle dealers, humanitarians, and railway officers were present, February 27, at a trial exhibition of the Tallman brake, attached to a train of new-style cattle cars. The cars are divided by flexible partitions into stalls, so arranged that the animals are kept apart and can be fed and watered on the road. The brake is so contrived that when the speed of the engine is slackened the drawheads are compressed by the momentum of the train, bringing certain friction pulleys together, causing the brake chain to be wound up and the brakes applied. The company owning these devices claim that by their system cattle can be brought from the West in less than half the time now required, and delivered in a condition for immediate killing, and with much less loss in weight than by the old and less humane method. During the trial trip, the train of ten cattle cars with two passenger coaches, running at a speed of thirty-five miles an hour, on a down grade of twenty-three feet to the mile, was stopped within 1,080 feet.

Proposed College of Electrical Science.

The President of the British Society of Telegraphic Engineers proposes the establishment of an institution for the instruction of electrical engineers.

The rapid advances in the application of electricity to the uses of daily life make, it is urged, a clear demand for a larger number of men skilled in the management of electricity than the existing schools can supply. This may be true in England, and to some degree in this country, though the subject is by no means neglected in our technical schools. At the Stevens Institute, in Hoboken, the course in practical electricity and electrical engineering is full and thorough.

Increasing Need of Brain-work in the Arts.

At a recent gathering of the spinners and weavers of a large Paisley firm, one of the proprietors gave his men an account of his recent visit to this country. Speaking of the race for industrial supremacy between the English speaking peoples of the Old and the New World, and the increasingly important part played by technical knowledge and inventive power in the great competition, he said:

"The time was when physical exertion alone could win the battle; but in these days of scientific research brain power is the element of success. A workman now requires to employ his head quite as much as his hands, and with every new invention physical labor will be lessened, but head labor will be increased. You cannot read too much, you cannot study too much, and you cannot tax your powers of thought too much. Specially would I say to young men: Never consider that your present machinery is perfect; look at it rather as crude compared to what it might be."

Some Electrical Properties of Indium.

The metal indium has always been a more attractive object for the physicist than for the metallurgist. If it were not for the two brilliant lines in its spectrum, blue and violet respectively, that helped Messrs. Reich and Richter to its discovery, some eighteen years ago, and which are still one of the favorite sights for the audience of a lecture on spectrum analysis, the general public might hardly know anything of its existence. *Engineering* says: It is so scarce, that even its prominent qualities could hardly secure it a future. The royal mines at Freiberg having come into possession of a somewhat larger quantity of indium than usual, they placed some at the disposal of Mr. Th. Erhard to enable him to make some experiments with a view of ascertaining the electric position of this metal, but great difficulty was caused by the metal being so very soft. To ascertain the conductive resistance in the wire drawn from it, Mr. Erhard rolled it up in a coil, but he found, however, after unrolling and remeasuring at the termination of his researches that the wire had extended its length by 5 mm. (one fifth of an inch), the original length being a little less than six feet. The formula quoted by Mr. Erhard—resistance equal to 0 08903 (1+0·004744 t.)—is based upon Dr. Werner Siemens' unit of resistance (the resistance of a prism of mercury of 1 m. in length, and 1 square mm. area, reduced to 0 deg. Cent.). It shows that indium offers a resistance about eleven times less than that of mercury, and increasing pretty regularly with a rise of temperature. The figures obtained from the observations at different temperatures and those derived from this formula agreed very well with one another. To find the thermo-electric force of indium, Mr. Erhard constructed batteries of pieces of indium on one side and iron, aluminum, tin, copper, gold, silver, and zinc on the other side, soldered together in the usual fashion. Pretty fair currents were obtained with iron and aluminum; with copper the electromotive force appeared to be weak, more so with gold and silver, and with zinc the currents were no longer measurable, though no doubt present. The temperatures applied by Mr. Erhard were 0°. Cent. on one side and 36°, 77°, and 98° Cent. on the other. From his results Mr. Erhard proposes to place indium between tin and zinc, the thermometric series being aluminum, tin, indium, zinc, silver, gold, copper, iron, etc. For small differences of temperature, however, the series undergoes some modification. Mr. Erhard's further experiments with regard to the action of indium when in connection with liquid conductors were not satisfactory.

New Hair Dye.

A one per cent solution of nitrate of silver gives to human hair a dull reddish brown, which is particularly unnatural and disagreeable in a strong light; but this defect, which is

visible in all cases in which nitrate of silver has been used, may be obviated by the addition of a certain amount of copper salt to the argentic solution.

Nitrate of silver, 30 grammes; sulphate of copper, 2·5 grammes. Dissolve the two salts in 250 cubic centimeters of water, and add sufficient ammonia to dissolve the precipitate formed, and make it up to one liter.

An instantaneous dye may be made by steeping the hair in a solution of pyrogallic acid in acetic acid, and then in the argenti-cupric solution dissolved above. The hair should be allowed to dry partially after the application of the pyrogallic solution. By varying the proportion of the pyrogallic acid from one gramme to fifty grammes per liter, any tint may be obtained from light brown to black.—*Moniteur Scientifique.*

To Cleanse a Soiled Chamois Leather.

Many workshops contain a dirty wash leather, which is thrown aside and wasted for the want of knowing how to clean it. Make a solution of weak soda and warm water, rub plenty of soft soap into the leather and allow it to remain in soak for two hours, then rub it well until it is quite clean. Afterward rinse it well in a weak solution composed of warm water, soda, and yellow soap. It must not be rinsed in water only, for then it would be so hard, when dry, as to be unfit for use. It is the small quantity of soap left in the leather that allows the finer particles of the leather to separate and become soft like silk. After rinsing, wring it well in a rough towel and dry quickly, then pull it about and brush it well, and it will become softer and better than most new leathers. In using a rough leather to touch up highly polished surfaces it is frequently observed to scratch the work; this is caused by particles of dust, and even hard rouge, that are left in the leather, and if removed by a clean rougy brush it will then give the brightest and best finish, which all good workmen like to see on their work.

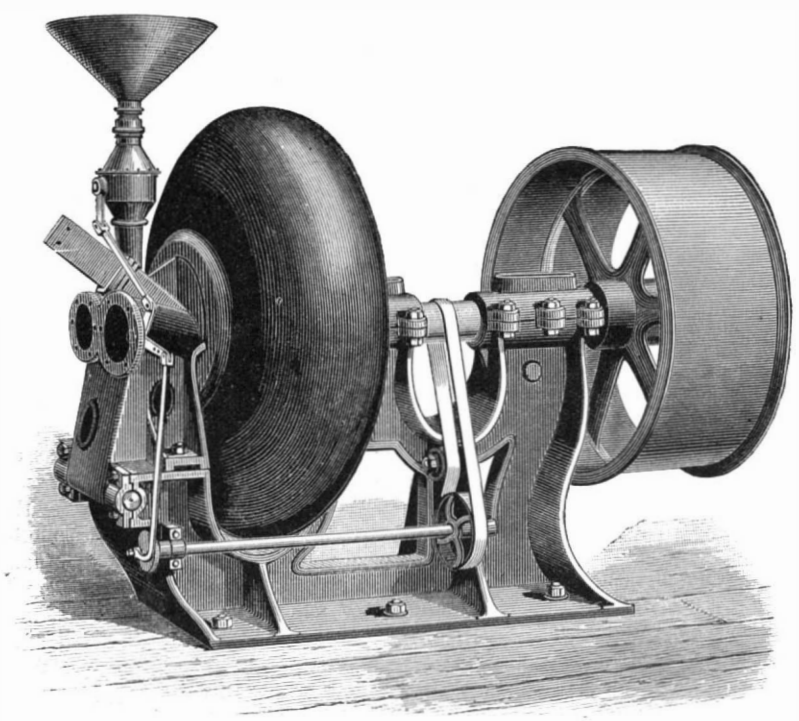
DUC'S PATENT MECHANICAL ATOMIZER.

[*Continued from first page.*]

contact with the revolving ring of rock. To compensate for the unavoidable abrasion, it can be inserted further in as may be found necessary, and in time, when worn out, may be replaced at very small cost, in two or three minutes' time. The broken material is fed into the shell, and falling in front of the plow bar is prevented by it from turning with the shell, and banks up in a pile, which is kept in a state of rest; meanwhile the ring or belt of rock before alluded to is passing under this pile, and the two surfaces are subjected to severe attrition, which reduces them to a powder in an exceedingly short space of time.

The dust produced by this wearing action of the particles of rock among themselves is removed from the mill by means of a vacuum induced by a small rotary exhauster, which sucks the air out of the shell of the mill, by which means the ground rock is floated out of the shell, and conducted by a pipe to a settling chamber underneath the floor. Here the velocity of the air current is so greatly reduced that the particles of dust are deposited, and by accumulating, gain weight enough to open the valve in the bottom of the chamber, and run out into a screw conveyor, or any proper receptacle.

Meanwhile the air, relieved of its load of ground material, although still holding in suspension a certain amount of the finest particles of dust, passes through the exhauster, and thence to a chamber consisting of a frame covered with coarse cloth, technically termed a "dust chamber." This portion of the apparatus may be located in any convenient place, and serves as a settling chamber for the finer particles of dust which were not deposited in the first chamber. To compensate for the air taken out of the shell, a pipe is connected from the dust chamber to the "return air port" of the mill, by means of which a "belt of air," so to speak, is formed, which is continually entering the mill, where it is laden with dust, and upon coming out, deposits it in the settling chambers, and again enters the mill on a similar errand. The amount of rock ground with the Duc atomizer in a given time, and by the application of a given power, is much greater than the output of burrstones or other devices used for that purpose, and the degree of fineness much more satisfactory; the ground material is quite uniform in grade, due to the fact that the exhauster maintains a constant amount of vacuum sufficient to draw from the mill only such particles of material as have attained the requisite degree of fineness.



DUC'S MECHANICAL ATOMIZER.

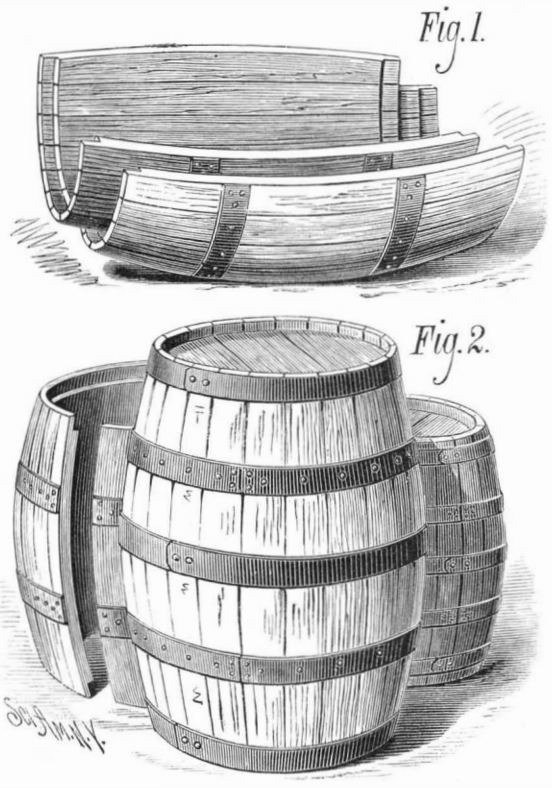
The usefulness of this machine is not limited in its adaptation to phosphate rock alone, but it has worked successfully on ores, quartz, marble, soapstone, etc., etc., and in fact may be employed for any refractory material which it is necessary to reduce to a powder.

This apparatus has been patented in the United States, Great Britain, and the Canadas, and is the property of the Continental Works, Brooklyn, N. Y., with the exception of the State of South Carolina, which latter territory belongs to the "Charleston Mechanical Atomizer Company," of Charleston, S C., and the said company reserves the right to sell all the machines which may be required in their territory, the Continental Works being the sole manufacturers.

Either party in interest will be pleased to furnish circulars giving detailed information, prices, etc., to parties making application personally or by mail, as above.

IMPROVED KNOCKDOWN BARREL.

It has been the custom of shippers of goods packed in barrels and casks to seldom, if ever, reship the package for use the second time, on account of the space occupied in car



ADAMS' KNOCKDOWN BARREL.

or wagon, it being too great to admit of transportation with any profit to the shipper; in fact, in many cases, it is less expense to buy the casks new than to pay freight on the old packages.

The engraving shows an improved separable barrel lately patented by Mr. Robert F. Adams, of Chariton, Iowa, which can be taken apart for shipment, so that the package will occupy no more space than the material from which the barrel is formed would occupy.

In carrying the invention into effect the inventor forms the cask in the old method, and the hoop or hoops on each end are attached to the cask by nails or otherwise, and may be divided into two or more arcs. The sections of the barrel thus fastened together may be put together to form a barrel by workmen, whether skilled or not, by driving the whole hoops, as in the old method of making barrels.

Eight or ten barrels made in this way can be knocked down and packed in the space required for a single complete barrel.

The advantage of this construction will be readily comprehended by makers and users of the ordinary barrel. A quantity of barrel sections is packed in a case for shipment, and the heads and hoops are placed on top.

The additional cost of this barrel over the ordinary barrel is insignificant compared with the immense saving in barrels that can be effected by this construction.

Further information in regard to this useful invention may be obtained by addressing the inventor as above.

RECENT INVENTIONS.

A novel mechanical musical instrument has been patented by Mr. Azro Fowler, of New York city. This invention relates to wind musical instruments that are operated manually by keys, or are played or controlled by means of one or more sheets or strips of paper or other suitable material perforated to represent the different notes or sounds it is desired to produce, and caused to automatically pass over air ducts, which, according as they are opened by the perforations in the paper, cause the reeds or other sounding devices to be played as desired; and the invention has special reference to the pneumatic action of the instrument.

In the manufacture of turpentine the crude article containing chips, bark, twigs, and other foreign substances is introduced directly into the still, and in the process of distillation the extractive coloring matter of these substances discolors the residual rosin, thereby depreciating its commercial value. Much time and labor are also spent in dipping or straining the chips, etc., from the liquid rosin, and the fire risks are greatly enhanced by the taking fire of the hot saturated chips as they are removed from the still, most of the conflagrations of turpentine stills originating from this cause. Mr. Allen Garner, of Americus, Miss., has patented an apparatus for the manufacture of turpentine and rosin which will avoid these difficulties, and will economize time and labor and lessen the costs and risks in distilling turpentine, and will produce a cleaner and more valuable rosin.

Mr. Anson J. Bacon, of Hallowell, Me., has patented an improved holdback, constructed so that the first resistance to the forward pressure of the vehicle will be elastic or yielding, so as to prevent any jar to the vehicle or horse.

An improved tire setter and cooler has been patented by Mr. William W. Whitmore, of Defiance, O. This invention relates to improvements in that class of tire setters and coolers in which a table carrying a wheel is raised and lowered in a tank containing water to cool and set the tire. In this device the center post ordinarily employed is dispensed with, and the operator is readily enabled by means of a lever to immerse the table and wheel in the water in the tank and hold it in any desired position.

Mr. Melville J. Fenwick, of Cottage Grove, Oreg., has patented an improved washing machine. The washing machine is provided with a rubbing cylinder attached to the lower ends of two connected rocking arms loosely mounted on a shaft of the machine, which arms also carry at their lower end an additional rubbing block, on which the clothes are held by a clamp bar provided with two arms fitting in sockets containing springs for pressing the clamping bar on the block.

Where Buttons Come From.

The button trade of New York is estimated at from eight to ten million dollars a year. Last year the importation of buttons exceeded three and a half million dollars, the aggregate for the four years just passed being but a little short of thirteen million dollars. At American rates of wages many of the imported buttons could not be put upon their cards for the price they sell for.

Glass buttons are made mostly in Bohemia, and children are largely employed at the work, which they do as quickly and as neatly as adults. The children get ten cents a day, men from forty to fifty cents, and women a little less. Pearl buttons are imported from Vienna, where they are almost exclusively manufactured; and the all-important shirt buttons are received mostly from Birmingham, England, where the majority of metal buttons are likewise procured. The most extensive of all the button manufacturing, however, is that of the Parisian and Berlin novelties. In one manufacturing village near Paris, where there are from 5,000 to 6,000 inhabitants, all the working people are engaged in making the agate button, which, even with thirty per cent duty added to the cost, sell, when imported into this country, at the extremely low figure of thirty-one cents per great gross. The material alone, it is reported, could not be procured here for double that amount.

While American manufacturers make no attempt, and probably have no desire, to compete with European producers employing hand processes, they excel in making bone, composition, brass, ivory, and gold buttons by machinery, and are able to export considerable quantities of these styles. In Providence, R. I., for example, sleeve buttons and jewelry buttons are largely manufactured expressly for exportation.

New Electrical Meter.

At a recent meeting of the London Physical Society, Mr. C. Vernon Boys read a paper "On a New Current Meter." The rate of a pendulum clock depends on gravity, and is proportional to the square root of the strength of gravity. That of a watch depends on the strength of the hair-spring, and is proportional to the square root of its strength. The force due to an electric current is proportional to the square of the current strength. Hence if part of an electric circuit is capable of vibrating under electro-magnetic force, the speed of vibration will be proportional simply to the current

strength, for the square of the speed measures the force, and the force is proportional to the square of the current. If, then, such a contrivance takes the place of the balance of a pendulum clock, the clock will measure electric currents instead of time. To keep the indications true the maintaining power must be so contrived that the amplitude does not vary much, or the parts must be so arranged that the force is directly proportional to the displacement. Mr. Boys showed several ways of producing a controlling power. The first was a combination of solenoids, one passing through the other, and in which the force was proportional to the displacement. Being without iron it applies to the case of alternating currents. In another a small armature is mounted on the balance staff, and around it are the two poles of an electro-magnet which forms part of the circuit. In a third form which is unaffected by residual magnetism, two crescent-shaped pieces of iron, forming the sides of the balance, pass through two fixed solenoids. In all these cases the direction of the current does not matter.

The maintaining power may be an ordinary escapement driven in the usual way. It may also be independent of clockwork, an impulse being given to the balance electrically at each swing. A meter of this kind was shown, in which the controlling power depends on iron crescents and solenoids, and in which a portion of the main current is shunted through secondary solenoids when the balance is in its natural position, at which time a variation in the currents in the controlling solenoids has no effect in disturbing the period of oscillation. Such a meter is regulated by an adjustable weight if it goes too fast or slow. Being independent of gravity it will work equally well anywhere.

MECHANICAL INVENTIONS.

Mr. Henry R. Dulany, of Alexandria, La., has patented a suction device for elevating sand, or for elevating sugar, mortar, or similar substances from large vats, holes, or tanks. The invention consists principally of a large inverted bucket provided with a piston head, the vessel being provided at the top with suitable air-valves, the piston rod passing through the center of the top of the vessel, and being provided with notches adapted to engage with a spring-actuated clutch for holding the piston head when forced up by the material to be raised.

Mr. Eugenio Beovide, of Mineral de Catorce, Mexico, has patented an improved machine for cleaning and separating the fibers of leaves. The object of this invention is to provide a machine for removing the epidermis and filling cellular tissue from the fibers of such leaves as those of the *Agave americana*, or aloe, *Heniquen zechuquitta marquisia*, or *Coprosma*, and other plants growing in Mexico, Central and South America, which fibers are then used in the industries in the same manner as hemp and jute fibers, etc. The invention consists of a frame in which two or more rollers provided with yielding, rasping, and scraping knives, and with yielding, feeding, and pressing blades guided by suitable guide rings on the frame, are journaled above each other, and are surrounded by suitable casings, into the upper one of which the leaves are fed from an inclined table by adjustable feed rollers, and are drawn downward through the several receptacles by adjustable feed rollers journaled between each pair of rasping rollers. The rasping rollers revolve very rapidly and scrape all cellular matter from the fibers, this waste being thrown out through openings in the casings, and the cleaned fibers passing out between two rollers below the lowest rasping roller.

An improved buggy top, which is of simple construction, light, durable, folded and raised conveniently, has been patented by Mr. James H. Howe, of Conneaut, Ohio. The buggy top is formed of a single bow, to which front and rear sliding arms are pivoted at the ends of the bow, which arms are braced by hinged or jointed braces pivoted to the bow and to the sliding side arms, the braces having a short rod pivoted to them at the joint for operating them.

An improvement in beam calipers, with devices for automatically registering or indicating variations in the size of work to which they are applied, so that small differences in size can be readily detected, has been patented by Mr. George B. Webb, of Thomaston, Conn. In filing, grinding, or turning, the amount removed and to be removed can be quickly and exactly shown by means of this tool. The invention consists in a slide and indicating lever combined with one moving jaw of the calipers.

An improvement in spinning machines has been patented by Mr. Philip Townson, of Thompsonville, Conn. The object of this invention is to automatically change the speed of spindles when the bobbins are about two-thirds filled, and also to facilitate the stopping of the spindles when the fliers have been stopped.

Mr. Abraham Van Trump, of West Elkton, Ohio, has patented an improved pump. This invention relates to a pump which is more particularly intended to be attached to a water tank or box mounted on wheels, so as to be carried from place to place to obtain its supply of water. The invention consists in a novel arrangement of the cylinder, piston, valves, a hose, and a double screen, for guarding against the entrance of foreign substances into the pump cylinder.

Mr. Herbert W. Reed, of Ware, Mass., has patented an improvement in the class of so-called "monkey wrenches" whose sliding jaw is combined with a rack-bar and pawl, and also an adjusting nut to adapt it for rapid and close adjustment to the work.

A novel device for converting motion has been patented by Mr. Frank Elbing, of Algersdorf, Bohemia, Austria. This invention is for converting reciprocating rectilinear to continuous rotary motion, and is designed to overcome the dead centers of the usual crank mechanism without loss of motion or power. The invention consists in a shifting crank pin guided to move in a path eccentric to the crank axis.

An improved tool for bending railroad rails, patented by Mr. Robert Fagan, of Hazleton, Pa., consists of a bar of iron of suitable size carrying a screw at one end, the bar being adapted to be yoked to the rail in such manner that the portion of the bar beyond the yoke will form the short arm of a lever, the end through which the screw passes being the long arm of the lever. The end of the screw, when the device is attached to the rail, rests upon the rail for operating the lever and bending the rail.

An improvement in swivel racks for looms has been patented by Mr. Buckley Weston, of Paterson, N. J. This invention consists in the combination, with the rack-bar, swivel-shuttle, and pick-bar, of pins hung on wires attached to the rack-bar and provided with lugs designed to drop in recesses near the extremities of the pick-bar, the pins being actuated by springs, so that they engage in holes formed in the shuttle.

A saw filer, which secures the accurate gauging of the depth of the saw teeth, the equal action of the file on the saw teeth throughout the whole length of the file, the automatic feeding of the file, and its adjustment for any desired angle or pitch of teeth, has been patented by Mr. William H. Shutte, of Emporia, Kan. The invention consists of a sliding carriage carrying a spring-and-pawl-actuated bent arm that serves as a gauge for the depth of the saw teeth, and at the same time to support the file frame; an adjustable clamp is secured on the bent arm for the direct support of the file frame, and so constructed that the direction of the frame and file can be changed vertically.

A useful improvement in wagon gearing, whereby the king-bolt passing through the head-block and the axle can be dispensed with, has been patented by Messrs. Zephirin Dulmaine and George H. Poole, of Laramie City, Wyoming Ter. The invention consists in a short pintle passing through the end of the reach and fastened at the ends to plates or clips of the axle and the head-block, the head-block and bolster being also pivoted to each other by a short king-bolt secured to clips on the head-block and the bolster in a like manner.

Solvent for Gallic Acid.

Mr. Frederick Long says, in the *British Medical Journal*, that he has accidentally discovered a method of dissolving gallic acid. Having a short time since a case of hæmaturia, the result of uric-acid gravel, he chanced to prescribe a mixture containing half a drachm of gallic acid and a drachm and a half of citrate of potassium, and to his surprise he found he had a perfectly clear liquid, the gallic acid being completely dissolved. He has since made further experiments, and he finds that, with care, twenty grains of citrate will dissolve as much as fifteen grains of gallic acid in an ounce of water, and remain quite clear for any length of time. To be able to give gallic acid in perfect solution is a great advantage, as absorption must take place more rapidly when the salt is in solution than when simply suspended in mucilage. The citrate, being a very simple salt, can do no harm in any cases in which gallic acid is required.

Etching Film for Tracing with a Needle.

Mr. H. Trueman Wood, the secretary of the Society of Arts, sends the following to the *Photographic News*:

There are many purposes in photography for which an opaque film capable of being etched with a sharp point might be useful. Such a film can be obtained by use of the following formula: Negative collodion, one-half ounce; ether, 6 drachms; alcohol, 6 drachms; shellac, 30 grains; aurine, 2 grains; Judson's mauve dye, 30 drops; water, 30 drops.

A collodion thus treated gives a film which is perfectly non-actinic, and which allows the finest tracery to be executed upon it without any tearing or chipping whatever. The film is the result of a good many experiments, and was devised by a friend of the writer for the purpose of reproducing tracings made by a geometric chuck in the lathe. As a general rule, these patterns, which form the delight of so many amateur turners, are either traced with a pencil suitably held, or by a glass pen charged with aniline ink, the latter being the more recent device which has superseded the old pencil. They are, of course, also cut upon wood or metal with suitable tools. By the use of a plate coated with a film of the above described mixture, a steel point can be used. The glass plate is properly held in the chuck, and a steel point, which may be fitted with a spring, so as to prevent undue pressure or risk of breakage, is placed in the position usually occupied by the pencil. The pattern is thus traced in perfectly clear glass, and from the negative—if the term may be used—thus produced, prints can be taken on ordinary albumenized paper. As the film itself transmits practically no actinic light, the printing can be carried to any extent, and a perfectly black print produced. The film may also be etched upon with an ordinary etching needle, or even with a common needle, and prints produced from the plate thus obtained.

Another use of the formula is for the preparation of lantern diagrams. Any diagram can be rapidly traced upon a coated plate, and the diagram can then be thrown on the screen in the ordinary manner, appearing, of course, in bright lines on a black ground. A diagram of this sort is quite as effective as, if not more effective than the ordinary black lines on an illuminated ground, as was shown by the very vivid way in which a negative diagram, recently employed by Mr. Bolas at one of his Cantor lectures, shone out upon the screen. It would, of course, be easily possible to obtain a printing block by any of the ordinary methods from a plate etched in this manner.

The mixture requires some little care in its preparation, and especially as regards the addition of water. It is better to add the water gradually, coating the plate occasionally after each addition of a few drops. The formula might doubtless be susceptible of considerable modification; but the one given above has been proved to give the best results of any which have yet been tried.

The Petroleum Outlook.

The outlook given in our last two preceding reports, indicating that the highest production has probably been reached, receives confirmation from the data which we present our readers in the present number.

The Bradford and the Richburg fields are now defined, beyond any reasonable doubt, by a cordon of "dry holes." All the present drilling in outlying localities, notwithstanding it has been very extensive, has entirely failed to indicate any new field in the producing horizon within the line of the known fields. Operations continue to be active, but with all the activity in drilling, and with all the appliances of pumping and torpedoing, the figures for the month of January, compared with those of December, show the significant decline in the daily production of 4,079 barrels.

The Richburg field exhibits all those characteristics of impoverishment of rock and uncertainty of yield which we attributed to it several months ago, and on this account its decline may be expected to be much more rapid than is that of the Bradford field.

From all this condition which at present exists in the region we are of the opinion that the long expected decline has at last set in, and (always, of course, unless a new field is discovered) the production must from this time continue to decline, in spite of the unrestricted energy of the restless producers to enlarge it.

As to the effect of all this upon prices in the immediate future we are not so confident. There are some causes which seem to indicate stagnation for some time at least. Europe having taken advantage of the exceedingly low prices which prevailed last year on account of the excessive competition, has become pretty well stocked with the refined oil. In our own country this is also the case, but probably to a less extent. The busy season of the year has been closed, and we may reasonably look for diminished foreign demand for some months to come. The export of last year has been so far in excess of its predecessors that we can hardly look for an increased demand for the present year. Then, too, our stock of crude oil has grown so large as at times to be rather burdensome. It will, therefore, be seen that there is considerable margin for a decline in the production, without materially affecting the prices.

On the whole, however, we are inclined to the opinion that the continued persistent decline in crude for several months will have the effect of inspiring holders with great confidence for the future, and in the event of a continued ease in the money market we may look for a much better average of prices for this year than prevailed last year.

Daily average production of the Bradford field, 56,000 barrels; decrease in January, 5,000 barrels. Daily average production of the Allegheny field, 12,039 barrels; increase in January, 1,300 barrels. Decrease average daily production in the northern field, 3,700 barrels; decrease average daily production in the southern field, 379 barrels; total decrease average daily production (whole field), 4,079 barrels. —*Stowell's Petroleum Reporter.*

THE skins of certain sharks are used in jewelry for sleeve buttons and the like, and when dried and cured take a polish almost equal to that of stone, and greatly resemble the fossil coral *porites*. The vertebræ of the shark are always in demand for canes. The opening filled with marrow during life is now fitted with a steel or iron rod. The side openings are filled with mother-of-pearl, and when polished the cane is decidedly ornamental. In India, in 1880, $300,000 worth of shark fins were shipped to China for food. In the islands of the Pacific the fish is in great demand for its teeth, which are manufactured into weapons of various kinds, ranging from spears to swords and daggers. The teeth are all serrated or saw-edged, and make terrible wounds. The base of the tooth is bored with some small instrument, and forty to fifty of them are tied or lashed to a hardwood sword, forming the edge. The hilt is alo protected by crosspieces armed in the same way. So effective are these weapons that the natives of these islands wear an armor made of rope especially to protect themselves from the shark's teeth.—*Sea World.*

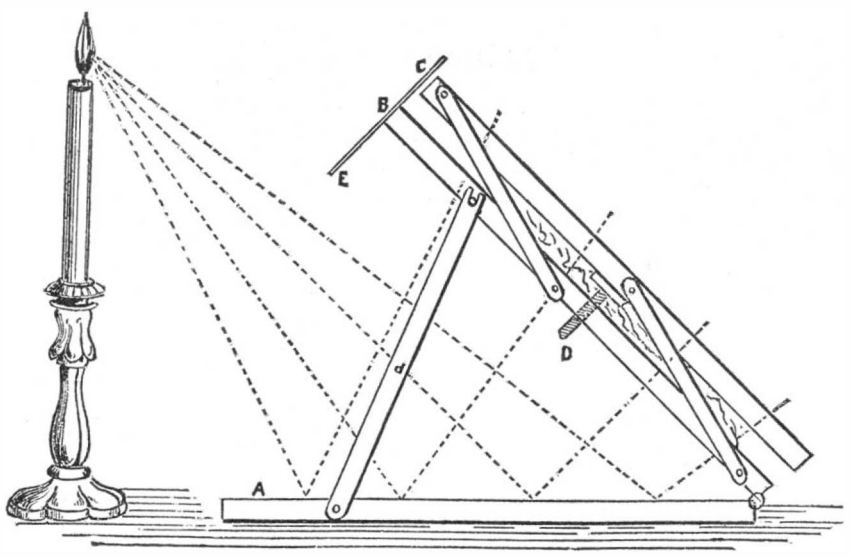
AN amateur was chaffering about the price of a table service in Dresden china. "But it is much too dear! There is not a single piece in it which has not been mended." The dealer has his answer pat. "My dear sir," he says, "why, that is the very thing that makes the set valuable. This is the table service that Bonaparte broke when he kicked over the preliminaries at Leoben!" The amateur, a little taken aback by this thrust, says: "Are you perfectly sure of that?" "Certainly I am. Would you like the same service without its being mended? I have that also."

Convention of Mining Engineers.

The annual meeting of the American Institute of Mining Engineers began in Washington, Feb. 21, Mr. William Metcalf, of Pittsburg, in the chair. The opening address was delivered by Gen. Sherman, and the address of welcome by Major J. W. Powell, chairman of the local committee of arrangements. At the second morning session, papers were read by E. F. Loiseau, of Philadelphia, upon the "Process for Making Artificial Fuel from Anthracite and Bituminous Coal Dust, and the Applicability of the Process to the Utilization and Solidification of the Slacking Lignites of the West; " by W. H. Adams, upon "Coal in Northern Mexico;" by J. C. F. Randolph, of New York, upon the "New Mill for the Batopilas Mining Company;" by Henry M. Hour, upon "Comparative Efficiency of Fans and Positive Blowers," and by C. Henry Roney, of Philadelphia, upon a new ore pulverizer. In the evening, papers were read and addresses made by Gen. Meigs, Capt. Lyle, of the Springfield Arsenal, Charles MacDonald, and others on the subject of organizing systematic tests of iron and steel, the speakers generally favoring the appointment of a commission by Congress to take charge of and continue experiments with the metal-testing machine at Watertown Arsenal. During the next day's session papers were read by Prof. H. S. Monroe, of New York, upon "First Aid to the Injured;" by N. S. Keith, of New York city, upon "Electrical Apparatus and the Processes of the Mining and Metallurgical Engineer;" by Prof. Silliman, of New Haven, upon "Some Newly Discovered Mineral Regions of Southern New Mexico," and by George W. Maynard, of New York, upon "Late Developments in the Siemens Direct Process."

THE SKIAGRAPH.

A is a looking-glass laid flat upon the table; B and C are wooden frames, each holding a square of plain glass. The flower to be drawn is laid between the glasses, which can be kept at any distance apart by means of the parallel links on each side, and the screws at D. A piece of paper is laid upon the upper glass, and, by the light of a candle reflected from the mirror, the shadow of the flower is projected through the paper, and its outline can be easily traced. The paper can then be removed, and the shading and coloring copied from the object, which is held in the same position between the glasses. A skillful draughtsman may despise such aid, but it has been found useful for drawings aiming rather at correctness of shape and size than at artistic effect. The shadows will, of course, be very slightly larger than the object. The machine might also be useful to designers of Christmas cards, or floral patterns of any kind. It can easily be made with a common looking-glass and two picture frames, and a few pieces of brass wire. A cardboard screen should be placed at E to prevent the light from falling directly upon either side of the paper. Everything must have a Greek name nowadays, so we call it the skiagraph. —*Knowledge.*



THE SKIAGRAPH.

Cutaneous Eruptions Caused by the Use of Certain Medicines.

Anspitz, in his valuable "System der Hautkrankheiten," gives the following list of eruptions liable to follow the use of certain remedies. It will be a useful table for reference:

Quinine.—(*a*) Scarlatinous erythema, (*b*) morbillous papular erythema, (*c*) hæmorrhagia and purpura, (*d*) wheals, œdema, pruritus.

Cinchona, Belladonna, Strychnine, and Stramonium.—Manifestations like papulæ sudorales.

Digitalis.—Erythema after a few days' use.

Aconite.—Vesicular exanthema.

Santonine.—Vesicles, wheals.

Rhus Venenata and Toxicodendron.—Vesicular eruption.

Opium and Morphine.—Erythema, papular eruption, with much desquamation and pruritus.

Pilocarpin (?).—Augmentation of the perspiration.

Phosphorus.—Purpura.

Phosphoric Acid.—Bullous eruption.

Mercury (internally).—Erythema, eczema.

Arsenic.—Erythema and papules, eczema.

Carbolic Acid.—Erythema, vesicles, or wheals.

Salicylic Acid.—Purpura, vesicles with laryngeal catarrh, wheals.

Chloral Hydrate.—Erythema (well colored), pruritus, desquamation, purpura and petechiæ, eczema with crust and scab.

Balsam Copaiba, Cubebs, Turpentine.—Vesicles, erythema, eczema.

Cod Liver Oil.—Acne.

Iodide of Potash.—Papules, vesicles and bullæ, pustules and ecthyma, eczema, ecchymoses, and purpura.

Bromide of Potassium.—Papules and pustules, deep tubercles and ecchymoses, vesicles, ulcers.—*Virginia Medical Monthly.*

Mr. Lawson's Boiler Experiments.

In June last Mr. D. T. Lawson succeeded in exploding a steam boiler of practical dimensions and containing a working amount of water by steam pressure. The experiment was described and illustrated in the SCIENTIFIC AMERICAN issues of July 9 and December 24, 1881. He has now constructed two boilers of the same type and dimensions, one of them containing his patent device for the prevention of explosions, and the other an exact duplicate of the one he exploded last summer. The one containing the patent device has been erected at Munhall's Farm, near Pittsburg, Pa., on the site of the former experiment, and on the 17th of February a new series of experiments was commenced; but on account of the imperfection of some of the attachments they have been interrupted for a few days to perfect the arrangements and also to procure steam gauges of standard accuracy. A commission has been appointed by the Secretary of the Treasury, consisting of United States boiler inspectors, who will be present to report the results to their chief.

Duration of Wire-Cable Bridges in France.

Engineer Bernadeau has recently published an interesting note on the preservation and duration of wire bridges in France, from which the Hanover *Wochenblatt* culls the following points of interest:

From 1870 to 1879 M. Bernadeau had oversight of six suspension bridges in the Department of Lot-et-Garonne, in France. These bridges were built in 1833 to 1845. He was required to undertake a careful examination of each bridge every year. His experience gained in this manner showed that in every form of construction there are always some points which cannot be accurately tested, and hence a possible accident could with difficulty be foreseen. There were, however, some signs or indications which pointed to imperfections. For example, if reddish spots appear on the surface of the cable in places that may become wet, one may be certain that the core or heart of the cable is rusted. These reliable observations were made on three bridges, and the cables had to be renewed in consequence. The rust had attacked nearly the whole cable, and the single wires had become so friable that it excited surprise that these bridges held together at all. At one bridge in Couthures, only 15 out of the 180 wires forming each cable were in good condition; all the rest broke like glass. These bridges had been built 32, 34, and 39 years respectively. Two bridges at Castelmoron and Caimont fell under the trial load because of the cable breaking in moist places which could not be examined. They had lasted for 25 and 28 years. The bridges at Maurin and Rayne fell during May and June, 1881, under the usual test load, after being in use 30 years. The cables of the Marmande bridge had to be renewed after 30 years' service.

From the foregoing we may conclude that the iron wire cables of suspension bridges become rusted in 30 years, so that they no longer offer sufficient security and must be replaced by others. The renewal of cables of three bridges, those of Couthures, Raissannes, and Tonneins, was accomplished in the following manner: Each of these bridges had four or five wire cables on each side, to which the suspension rods of the roadway are fastened. First, one of the cables was loosened and the strands separated, all the rusted wires cut away and taken out of the cable. The other wires were lengthened by drawing and beating with wooden hammers to remove adhering particles, then wound on spools. Strands were next formed from a definite number of wires and dipped in boiling linseed oil. The cable is made in the usual manner from strands prepared in this manner. Whatever wires are lacking are supplied by new ones, and the reconstructed cables put up again. In this way the cables can be renewed without interruption of the street traffic, only no heavy loads can be allowed to cross, nor two teams at one time. Each bridge was tested, after being renewed, by loading it for twenty-four hours with a load of 200 kilos per square meter (40 pounds per square foot) of the road-bed.

SOUNDING-BOARD TRANSMITTER.—If a sound is produced at a certain distance from the sounding-board (*? table d'harmonie*) of a piano, it is known that this board, as well as the strings which are in unison with the sound produced, or with one of its harmonics, enter into vibration. The author finds, on applying a microphone to such a board, that the sound transmitted in a circuit containing a telephone is considerably strengthened without any alteration either in its distinctness or in its quality, and upon this principle he has constructed a very sensitive transmitter.—*M. Bourbouze.*

The Cricket's Chirp and the Temperature.

The rate of the cricket's chirp varies with the temperature, becoming faster as the latter rises. Recently a writer in the Salem (Mass.) *Gazette* gave the following rule for estimating the temperature of the air by the number of chirps made by crickets per minute: "Take seventy-two as the number of strokes per minute at 60° temperature, and for every four strokes more add 1°; for every four strokes less deduct the same." In a letter to the *Popular Science Monthly*, Margarette W. Brook gives an account of observations she made with a view to testing this rule on twelve evenings, from September 30 to October 17. Her column of temperatures, as computed by the rate of vibration, shows a close agreement with that of temperatures recorded by the thermometer.—*Nature*

Boracic Acid as an Antiseptic in Skin Affections.

Dr. George Thin, of London, emphasizes strongly the advantage of using some preparation of boracic acid to overcome the offensive odor of the feet, and gives instances in which this treatment has been thoroughly successful. In some cases he recommends the wearing of stockings and cork soles saturated with the acid. In others he prescribes an ointment, or rather a kind of glycerine cream, made as follows: A solution of boric acid is incorporated with a fatty basis of white wax and almond oil, which produce a soft, homogeneous mixture, free from the irritating crystalline plates of the crystal that are apt to separate from vaseline. He finds that this is also a very useful remedial agent for inflamed feet, as after long walking tours, and in such eczemas as are produced by the irritation of dyed underclothing.

Health of Workmen in Chrome Works.

The manager of the single establishment in Russia for the manufacture of chrome reports a curious disease among his men. He says:

"The workmen suffer from the action upon the nose of the dust of bichromate of potash, and the disease manifests itself thus:

"A little hole is formed on the partition of the nose (dividing the two nostrils), and increases gradually until the partition entirely disappears, with the exception of the lower part of it, so that to a superficial observer there is nothing the matter with the nose except perhaps a little outward depression. It must be remarked that as soon as the partition is gone the process seems to stop there, and neither the lungs, air tubes, nor throat is in the least affected. Its influence is very different with different individuals. Some workmen after having been employed for ten years at the works remain unaffected, while with others the hole in the nose begins to be formed after one month's work. A general inspection of all the men at the works not long ago proved that more than fifty per cent of them had diseased noses. When the disease sets in first, the man feels tickling in the nose; a week or so after it bleeds, and in a few days more there is no uncomfortable feeling of any sort, and thus the hole is formed almost without any pain."

There are, it is said, six works of the kind in the world—three in Glasgow, Scotland, one in Russia, one in Austria, and one in this country. It would be interesting to know whether the same trouble has ever been noticed outside of Russia.

The Colorado Desert.

Mr. Joseph F. James, who spent some four weeks in traveling over the Colorado Desert, in California, gives rather an unpromising account of it in an article communicated by him to the *Popular Science Monthly.*

The desert occupies almost the whole of the large county of San Diego. It is some 150 miles long and 50 miles wide, and the Southern Pacific Railroad runs through its center. At about sixty miles from Los Angeles the railroad encounters a very heavy grade, 100 to 110 feet to the mile, and it continues for twenty-two miles. At the summit, known as San Gorgonio Pass, begins the descent into the desert, and every mile brings you to a more desolate country. At Whitewater Station, twenty miles from the summit, the desert begins in earnest. First a few flowers enliven the scene. Large *Œnotheræ*, three or four inches in diameter, grow on small stalks five or six inches in height. Large plants of *Abronia maritima*, with clusters of brilliant purple flowers, spread over the ground. A little *Gilia* (*G. lemmoni*), with white corolla and yellow center, adds its beauty to the scene; and the only shrub, *Larrea mexicana*, or "creosote plant," with yellow flowers and sticky leaves and branches, reminds you of the forests you have left behind.

During the seven miles to the next station, Seven Palms, the vegetation gradually thins out. Progressing beyond this the flowers disappear, and the *Cacti* predominate; and further on these are replaced by the stunted "grease wood." Finally, even the latter vanishes, and when Dos Palmas is reached we come to a country where there is absolutely nothing in the shape of vegetation. Every one knows how a well-kept field looks when it has been plowed and harrowed and cultivated until not a stick nor stone nor weed shows itself above ground. In order to form a picture of this part of the Colorado Desert, imagine a field such as this extending for miles and miles, level as a floor, with no signs of life visible, and no indications of man's presence save the rail-

road track and the telegraph poles. Imagine the ground covered with an incrustation of alkali, which, when stepped on, breaks and lets one sink ankle-deep into soil as soft and fine as powder. Picture a gale of wind blowing over the waste, the air filled with fine particles of sand, the sun obscured, and no objects visible one hundred feet away, and you will have formed a faint idea of the worst aspect of the desert. It is hard to imagine anything so fearful as the reality; and, unless one can see the ground, and feel the sand, and experience a heat of 120° in the sun, we can have only a poor conception of the desert.

IMPROVED VELOCIPEDE.

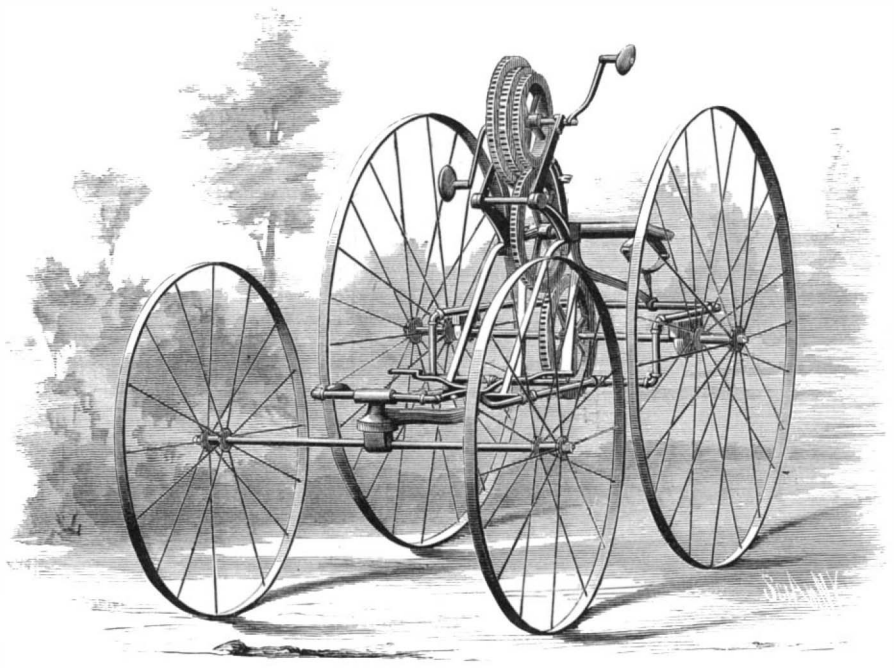
We give an engraving of a novel velocipede lately patented by Mr. A. C. Johnson, of Martin, O., which is propelled entirely by the hands and guided by the feet. The rear axle is fixed in the hubs of the rear wheels, and turns in roller bearings on the frame. The driving mechanism consists of a train of three spur wheels, one being fixed to the middle of the rear axle, another turning in bearings on a triangular frame supported by the main frame of the vehicle, the third and uppermost wheel in the series being mounted on a shaft having at opposite ends hand cranks for driving. The bearings of this shaft are in a movable frame, pivoted on arms projecting from the top of the triangular frame. This arrangement is to admit of bringing one or another of three driving wheels on the upper or driving shaft into gear with the intermediate wheel to secure the advantage of more or less leverage over the resistance to be overcome.

The forward end of the frame of the velocipede rests upon a fifth wheel on the front axle, and the latter is connected by levers with a steering foot lever conveniently near the rider's seat. This seat is mounted on springs attached to the rear of the main frame.

All of the parts of this machine are made very light and graceful, yet strong enough to endure every-day use.

The use of four wheels gives a wide base, and the forward or leading wheels run in the regular wheel tracks of a road, giving, in this respect, a great advantage over the three-wheeled velocipede. There is also considerable advantage in running the machine by hand instead of foot, especially if the upper portion of the body of the rider needs development by exercise.

This velocipede is light running, easily propelled, and is not expensive in its construction.



JOHNSON'S IMPROVED VELOCIPEDE.

IMPROVED BAND SAWING MACHINE.

The band-sawing machine shown in the annexed engraving is designed principally for cross-cutting logs into measured lengths for heading, shingles, fuel, staves, and for the various other purposes for which timber in this form is used, and by changing the carriage it may readily be converted into a saw for making lumber.

This machine is the invention of Mr. Lewis F. Kettler, of New Bremen, O., who has lately secured a patent for it.

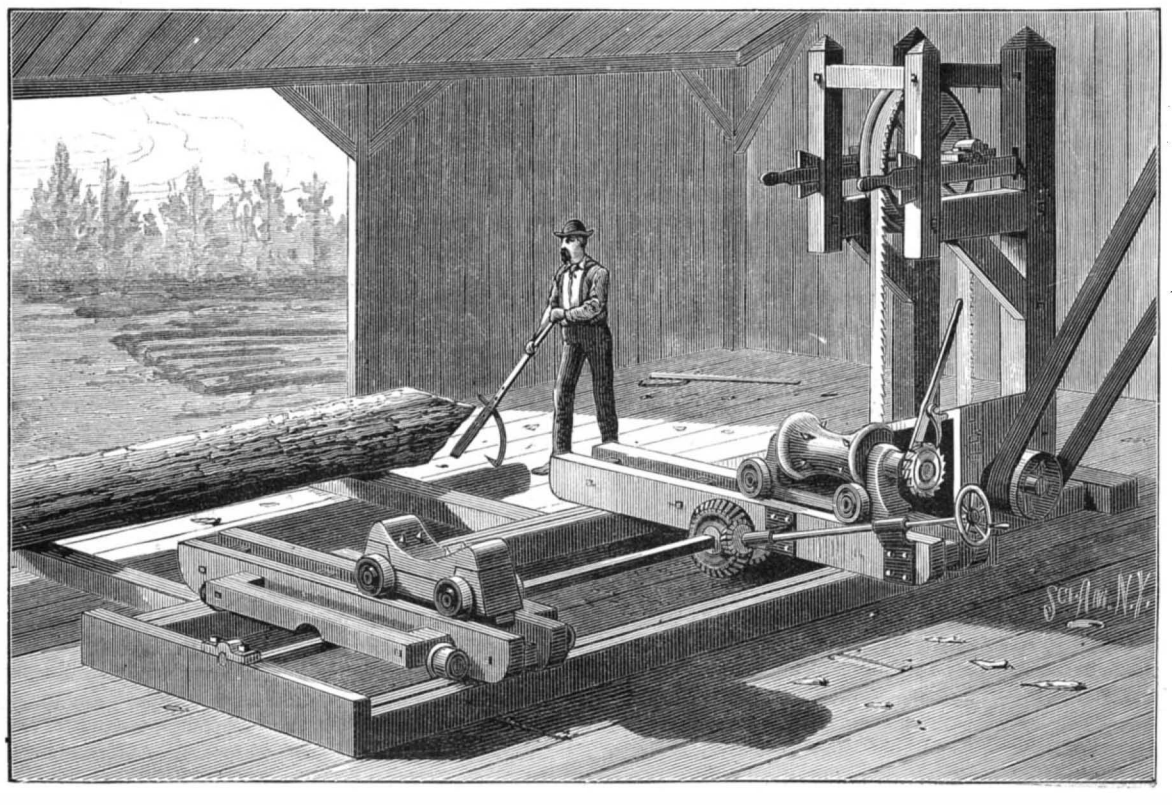
The base of the machine, which rests upon the ground or any suitable foundation, consists of two timbers connected by crosspieces and supporting the framework which contains the upper wheel of the saw, the lower wheel being carried by a shaft journaled in boxes on the base timbers. These two wheels are covered with rubber on their peripheries, and the journals of the upper one are supported by levers, adjustable up or down by wedges entering the mortises above and below the levers.

The head block near the saw is provided with a toothed roller for moving the log forward preparatory to making a new cut, and this head block is movable only across the bed frame of the machine. The tail block is mounted on two sets of rollers and is capable of being moved either lengthwise or crosswise of the bed frame.

A square shaft running the entire length of the bed frame carries two pinions which engage racks on the head and tail blocks. The pinion carrying the rack on the tail block is movable along the shaft, but cannot turn upon it. The shaft is rotated by means of bevel gearing at the side of the head block, a crank wheel being secured to the outer end of an inclined shaft for the purpose of operating the gearing.

Power is applied to the pulley on the shaft of the lower band-saw wheel. The log is moved forward by means of the lever and pawl mechanism connected with the toothed roller, and the log is carried against the cutting edge of the saw by turning the crank wheel on the inclined shaft. It will be noticed that with this arrangement both ends of the log are moved at once.

This saw, while being very simple in its construction, is adjustable in all essential parts, is easily managed, and does it with the application of a minimum of power.



KETTLER'S BAND-SAWING MACHINE.

Education in Iceland.

The correspondent of a Swiss journal thus writes as to this subject: "One would certainly have no trouble in finding among the corps of teachers some men of great merit, even erudite, whose obscure and modest science is devoted to study and to the good of their country, without care for renown or the reward of this world. I once asked a young Icelander, Who undertook the instruction of children who, from the distance of their dwellings or the poverty of their parents, could not attend school? 'At the age of seven years,' he replied, 'all our children know how to read, write, and cipher; among the poorest fishermen of the coast there is not one who has not received what may be called a good primary education. Our mothers are our teachers, the *boer* (Iceland house) our schoolroom. The nearest pastor has an oversight of the progress of the children, and that one who does not furnish the proof of a sufficient education would not be admitted to confirmation. An Icelandic mother would not survive the chagrin of seeing her children refused by the pastor, and not a single example is known of it.' Ask the first child you meet who it was that taught him or her the history and geography of his country, the name of the birds and flowers, and the invariable reply will be, *Modremin*, my mother. Touching in its simplicity and grandeur, and revealing truly the character of this sympathetic people! At twenty-five the young man is profoundly religious, chaste, gentle, and honest as on the day when at his mother's knee he was spelling out his first lesson. Can one be astonished after this that in Iceland there are neither soldiers nor cannon; that the art of robbing one's neighbor of his purse or his land is unknown; that one sees there no police nor prison; and that for centuries one has lost the memory of every kind of crime?"

NEW INVENTIONS.

Mr. Louis Wolf, of San Antonio, Texas, has patented an improved device for pressing and drying garments, which consists in a combination, with a hollow form of the shape of the garment to be dried and pressed, of hollow half-forms, and means for adjusting the half-forms on the form and heating them.

A novel folding seat for counters, patented by Mr. James A. Reeder, of Corinth, Miss., has an arm pivoted to the bottom of an upright, and supported by the ends of one or two downwardly-inclined guide-bars The upper end of the arm carries a seat, and, when not in use, the seat is raised up against the upright and under the counter by a counter-weight.

An improved open link has been patented by Mr. Solomon Shetter, of New Cumberland, W. Va. The link is formed of two parts, which are oppositely bent to form hooks, which are diagonally flattened or faced to fit upon each other. The straight end of one part is flattened at right angles to the plane of the hook, and this flattened portion is perforated and pivoted on the end of the other part.

Mr. Asa G. Golding, of New York city, has patented an improved butter-dish, made with an interior plate-supporting flange, by which the plate will be supported out of contact with the bottom of the dish, and in a cap ring, by which the edge of the plate will be covered and concealed.

A novel corner piece for wagon bodies has been patented by Mr. Richard B. Perkins, of Hornellsville, N. Y. The object of this invention is to provide means whereby the boards of wagon or carriage bodies and wagon seats, and other similar boxes, may be securely joined at the ends to form square or rounded corners without dovetailing and without the use of nails, screws, or similar fastenings, and in such manner that the corners will be shielded and protected from every direction, the rounded corners being rounded both upon the inside and outside of the box, or only upon the outside, as desired.

Mr. Edwin M. Fitzgerald, of New York city, has patented an advertising apparatus combining a clockwork, a series of rollers carrying an endless band, and a spring-driven chain of gear wheels, the band being moved automatically through fixed distances at regular intervals.

A combined child's chair, seesaw, wagon, and swing, has been patented by Mr. Thomas C. Keeler, of Mount Holly, N. J. This invention consists of a high or table chair for children, constructed so that it may be readily converted into a seesaw, wagon, or swing.

Mr. John C. Klett, of New York city, has lately patented an improved folding invalid chair. This chair is convenient for use in sick rooms, and it can be folded into small compass for transportation or for storage.

A case for clocks which is unaffected by heat, and which is practically dust-proof, has been patented by Mr. John G. Raine, of Grand Island, Neb. This clock case is intended particularly for clocks used on locomotives and in similar places.

Mr. David Thompson, of Leeds, County of York, Eng., has patented an improved kiln for bending, burning, staining, and annealing glass, burning art-tiles and pottery, and for other similar purposes. The object of the invention is to improve the use and application of gas and air so as to produce a uniform, safe, and certain result with less labor, time, cost, and liability to damage, and without the employment of additional or mechanical force or pressure to either the gas or the air.

An improvement in gas cooking stoves and ranges has been patented by Mr. William W. Goodwin, of Philadelphia, Pa. The object of this improvement is to perfect gas cooking stoves so that they will utilize the heat to the greatest possible extent, thereby economizing in the use of gas fuel. This stove is so designed as to give the greatest facility and convenience for cooking operations.

An improvement in hollow table ware, patented by Mr. Henry Korf, Jr., of Cincinnati, O., consists in a peculiar manner of cushioning the bottom or the feet or legs of ice pitchers, butter dishes,

tea and coffee pots, and similar articles, to prevent scratching of the table, tray, stand, or other things upon which they may be placed.

An improvement in grain-meters has been patented by Mr. Alexander Kaiser, of Munich, Bavaria, Germany. The object of this invention is to provide an improved apparatus for weighing and measuring cereals or other granulated or pulverized substances.

An attachment for ladders, patented by Messrs. Joseph D. Norton and Leonard M. Norton, of Loudville, Mass., consists in a central arm clamped on to the upper rounds to act as a pivot to permit the bottom of the ladder to stand square upon the ground when the ladder is placed against any oblique or irregular object, like the limb or crotch of a tree

IMPROVED BELT STRETCHER.

The engraving shows an improved belt stretcher recently patented by Mr. P. H. Kum, of Dixon, Ill. It consists of two clamps capable of grasping the belt tightly, and provided on opposite ends with pulleys, around which ropes pass, one rope being upon each edge of the belt. The ends of the ropes are attached to a windlass located between the clamps and operated by levers at opposite ends of the windlass, or by a lever and pawl acting on a ratchet wheel in the center of the windlass.

The clamps are made with a wedge-shaped serrated piece that clamps the belt in a wedge-sbaped mortise, an increase in strain on the belt increasing the pressure of the clamp.

A Boss Miner.

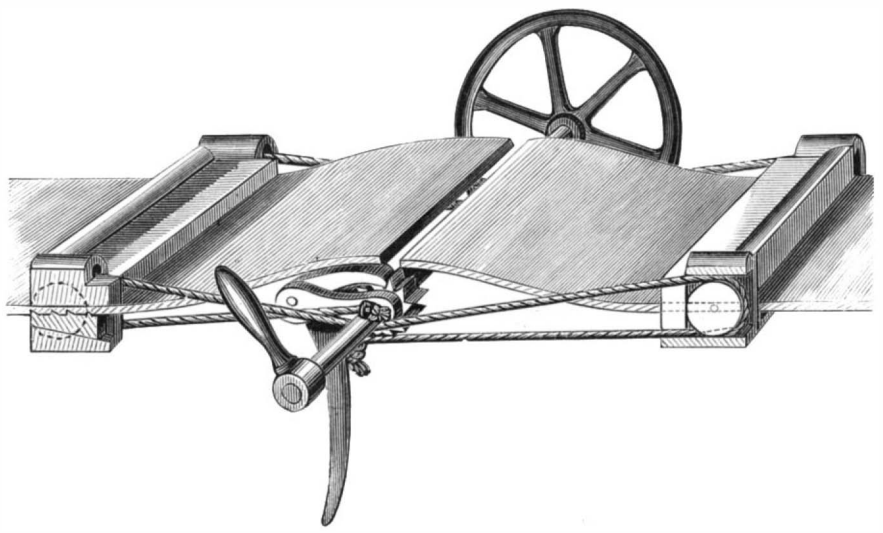
A fire broke out in a shaft of a deep coal mine at Canton, Ill., and the miners made a wild rush for the elevator, crowding the cage and fighting for places. Five trips of the cage would carry them all up, but it looked as though the flames would quickly close the exit, and in the fright and confusion all struggled to be first. Tom Lukey, the cool and muscular boss of the gang, drove them all aside, and then called out the names of as many as could be hoisted out at once. In making the selections he chose those who had large dependent families. When the cage came down he filled it with those who had fewer relatives, and next time with husbands who had no children. It was not until the fourth lift that unmarried men were given a chance. The fifth carried some almost worthless bummers and Lukey himself, with the fire scorching their clothes. When praised for his act he carelessly replied: "Oh, that wasn't anything. If I hadn't got those fellows out of the way I would have been burned up, don't you see."

Canadian Industries.

A marked improvement in the industrial condition of our northern neighbor has taken place during the past year or two. The Minister of Finance, Sir S. L. Tilley, in presenting his annual budget the other day, said that at no period in the history of the country had government met parliament with the finances in as good a position, credit so high, and the people more prosperous, and he claimed that this state of affairs was greatly dependent on the protective policy of the government. The revenue year by year had been increasing until, from having a deficiency of $200,000 in 1879, the treasury had a surplus of over $400,000 for the twelve months ending last July. In 1879, government had proposed and parliament had agreed to remodel the tariff so as to protect native industries, and to-day, as a consequence, the factories were running full time and extending their premises and machinery; people were fully and remuneratively employed, money was plentiful, the ability of the people to buy was greatly increased, and, as a consequence, the volume of imports kept the revenue flourishing. He proved from statistics that the result of the tariff was largely to increase imports from Great Britain, and that the trade in breadstuffs between Canada and the United States had increased from 8,500,000 bushels in 1877–78 to 12,143,000 bushels in 1880–81, proving the groundlessness of the predictions of the opposition as to the results of the operation of the tariff.

Electric Lights in Philadelphia Post Office.

A Philadelphia paper says that there are seventy-five small incandescent lamps at present in use in the City Post Office, supplied by the Maxim Electric Light Company. Each lamp is run to twenty-four candle power, though the power can be more than doubled. When the lamps were first placed some trouble arose in the machinery, in breaking globes, and in the carbons burning out; but the two latter difficulties have been overcome. The carbons are supposed to burn from six hundred to seven hundred hours. Theoretically there is no reason why they should ever burn out, but experience demonstrates, in the Post Office at least, that the carbons rarely last over three hundred or four hundred hours of actual service. The base of the Maxim lamp is of vulcanite rubber and metal, and the work of removing the exhausted carbon and substituting a new one requires but a few minutes. Postmaster Huidekoper expresses himself very much pleased with the lamps. When they were first introduced some of the employes thought the light hurt their eyes and they wore shades, but, with two or three exceptions, these protectors have been discarded.



KUM'S BELT STRETCHER.

EFFECTS OF HEAT UPON STEEL.

The illustration shows the effect of heat upon steel. To produce these effects take a bar of steel of ordinary size, say about an inch by a half, and heat six or eight inches of one end to a low red heat, and nick the heated part all around the bar at intervals of half to three-quarters of an inch, until eight or nine notches are cut. This nicking is done at red heat, to determine the fracture at the nicks. Next place the end of the bar in a very hot fire and heat it white-hot until it scintillates at the extreme end, leaving the other parts enough out of the fire to heat them only by conduction. Let the end remain in the fire until the last piece nicked is not quite red red-hot, and the next to the last barely red hot.

Now, if the pieces be numbered from one to eight, commencing at the outer end, No. 1 will be white or scintillating hot, No. 2 will be white hot, No. 3 will be high yellow hot, No. 4 will be yellow or orange hot, No. 5 will be high red hot, No. 6 will be red hot, No. 7 will be low red hot, No. 8 will be black hot.

As soon as heated, let the bar be quenched in cold water and kept there until quite cold. After cooling, the bar should be carefully wiped dry, especially in the notches. An examination by the file will reveal the following, if high steel has been used:

No. 1 will scratch glass; Nos. 2, 3, and 4, excessively hard; Nos. 5 and 6 well hardened; No. 7 about hard enough for tap steel; No. 8 not hardened. In breaking off the pieces over the corner of the anvil they should be caught in a clean keg or box, to keep the fractures clean and bright.

No. 1 will be as brittle as glass; Nos. 2 will be nearly as brittle as glass; Nos. 3, 4, and 5 will break off easily, each a little stronger than the other; Nos. 6 and 7 will be very strong, and much stronger than No. 8, or the bar unhardened.

Place the pieces in the order of their numbers fitting the fractures, then upend each one, beginning with No. 1, and following with each in the order in which they lie, and the result will be fractures as shown so beautifully in our illustration, each differing from the other.

No. 1 will be coarse, yellowish cast, and very lustrous; No. 2 will be coarse and not quite so yellow as No. 1; No. 3 will be finer than 1 or 2, and coarser than No. 8, and will have fiery luster; No. 4, like No. 3, not quite so coarse, yet coarser than No. 8; No. 5 will be about the same size grain as No. 8, but will have fiery luster; No. 6 will be much finer than No. 8, will have no fiery luster, will be hard through and very strong. This is what is called REFINING by hardening. No. 7 will be refined and hard on the corners and edges, and rather coarser, and not quite so hard in the middle. This is about the right heat for hardening taps, milling tools, etc., the teeth of which will be amply hard, while there will be no danger of cracking the tool. No. 8 illustrates the original grain of the bar.

In nine cases out of ten the bar will crack along the middle to the refined piece. In the illustration the crack shows very plainly in No. 4, but we have never known this crack to extend into the refined piece, although we have repeated the experiment many times. We learn from this experiment the following:

FIRST, "*a*" Any difference in temperature sufficiently great to be seen by the color will cause a corresponding difference in the grain. "*b*" This variation in grain will produce internal strains and cracks.

SECOND, Any temperature so high as to open the grain so that the hardened piece will be coarser than the original bar will cause the hardened piece to be brittle, liable to crack, and to crumble on the edges in use.

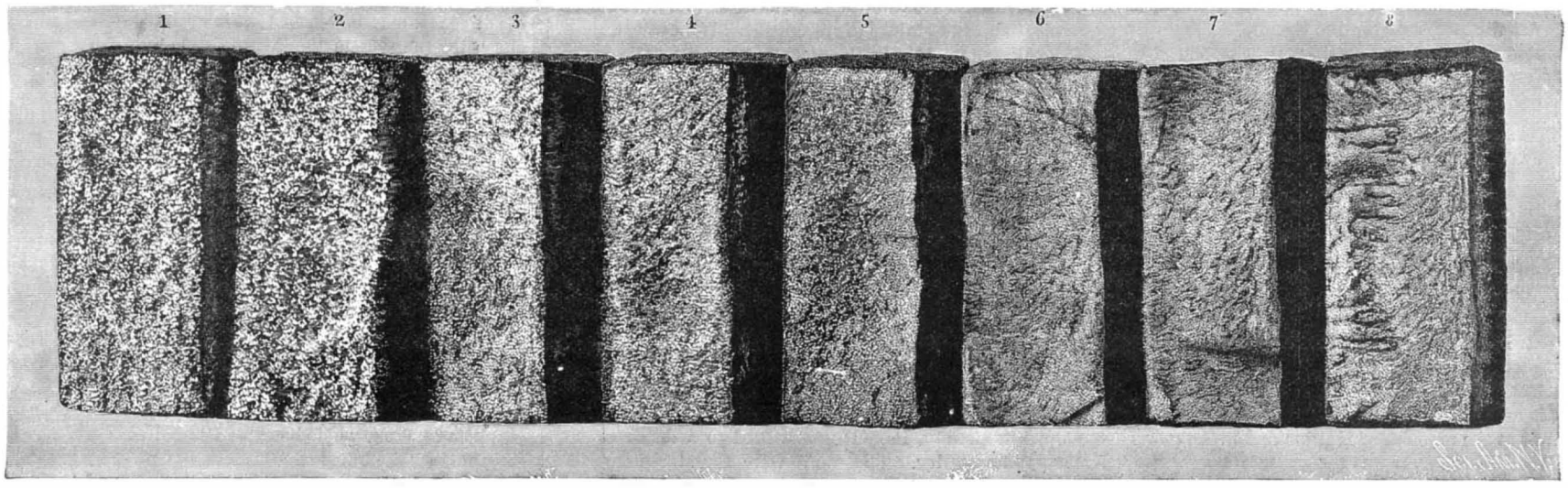
THIRD, A temperature high enough to cause a piece to harden through, but not high enough to open the grain, will cause the piece to REFINE, to be stronger than the untempered bar, and to carry a tough, keen cutting edge.

FOURTH, A temperature which will harden and refine the corners and edges of a bar, but which will not harden the bar through, is just the right heat at which to harden taps, rose-bits, and complicated cutters of any shape, as it will harden the teeth sufficiently without risk of cracking, and will leave the mass of the tool soft and tough, so that it can yield a little to pressure to prevent the teeth tearing out. These four rules are general, and apply equally well to any quality of steel or to any temper of steel.

Steel which is so mild that it will not harden in the ordinary acceptance of the term will show differences of grain corresponding to variations in temperature.

To restore any of the first seven pieces shown to the original structure, as shown in No. 8, it is only necessary to heat it through to a good red heat, not to a high red, allow it to stay at this temperature for ten minutes to thirty minutes, according to the size of the piece, and then to cool slowly. If upon the first trial the restoration should be found incomplete, and the piece upon being fractured should still show some fiery grains, a second heating continued a little longer than the first would cause a restoration of fracture. This property of restoration is not peculiar to any steel, and its performance requires no mysterious agencies beyond those given above.

It should be distinctly borne in mind that a piece restored from overheating is never *quite* as good as it would have remained if it had never been abused, and we strongly advise that no occasion should ever be given for the use of this



THE EFFECTS OF HEAT UPON STEEL.

process of restoration except as an interesting experiment. The original and proper strength of fine steel can never be FULLY RESTORED after it has once been destroyed by overheating.—*Treatment of Steel.*

Geology of the Panama Canal Route.

Discussing the geology of the Isthmus along the route of the proposed canal, the Panama correspondent of the *Herald* says:

The nearest signs of comparatively recent volcanic action are to be found in the neighboring Department of Veragua, in this State; and the conical hills between here and the Atlantic are not, as one might suppose, of surface volcanic origin. But it is admitted that the signs of submarine igneous action are to be found in considerable variety. Granite, syenite, and crystalline schist are not plentiful. Trachytes, blendes, dolomites, and basalts are, however, to be frequently met with. Columnar basalt composes a goodly portion of the Culebra Mountain, and it is very hard. The trachytes line much of the Chagres banks on both sides, forming hills that range away back into the country. In the bed of the Rio Grande dolomites and trachytes predominate, while on its bottoms the sedimentary earths are formed of vegetable mould and submarine tuffs. On the Atlantic side, near Mindi, these formations are of rocks which have little cohesiveness. The corresponding formations on the Pacific slope belong to a more ancient period. A variety of conglomerates, containing porphyry, granite, and syenite, is discoverable in the vicinity of Panama; but neither dolomites nor basalts appear here. The rocks receive their characteristic color from the presence of peroxide of iron. The stratified ledges in the center of the isthmus are acknowledged to have originated in submarine volcanic action of the tertiary period.

The conglomerates around Barbacoas are exceedingly hard and tenacious. Near San Pablo station the gray conglomerate, whose layers may be seen from the railroad, contains trachyte of a totally different nature from what is found within a radius of twenty-five miles, as it does not show any fossil remains. Some not very distinct traces of fossils are discoverable among the calcareous spars on the banks of the Obispo River. At Gatun the upper strata are mostly made up of brown argillaceous matter and rocky detritus. Here fossils are met with in such small fragments that it is difficult to classify them; nevertheless, they appear to differ but little in character from those of Aspinwall bay. Under some of the recent tertiary formations deposits of conglomerates repose whose upper portions present the aspect of volcanic tuffs. Porphyritic and trap formations make up much of the rocky mountains in the background to the central chain of the Varro Colorado. The Panama sandstone formation belonging to the transition period extends to the slopes of the Cerro Grande, at which latter point it may be considered as almost identical with the rocky layers of Barbacoas. Only at the point called Varnos-Varnos is there a deposit which may be assigned to the secondary strata. The tertiary formation of calcareous and fossil bearing sandstone, and the most considerable after the traplic and porphyritic deposits, comprises all the distance from Trinidad River to the sea. Baila Monos marks the northern limits of the dolomitic, porphyritic, and trachytic deposits. At Mamei, in addition to the formations already named, there must be included several species of phonolites, granite, quartz, and dolomites coming from the rocky ledges above Las Cruces. Matechin, in addition to the rocks already mentioned, has trachii-dolomites, simple dolomites, and several other kinds. It is here where the heavy work of excavation must begin if that sort of labor shall ever commence. Near Emperador the coniform hills are mostly made up of dolomites mixed with tuff of the conglomerate character in the nature of volcanic and marine matter. Coming up from the Pacific basalt is met with at Paraiso, nine miles from Panama. In the valley of the Rio Grande, which begins near there and runs toward the ocean, the pyramidal hills seen on either hand chiefly consist of basalts and dolomites, with conglomerite tuffs in the bottoms, mixed with earthy cements containing fragments of rocks belonging to the various orders. Around Pedro Miguel the formation is about the same in nature, excepting in this locality some beautiful agates have been picked up. Rocks of remote volcanic origin are found along the line to near Panama without showing the presence of either granite or gneiss. At the mouth of the Rio Grande, a little west of this city, there is a stratified horizontal belt of sandstone, holding no fossil remains, which seems to belong to the transition period. Panama is built on a small peninsula of this reddish conglomerate sandstone, and the picturesque Cerro de Ancon, a mile or so distant, is for the most part composed of conglomerate trachytes.

The Cause of Explosion in Kerosene Lamps.

The *Technologische Blätter*, of Vienna, contains a scientific disquisition by P. Knopp upon the causes upon which depend the explosions too frequently noticed in petroleum lamps.

The combustible hydrocarbon gases formed by the evaporation of petroleum burn easily, and when mixed in certain proportions with oxygen gas they burn so rapidly as to produce a violent explosion. This takes place when one part of the vapor is mixed with two parts of air. This gaseous mixture expands at the moment of ignition and in consequence of the heat generated, so that it far exceeds its former volume, and it makes room for its increased bulk by destroying the surrounding bodies. The explosions that occur in petroleum lamps have their origin in the existence of such explosive gas mixtures. What remains to be shown is: first, how such a mixture is formed in the receptacle; and secondly, in what manner it can be ignited.

The oil receiver, which in the greater majority of kerosene lamps consists of glass, has only one opening which is provided with a metallic collar. This is used both for filling the lamp and for receiving and holding the burner. This receptacle and the oil contained in it, when the lamp is burning, acquire a certain temperature, which is different under different circumstances, but in nearly all cases it is high enough to generate these hydrocarbon vapors. The higher the temperature of the oil in the receiver the more rapid, of course, will be the evolution of vapor.

Every burner, consisting of a good conductor, becomes heated by the flame and communicates this heat to the petroleum holder. Since heat and light are very nearly related this development of heat will increase in proportion to the illumination given by the lamp. For example: if a lamp that gives a poor light is burning in a cold room no vapors will be generated at all. On the other hand, if a lamp that gives a good light burns in a well-heated room, at a short distance from the ceiling, where the temperature, owing to the ascending heated air, often exceeds 30° R. (100° Fah.), and in addition to that a shade is suspended above it and thus reflects the heat down upon it, there will be a rapid evolution of gas and vapor. (Yet these hanging lamps very rarely explode, because they are let alone.)

Now let us imagine that a lamp has been filled to the rim with oil before the wick is lighted. The petroleum is consumed by the flame, and hence the volume of oil in the lamp gradually decreases. The empty space thus formed, so long as little or no vapor is generated, will be filled with atmospheric air sucked in through the burner. It is absolutely impossible to prevent this entrance of air; for if it were technically feasible, a vacuum would be formed in the lamp, and the oil could not be drawn up the wick to the flame, so that the burning of the lamp would be hindered if not entirely prevented. This admission of air, combined with the gases evolved in the lamp, are adapted to the production of the explosive mixture.

We now come to the question of how it is possible for this mixture to be ignited.

In all the burners hitherto in use in Germany the flame is regulated by shoving the wick up or down in the metallic case by means of a ratchet wheel at the lower part of the burner and attached to a projecting wheel and axle. Owing to the softness and flexibility of the wick this movement is possible only when the wick is rather loose and has some play in the tube. This space, which is frequently increased accidentally still more by the wick being too small or thin, would be of no importance so long as it merely permitted the atmospheric air to enter the oil holder, for this access of air, as already remarked, is not to be prevented, but rather aided. Unfortunately this space permits the gases rising from the oil to reach the flame, which is sure to take place as soon as there is the slightest pressure in the receptacle. This pressure, however, is necessarily produced by the development of gases in the holder.

If, now, these gases are pressed upward through the wick space by the side of the wick, they reach the flame and are at once consumed there without any explosive action as long as the gas is not mixed in the requisite proportions with the atmospheric air. Since this intermixing may take place in many different ways, we can explain in this way the many explosions and the greater or less danger with which they are attended.

If no explosive mixture of gases has been formed in the receptacle itself, but only in the tube with the wick, the explosion will be but a slight puff, accompanied by a flickering of the flame and the evolution of some smoke. This little explosion will be more violent and noisy the greater the volume of explosive gases that have collected in this wick tube. If the dangerous mixture almost fills the free space within the wick tube, the burning gases will burst out below because of their expansion at the moment of combustion. In such cases a bluish flame can be distinctly seen to descend into the oil cup or holder. This flame is immediately extinguished without any injury being done, provided there is no explosive mixture present in the oil receptacle itself, because the force generated by the expansion of so small a volume of gas as that burned in this case, does not suffice, as a rule, to break or injure the receptacle. If, however, there is an explosive mixture in the receiver itself, an explosion can not but take place, and its violence again will depend upon whether all the space in the receiver above the surface of the oil is filled with the explosive mixture of air and vapor, or only a part of it.

We may add that the less oil there is in the lamp the larger the space which may or may not be filled with this dangerous mixture. The relative safety of an oil is judged by the temperature at which it gives off combustible vapors, but in a lamp where a certain degree of rarefaction may exist it is quite possible for these vapors to be generated a few degrees lower than in the usual petroleum tester.

A Deep Oil Well.

One of the deepest wells ever drilled for oil purposes is the Tack Bros. well, recently finished in Millstone Township, Elk County, Pa. It was drilled to a depth of 2,600 feet, and was dry. The sands were found regularly, and the second sand looked very encouraging, but all hopes were abandoned when the third sand was passed and no oil found.

AGRICULTURAL INVENTIONS.

Mr. John Bartlett, of Oshawa, Ontario, Canada, has patented an improved root-harvesting machine, which removes the tops while the root is in the ground, and afterward removes the root from the ground.

Mr. John H. Bethune, of Fayetteville, N. C., has patented an improved cotton-chopper of very simple and inexpensive construction. The chopping wheel is rotated by connection with one of the driving wheels, and the forward end of the machine is supported on a shoe or runner of peculiar form.

An improvement in seed-drills has been patented by Mr. John Bartlett, of Oshawa, Ontario, Can. The object of this invention is to facilitate the planting of grain and seeds in drills and promote the convenience of the farmer by enabling him to plant different kinds of grain and seeds with the same distributing apparatus.

An improved harvester-finger has been patented by Mr. Charles Jay Johnson, of Lone Pine, Cal. The object of this invention is to increase the durability of mowing and reaping machine fingers by reducing the wear, and by providing a detachable wearing block at the back of the guide for the sickle-bar.

Sensitiveness of the Retina.

Any photographer who has ever considered the subject of the human eye as a camera and lens must have been struck with the marvelous sensitiveness of the retina, the part of the eye which represents the photographic plate or film; but probably it has never come under his notice that this sensitiveness varies, and to a very great extent. We know that the iris of the eye changes in diameter without our being conscious of it, and that it forms, in fact, a most perfect self-adjusting diaphragm, and we know that by this means a larger proportion of the light reflected by surrounding objects is allowed to enter the eye when these are dimly lighted, than when they are brightly; but it is not generally taken into account that there is a far greater change than this—that besides the change in the amount of light admitted, there is an enormous change in the sensitiveness of the retina. The very change is of such a nature as to prevent us from perceiving how very great is the range of light through which we can see distinctly. We shall take an example.

On a brilliant moonlight night, some hours after sunset, our friend, on looking round, remarks, "Oh, how beautiful, how bright the light; almost as bright as daylight," and really it almost seems to be so; yet we know that the light is in reality vastly less bright than sunlight. Let us look a little into what really is the ratio of the brightness of moonlight and sunlight. We all know, of course, that the light of the moon is but borrowed light—light received from the sun and reflected from its surface. Now, were the surface of the moon a perfect reflecting medium—that is to say, were it to reflect all light which reaches it—the amount which we should receive from a full moon would be only about a one-hundred-and-eighty-thousandth part of what we receive from the sun in the daytime. But it is evident that the moon's surface will reflect but a small fraction of the light which reaches it. Probably its average color is about the same as the color of the rocky parts of the earth's surface, and it is likely that we are overstating the amount actually reflected when we say that it may be a fifth or a sixth of the whole received, yet this assumption leads us to the astounding conclusion that the bright moonlight which we have so much wondered at is really about a million times less bright than sunlight. It is quite evident that, besides the alteration in the area of the iris of the eye which has taken place, there must, in the few hours between sunlight and moonlight, have been an enormous increase in the sensitiveness of the retina.

We have stated the ratio of the brightness of the sun and moon as perhaps a million to one; but certain experiments in moonlight photography, which we made some time ago, lead us to the conclusion that the ratio is probably considerably higher—likely about two millions to one.

The limit of sensitiveness which may, so to speak, be excited in the retina, does not, however, stop here. Under certain conditions it may be still more increased, so much so that moonlight may in its turn appear by comparison an almost unbearably strong light. It is not, as might be expected, by remaining in total darkness that the maximum sensitiveness may be reached; it is by working and continually using the eyes in the least possible light for a considerable time. We have experienced such a sensation when experimenting with extremely sensitive emulsions. We have worked for several hours in our dark room at night time by artificial light, and have kept the light just to the lowest point at which it was possible to see at all. On emerging from our room into the open air, the moonlight appeared so powerful that, for some seconds, it was painful to look at any white object lying in it. From this we conclude that the sensitiveness of the retina may become so marvelously great that it can perceive objects, and follow the rapid motion of those objects, in a light which may be white, but so dim that, were the retina replaced by the most sensitive gelatine film, it would take weeks or even months for a developable image to be impressed upon it.

But what is the practical outcome of all this to photographers? Well, we deduce from it a lesson which all of them might take to heart. There is the most extraordinary difference of opinion as to what is and what is not a safe light in which to work in the dark room. Now, we believe that a great deal of this difference of opinion is due to the

fact that the constant change in the sensitiveness of the retina makes it most difficult to judge of the amount of red light which is being used. For example, one man is in the habit of leaving his brilliantly lighted studio, and immediately entering his dark plate room. At this time his retina is at its lowest sensitiveness. He will tell you: "I work in a place about as dark as pitch, and yet my plates fog if I do not keep them shaded from the apology for a light which I do have."

Another man exposes plates in the field. He brings a number home and develops them a few hours after sunset. He will tell you: "I use plenty of light. Ruby, doubtless, but a perfect flood of it, and my plates never fog." Now it may seem astonishing, but it is more than likely that the first photographer was working in a very much more bright light than the second, even although the non-actinic medium may have been of the same color in both cases.

A room which will—for developing—appear brilliantly lighted when entered some hours after sunset, will appear absolutely dark if entered from the open air at midday. We believe we do not exaggerate when we say that the photographer sometimes works in the daytime with a light a hundred times more bright than one which he would not consider safe if he entered his room at night.—*Photo News.*

DECISIONS RELATING TO PATENTS.

Supreme Court of the United States.

PATENT FOR MANUFACTURE OF IRON.—VINTON *vs.* HAMILTON *et al.*

The bill of complaint alleged that the defendants were infringing certain letters patent, dated October 14, 1873, granted to the complainant, John J. Vinton, for an improvement in the manufacture of iron from furnace slag, and prayed for an injunction to restrain them from further infringement and for damages and an account of profits. The answer of the defendants denied that Vinton was the original or first inventor or discoverer of the improvement in the manufacture of iron from furnace slag or from the slag of blast or smelting furnaces, set out in his patent, and denied infringement. Upon final hearing in the Circuit Court the bill was dismissed because the process described in complainant's letters patent was known and in common use before the complainant's application for his letters patent, and the same were therefore null and void. The complainants, therefore, appealed the case to this court.

Mr. Justice Woods delivered the opinion of the court.

It is matter of general knowledge that pig iron is made from iron ore in a blast or smelting furnace; that to secure this product the furnace is charged, first, with a layer of coke or charcoal, then with a layer of iron ore mixed with broken limestone, and so on in alternate layers until the proper quantity of these materials is placed in the furnace. The fuel is then ignited, and for the purpose of increasing the heat, streams of air are forced into the furnace by means of blast-pipes, the nozzles of which, called "tuyeres," are inserted in openings in the walls of the furnace, usually from four to six feet above its bottom. The limestone is used merely as a flux. The ore under this process undergoes a chemical change, and iron is formed and sinks in a molten state to the bottom of the hearth, by which is meant not only the bottom of the furnace, but its sides as high up as the foot of the boshes. The refuse left after the melted iron has dropped into the hearth is also in a molten state, and, being lighter than the iron, floats on its top. This is indifferently called "cinder and slag." About three or four times in every twenty-four hours the melted iron is drawn from the furnace. This is accomplished in the following manner: The furnace is constructed with two holes, one called the "iron" and the other the "cinder" notch. The iron-notch is made at the bottom of the hearth. The cinder-notch is higher up the side of the furnace, just below the level of the tuyeres—so high that the cinder can be drawn through it without letting off the molten iron. These holes are kept habitually closed with clay or other similar material. At frequent intervals, and always just before drawing off the molten iron, or making a "cast," as the ironmongers call it, the cinder notch is opened and the cinder or slag is allowed to escape, and is carried away from the furnace in a trough made of moistened sand. The cinder notch is then closed and the iron notch is opened, and the molten iron is drawn off through a sand trough, and conducted into moulds made in sand beds, called the "sow and pigs," where it is allowed to cool. The result is the pig iron of commerce. In the meantime the furnace is supplied with constant charges of fuel and ore mixed with limestone in alternate layers, dumped in from the top, and this process is kept up without cessation for months and sometimes for years. The sand trough which connects the pig-beds with the iron notch is usually larger and deeper, but more elevated than the sow or general gutter which conducts the iron into the moulds or grooves in the pig-beds. When the metal is first let into the trough it accumulates so as to fill it nearly to the brim. As the flow from the iron notch decreases, the iron and a small quantity of cinder or slag, which has been chilled by coming in contact with the cold surface of the trough, adhere to its sides and bottom. When the molten iron on the hearth is about exhausted the blast is increased, and the material left on the hearth is blown out through the iron notch into the sand trough. This also cools in the trough, and thus is formed what are known as "trough-runners," consisting of iron and slag, which have been forced through the iron notch by letting on the blast, as just mentioned.

A cupola furnace is one used for melting pig iron for the purpose of casting it into useful forms and articles. It constitutes part of the equipment of a foundry. In shape it is generally a hollow cylinder. The iron is melted by substantially the same process as the ore in a blast furnace. The cupola furnace has an iron notch, but no cinder notch, because there is generally so little cinder or slag in pig iron as to render such an opening unnecessary.

In order to reach the merits of the controversy it is necessary to obtain a definite idea of what, if anything, the appellants are entitled to under their patent. The specifications are ambiguous in respect to the particular kind of slag which is to be used in the process therein described—that is to say, whether it is the slag drawn off through the cinder notch or the runners which are left in the trough through which the molten iron is discharged from the iron notch of a blast furnace. It appears, however, from the evidence that the use of the latter only is contemplated, the former containing such a very inconsiderable quantity of iron as to be valueless.

We observe, in the first place, that the patent cannot be held to cover the discovery that the slag which is to be used in the process described in the specifications contains so large a percentage of good metallic iron that it can be profitably extracted by again smelting it.

The evidence shows beyond controversy that for many years before September 18, 1873 (the earliest date assigned to the discovery or invention of the complainant), it had been well and generally known that the trough runners contained a large proportion of metallic iron, and they were broken up and resmelted in blast furnaces. They were thrown into the furnace with scrap iron and iron ore, and smelted in the same manner. It was formerly a notion among old-fashioned furnacemen that the use of this material injured the furnace and deteriorated the quality of the iron produced; but this conceit had been exploded long before the date of appellant's patent, and the runners and other heavy slag were used habitually in many blast furnaces, as above stated.

Secondly. The appellant cannot claim as any part of his invention the use of a cupola furnace for the purpose of resmelting trough runners and heavy slag. The evidence in the record shows that as early as the year 1844, at the Jackson Furnace, in Venango county, Pennsylvania, which was a blast furnace, a cupola furnace was erected and used for the purpose of smelting heavy slag, from which was manufactured plow points and hollow ware, such as skillets, pots, and Dutch ovens. Sometimes the product was made into pig iron. This cupola furnace was thus used for three or four years. The fact of such use was public; no effort was made to keep it secret, and it was known in the language of the witnesses, "all around the furnace."

It is therefore abundantly shown in the record that before the date of complainant's patent or of his invention the smelting of trough runners and other heavy slag in cupola furnaces was practiced and well known.

Thirdly. The method of making slag granulous or spongy, by passing water or air through it when in a molten state, is not new, nor is it claimed to be new. Besides, there is no evidence that this process is used by the appellees.

Fourthly. The method of charging the cupola furnace and of smelting the slag as described in the specification of appellant's patent is as old as the art of making pig iron, except, perhaps, the sprinkling of scale or black oxide of iron on the top of the coke, and this is not done by the appellees.

Fifthly. The appellant does not claim that his invention covers a cupola furnace. A review of the case shows, therefore, that appellant did not first discover the value of furnace runners or heavy slag for resmelting; that he was not the first to smelt them and use them for running into pigs or castings, either in a blast furnace or a cupola furnace, and that there is nothing new in his process of smelting which is used by the appellees.

All therefore that is left for his invention to cover, and which appellant can claim as infringed by the appellees, is the employment of a cinder notch or hole in a cupola furnace to draw off the cinder when the furnace is employed in smelting furnace-runners or heavy slag. But if the testimony of unimpeached and uncontradicted witnesses is to be believed, as early as June, 1872, at Beaver Falls, Pennsylvania, a cinder notch was used by the Beaver Falls Co-operative Association in a cupola furnace when employed in smelting furnace-runners.

But even if the application of a cinder notch to a cupola furnace was first made by the appellant, the question remains whether, standing alone, it implies invention and is patentable.

We think this question must be answered in the negative. Neither a cupola furnace nor a cinder notch is new. The use of a cinder notch for drawing off cinders from a blast furnace is as old as blast furnaces themselves. The function which the cinder-notch performs in the process covered by the appellant's invention is precisely the same for which it is used in a blast furnace. In smelting slag in a cupola-furnace it was found that the molten cinder accumulated and floated on the top of the molten iron. The application to a cupola-furnace, for the purpose of drawing off the cinder, of the cinder notch used in the blast furnace to accomplish the same end, would occur to any practical man. When applied to a cupola furnace the same function was performed in the same way by the same means. In making this application there was no invention. (*Pearce* vs. *Mulford*, 102 U. S., 112.)

We are of opinion, therefore, that the application of a cinder notch to a cupola furnace for the purpose designated is neither patentable nor new, and that all the other parts of the process and appliances covered by appellant's patent were old and well known long before the date of his alleged invention and the patent therefor. The complainant was not the first inventor, either in fact or in law, of the discovery or invention described in his letters patent. The patent is therefore void, and the decree of the circuit court dismissing the bill was right and must be affirmed.

MISCELLANEOUS INVENTIONS.

An instrument for training and strengthening the muscles used in writing, for the use of learners, and also to correct bad habits of penmanship, has been patented by Mr. Horace Forbush, of New York city. The invention consists in a spring-slide provided with a handle for being held, and fitted so as to be moved in a manner similar to writing and to enforce correct position of the operator's hand.

Mr. James M. Hendershot, of Atchison, Kan., has patented a flexible spout for loading cars with grain from grain-elevators, and of the particular construction and arrangement thereof in connection with a wooden spout leading from the elevator. The spout or conduit is made of rings tapering, or sections hinged together in sets, the hinges of the sets being arranged on different diametrical lines of the spout.

A novel well-bucket, patented by Mr. William T. Hendricks, of Athens, Ala., consists of a bucket provided with pivots and a pail-frame made of a single piece of metal, and having a ring secured between the lower ends of its side pieces. By means of the frame the bucket is supported in such manner that the contents of the bucket may be easily emptied into another vessel by simply turning the bucket on its pivots.

A novel pole-rest for annealing-ovens, patented by Mr. Niles Granger, of Saratoga, N. Y., consists in providing the ordinary pole-rest bar of annealing-ovens with a bracket in which is pivoted a stand or support for a grooved wheel. In using the invention the pole, instead of being supported directly on the bar, rests in the groove of the wheel, which, by reducing the friction of the pole, lessens the noise and labor of packing the ware.

Telegraphic Progress in England.

Lecturing recently on "Electricity and the Electric Telegraph," at Kensington, Mr. Robert W. Johnston, Postmaster of the Eastern Central or "City" district, quoted some of the statistics of the Postal Telegraph system, which are interesting and instructive at the present moment. He showed that whereas the earliest telegraph of which we have any account required a separate wire for each letter of the alphabet, and that in the first really practical telegraph two wires were necessary for the transmission of a single message, as many as four messages can now be sent on a single wire at the same time—that the 6,000,000 telegrams forwarded by all the companies in their palmiest days had increased to more than 31,000,000 forwarded by the Post Office last year, and that whereas it might be remembered when the charge for a message from Edinburgh to London was something like 12s. 6d., it was now possible to telegraph from Scilly to Shetland, or from Jersey to John o'Groat's for 1s. Fifty thousand miles of wire in 1870 had increased to considerably more than 100,000 in 1882; 2,200 instruments worked by all the companies had increased to nearly 9,000 worked by the Post Office; and 2,500 telegraph offices under the old *régime* had increased to more than 5,500 under the new. Four thousand persons of all classes employed by the companies had increased to nearly 12,000 employed by the Post Office, and of these about 1,600 were women, of whom 600 are employed in the Central Telegraph Office alone. As to the transmission of news for the press, the Post Office had converted into an attractive monopoly what used to be a rather repulsive combination on the part of the old telegraph companies, and on one occasion quite recently as many as 70,000 words, equal to 350 average columns, had been transmitted from the Central Office alone. The lecture, which was of a thoroughly popular character, was illustrated by specimens of most of the instruments in use by the Post Office, as well as by a working model of the pneumatic tube system, telephones in circuit, and some minor experiments with the electric light.

THE ethereal oil of *Satureja montana*, L., is an orange yellow liquid having a specific gravity of 0·7394; $\alpha_D = -6·5°$. On shaking this oil with dilute sodium hydrate a phenol is obtained which was recognized as carvacrol. The oil contains 30 to 40 per cent of carvacrol. The hydrocarbons boil at 172° and 182°, and appear to be terpenes.—*A. Haller in Comptes Rendus*, xciv., 132.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

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

(1) A. G. M. asks: 1. Where is it best to pump water into a stationary boiler, locomotive build? We now pump into side of back end from fire-box door, but would like to change to the bottom of the front or fire-box part behind, where the ash pit is, but outside, of course. Would it not answer as well? A. It is not well to feed against any part of the fire-box. Feed near the bottom of the cylinder part of the boiler furthest from the fire, and where there is a large water space in the boiler. 2. What pressure should a small upright boiler stand, 24x60, used quite a while, but apparently in good condition? What size safety valve should it have? A. We cannot say what pressure, without knowing the thickness of the iron and its condition.

(2) G. S. asks: What is a surface blow-off valve with a scum pipe inside of boiler; how made, etc.? A. It is an ordinary blow-off valve or cock, with a connecting pipe to a long narrow pan inside the boiler, the upper part of the pan open, the pan fixed so that its upper edges is about or just above the surface of the water; the floating scum collects in this pan, and when the valve is opened is blown out.

(3) E. S. asks: Which of the two balance wheels will give the most power and run the steadiest for a foot lathe: a 14 inch wheel, weight 25 pounds, geared to run three times faster than the crank shaft, or an 18 inch wheel, weight 50 pounds on the crank shaft? A. The small wheel at three times velocity of crank shaft.

(4) W. M. S. asks: Where is the largest chimney in the world, and what is its height? A. We believe at Port Dundas, near Glasgow, 454 feet above ground. The St. Rollox chimney (near Glasgow) is 435½ feet above ground.

(5) H. S. N. asks: 1. What is the best thing to kill water bugs? I have tried borax—it doesn't work very well. A. Use plenty of finely powdered dry borax, injecting it, by means of a small bellows, into all cracks and crevices. We have found this to be a sure remedy. 2. Is there anything better than lime for a oxyhydrogen light? A. We believe there has been no good substitute for lime in this connection yet discovered. 3. What proportioned boiler would be used for an engine with two inch stroke, diameter of cylinder one inch? A. A boiler having 1¼ to 1½ square feet heating surface.

(6) J. B. M. asks: Are pearls out of mussel shells of any account? A. Yes; if fine.

(7) W. P. asks: Will you please inform me which gives the most powerful light, the oxyhydrogen or oxycalcium? A. The oxyhydrogen, so called—if by oxycalcium a light wherein alcohol or oil is made to take the place of hydrogen in connection with oxygen upon lime.

(8) A. E. B. asks: Will you please give us a process for ebonizing wood, and what wood is the best? A. Digest the wood for an hour or more in a strong hot solution of extract of logwood; then in a strong cold solution of iron sulphate (green copperas) The baths may be prepared by dissolving three-quarters of a pound of logwood extract in 2 gallons hot water and 1 pound copperas in 1½ gallons water. Repeat the digestions if necessary until the wood is properly stained. Light porous woods are most easily stained, but any variety of wood may be blackened by this process.

(9) G. W. B. asks: 1. Has pure nickel any physical or chemical properties that would make a watch case superior to one of silver? A. Nickel is very much harder than silver and will wear longer. It is also much less malleable and stiffer, and of a lower specific gravity. 2. Is there a company in the United States making such cases of solid pure nickel? A. Yes, there are several.

(10) B. B. B. writes: I am about getting a small steam yacht, and a friend of mine has an iron hull, 34 feet long, 8 feet beam, but I think she has beam enough for the length. I want to run it on the Delaware River. What size and shaped boiler and what size of engine do I require to get the best results? A. The boat has beam enough for her length. The usual inverted direct acting engine, 6 inches diameter of cylinder by 6 to 8 inches stroke. A horizontal return tubular boiler, or a vertical one, to be of a size suitable for the engine. The horizontal will be best, as it will sit lower in the boat.

(11) R. C. B. asks: Can power be conveyed by a rope (not a wire rope) to a good purpose? I wish to convey power about 150 feet, for the purpose of driving a wood lathe and a circular saw for ripping inch lumber. The rope would be under cover. What size rope would I want? A. Yes; but a hemp rope would wear rapidly. The size would depend on the velocity; but we think a rope three-quarters inch or seven-eighths inch diameter sufficient. Use a good hemp rope—not manila—and keep it well protected from the weather.

(12) W. H. P. asks: Will you please inform me through SCIENTIFIC AMERICAN the cheapest and best way of making nitrous oxide gas for dental purposes? A. Heat a quantity of pure ammonium nitrate in a glass or iron retort over a sand bath until the gas begins to be evolved therefrom. This consists chiefly of nitrous oxide (so-called) and steam. It is purified by passing it slowly through a strong aqueous solution of sulphate of iron (green copperas) which absorbs any nitric oxide present. It is then ready for inhalation.

(13) B. W. S. J. asks: 1. How can holes be drilled in china or glassware? A. Use an ordinary machine drill (of hard tempered steel), and moisten the parts with turpentine. If the holes are to be "hand bored" use a bow with hempen string twisted once about the drill, held in and directed by a loose clutch awl handle, the motion of the bow backward and forward causing the drill to rotate rapidly against the surfaces to be drilled. 2. How can scraps of sperm candles be restored to their original white color after having been melted and remoulded? A. Pass the melted material through a warm sand or clear charcoal filter, which will retain the particles of carbonaceous matter, to which the color is due.

(14) N. P. asks: How much face will be required to give an overshot waterwheel sufficient power to run a fifty inch circular saw, and also the number of square inches vent under a two-foot head of water, and the number of revolutions the wheel should make per minute and the revolutions of the saw? The wheel is a nine foot over shot. A. The power required depends upon the amount of work to be executed; but we suppose you require at least 20 horse power. Three times this, or 60 horse power, can be readily applied to a saw 50 inches diameter; but for 20 horse power you will want 14 feet face, or, better, 15 feet. Make about 10 revolutions per minute, and the vent about 650 square inches.

(15) H. A. R. asks: Can you give us a receipt for the white plating seen on cheap table ware, etc. It is neither silver nor nickel, but in some respects resembles both, though the color is closer to a white alloy of tin and zinc. One man says it is done by dipping into hot metal; another by boiling in a liquid for fifteen or twenty minutes. A. You will find practical directions for plating of all kinds in SUPPLEMENT, No. 310.

(16) G. F. K. asks: 1. What is the right temperature of a drying room for evaporating apples? A. About 100° Fah. 2. How many square feet of heating surface steam pipe should I have (using live steam) for a room containing 400 cubic feet of air? A. About 130 square feet.

(17) C. W. W. asks: What is the lifting power of one cubic yard of coal gas? A. It varies considerably according to the method of manufacture—usually something less than one pound per cubic yard (27 cubic feet).

(18) R. & B. ask: 1. Is sugar maple wood good for paper making? A. Yes, but it is not commonly used, as there are better and cheaper woods obtainable. 2. Would it pay to make paper pulp, where shavings of said wood are to be had in large quantities for nothing, and good soft water abundant, also water power? A. Very probably, if the pulp could be manufactured near at hand and on a sufficiently large scale. 3. Is the machinery to convert shavings into pulp very costly? Which would be lowest estimate of the same? A. Not necessarily; a small plant could probably be procured at a cost of a few hundred dollars. 4. Where can information about this matter be obtained in particulars? A. Address machine builders who advertise in our columns.

(19) Mrs. M. J. D., referring to our reply to B. C B., respecting the removal of lime incrustations choking the pipes of a water-back, calls our attention to the fact that petroleum (or refined coal oil) may and has been used to advantage in softening such lime incrustations so that they may be readily detached (as a whole or in pieces) from the metal. In the case in point it should be noted that the question is not how to loosen, but how to remove the incrustation without disconnecting all the pipes or taking out the water-back—an operation which obviously involves solution or some similar process, not within the power of petroleum or any similar oils to accomplish. A. A practical solution of the question would be of much interest to many householders as well as to engineers and plumbers.

(20) R. O. K. writes: We have a planing mill in this town, and last week the engineer discovered that the boiler used in the establishment leaked steam somewhere at the back end. One of the men in the mill took some brick off the top and he could see the steam coming out of the boiler in a jet about as large as a pin. He put a cold chisel to the place and struck it a light blow, and the chisel bedded itself in the head. They sent for me to look at it, but it was too hot to go inside to examine it. I gave it a few blows with my hammer, and the head gave way at every blow for about 18 inches along the head just above where the upper braces were riveted on. When the boiler was cool I went inside and examined it, and found that the head was rusted nearly all away. In some places the iron was not one thirty-second of an inch thick, and they had had 65 pounds of steam that morning, but at the time when they discovered the leak they had only 25 pounds. The boiler is 10 feet long, 40 inches diameter, and 36 3-inch flues, and has been in use about eight years. It has not been running much more than half the time. Now, could you tell me the reason of the corrosion, and why it did not explode? A. As to the cause of the corrosion we could not say without examination of the iron and the water. It is fortunate that the weakness was discovered in time to prevent an explosion. It would have soon blown out, and the destruction would have depended on the character of the initial break. A boiler not in use will deteriorate more rapidly, as a rule, than if constantly worked. So far as we can judge the head was not braced sufficiently, and there has been a constant springing or movement of the head, thus favoring rapid oxidation by constantly presenting new surface.

(21) P. R. asks: 1. Can a bar of steel six inches by one and a half inches be strongly magnetized by a Holtz electric machine that gives a spark six inches long? A. No. 2. How many cells (if any) of the secondary battery described in SCIENTIFIC AMERICAN, June 25, 1881, page 406, can be charged by the same machine? A. The secondary battery is only very slightly affected by the current from a Holtz machine. 3. In what proportion does the spark increase from a single to a double Holtz electric machine? A. There is no increase in length of spark. Increasing the number of plates makes the spark larger. 4. How can I make it self charging? A. By applying to it a small frictional machine to be worked by the same handle that is used to turn the Holtz plates. 5. How should it be arranged for medical purposes? If your space does not allow a full answer to this question, please refer me to some work on that subject, as I should need a good deal of information on this point. A. See SUPPLEMENTS 278, 279, 282. 6. Does it in any way interfere if points, conductors, and discharging rods are varnished? Also, would it be well to varnish the plates and inductors? A. Varnishing the brass work does no harm, and you will derive no benefit from varnishing plates. 7. Suppose the electrical condensers to be eight by two inches diameter and covered half way, and the electrical tension sufficient to overcome the distance: would not the spark discharge from the external coating to the chain that connects the inside coating with the conductors of the machine (distance five inches only) instead of going down the jar to the inside coating (distance eight inches), if not why? A. It might discharge both ways. The surface of the jar offers a partially conducting surface over which the electricity would pass rather than leap the space between the side of the jar and the chain. 8. Will increase of surface in the condensers increase the spark? A. It will make the spark "fatter," but the discharges will be less frequent. 9. How can I polish the glasses in a pair of spectacles that is very dull? A. This is impossible without proper tools. Better buy new glasses

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

L. J. R.—It is a variety of pyrrhotine—a native magnetic sulphide of iron. It contains a little antimony and copper and probably a trace of nickel. A quantitative analysis would be necessary to ascertain its value.

COMMUNICATIONS RECEIVED.

How to Raise Early Corn. By S. E. T.

A Simple and Cheap Barometer. By G. H.

NEW BOOKS AND PUBLICATIONS.

U. S. COMMISSION OF FISH AND FISHERIES. SPECIAL BULLETIN. A MONOGRAPH OF THE SEAL ISLANDS OF ALASKA. By Henry W. Elliott. Washington. Government Printing Office. Quarto, pp. 176.

This valuable monograph, embodying the personal observations of the author during four seasons, 1872, 1873, 1874, and 1876, gives the first minute scientific account of the life and habits of the North Pacific fur seals and sea lions that has been written. Indeed the minuteness of Mr. Elliott's observations prevented the use of the work as a portion of the report of the tenth census, for which it was intended. Thanks, however, to the enterprise of Professor Baird, an edition was secured for the Smithsonian Institution and issued under its auspices. The report is illustrated by maps and numerous engravings.

MARRIAGE AND PARENTAGE AND THE SANITARY AND PHYSIOLOGICAL LAWS FOR THE PRODUCTION OF CHILDREN OF FINER HEALTH AND GREATER ABILITY. By a Physician and Sanitarian. New York: M. L. Holbrook & Co.

Books on this subject are too commonly written by "cranks," some vicious, some merely ignorant and carried away with fanciful theories. This volume is radically different; it is scientific, sober, clean, and worthy of conscientious consideration by every possible parent, particularly by the young.

THE WATCH AND CLOCKMAKER'S HAND BOOK. By F. J. Britten. London: W. Kent & Co.

A fourth edition of Mr. Britten's pamphlet substantially bound. It describes in a simple practical way the mechanism of timepieces, and the tools and processes employed by watch and clock makers and repairers.

THE COMPLETE PRACTICAL CONFECTIONER. By J. T. Gill. Chicago: Confectioner and Baker Publishing Company. 12mo.

Though intended primarily for the trade this practical hand book will be found handy and useful to the better sort of housekeepers and cooks. Its eight parts comprise a large number of receipts, processes, etc., with relation to iced confections, compotes, jellies, preserves, etc.; the canning and bottling of fruits, etc.; sirups, aerated and other beverages; machinery and materials for candy making; candy making processes, fruits, nuts, etc. The author offers no information with respect to the adulteration of candies further than to condemn in very plain language certain well known practices.

ANALYTICAL AND TOPICAL INDEX TO THE REPORTS OF THE CHIEF OF ENGINEERS AND THE OFFICERS OF THE CORPS OF ENGINEERS, U. S. A., UPON WORKS AND SURVEYS FOR RIVER AND HARBOR IMPROVEMENT, 1866 to 1879. Compiled under the direction of Major Henry M. Robert, Corps of Engineers. Washington: Government Printing Office. 1881.

The value of this index is not confined to its obvious convenience to officers of the engineer corps. Its plan makes it a ready guide to a vast amount of local information concerning the botanical, geological, geographical, and other features of our rivers, valleys, and harbors; and also to a vast amount of professional experience in operations for river and harbor improvements, canal construction, the construction of dams, diking, dredging, rock cutting, mining, and so on.

WESTWARD HO! By Charles Kingsley. 12mo, cloth. pp. 591. $1.

HYPATIA. By Charles Kingsley. 12mo, cloth. pp. 487. $1. New York: Macmillan & Co.

These two novels of Mr Kingsley, which have won an enduring place in English literature, are here presented in substantial library style, at a price which makes them as commendable specimens of cheap book making as we have seen.

THE CARPENTER AND JOINER'S HAND BOOKS. By W. H. Holly. New York: John Wiley & Sons. 32mo, cloth. 75 cents.

A revised and enlarged edition of Mr. Holly's little hand book. The directions are plain and amply illustrated with cuts.

FAMILIAR SCIENCE STUDIES. By Richard A. Proctor. New York: R. Worthington. 12mo, cloth. pp. 442. $2.25.

Mr. Proctor has brought together in this book a number of his later contributions to English and American periodicals. They cover a wide range of subjects, from "infinity" to the "fifteen puzzle." The book includes the chapter on the "menacing comet" just now attracting attention in certain quarters.

LECTURES IN A WORK SHOP. By T. P. Pemberton. New York: The Industrial Publication Company.

The writer has the moral, social, and industrial welfare and improvement of mechanics very much at heart, and talks to working men in a sensible, kindly, and encouraging way, which cannot fail to be inspiring and helpful. The appendix contains the more notable and not easily accessible papers of the eminent mechanician and inventor, Sir Joseph Whitworth.

SEAMANSHIP. By Captain Sir George S. Nares, R.N. Revised and enlarged, by Lieutenant A. C. B. Bromley, R.N. 8vo, pp. 291. 21 shillings. Portsmouth: Griffin & Co.

The additions to this, the sixth edition of Captain Nares' thorough and comprehensive treatise on practical seamanship, are many and important. They include the use of steel and flexible steel wire in ships' fittings; torpedo boats and the handling of them; the construction of broadside and turret ships; life boats and their management; night and fog signals; rocket apparatus; the Walker and the Thomson sounding machines; Walker's patent log; Sir William Thomson's compass, and other recent developments in marine methods and appliances. The work is abundantly illustrated; and, though specially designed as a hand book for British officers, it is well calculated to be of use to young American officers in the mercantile as well as the naval service.

[OFFICIAL.]

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AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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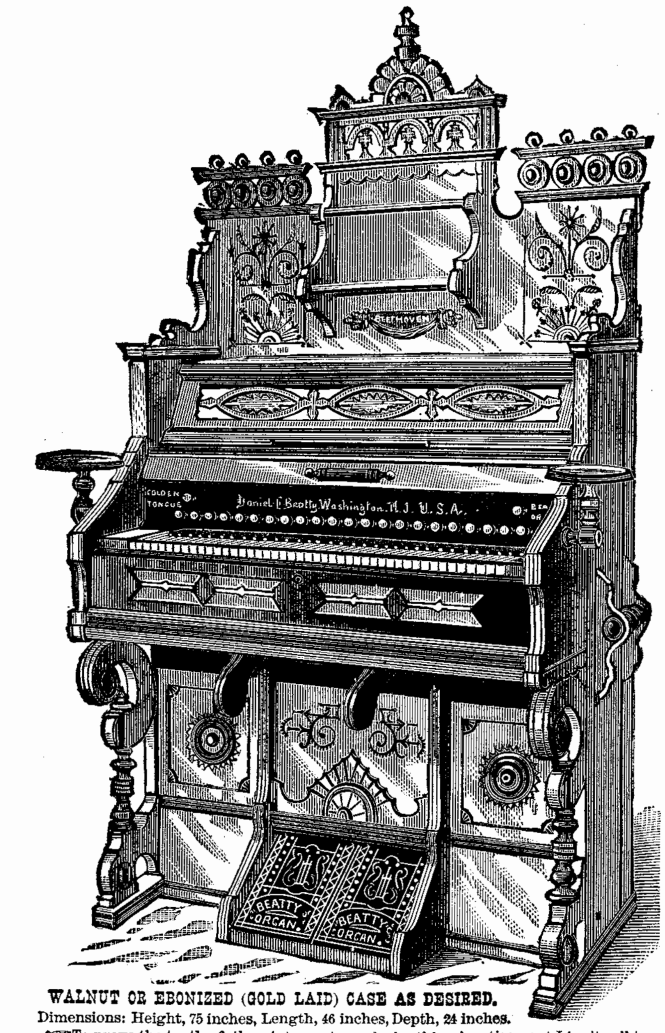

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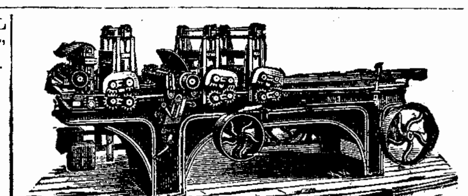

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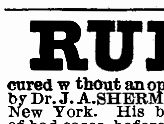

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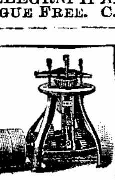

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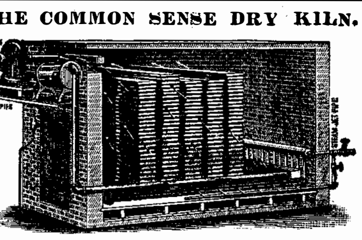

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