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THE VIRGINIA DITCHER.

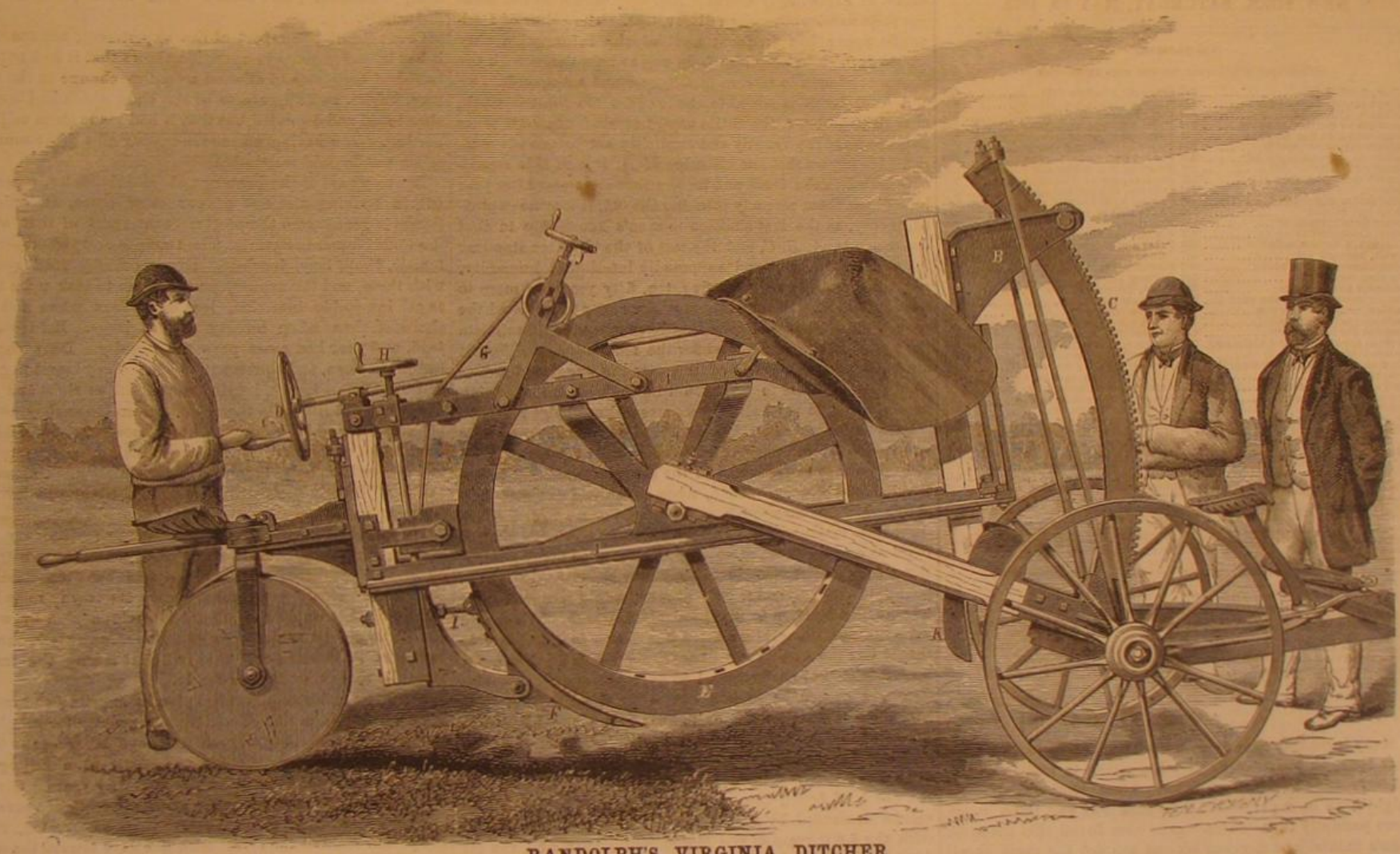
Some writer has said that drainage is to the earth what breath is to man. Good drains are earth's lungs. Science and experience have demonstrated, beyond intelligent dispute, that the producing capacity of the earth, not to mention its healthfulness, is largely in proportion to its ability to receive Nature's nourishment, namely, heat, air, and moisture, and to expel the poisonous secretions left within the earth.

The intelligent farmer should as soon expect health to his body and vigor to his mind with congested lungs, as life-giving power in his acres when clogged, soddened, or even of heavy soil. Even the lightest soils lack porosity. Respiration, then, must be set down, by the farmer who would be successful in the largest sense, as being absolutely as essential to his acres as to himself.

Nor is the capacity to receive Nature's gifts (air, heat, and moisture), which drainage secures, the limit of its advantages. That the richest of natural soils, when undrained, will not compare with much inferior soil when drained, all intelligent persons know; but the utility and wonderful economy of the drainage system is best illustrated when fertilizers come to be used. The drained land receives and retains, almost without loss, the fructifying qualities of fertilizers; while, from obvious causes, the undrained land receives slowly, wastefully, and always coldly, the expensive helps to its productiveness. The best of fertilizers, used on undrained soil, will yield but a temporary benefit; while much poorer land, drained and fertilized, will be almost inexhaustible.

We devote the initial page of this issue to the representation of a new and simple apparatus, which, for the slow, costly, and uncertain ditching process of the past, substitutes the certain, cheap, and reliable labor of machinery. It is the invention of ex-Governor (now United States Senator) Theodore F. Randolph, of Morristown, N. J. It is fully covered by patents, both in this country and abroad, taken out through the Scientific American Patent Agency. The machines are of two constructions, one having three traction wheels, as shown in the engraving, Fig. 1, and the other having four traction wheels, differing only from the first in its adaptability to side hill cutting or use on very uneven ground. Fig. 2 represents all that is material to be shown in the latter, the four-wheeled ditcher.

Turning to Fig. 1—the three traction wheel machine—we describe as follows: A is the supporting frame, which rests on the rear on the following wheel, and is held up in front by the bracket, B, in the forward part of which is a pinion which engages with the rack, C. A worm gear, meshing with the pinion, is actuated by a rod which extends to the rear and terminates in the hand wheel, D, so that, by turning this hand wheel, the bracket pinion may be rotated on the rack; and thus the forward end of the frame, A, upon which the ditching wheel is suspended, is raised or lowered as desired. The rack, as well as the driver's seat, is supported on the forward axle. Suspended in bearings in the frame is the cutting wheel, E. This consists simply of the strong, circular, sharp-edged steel flanges, of such width apart and depth of cut as is desired. When the frame is lowered, these cut into the ground, dividing it, and forming the perpendicular sides of a ditch. Directly in rear of the wheel, and between the flanges, is a steel-pointed shoe, F, the forward edge of which makes a horizontal cut, generally, on a line with the lower edge of the flange.



RANDOLPH'S VIRGINIA DITCHER.

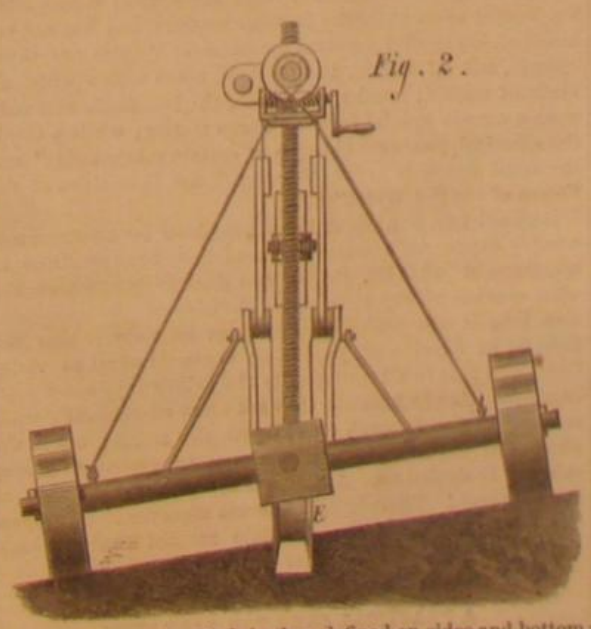


Fig. 2.

The shape of the ditch is thus defined on sides and bottom; and the earth, loosened at all points, is carried up, by the revolution of the ditching wheel and between the flanges, until it reaches the chute on the forward upward portion of the machine, out of which it passes to the ground, whereon it piles regularly, convenient for refilling the ditch or removal. The construction and mode of adjusting the shoe, E, should be particularly noted, for herein, it is claimed, lies the simple and effective mechanism that renders rotary ditching practicable and very economical. The adjustable shoe and plow effectually prevent the machine from clogging; the pivoted plow, resting on the sliding shoe, is readily raised or lowered; and thus any temporary excess of earth or unexpected impediment can be removed or relieved, or any deficiency in cutting promptly made up. The pitch of the shoe is adjusted by the set screw, I, by means of which its upper or lower extremity is drawn from or set toward the rim of the ditching wheel. Provision is thus made for the different strata of soil, frequently found under a common surface. The hand wheel, J, is simply a belt tightener. The cutters, K, on the lower end of the front post relieve the work of the ditcher somewhat, and can be made to give almost double width to the ditch, without widening the flanges. Knives of proper strength are also arranged for the rear post, by which sloping sides are made in ditching, when required.

The machine can be used for digging narrow and deep tile ditches, or open and broad ones. They vary in size and capacity, and require animal power from two horses, necessary to draw an apparatus weighing 1,500 lbs., to six horses, pulling a machine of 2,500 lbs. weight, and fitted for work in the stiffest soils. The machine does not undertake to dig stumps, or to remove stones larger than the capacity of the flanges.

From reports of practical trials, we learn, the machines cut perfectly smooth ditches, of any depth and of any width desired, the power to work them being increased in a diminished proportion to their larger size and capacity. The usefulness of the machine is not confined to ditching. As an excavator, it shows considerable capacity; the machines of six horse power dig from 250 to 300 lineal feet a minute, ten inches wide, and three or four inches thick. This will be found to be equal to 5,000 lbs. solid earth, and nearly two cubic yards, per minute. As a road maker, for pipe trenches, railway embankments, underground telegraph wires, and the like, it would seem to be of much utility. A machine is now being constructed, we understand, for digging irrigating canals in Texas. The agents suggest that, as a single machine will do the work of many farms, the club system would be the best in purchasing, thus making the cost to each person comparatively small.

Full particulars can be had by addressing Randolph Brothers, agents, 111 Broadway, New York city.

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VOLUME XXXII., No. 22. [NEW SERIES.] *Thirtieth Year.*

NEW YORK, SATURDAY, MAY 29, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

A WANT.

Many ingenious experiments have been made to determine how long, on the average, it takes a man to receive a mental impression and respond to it by some simple action. As might have been predicted, some men feel and think much more promptly than others. It is also found that the same man's mental and nervous actions are not the same at all times; the quickness of the response varies, too, with the nature of the signal, and with the practice the observer has had in noting the same or similar phenomena.

A series of corresponding investigations of the rate at which the human mind acts in bulk is also very much needed. In them it would be not the mental action of individuals, but of classes, that would be studied: how long it takes the various grades or classes of men to receive a new idea; how long it is before the idea is generally accepted by the class and carried into practice; and what are the relative periods required for the acceptance of different sorts of ideas by different classes.

The investigation would have to be made historically, by such a man as Francis Galton or Herbert Spencer, assisted by specialists in the several departments of human progress, who would compile tables of the great discoveries in their special fields, setting opposite to each discovery of important fact or principle the time required for the several stages of its progress to general acceptance. One table, for example, would record the more important discoveries in Science, giving the date of each, the date of its endorsement by some prominent man of Science, then the time elapsing before it was accepted generally by the leaders of that particular department of Science, the time when the scientific world at large received it, the date of its adoption by men of culture, by practical men, and lastly by ecclesiastics. Other tables would mark in like manner the advance of human thought along other lines of progress, so that a comparative statement could be drawn up, showing the relative rapidities of different sorts of intellectual movements in different classes of society.

That such a scheme could not at once be carried out, with any degree of perfection or completeness, is no argument against it. It is true that only a very few scientific and other discoveries have yet permeated all classes; nevertheless the very gaps in the tables would be instructive, as evidences of the hollowness of the pretended culture of many respectable classes, and the impenetrability of other classes to large congeries of truths. Even approximate tables would be immensely valuable; they would save such a world of anxiety!

For example, a man makes, after years of patient study, an important discovery—say in optics. He hastens to lay his achievement before the world, and naturally expects that the world will be as glad to receive as he is to publish the new truth. But somehow the world does not see it. Most likely, if the discovery be of prime importance, it will be disputed with the intensest vigor by the very men who ought to welcome it. In such a case, our unfortunately fortunate student would have simply to turn to his table book to learn that, on the average, it takes so many months for a discovery of the kind to be accepted by some acknowledged master of the science of optics; so many years before it commands the assent of opticians generally; so many decades before it is incorporated into advanced optical teaching, and so reaches the world of general culture, and so on. Then he would be able to possess his soul in patience, knowing how useless it is to expect the thoughts of the world to transcend their usual capacity for speed.

Possibly there are men, like Dr. Draper, who have learned from long experience—at least in their special departments—pretty much all that such tables would teach them; but for younger men and men of more hasty temperaments, they would be exceedingly useful. And they would be not without their uses to other than discoverers. The editor of a scientific paper has frequent need of the information they would furnish to keep him from undue impatience with the slowness of men to receive intelligence and act upon it.

A vital truth is added to the world's too limited stock, changing, perhaps, the entire aspect of a science. He takes pains to have it promptly and explicitly set before his readers. He knows that the attention of *A*, *B*, and *C* is repeatedly called to the truth and its bearings; yet year after year he will see them serenely teaching the old, it may be exploded, theory, as the last addition to men's knowledge in that department: *A*, *B*, *C*, and the rest of the alphabet standing for classes of honest and supposedly intelligent humanity, requiring respectively one, five, ten, fifty years, or more to learn anything. If our afflicted editor really appreciated the natural sluggishness of class intelligence, and could estimate the probable period required for the incubation of different ideas in different orders of men—as the suggested tables would enable him to do—would he chafe so at the persistence of error, or the halting progress of knowledge?

Personally, we often feel the need of just such specific knowledge of the varying rates of speed at which intelligence becomes incorporated in the mental furnishing of various classes of men. Then, when we should see some scientific doctrine atrociously misstated by some "leader" in literature, metaphysics, or theology, the knowledge that it requires on the average so many years, or so many generations, for a clear conception of any new scientific thought to penetrate that particular body of men, would reconcile us to its slow illumination in that particular instance. We should say—not that the misdoer was a knave or a fool, but merely that it was too soon to expect anything better in that quarter. We should not be surprised even to learn that a sensation was caused in certain circles by the bold assertion that the world is not flat; or to hear that a like effect was produced in theological circles where one of the most liberal and talented men of the English church plucks up courage to say, as Dean Stanley did the other day, in a sermon on the death of Lyall, that "it is now known that the vast epochs demanded by scientific observation are incompatible with the 6,000 years of the Mosaic chronology, and the six days of the Mosaic creation," implying that geology is right and Genesis wrong. And we might possibly be patient at still another infliction, upon confiding readers, of the mythical Three Buttes of the solar spectrum by one who professed to present the latest scientific aspect of "Chemical Radiation" in a periodical of the standing of the *Popular Science Monthly*.

"There are three spectra," says the writer: who quotes Dr. Draper as an authority in solar matters, but has not yet heard of his most important discoveries: "there are three spectra, one of which, the thermal, takes action upon all kinds of matter; another of which, the luminous, acts only upon a certain special form of nerve matter; while a third, the chemical, produces changes in certain compounds;" and the usual figure is given, showing "the Intensities of the Forces of the Spectrum."

It would be a comfort to know just how long we can reasonably expect such popularizers of Science to continue in ignorance of what Dr. Draper has done to demonstrate the utter absence of any such triple division of the sunbeam; how long it will probably take them to discover that red light is as capable of producing chemical effect as violet light, and that in all probability the yellow rays seem most luminous simply because they act most energetically upon carbon compounds, such as compose the retina; but in the absence of the investigation we have suggested, such consolation is denied us. And there are such a multitude of similar cases! Therefore, we assure whoever shall prepare the tables demanded that a certain market awaits at least one copy. We will take it for personal use.

A PRACTICAL CURE FOR VAGRANCY.

When Count Rumford became the friend of the King and virtual ruler of Bavaria, he found the country swarming with beggars. In the large towns, beggary was an organized imposture, insolent, clamorous, persistent. The rural districts were overrun with tramps of all ages and every nationality, who levied contributions, robbed, and tyrannized everywhere: and not only their impudence and clamorous importunity were boundless, to use the Count's own words, but they had recourse to the most diabolical arts and the most horrible crimes in the prosecution of their infamous trade. All the regular machinery for the repression of vagrancy was unavailing. The people were disheartened. Industry was well nigh paralyzed by the parasitic multitude, and the honest peasantry had become so corrupted by bad example that they would leave their work in the fields to beg of travelers on the highway. Beggary had become so common and customary that it no longer seemed shameful or infamous.

Yet the whole system fell in a day when attacked by the Count's resolute will and sterling sense. His remedy was work, fairly rewarded, so presented as to make industry as attractive as possible, but rigorously insisted on. His plans for housing, feeding, and employing the beggar class were quietly perfected; then, on the first day of January, 1790, every beggar was arrested and set to work.

The law was: No idleness, no begging, no dirt or debauchery; but work for all, good food, kind treatment, and instruction in the ways of honest living. In one day the plague of beggary was stopped. And it was not long before the majority learned to prefer the comfort, decency, and respectability of honest industry to their former squalor, idleness, debauchery, and crime. And the experiment paid financially.

Count Rumford's report of the experiment, written after it had been five years in operation, shows that it had not only banished beggary and effected an entire change in the manners, habits, and appearance of the class which had been so abandoned and degraded, but that it had made them self-supporting. The saving effected in cutting off a great source of crime was beyond estimation.

In every part of the Eastern and Middle States, especially within walking distance of our chief cities, an order of things is growing up the precise counterpart of that which the Count found in Bavaria. The tramp is everywhere—male, female, limp, lazy, insolent. Every country road swarms with them, and the country people begin to look upon them as an inevitable infliction, less dangerous when fed and sheltered than when hungry and at large. Refuse them food, and your hen roost pays the penalty. Deny them a bed in the barn, and they set it on fire. They travel in gangs and disperse to forage, levying contributions right and left. Their vagrant life suits them; and miserable as they seem to be, no proffer of honest wages for honest work will induce them to leave the road. Every season their number increases, and competition only increases their audacity. Unless the evil is differently dealt with, it will soon become as intolerable as it was in Bavaria.

No method of treatment involving large preliminary outlay for workshops, concert of action, or central authority can be looked for here; we need not one but ten thousand Rumfords. Every town must apply its own remedies: nevertheless it would not be hard to devise a plan by which the whole system of tramping could be as quickly broken up as it was in Bavaria, and that without taking the tramps from the roads they love so dearly.

Any town can inaugurate the plan by enacting and enforcing a regulation to this effect: Fix the penalty for begging—that is, professional begging—at ten days' labor on the highways for each offense; there is no danger of a failing demand for that sort of labor for the next fifty years. Give to every citizen the power to make arrests in cases of vagrancy; and for every ten days' labor by the party so arrested, credit the person making the arrest with five days toward the working out of his road tax. For his labor, give the tramp decent board and lodging, and from ten to fifty cents a day as wages, according to his efficiency. Let such a law be rigorously executed, and in a little while we should have better roads and fewer tramps.

The honest seekers for work would suffer less under such a system than they do now, when they are apt to be confounded with professional beggars, who are always in search of a job—somewhere else. If seriously in need of work and money, the temporary tramp would simply have to apply to the road master, who would never be without employment to give and fifty cents a day to pay for it. The work hunter would not be long in acquiring enough to pay his way further or to support himself until he found work in the neighborhood. Farmers and others in want of help would soon learn to resort to the road gangs to pick their men, the volunteers being free to engage themselves at any time, those under arrest when their ten days were up. The professionals would more or less quickly learn to prefer free labor at high rates to enforced work on the roads at low rates; in the meantime an enormous "waste product" would be utilized, and the highways improved at small cost to the residents. It is safe to predict that any community adopting such a plan would soon have better roads or fewer beggars—possibly both.

THE WRECK OF THE SCHILLER.

A terrible marine disaster occurred on May 7, off the Scilly Islands, near the English coast. The Schiller, a new and magnificent steamship belonging to the Eagle line, was entirely wrecked. The ship was on her voyage from New York to Hamburgh, and was endeavoring to reach Plymouth, England, in the midst of a thick fog, which, for three days, had prevented observations. The captain probably mistook his position, and at ten o'clock at night the vessel struck on Retarrière reef, while under almost full steam headway. A strong gale and heavy sea speedily caused her to drift broadside on the rocks, the waves sweeping her decks, and finally, as the tide rose, carrying away her masts, which were loaded

with passengers who had ascended the rigging for safety. But two of the boats reached shore; and out of three hundred and eighty-five people on board, but forty-three were saved. Ordinary life preservers, it appears, were on board; and after the shock, every woman was secured in one. It is curious to note, however, that, despite this precaution, all, with one exception, were drowned.

It is impossible to suggest any means of safety which could be provided, which would preserve life under such circumstances as these, in the midst of a raging sea; but we are not without hope that some inventor will yet devise a life preserver capable of meeting all emergencies. The apparatus must be such as to support the person entirely independently of his own exertions; it must prevent his becoming drowned by constant submersions by the waves breaking over his head; it must be capable of easy application, and be as self-adjusting as an old coat. There must be but one way of getting into it, and that perfectly obvious under extreme excitement; and to sum up all, it must possess the element of simplicity to such a degree that a thoroughly frightened woman cannot by any possibility mistake what it is for, and what to do with it.

The Schiller had eight boats, and seven watertight compartments. Her length was 375 feet, beam, 40 feet, and tunnage, 3,000. Her engines were of 3,000 indicated horse power. She made her first trip in February, 1874. Her cost was $800,000, gold.

A SUCCESS FOR THE FISHERY COMMISSION.

"Never see'd nuthin like it, Sir; I've been a settin' nets on this 'ere river for more'n ten year, and there aint been no time when North River shad was as many as they are now. They're as plentiful as porgies, and we can't get nothin for 'em. Why we used to get our two dollars or a dollar an' a half a piece for them in the early spring; but now—why there's an old woman a sellin' em out of a keg for twenty-five cents a pair. It's ruinous, this is: them fishery fellers have just busted the business; I might jes' as well sell the nets, and take ter mackrel fishin'." Thus remarked a Washington market fish dealer to us the other day, after we had requested his opinion on the sudden increase in the shad catch, which over 30,000 fish taken already this spring denoted. "Them fishery fellers," in other words the State Fishery Commission, had stocked the river anew, broken up the fish famine, and filled the Hudson with finer and better shad than have been seen in it for years. The use of nets extending clear across the stream, which now, we believe, is forbidden by law, had resulted in practical depopulation; for the fish were completely barred out of the head waters where they were wont to spawn. Gradually they diminished until North River shad became a dainty far beyond the reach of the average pocket.

Three or four years ago, Science, under the guise of Mr. Seth Green and his assistants, set to work to make up the deficiency. Five million young fish were placed in the Hudson and its tributaries, and the result we are now gathering. This is a grand success for the pisciculturists, and the people will appreciate it. We trust that it is but the precursor of other palpable proofs of the possibility of enlarging our supply of finny food; for an increased popular interest, which will thus be engendered, is sure to be followed by substantial contributions through which the labors of the fish culturists can be aided and their value further augmented.

DESIGN PATENTS AND TRADE MARKS.

The importance, to manufacturers, merchants, and others, of securing protection for the use of emblems, vignettes, or names on their goods, whether of domestic manufacture or imported, does not seem to be sufficiently appreciated. Trade marks are granted to any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, and extend for 30 years. A great many agents of foreign manufacturers, residing in our large cities, have availed themselves of the simple provision of our law by securing trade marks on imported goods. But our own manufacturers do not seem to be alive to the importance of availing themselves of that protection, afforded under our patent laws.

The "centennial" year is approaching, and we should think that any manufacturer would do well to secure a trade mark on the word as applied to a great variety of articles, such as hats, caps, collars, shirts, shoes, knives, inkstands, stoves, ranges, etc.

The above remarks apply with equal force to all persons who neglect to take patents on any new and original designs for busts, statues, stove plates, picture frames, crockery, cutlery, stoves, or any other ornamental articles. Patents are also granted on any new and original design for the printing of woolen, silk, cotton, or other fabrics, any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture. Design patents afford protection for different periods (three and a half, seven, or fourteen years) as the party applying may elect, and the cost varies accordingly.

For information on the securing of trade marks and design patents, address the publishers of this paper, who will be pleased to impart, free of charge, all necessary advice.

THE NEW INTERNATIONAL POSTAL RATES.

On and after July 1, uniform postal rates will be collected on mail matter sent between the United States and Germany, Austria, Hungary, Belgium, Denmark, Egypt, Spain, Great Britain, Greece, Italy, Luxemburgh, Norway, Holland, Portugal, Roumania, Russia, Servia, Sweden, Switzerland, and Turkey. After January 1, 1876, France is also to be included in the union.

These new rates have been established by treaty between the different powers, and offer in some cases great reductions on the charges now existing, while in others the tariff is increased. To all the above countries, the tax for letters, paid or unpaid, per half ounce, is ten cents; postal cards, two cents each; newspapers under four ounces, two cents; other printed matter, samples, etc., two cents per two ounces or fraction. The registration fee on any letter is fixed at eight cents. For letters, these rates are less than the present to Spain, Egypt, Greece, Portugal, Russia, and Turkey; to other countries, with the exception of Italy, Norway, Holland, and Roumania, they are increased. The newspaper postage is largely reduced in every case, excepting in that of Great Britain, to which country it remains practically the same. The postal card rate is an innovation, and the fact that a missive may soon be sent from San Francisco to Constantinople for two cents is certainly a remarkable indication of progress.

The public will be greatly the gainers in thus having a fixed and reduced rate of postage, to nearly all the civilized countries, substituted for the numerous and different charges now in existence.

SUCCESSFUL TRANSPLANTATION OF BONE.

Speaking of surgical operations in a late issue, we said that attempts had been made to substitute healthy for diseased bones by a sort of grafting process, but they had fallen short of complete success.

A peculiarly interesting, because completely successful, operation of the sort is reported in a recent German medical journal. The patient was a young officer, twenty-four years of age. In 1870, he received a gunshot wound which resulted in a false joint in the middle of the right ulna—the large bone of the fore arm. The functions of the limb were seriously impaired, notwithstanding the smaller bone, the radius, was uninjured. To relieve the deformity, the false joint was laid bare, and the cartilaginous ends of the bone, together with the false ligament, were removed by strong scissors. Then the upper part of the ulna was sawn half through, about two inches above the end of the bone, and the upper piece, with its enclosing sheath—the periosteum, by which the nutrition of the bone is effected—was split off with a hammer and chisel, leaving, however, a small bridge of the periosteum to keep the bone alive. The detached bone was neatly fitted into the place of the false joint; the fatty and indurated soft parts were divided so as to set up an inflammatory reaction; the bleeding was checked by a stream of carbolized water, the wound closed by sutures, and a fenestrated plaster of Paris bandage applied. A single splinter of dead bone subsequently came away. The patient made a perfect recovery, regaining such full use of his arm that he was appointed to a regiment.

OUR NATIONAL UNIVERSITY OF TECHNOLOGY.

The late Hon. J. C. Osgood, to whom we owe the canal dredge and other useful inventions, became an inventor, it is said, through his lively sense of the ridiculous. He was in an upholstering establishment one day, where he saw a number of people at work picking and curling horsehair. The systematic waste of time and labor involved in the operation seemed to him so ridiculously absurd that he laughed heartily, rushed out of the shop, and—so the story runs—invented a picking and curling machine which "produced a revolution in that branch of industry." Having tasted the sweets of invention, he went on to more serious achievements.

Volumes of similar incidents might be compiled from the experience of inventors in this country. There is scarcely an industry which has not been more than once revolutionized by means of labor-saving inventions: scarcely an inventor whose inventive genius has not been awakened by some seemingly trifling circumstance, some happy thought, and afterwards developed by creative exercise.

The rationale of such occurrences is worth inquiring into. Why do such things happen so frequently here, so seldom in other countries?

It was a Frenchman who said it was to be expected that a Yankee would be sharp at a bargain. It was dinned into his ears from earliest infancy; the burden of his mother's lullaby was: "Buy low, baby!" Still more, according to the facetious Englishman, is it to be expected that a Yankee will invent. It is born in him. While the baby lies in his cradle he invents an improvement on it, and says to himself: "When I'm a little bigger, I'll take out a patent!"

Seriously, there is more in the idea than the Englishman gave himself credit for. The great incentive to invention—an incentive which has made us a nation of inventors—is the possibility of taking out a patent easily and cheaply. Every American knows that, for an almost nominal sum—which might be further reduced to the country's advantage—the Patent Office will give him a certificate of exclusive proprietorship in any new idea he may develop, and that the courts will protect him in making as much money out of it as he can during the term of seventeen years. He knows that there is no more profitable investment for capital than a good patent; no way by which a man without capital can command capital so surely as by a good invention; no property more productive than a good patent; no way by which brains will bring to the possessor a greater portion of this world's goods than through invention; no means of self-culture so effective or so sure to have its good results so promptly recognized by the world. Consequently the country swarms with inventors, each doing his best to make life easier and richer to every inhabitant of the land. The inducements which the government holds out to men of ideas have thus made the Patent Office practically a National University of Science and Art, with millions of students. Its functions are those of a true university, to encourage study, to examine and certify results, irrespective of the age, sex, or nationality of the applicant; and its degrees are such as practical men covet.

Where our literary institutions graduate hundreds, our National University graduates thousands. Its degrees cover the widest possible range of merit, yet their worth is not exceeded by the degrees of Harvard or Yale. Notwithstanding the multitudes of unimportant patents issued, the multitude of patents which, for one cause or another, are never practically developed, the average value of a patent to the possessor and to the country at large is greater than the average value of a farm. We owe this enormous addition to national wealth, not so much to national genius for invention, as to the fact that inventions are encouraged by a liberal system of granting patents, and a spirit of great liberality in their interpretation by the courts.

The opinion prevails in some circles that the inventor, like the poet, is born, not made; that great inventions are, like great poems, the fruit of inspiration; and that the inventor needs none of the inducements and favorable conditions required for less creative work. Nothing could be wider from the truth. Invention is an art to be acquired by persistent effort, just as any other art is: the fact that men differ in natural capacity for such work no more proving the art unacquirable than similar diversity in capacity for other arts proves them to be altogether innate. And though many striking inventions have been made, like Goodyear's, through accident, and by men whose attention had never before been directed that way, still, as a rule, such accidents are few, and happen only to men on the watch for them, men so accustomed to regard all things as open to improvement that they are ready at all times to follow up the slightest clue to a new process or application.

To any writer who wishes to cultivate a new and profitable field, we could not suggest a more promising one than the interior history of inventions and inventors, to discover the process by which great inventions and great inventors have been developed. Their beginnings and failures would be peculiarly instructive. For of many a man, known to the world only as a successful inventor, the Patent Office has records of a slow development from weak and insignificant beginnings, often in an entirely different field from that wherein he has achieved his successes. Time after time he has come up to the great university for a degree, only—to use a bit of scholastic slang—to be plucked. Not unfrequently men begin so low even as to attempt a perpetual motion, in utter ignorance of all mechanical principles, and by study and experiments work themselves up to an honorable standing, sometimes becoming public benefactors of no mean order.

Where patents are less freely given, such developments are impossible. Heavy fees and unfavorable conditions discourage every effort; the poor man—and most inventors are poor to start with—cannot patent his invention if he makes one; without a patent it is useless to him; so, though he has the crude idea, or has the natural capacity for great inventions, he never makes any, and the world loses what might be of inestimable value.

A New Cause of Trichinæ in Pork.

Some new cases of deaths, due to the eating of pork infested with *trichinæ*, which are being quoted in Western journals, should be the means of directing public attention anew to the horrible disease of swine, called *trichinosis*, and to the fact that, when once the parasite attacks a human being, the result is prolonged suffering and, in a multiplicity of instances, death. The worm existing in the pork literally bores its way out of the stomach and into the muscles.

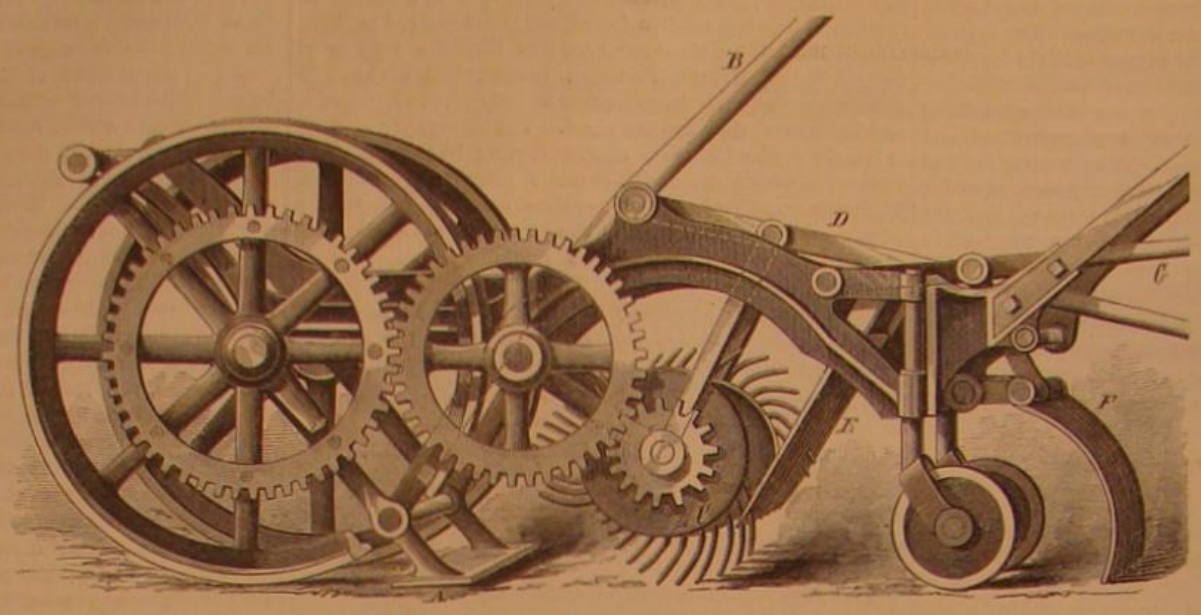
It has lately been found that swine may become infested with trichinæ through eating carrion, or even decayed vegetable substances. This is a point worth consideration by farmers who incline to the belief that dead chickens, putrid swill, or any other filth about the place is legitimate food for the pig. The animal is not dainty in his tastes, and will lunch off his dead relatives with infinite gusto; but it is the poorest economy to permit him to assume the rôle of scavenger. No milk dealer will allow his cows to eat garlic if he can help it, though the brutes are crazily fond of the odoriferous weed; and there is certainly more reason for the farmer to see that his porkers have no access to unclean food. In the one case, if precaution be neglected, the taste of the milk is affected; in the other the entire flesh is rendered poisonous and dangerous food.

The Coming Cincinnati Exposition.

It will be seen, from an advertisement in another column, that the sixth Grand Industrial Exposition held in Cincinnati is to be open for the reception of goods on August 2 next. An important feature in this Fair is the thoroughness, accuracy, and honesty with which the tests of machinery are conducted, in contrast to the irregular and unreliable manner in which the same have been carried through of late in some other well known exhibitions. A large number of valuable prizes are offered, and excellent opportunities will be afforded for the exhibition of goods. Applications for space should be made at once. The Fair opens to the public on September 2, and closes October 9.

IMPROVED WALK AND ROAD CLEANER.

In large pleasure grounds, such as the Central Park in this city, or in extensive country seats, the labor of keeping the walks and roads clean and free from weeds is both arduous and constant, requiring the employment frequently of a large number of men. A new machine has lately been devised for this purpose, which, drawn by a horse and guided by one man, does the work far more effectually and expeditiously. It is the invention of Mr. Robert McKinley, a practical gardener of Hyde Park, N. Y., and its construction and capabilities will be understood from the annexed illustration.



McKINLEY'S WALK AND ROAD CLEANER.

A is the hoe, which flares forward so as to work close up against the edges of the walk, cutting the same square and clean. This is hung to the forward axle, and is also suitably jointed to a lever, B, by means of which it can be depressed to cut to any required depth, or raised out of action altogether. Following in rear of the hoe is a rotating rake, which may be also lowered or raised through jointed bars connecting with the hand lever, D. The rake is provided at one end with a pinion which is revolved by a gear wheel which, in turn, is rotated by the cog wheel on one of the main wheels of the apparatus, said main wheels being loose on the axle. The teeth of the rake are kept clear by the comb, E. Lastly, in rear of the machine is a gathering rake, F, which may be governed by the lever, G.

The hoe, A, serves to cut out the weeds, after which the ground is raked and the weeds shaken clear of earth by the revolving appliance. Lastly, the gatherer collects the refuse and deposits the same at proper points according to the will of the operator. By replacing the hoe with another of different form, the machine may be utilized for cultivating and other purposes of the farm.

The invention is manifestly a labor-saving one, and is of timely importance just at present. For further particulars the inventor may be addressed as above.

THE MERRIMAN LIFE-PRESERVING DRESS.

We recently published an account of Captain Boyton's daring attempt to swim from Dover to Boulogne, in the life-preserving dress invented in 1869 by C. S. Merriman. Although the adventurer did not complete his task, a journey of probably 30 miles, lasting 15 hours, must be considered a triumph for the inventor, as well as a proof of Captain Boyton's courage and endurance.

Our illustration gives a clear idea of the manner of using the invention, which certainly seems to be a comfortable and pleasant mode of traveling by sea. Under full sail, with the paddle for steering apparatus, the voyager seems to be as safe on the crest or in the trough of the waves as he would be in a boat; and the reclining position is much less wearisome than either standing or sitting. The steamer Rambler convoyed him across the channel, and he was much applauded when he landed from that vessel in Boulogne harbor.

CAPTAIN BOYTON IN MID-CHANNEL.

The Philadelphia Exhibition.

In little more than twelve months the largest exhibition building that the world has yet seen will be opened at Philadelphia. We have already published some descriptive particulars of the huge structure now springing up in one of the principal centers of American commerce. The most recent advices from the States tell us that within the next two months no fewer than ten thousand hands will be actively employed in its construction. The circulars of the British Commission have been issued by Mr. Cunliffe Owen, and applications for space must at once be sent in. It is not too early, then, to consider what the project really means, and we can assure our readers that the subject deserves their best attention. Although the exhibition is, after all, to be nominally provincial, and government aid is withheld, it cannot be denied that the magnitude of the undertaking will really confer on it the dignity of a national enterprise. So far, therefore, the Philadelphia Exhibition cannot well be regarded as inferior in its scope to that of Paris in 1867, or of Vienna in 1873. Many engineers and manufacturers of Great Britain will therefore contemplate the sending of their productions to the other side of the Atlantic. Our purpose now is to urge upon these gentlemen the importance of considering very carefully what they are about before they incur any expense in carrying out this idea.

In plain English, international or provincial exhibitions are simply great bazaars, in which space is taken and to which goods are sent, either to effect sales, or to serve as advertisements. The latter scheme has been so thoroughly carried out, indeed, that instances have occurred in which manufacturers have agreed for space, and exhibited nothing after all but dozens of photographs of their wares, and cases of the medals which they had previously obtained elsewhere. The Philadelphia Exhibition will prove no exception to the general rule. It will constitute a gigantic bazaar, in which a good trade may or may not be done, according to circumstances.

But the question arises here: Is what England is likely to receive, in return for her trouble, worth having? In one word, will it be a good speculation to exhibit at Philadelphia in 1876? We call spades spades, it will be seen, and have no fear of shocking our readers when we state that the work of exhibiting in the present day has become a speculation, which can only be justifiable when it affords a fair prospect of proving remunerative. Let us take this consideration as the basis of our reasoning regarding the propriety of exhibiting at Philadelphia, and we venture to think it can easily be shown that no exhibition has ever existed which holds out so little promise of being serviceable to English manufacturers. The principal things we have to sell as a nation are coal, iron, machinery, and woolen and cotton goods. It is not likely, for obvious reasons, that any English coal owner will do at Philadelphia as continental coal owners did at Vienna, and exhibit trophies of mineral fuel, so that we may dismiss coal from our list at once. All the remaining articles are so heavily burthened by import duties that it is vain to expect that we can trade successfully in them with America. On woolen goods, for example, a tax of fifty cents a pound, and 40 per cent *ad valorem*, must be paid before they can be taken out of bond. Under such conditions, what possible value can accrue to our Leeds or Huddersfield houses by exhibiting in the United States? As regards iron, again, it is obvious, in the first place, that we can show nothing which America cannot produce equally well, albeit at a much greater cost; and the idea of establishing any trade in iron with the States as a result of exhibiting iron in 1876 is simply absurd. The duty on machinery is just as prohibitive, and the value of the machinery which we send to the States now would certainly not be augmented by a single dollar if every engineer in the United Kingdom exhibited at Philadelphia. It may be urged, perhaps, that, at all events, goods sent for exhibition would be admitted and sold duty free, and in so far would pay for the sending. This is a mistake. Goods sent to the States for exhibition will be virtually in bond in Fairmount Park, and the exhibitor can carry them back to England without paying duty; but if he sells anything for use in the States, the custom house officers will demand and must obtain the tax before it will be suffered to leave the building. In the fact that a prohibitive American tariff intercepts the course of trade between the two countries lies the reason for which we assert that English exhibitors can secure no possible benefit of any kind by sending their productions to Philadelphia.

We are not singular in holding this opinion. The weavers of Kidderminster have determined that they will send no carpets for exhibition. The implement makers of Birmingham will keep their goods at home. The leading agricultural engineers have already held a meeting, to discuss the propriety of exhibiting in 1876. After careful discussion, the following resolution, moved by Mr. James Howard, Bedford, and seconded by Mr. Shuttleworth, Lincoln, was unanimously passed: "That, looking to the prohibitory duties—from 30 to 40 per cent—imposed by the United States upon English agricultural machinery, the Association of Agricultural Engineers recommends its members to hold aloof from the Philadelphia Exhibition, considering the imposition of prohibitory duties to be out of harmony with the objects of international exhibitions." Members of nearly the whole of the great firms, and many of the smaller ones, were present, and the feeling was that no good could accrue to the English makers from exhibiting, although it would unquestionably be of advantage to American makers to have our best specimens of agriculturing engineering displayed before their eyes.

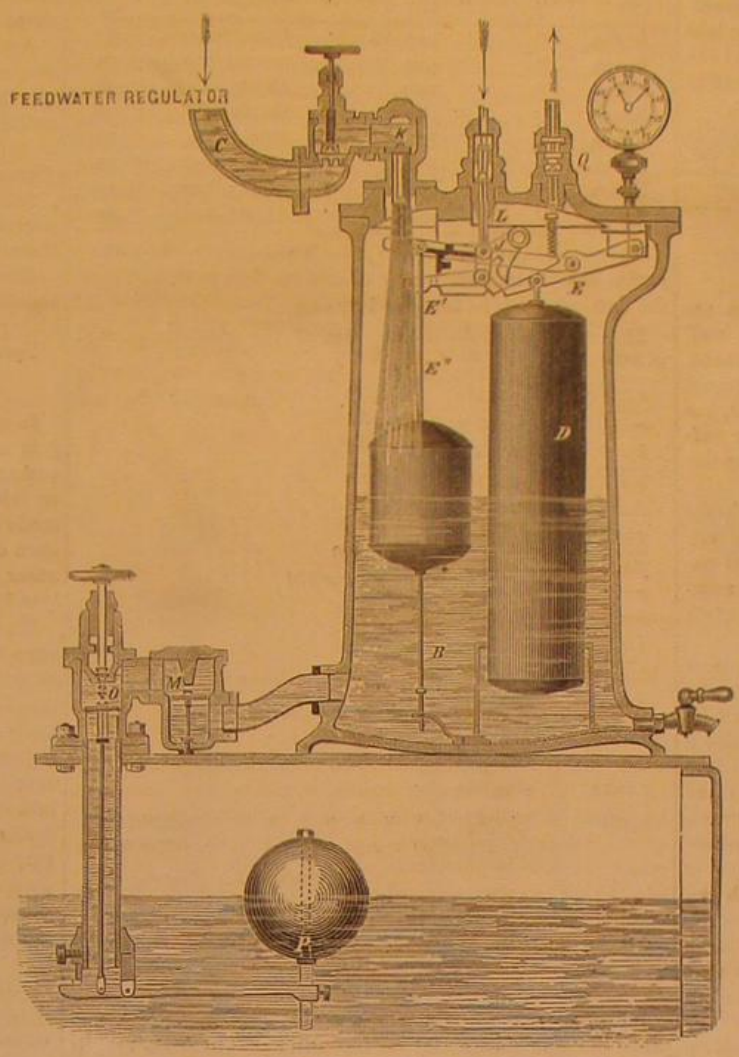
The fact that the United States *pin their faith on protection*, both in theory and practice, renders it impossible that exhibiting at Philadelphia could repay English exhibitors. A nation which carefully excludes the wares of other countries has no right to expect those whom she treats as trade foes to send their choicest productions to her for inspection.

There is yet another reason why Englishmen should hesitate before taking part as exhibitors in the Philadelphia enterprise. Apparently the matter may be regarded as of little importance, but it really deserves very careful consideration. Up to the present moment all experience goes to show that the Americans are unable to carry out with success the organization of an exhibition. The questionable transactions which disgraced the administrative department of the American section of the Vienna Exhibition are, no doubt, more or less familiar to all our readers. Scarcely a "fair" can be held in the States that is not attended with some more or less unworthy squabble among officials, exhibitors, or both. Have we any reason to expect that everything will be done in Fairmount Park during the summer of 1876 with a strict regard for the best interests of British exhibitors? The United States have availed themselves of their opportunity to show that they can do without us. The chance of manifesting a reciprocity of feeling on this point is now afforded to British manufacturers. We trust they will not suffer the occasion to slip. They will have truth and justice on their side if they say to the people of America You will not buy from us; why should we trouble ourselves to show you what we have to sell? Of course, it may be said that this is a very selfish and illiberal policy. Those who talk in this way are ignorant of the true character of such exhibitions, and practical men, whether engineers or journalists, must deal with things as they are, not as they are believed to be by amiable enthusiasts.—*The Engineer.*

IMPROVED BOILER FEED REGULATOR.

Messrs. Bede & Co., of Verviers, Belgium, have recently introduced a new device for automatically controlling the supply of water to a steam boiler, which, they claim, insures a uniform hight of water in the boiler, thus avoiding danger of explosion and diminished pressure from too sudden or over feeding. It consists, principally, in the water cistern, B, which communicates with the boiler through check valve, M, and stop valve, O, and it is fed by the pipe, C, through the valve, K. When the water in cistern, B, rises so as lift the smaller float, E'', the extension lever, E', is moved so as to disengage the larger float, D, which has previously been held down by the lever, E; and the float, D, lifting the lever, E, actuates the bell crank, J, to open steam valve, L. The entrance of the steam at L closes the valve, K, shutting off the water supply.

Equal pressure is thus established in the receptacle, B, and the steam boiler, and the water may then pass through the valves, M, O, into the latter. The valve, O, is regulated by the boiler float, P, so as to be opened or closed, to maintain a uniform hight of the water in the boiler. The smaller float of the receptacle, E'', follows the falling water, and strikes a pin or stop at the lower end of its guide rod when the receptacle is nearly empty. The weight of the small releases the large float, D, which presses on the link, J, closes the valve, L, and opens the water supply valve, K, and an exit valve, Q. The steam escapes through the valve, Q, into the reservoir, where it is condensed, while the water fills the receptacle, B, through valve, K. The supply is thus kept continuous through the alternate action of the apparatus, which is also provided with a registering device, indicating how often the receptacle is emptied and filled, and consequently what amount of water has been used. By comparison with the quantity of fuel consumed, a simple and reliable test of the operation of the boiler and engine is afforded, the control of the engine by the attendant is facilitated, and economy in the use of fuel necessarily follows. The regulator was exhibited et the Vienna Exposition in 1873, and received a premium medal at the Paris Exposition in 1867. A number of these appliances are in use in Europe.

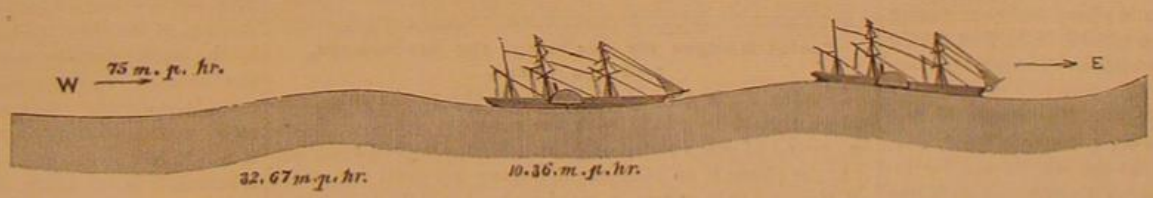


BEDE'S FEED WATER REGULATOR.

HIGHT OF WAVES.

J. W. Black, in a recent letter in *Nature*, says: "Dr. Scoresby's observations in the North Atlantic record 24 feet, 30 feet, the highest 43 feet, and the mean 18 feet in westerly gales; and the frigate Novara, 20 to 30 feet off the Cape Promontory. French observers in the Bay of Biscay state a hight of wave of 36 feet; Capt. Wilkes, U.S.N., writes of 32 feet in the Pacific, and Sir J. Ross of 22 feet in the South Atlantic. Hights of waves in N.W. gales off the Cape of Good Hope were computed at 40 feet, those off Cape Horn at 32 feet, in the Mediterranean Sea at 14 feet 10 inches, and in the German Ocean at 13½ feet; but in British waters they are only found to average 8 to 9 feet. The velocity of ocean storm waves was observed by Dr. Scoresby in the North Atlantic to be about 32 miles per hour; Capt. Wilkes recorded it at 26½ miles in the Pacific, and French sailors in the Bay of Biscay at 60 miles an hour. Dr. Scoresby has estimated the distance between or breadth of his Atlantic storm waves at about 600 feet from crest to crest, which is only about half of that stated in the letter, and with a proportion of only $\frac{1}{20}$ for hight to breadth. Dr. Scoresby states that his waves of 30 feet in hight move at the rate of 32 miles per hour.

The accompanying diagram is constructed according to Dr. Scoresby's scale of measurements, 600 feet breadth, 30 feet hight, and 220 feet vessel, with rates of wind, wave, and vessel; and from it one may ponder on what small dimensions these terrific-looking waves are constructed, and that a ship after all looks only like a cork or chip on the great seas."



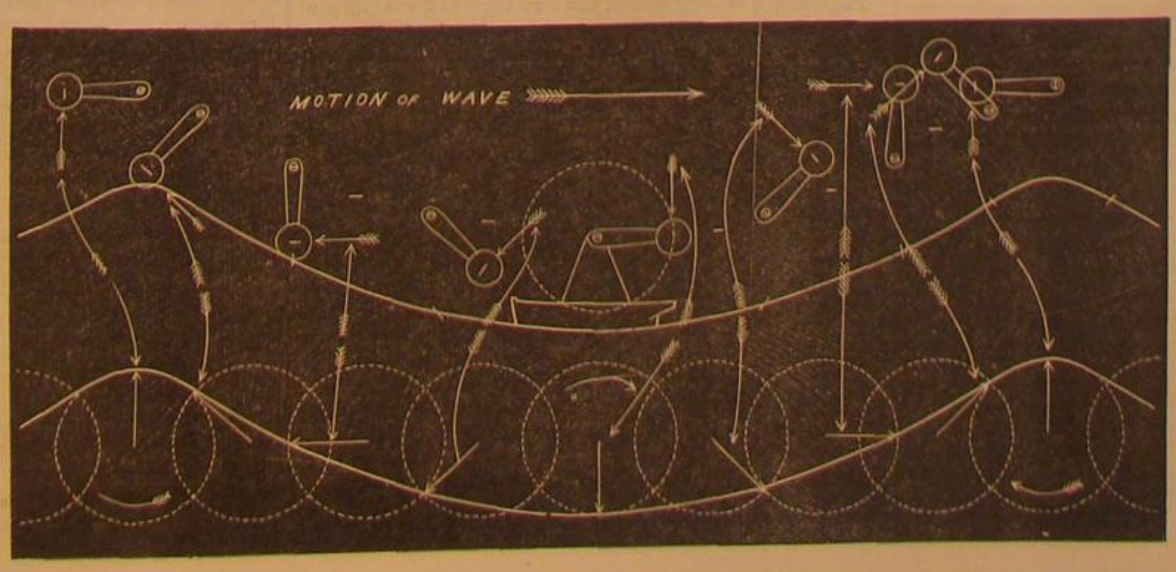
MOTIVE POWER FROM WAVES.

At a recent meeting of the Institution of Naval Architects a paper was read by Mr. B Tower, on a method of obtaining motive power from wave motion. He said that this inquiry originated with Mr. Deverell, whose proposition was to suspend a heavy weight on board a ship by means of springs, and to obtain motive power by the oscillation of this weight through a distance not exceeding the hight of the waves.

It however appeared to Mr. Tower that, since the centrifugal force of wave motion in a vertical direction is alternately added to and subtracted from the force of gravity, thereby causing a virtual vaiation of the intensity of that force, the question might be broadly stated as follows: Supposing the force of gravity to vary in intensity at regular intervals, that is, to become alternately greater and less than its normal amount, what is the best means to obtain the maximum amount of energy from a given weight oscillating under the influence of these variations? For example, supposing the force of gravity to be for three seconds one fifth greater, and for the next three seconds one fifth less, than its natural intensity, and suppose that we have a weight of five tuns suspended by a spring, with an infinitely open scale, so that the spring will continue to exert a uniform upward force of five tuns, no matter how far the weight moves up and down, it is clear that, during the three seconds' interval, during which gravity is one fifth more than its normal intensity, the five-tun weight will virtually weigh six tuns, and will thus exceed the upward force of the spring by a downward force of one tun; in the same way, when the force of gravity is one fifth less, the weight will only weigh four tuns, and the spring will then exert an unbalanced upward force of one tun. Now, as energy or power is defined as force moving through distance, it is clear that the quantity of energy or power to be obtained by this system will depend on the distance through which this weight is caused to move during each successive variation of gravity. Thus, supposing that during the *plus* interval it moves downwards through one foot, and during the *minus* interval it moves upward through one foot, it is clear that during each of these intervals it will exert a force of one tun moved through one foot, that is, one foot tun; but if, instead of one foot, it moves through ten feet, it will exert ten times the power—that if, ten foot tuns; or if moved through one hundred feet, it would exert one hundred foot tuns during each interval of three seconds.

The first experiments Mr. Tower made, with a model apparatus constructed on these principles, showed him that the best arrangement would be to put a weight on the end of a revolving arm, whereby the centrifugal force of the wave motion might be utilized as well as the rising and falling motion.

The diagram shows the position of the vessel and of its revolving arm at all parts of a wave; the arrows show the direction of the centrifugal force of the wave motion according to the generally received theory. This force is upwards at the crests, downwards in the hollows, and horizontal midway between the crests and hollows. If the weighted arm is compelled to assume successive angular positions, so that it is always at right angles to the force, it is evident that the force will be continually acting to cause the arm to rotate. It is easy to see how the work is taken out of the waves; for when the vessel is descending, the weight is performing the upper half of its revolution, and is consequently exerting an upward centrifugal force; and when the vessel is ascending, the centrifugal force is pushing down and resisting the vessel's ascent, so that the revolving weight affords a resistance against which the vessel can push just as if it were a fixed point in space. The shaft of the revolving weight can be made to turn a screw in the stern of the vessel by means of a proper system of gearing; and by a delicate arrangement of electric brakes and hydraulic accumulators, Mr. Tower proposes to regulate the revolving arm so as always to keep it at right angles to the centrifugal force of the waves.



New Asphalt Paving.

A specimen of street paving has just been laid in Glasgow, the material employed being the rock asphalt which is obtained in the Val de Travers, near Neufchatel, in Switzerland. During last autumn several portions of wood paving, on the same system, were done in Glasgow by a London company; and as they were well executed, they seemed to give very general satisfaction. Profiting, apparently, by the experience gained by witnessing the system of wood paving in operation, the Scottish Val de Travers Paving Company determined upon attempting something similar.

According to this system, a foundation is first formed of Portland cement concrete, about 9 inches in depth, and on this the paving proper is laid. The rock asphalte from the Val de Travers, the material employed in the paving, contains about 12 or 13 per cent of bitumen, and the remainder of the rock consists almost entirely of hard limestone, through which the bitumen is very uniformly diffused. This material is first broken into pieces of convenient size in a crushing mill, and is subsequently put into a disintegrator, in which it is reduced to a very fine state of division. When it has been treated in this way, the asphalt is thrown into a revolving cylinder, in which it is subjected to a temperature of about 260° Fah., which brings it almost to a pulverulent condition. While it is in the state of hot powder it is filled into cast iron molds, in which it is pressed and made to assume the form of bricks, about nine inches long by four inches broad and two inches in thickness. The tendency of its particles to cohere is very great at that temperature. The cast iron molds are so formed that the bricks cast in them have a chamfer or bevel about half an inch broad imparted to them, all round what is intended to become the upper surface: and thus, when the bricks are placed in the causeway, they are separated above by a series of grooves, by means of which an excellent bite is secured for the feet of the horses passing over it. When the cement concrete, forming the substratum, is sufficiently well set, the asphalt bricks are laid in a manner somewhat similar to that of ordinary causeweying with dressed granite or whinstone setts. Instead of bedding them in sand, however, they are laid in a thin stratum of liquid rock asphalt, just as ordinary bricks are laid in mortar, bottom, sides, and ends all being coated with the agglutinating material. The bricks are placed about a quarter of an inch apart, and the space thus left is filled in with a hot liquid, which consists of Trinidad pitch and crude shale oil, and which long remains very tough and elastic, in addition to which it most effectually prevents any water from passing through the pavement.

The portion of roadway executed in Glasgow in the above manner seems to give satisfaction, and will apparently be very durable. Of course there is no actual information avail-

able regarding the durability of the particular specimen of paving under notice; but the experience gained from the Rue Bergère, in Paris, which was laid in 1865 with Val de Traverse asphalt, is quite sufficient on the point in question. After having been in use for fifteen years, a portion of it was lifted in 1869, when it was observed that its thickness had only been reduced from two inches to one and three eighth inches: but while it had diminished in thickness only five-eighths of an inch in fifteen years, it had undergone considerable compression, inasmuch as the actual loss in weight was not more than five per cent. The special feature of the new paving in Glasgow is the almost absolute immunity from slipping which horses enjoy when passing over it.

Correspondence.

Invention of a New Numerical System.

To the Editor of the Scientific American:

In our common decimal system, distinct characters are given to the numbers from one to ten; and it is very well known that, instead of ten, any other number—for instance, eight, or twelve, or sixteen, or even two—may be selected for a base. Such systems have actually been calculated, but they have not come into use: the advantages not being sufficient to counterbalance the inconvenience of changing one system into another.

The subject may be treated, however, in quite a different manner. There is no necessity for taking any base at all, and the numbers may be made to progress in their own natural succession; or, to express it in other words, every number, even one, may be made to serve as a base for a certain time. This can be accomplished as follows:

Instead of dividing off the original units in sections of ten, as in our common numerical system, we divide them in the natural succession of the numbers themselves, first one, then two, then three, etc., and for each division we make a mark in the second column. If, in the first column, a rest should remain, such rest can never be greater than the number of marks in the second column, because if the rest were one greater, a new mark would be made in the second column.

There is no necessity at present for going through the whole process, which would require a great deal of writing and many diagrams. It has taken me nearly twenty years to construct the first twenty numbers. Suffice it to say that the final result is very simple, and can be readily understood by everybody without studying the details.

The whole theory is based upon the fact that the rest in any column can never be greater than the number of marks in the next column. If the marks in the second, third, and all following columns, and all the rests, are divided in the same way, that is, in the natural succession of the numbers one, two, three, and so forth, the numbers will appear in a very simple form, each consisting of a base and a rest; this rest, however, is sometimes naught.

Of course there must be certain characters for the numbers, and the characters of our common numerical system are neither suitable nor sufficient; there must be twenty new characters instead of ten. Hence we have either to invent new characters or use the common letters. The first would require new types for printing, which is too expensive, hence we use letters.

Let the first twenty letters, excluding *j*, represent the first twenty numbers, so that *a* stands for 1, *b* stands for 2, etc., until *u* stands for 20; and let one of the last letters, for instance, *x*, stand for 0. Let us write these numbers in the following triangular shape:

					*u*20
				*o*14	*t*19
			*i*9	*n*13	*s*18
		*e*5	*h*8	*m*12	*r*17
	*b*2	*d*4	*g*7	*l*11	*q*16
*x*0	*a*1	*c*3	*f*6	*k*10	*p*15

These letters and numbers mean:

x stands for 0, *a* stands for 1, *b* stands for 2, etc.

It will be seen that the vowels *e*, *i*, *o*, *u* stand at the head of their columns; if the letter *j* were used, this order would be disturbed.

These letters and numbers are to be used as follows:

Naught	with	the	rest	naught	equals	naught,	equals *x*
One	"	"	naught	"	one	"	*a*
One	"	"	one	"	two	"	*b*
Two	"	"	naught	"	three	"	*c*
Two	"	"	one	"	four	"	*d*
Two	"	"	two	"	five	"	*e*
Three	"	"	naught	"	six	"	*f*
Three	"	"	one	"	seven	"	*g*
Three	"	"	two	"	eight	"	*h*
Three	"	"	three	"	nine	"	*i*
Four	"	"	naught	"	ten	"	*k*
Four	"	"	one	"	eleven	"	*l*
Four	"	"	two	"	twelve	"	*m*
Four	"	"	three	"	thirteen	"	*n*
Four	"	"	four	"	fourteen	"	*o*
Five	"	"	naught	"	fifteen	"	*p*
Five	"	"	one	"	sixteen	"	*q*
Five	"	"	two	"	seventeen	"	*r*
Five	"	"	three	"	eighteen	"	*s*
Five	"	"	four	"	nineteen	"	*t*
Five	"	"	five	"	twenty	"	*u*

This shows that every number may be supposed to consist of a base and a rest. After 20, the progress of the numbers is very easily seen, and may be stated as follows:

Six	with	the	rest	naught	equals	twenty-one, equals *fx*
Six	"	"	one	"	twenty-two	" *fa*
Six	"	"	two	"	twenty-three	" *fb*
Six	"	"	three	"	twenty four	" *fc*
Six	"	"	four	"	twenty-five	" *fd*
Six	"	"	five	"	twenty-six	" *fe*
Six	"	"	six	"	twenty-seven	" *ff*
Seven	"	"	naught	"	twenty-eight	" *gx*
Seven	"	"	one	"	twenty-nine	" *ga*
Seven	"	"	two	"	thirty	" *gb*
Seven	"	"	three	"	thirty-one	" *gc*
Seven	"	"	four	"	thirty-two	" *gd*
Seven	"	"	five	"	thirty-three	" *ge*
Seven	"	"	six	"	thirty-four	" *gf*
Seven	"	"	seven	"	thirty-five	" *gg*

The general rule for writing these numbers is: The second part is to be increased until it equals the first part, and then the first part is to be increased by one.

This table shows the construction of the numbers from 0 to 359026206.

x=0	*q*=16	*gd*=32
a=1	*r*=17	*ge*=33
b=2	*s*=18	*gf*=34
c=3	*t*=19	*gg*=35
d=4	*u*=20	
e=5	*fx*=21	
f=6	*fa*=22	*uu*=230
g=7	*fb*=23	*f x x*=231
h=8	*fc*=24	
i=9	*fd*=25	
k=10	*fe*=26	*u u u u*=26795
l=11	*ff*=27	*f x x x*=26796
m=12	*gx*=28	
n=13	*ga*=29	
o=14	*gb*=30	
p=15	*gc*=31	*u u u u u u u u*=359026205
		f x x x x =359026206

FERDINAND EISSFELDT.

Room 30, 33 School street, Boston, Mass.

An Invention Wanted---Five Thousand Dollars Reward Offered.

To the Editor of the Scientific American:

Believing that the horse has served his time before the street car, and that American ingenuity should allow him to retire before our Centennial anniversary, by inventing some improved motor for street passenger railways, we offer five thousand dollars reward to any person or persons who will invent, perfect, and present to this company any satisfactory device that will propel our cars and can be used on the streets of Philadelphia, provided it is acceptable to this company and its control placed exclusively with us.

R. W. FLOWER, JR., President.

West End Passenger Railway Company of Philadelphia, No. 206 South Fourth Street, Philadelphia. May 7th, 1875.

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

In using Paris green to exterminate the potato bugs, the poison should be mixed with the cheapest grade of flour, one pound of green to ten of flour. A good way of applying it to the plants is to take an old 2 quart tin fruit can, melt off the top, and put in a wooden head in which insert a broom handle. Bore a hole in the head, also, to pour the powder in, and then punch the bottom full of holes about the size of No. 6 shot. Walk alongside the rows, when the vines are wet with dew or rain, and make one shoot at each hill.

In some parts of the country, there have been large numbers of the orchard or tent caterpillars which have left their rings of eggs on the young twigs. If these are now cut off with a clipping pole, it will prevent in every instance a large nest of caterpillars, and be much more easily done than after the latter have grown.

Equal proportions of turpentine, linseed oil, and vinegar, thoroughly applied and then rubbed with flannel, is an excellent furniture polish.

Tin can be removed from copper vessels very thoroughly by immersing the objects in a solution of blue vitriol.

The German washerwomen use a mixture of 2 ozs. turpentine and 1 oz. spirits of ammonia well mixed together. This is put into a bucket of warm water, in which ½ lb. soap has been dissolved. The clothes are immersed for twenty-four hours and then washed. The cleansing is said to be greatly quickened, and two or three rinsings in cold water remove the turpentine smell.

Five parts of sifted whiting mixed with a solution of one part glue, together with a little Venice turpentine to obviate the brittleness, makes a good plastic material which may be kneaded into figures or any desired shape. It should be kept warm while being worked. It becomes as hard as stone when dry.

Artificial malachite which is susceptible to a fine polish is made by precipitating a solution of sulphate of copper in the cold by carbonate of soda or of potash. The precipitate, which is voluminous, should be allowed first to cohere, and is then dried and washed.

Water containing about seven grains of salt in each pint, is, when used continuously, a poison to the weaker forms of vegetation.

The alloy popularly known as oroide, from which a large number of cheap watches, chains, and trinkets are now manufactured, is made of pure copper 100 parts, tin 17 parts, magnesia 16 parts, sal ammoniac ½ part, quicklime ½ part, tartar of commerce 9 parts. The copper is first melted, then the magnesia, sal ammoniac, lime, and tartar in powder are added little by little and briskly stirred for half an hour. The tin is lastly mixed in in grains until all is fused. The crucible is covered, and the fusion maintained for 35 minutes, when the dross is skimmed off and the alloy is ready for use.

A simple way of preparing paper for bank checks, bills, etc., so that no writing can be erased without leaving plainly visible marks, is to pass the sheets through a solution of gallic acid. One milligram (0·01543 of a grain) is dissolved in as much pure distilled water as will fill an ordinary soup plate to a moderate depth.

Sandarac varnish is the best material for mending plaster models. Saturate the broken surfaces thoroughly, press them well together, and allow them to dry.

Silver ware may be kept bright and clean by coating the articles (warmed) with a solution of collodion diluted with alcohol.

Dampness will cause honey to become thin and watery.

The Suet Butter Manufacture.

In spite of the prejudice which exists against suet butter, it is a fact that the manufacture has of late made great progress; and the quantity of the material now consumed is certainly now larger than ever before. We illustrated the mode of making the butter many months ago. The process then described is the same as now practised in this city and other places, under the original patent granted to M. Hippolyte Mége.

There is a large factory in Hamilton, Canada, from which some 2,000 lbs. per week of imitation butter are shipped to all parts of the world. Another and still larger establishment in Boston, Mass., turns out a very great product. In many cases, it is said, this butter finds its way directly to the butter producing districts of New York and New Jersey, and then is sent to market as genuine spring butter. It is certain that immense quantities of the oleomargarin are sold by dealers as true butter, and that the profits of the trade are very large. We see it noted in a daily contemporary that the suet compound is in use in some of the principal hotels and restaurants in this city, and that the frequenters of these places have as yet not discovered the fact. We do not pretend to the skill of the professional butter taster; but we have no difficulty in instantly recognizing the artificial compound. We may add that, not long ago, we discovered it on the table of one of our New York hotels; and after satisfying ourselves as to its identity, we taxed the proprietor with its use. He strenuously denied the charge; but at a subsequent meal, we found the "ox butter" (as the Harvard students have named it) replaced by "cow butter."

We do not mean to say that the oleomargarin is unsavory or unwholesome. On the contrary, it is made with the utmost nicety from the cleanest of materials. Neither is it unpleasant in any marked degree to the palate, nor to the stomach. It certainly is infinitely better than the abomination sold by grocers under the generic name of "cooking butter." Still most persons have a prejudice against suet butter, and that feeling, so far from being weakened, has been strengthened by the knowledge that the reprehensible practice of selling the imitation as the genuine is so widely practised. If the material were advertised and sold uniformly for what it is and on its merits, we have no doubt but that the prejudice against it would in a great measure subside. For shipping to hot climates, it is, no doubt, far better than the butter usually sent to southern ports.

Parliamentary Signal Light.

The gas signal light on the clock tower of the Houses of Parliament is now shown from its new position, 30 feet higher than formerly. The new lantern is constructed to run in and out of a loophole in the roof of the tower—similarly to a ship's gun—so that during the daytime nothing is seen of it, and it is now no disfigurement to the appearance of the tower. The illuminating power is a Wigham's patent gas light, as used for lighthouses, and at present is shown naked, no lenses being used. The light is only visible while the House of Commons is actually sitting. Immediately on an adjournment, the light is extinguished. This light is fully described on page 403, volume XXVIII, and page 40, volume XXIX.

A New Indication of Death.

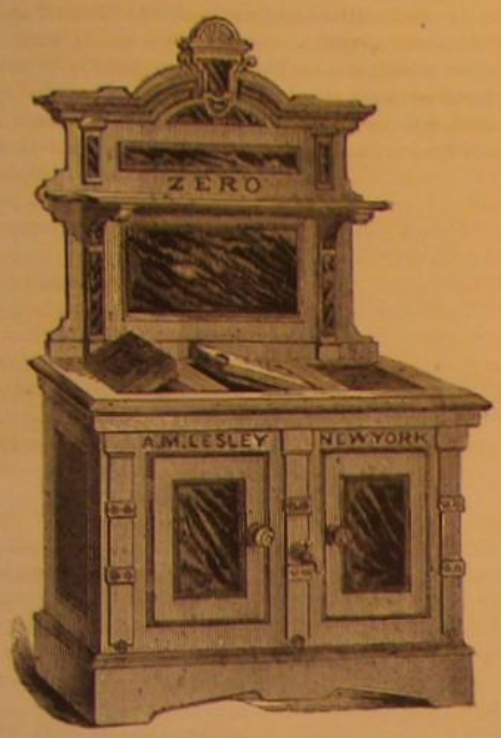
Is the patient really dead or not? is at times a very anxious question. A medical practitioner of Cremona proposes a simple method by which the question may be answered with certainty. It is to inject a drop of ammonia beneath the skin, when, if death be present, no effect, or next to none, is produced; but if there be life, then a red spot appears at the place of the injection. A test so easily applied as this should removed all apprehension of being buried alive.

ELECTRIC science occupies a place of no mean importance in the new opera house in Paris. A special room is set apart as a battery room, in which 360 Bunsen's cells, arranged in sets of 60 on rough plate glass tables, are manipulated to pass a current to any part of the stage, so as to direct the electric light upon any point of the scenery. The sunlight and startling effects produced by French scenists are really beautiful. The rainbow in the opera of *Mosè in Egitto* is wonderful.

AN agreement without consideration is void.

SIDEBOARD REFRIGERATORS.

The season for refrigerators being at hand, persons about to purchase will be interested in knowing what is new in this line. The last improvement we have seen is in the form of a sideboard, as shown in our engraving, made by Mr. Alex. M. Lesley, No. 226 West 23d street, New York city.



As all the refrigerators thus far brought out are only adapted to the kitchen or the hall, the handsomest of them having no claim to any beauty, and much less deserving to be called ornamental, it was for a long time the desire of many housewives to have a refrigerator that would not disgrace a dining room. To Mr. Lesley belongs the credit of having brought out such a refrigerator, in the exterior form of a sideboard, and therefore called the "Sideboard Refrigerator." It is constructed in the most tasteful style, of solid wood—oak and black walnut—and, as the engraving sufficiently shows, is a decidedly ornamental piece of furniture, well adapted for even the most stylish dining room.

It is scarcely necessary to sum up the advantages of having the refrigerator in the dining room instead of in the kitchen. 1st. It is less under the control of the servants, which may be of some importance, especially when wines and delicacies are preserved in it. 2d. It is out of the heat of the kitchen. 3d. It is not exposed to the unavoidable flavors of the kitchen, which may affect certain delicate articles of food. 4th. If a refrigerator diffuses some coolness around it, especially on being opened, it is better that the dining room should have the benefit of it than the kitchen.

In regard to the interior arrangement of these elegant sideboard refrigerators, they are the same as those of Mr. Lesley previously described by us, and this arrangement has been proved very satisfactory in all respects. The water proceeding from the melting of the ice is stored in a separate tank, and can be drawn off for drinking purposes, while the water of condensation, always tainted with the odors of the meats and fruits preserved, is drawn off by a separate channel. This elegant appliance costs about double one of the plain kitchen or so called Zero refrigerators, which has been described in these columns.

Prize offered by the King of the Belgians.

A recent *Landon Gazette* contains a translation of documents which have been received at the Foreign Office respecting the $5,000 prize which the King of the Belgians proposes to award annually for the best work on a subject of national interest. His Majesty explains his design in a letter to M Delcour, the Minister of the Interior, who, in conjunction with the king himself, is to choose the jury of seven members—namely, three Belgians and four foreigners—the president to be a Belgian. The first award is to be made in 1878 for the best work on the national history of Belgium; the second in 1879, for the best work on architecture; the third in 1880, for the best work on the development of the commercial relations of Belgium; and the fourth in 1881, for the best scheme of harbor improvements on low and sandy coasts like those of Belgium. The first three competitions will be limited to Belgian subjects, but the fourth will be open to foreigners. In each succeeding four years, there will be three restricted and one open competitions. At King Leopold's wish, regulations have been drawn up and published by the Minister of the Interior.

The New Twenty Cent Coin.

Dr. Linderman, director of the mint, has selected the design for the new twenty cent silver piece. The obverse will bear a sitting figure of Liberty with the word "Liberty" inscribed on the shield, the whole surrounded by thirteen stars. Beneath the figure is the date. On the reverse is an eagle with the words "Twenty cents." The edge of the coin will be perfectly smooth in order to distinguish it from the twenty-five cent piece.

A Boiling Lake.

Mr. J. Sturge favors *Iron* with the following: "A discovery of some interest has been made in the Island of Dominica, West Indies. Drs. Freeland and Nicholls, Captain Gardner, and Mr. Watt, exploring the steep and forest-covered mountain behind the town of Rosseau, came upon a boiling lake about 3,500 feet above the sea level, and two miles in circumference. When the wind cleared away, for a moment, the clouds of sulphurous steam with which the lake was covered, a mound of water was seen, ten feet higher than the general level, and caused by ebullition. The margin of the lake consisted of beds of sulphur, and its overflowing found exit by a waterfall of great hight."

ARRANGEMENT OF GALVANIC BATTERIES.

The arrangement of the elements into batteries varies according to the purpose they have to serve. A maximum magnetic effect may be obtained from a given number of elements, if they be so arranged that the resistance in the battery is equal to the resistance in the closing wire. A given number of elements can be combined in very different manners. For instance, eight elements can be arranged in four different ways, as shown in Figs. 1, 2, 3, and 4. Which one of these combinations should be selected, in a given case, depends upon the resistance to conduction of the circuit. That combination must be taken, the resistance of which is nearest to that of the given circuit.

In Fig. 1, the elements are connected, one after another, into a battery containing eight successive pairs of plates, and the current has to pass in succession through each of the eight elements.

Fig. 1.

Fig. 2.

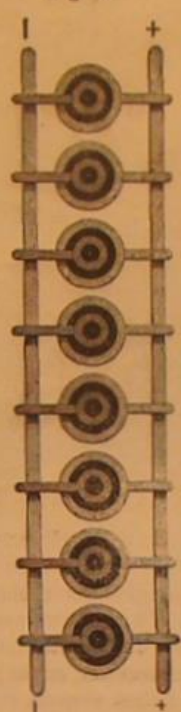


Fig. 2 represents the reverse, all the zinc cylinders being connected together to form one zinc pole, and all the copper cylinders connected together to form one copper pole, the whole forming a single element of eightfold surface. In this case, the elements are connected side by side for the production of the largest quantity of current through a circuit of the least resistance. In the former case, the elements were connected for the purpose of producing the greatest quantity of current through a circuit of the most resistance.

Between these two cases, there are the two others, represented by Figs. 3 and 4. In Fig. 3, the four elements, 1, 2, 3, and 4, one after another, are connected as one battery, as are also the elements 5, 6, 7, and 8. The corresponding poles of both batteries are connected with each other, and hence this battery represents a voltaic pile of four pairs of plates, of which each has double the surface of the pair of plates shown in Fig. 1.

Fig. 3.

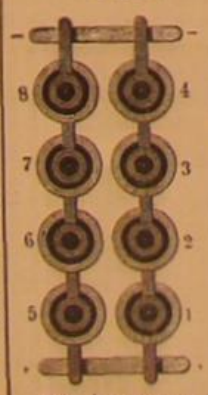


Fig. 4.

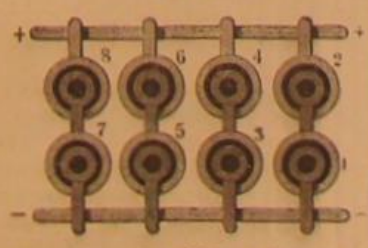
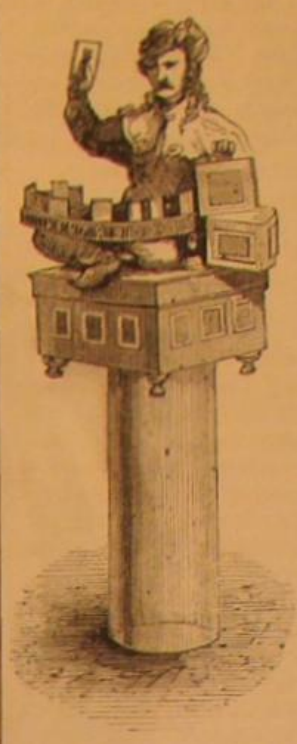


Fig. 4 represents the connections in which each two elements, 1, 2—3, 4—5, 6—7, 8, form a battery of two pairs of plates, whose surface is four times as large as in the pairs of plates shown in Fig. 1. Supposing the resistance of an element to be 4 ohms, the resistance of battery shown in Fig. 1 would be 32 ohms; in Fig. 3, 8 ohms; in Fig. 4, 2 ohms, and in Fig. 2, 0·5 of an ohm. Considering the different combination of the 8 elements represented, it is seen that, as the pile is shortened, it becomes broad in the same proportion; and hence, by making the pile one half as long and twice as broad, the resistance is reduced to one fourth of its former amount.

Now, in determining which combination of the above elements would be the most suitable for any given circuit, reference must be had to the resistance of the circuit; and if the greatest magnetic effect was desired upon each, the resistance of the closing wire, including the electromagnet, must exactly equal the resistance of the battery

PSYCHO EXPOSED.

An exhibition is now being held in the Egyptian Hall, London, England, of which an automaton, called Psycho, until recently, formed a part. The figure performed many curious tricks, solving mathematical problems, and playing cards with great skill and accuracy.



Psycho is an oriental personage, sitting on a box some three feet square and eighteen inches high, while he himself is about twenty inches in hight, placed on a glass cylinder to show that there is no connection with the stage under the table. The movements were, of course, caused and governed by a secret force, but the method of communication with the figure defied detection for a long time. Mr. Maskelyne, the inventor, allowed any one to inspect the figure. One night a military gentleman, among others, sent up his card for that purpose. He examined the glass pedestal and other parts, but could see nothing of any mechanical contrivance. Subsequently, however, the mystery was solved by Mr. W. H Coffin, son of Dr. G. W. Coffin, an American dentist in London, Mr. Maskelyne being unwilling to submit his figure to the test proposed. The solution is that Psycho is worked by the condensation and diminution of the column of air in the glass cylinder on the top of which he sits. Beneath the carpet at the bottom of the cylinder is a perforated plate of zinc, connected with the operator behind the scenes, who, at his will, may increase or decrease the column of air, the figure moving one way or another in accordance with the pressure put upon it. The conjuror was at first disposed to deny the explanation, but Mr. Coffin told the audience that it could easily be tested by Mr. Maskelyne allowing him to put a newspaper between the figure and the cylinder. This the conjuror declined to do, and then followed great applause, when it became recognized that Psycho, as a mystery, had passed away.

London Fires.

The actual number of fires in London in 1833, as returned, was 458. The population then was 1,710,059. This gives one fire to every 3,734 persons. Last year the fires were 1,573, in a population of 3,400,701, or at the rate of one fire to every 2,162 persons. The population of London in 1874 was not quite double that of 1833, but the fires last year were more than three times as numerous as at the earlier date. Had the fires simply increased in the ratio as the population, the number last year would have been 911 instead of 1,573. The actual excess, therefore, is fully 72 per cent. A further investigation of data shows that this disproportionate growth of the London fires is a persistent phenomenon during a considerable series of years.

Reverting to the simple question of fires, apart from the success achieved in extinguishing them, there is a remarkable fact pervading the statistics—namely, that fires have a tendency to outstrip the population.

The frequency of fires in London far exceeds anything known in ordinary country towns. Moreover, we have the statistics of London itself, showing that, when it had half its present population, it had less than one third its present number of fires. The conclusion which appears warranted is this—that a population distributed over a number of separate towns is less liable to outbreaks of fire than the same population brought together within the compass of one town. In order to explain this social phenomenon, we may allude to the greater density of population in large towns as compared with small ones, though, on the other hand, this very density would seem to afford means of protection by rendering it less likely for a fire to pass beyond the incipient stage without being detected. On the whole, we are warranted in concluding that there are circumstances connected with the furnishing of houses, the storage of goods in warehouses and elsewhere, and the general hurry and pressure of metropolitan life, which involve contingencies more favorable to the occurrence of fires than are likely to be found in many country towns. The fact that fires increase more rapidly than the population creates a danger in large and growing communities lest the arrangements for extinguishing fire should not keep pace with the real necessity. There is also the circumstance that large cities have large buildings, so that fires in such localities are likely to be not only numerous but extensive. Examples of this kind are not wanting in London, and the peril is increased by the enormous hight to which buildings are carried where the ground is costly.—*The Engineer.*

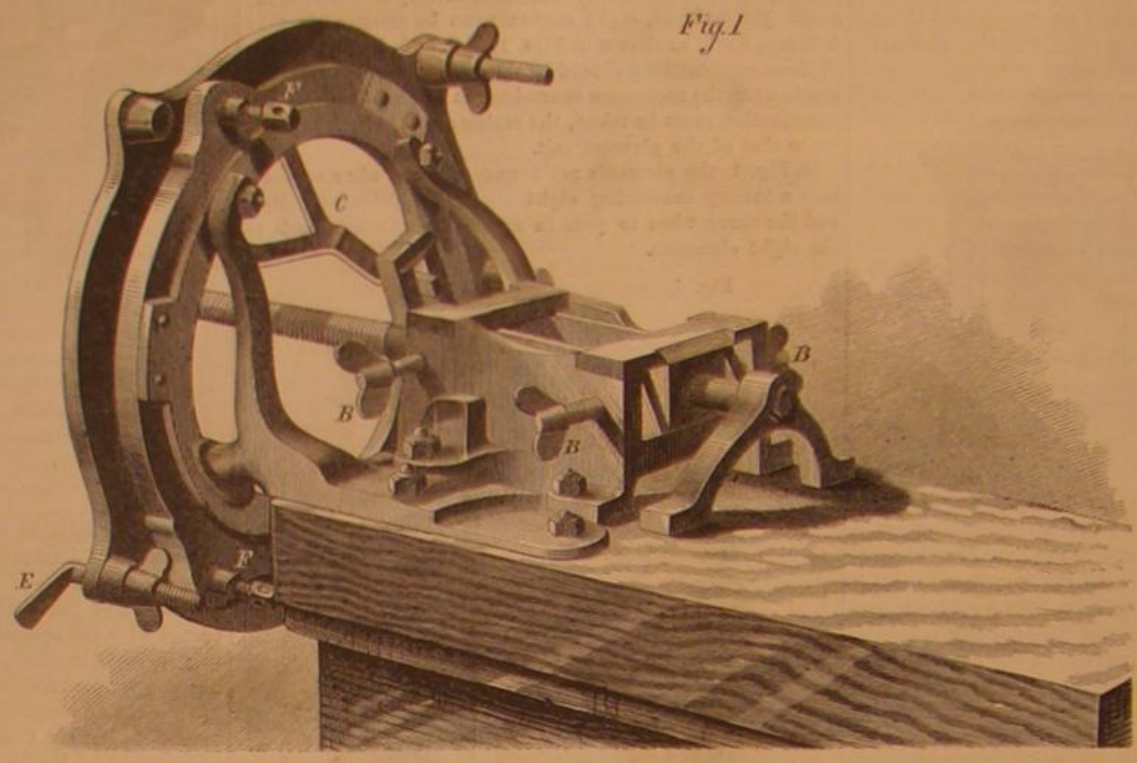
ELECTRIC "armored" cables are to be experimented with on board the torpedo school ship Vernon at Portsmouth, England, in connection with torpedoes laid down for harbor defense. Should these invulnerable cables prove a success as a means of connecting torpedoes with the shore, the value of these machines for defensive purposes will be considerably increased

IMPROVED HUB BORER.

The greatest strain which a wagon is subjected to falls upon the wheels; hence it is at such portions that the best and nicest workmanship is required in order to insure the maximum of strength, close fit, and durability. The first boxes ever put into wagon hubs were placed in holes which fitted at one end, but which, at the other extremity, were large enough to admit being set over to one side, the intervening space being filled with wedges. This was and is, at best, but a clumsy operation, for the work is certainly inaccurate, and at a part just where accuracy is required; but despite the knowledge of the fact, carriage makers, in many cases, still cling to the antiquated method, though for what reason, while machinery, which accomplishes the labor far better, is extant, it is difficult to explain.

We present, in the annexed engravings, a rear view, Fig. 1, and a front view, Fig. 2, of new device for boring hubs, for which a large number of important advantages are claimed. The hole is made perfectly true with the rim of the wheel, and of the right size and shape for the box, it being possible to cut out deeper at the spokes or at any other part, so that the box can be caused to bind at any desired place. The machine requires no adjustment for different sized wheels. The knife is set the same for one sized hole as for another, the size and taper being regulated entirely by setting the shaft out of the center or on an angle. This obviates the trouble of setting the knife more than once for each wheel. The latter is handled but once, and does not leave the machine until the box is fitted. The hole for the nut is cut true with the box aperture, so that the nut will go on after the box is driven as well as it will before, while it cannot rub the wood, and so cause the axle to heat.

Fig. 1

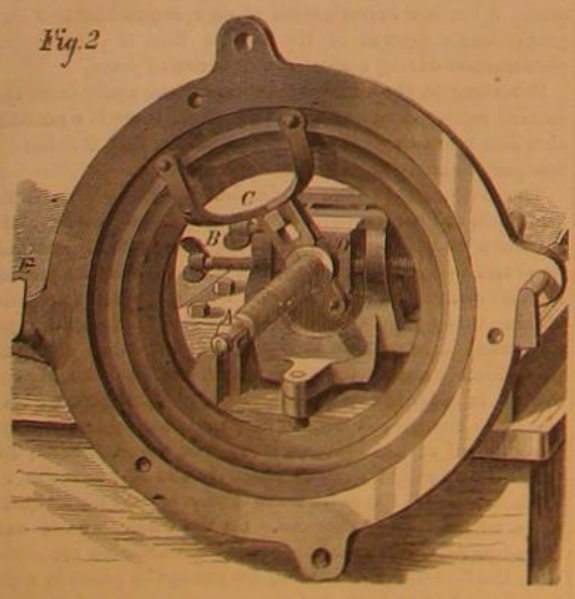


ABBOTT'S LITTLE GIANT HUB BORER.

From the engravings, it will be seen that the machine is of that class in which the wheel is turned while the cutting is done by a bit, A, Fig. 2, placed on the end of a mandrel. The latter can be quickly set at any angle or for any size desired, the size of hole and degree of taper being regulated by the thumbscrews, B, in the side of the box The bearing is placed near the spokes and within the limits of the hub, so that the weight of the wheel is carried without any cramping or sideways pressure.

The feed is actuated by an arm, C, which projects under the inner ring of the bearing, and which merely pushes the feed nut, D, around and does not cramp when put on a taper. The feed nut is closed over a projection on the end of the block in which the shaft runs; so that when placed on an angle, there is no tendency to cross the thread of the screw. The irregular motion, which is inseparable from a machine which makes a taper hole, occurs, it is stated, only at the point where the arm touches the feed nut, and is simply a sliding back and forth of the former as the wheel is turned.

Fig. 2



In operation, the wheel is fastened to the face plate by the gripes, E, and caused to run true by the set screws, F, which connect the face plate with the outside ring of the bearing. The hole for the taper part of the box is cut, then the hole for the shoulder at the back, and, lastly, the hole for the nut at the front. This completes the work with the exception of driving the box.

The machine is, in fact, a small and complete lathe, in which the wheel and tyre serve as a balance wheel. It is guaranteed to be capable of boring an ordinary set of wheels in less than one hour, and we are informed that it has performed that work inside of twenty minutes. Its weight is about 50 pounds. It is durable, one firm having bored some 2,000 sets of wheels with a single machine. The use of wedges it obviously dispenses with altogether, and thus insures the tight working of the wheel.

Patented January 5, 1874. For further particulars and machines, address H. W. Pell & Co., Rome, N. Y., or Wilcox, Bros. & Co., Adrian, Mich., or any dealer in carriage hardware.

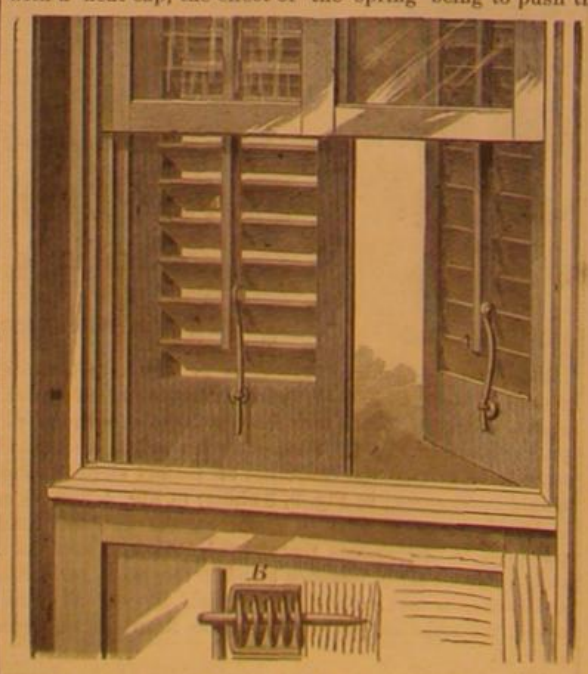
Cleaning Photo Plates.

Dissolve 1 lb. potash in 2 quarts water; pour it into an earthenware dish or tray. Introduce each glass separately into the liquid, taking care to prevent air bubbles. The plates are allowed to remain at least twenty-four hours in this solution; they are then taken out one by one, placed under a tap, and well scrubbed with a cocoanut fiber brush until all the old collodion and varnish disappear. They are then plunged into another dish containing a solution of three per cent of hydrochloric acid, well washed under a tap, and wiped dry with towels. On no account must they be left to dry spontaneously, or they will become stained. Before the plates are used they required to be cleaned with a solution of rottenstone into which a few drops of ammonia have been introduced.

SMITH'S BLIND SLAT HOLDER.

After a blind has been exposed to the weather for some little time, it is very rarely thereafter that the slats can be made to stay in any required position. They may be closed by turning them up, or partially opened by turning them down all the way; but they will not rest squarely across the opening so as to admit a breeze, or remain slightly tilted so as to ward off the sun's rays, unless adjusted and fastened in place by temporary wedges.

Mr. Ira H. Smith, of Topeka, Kansas, has devised a very simple little attachment, which anybody can affix to a blind, and which appears effectually to overcome the above difficulty. It consists of a piece of curved wire, pivoted to the shifting bar, at A, in the annexed engraving, and passing down through a staple on the frame of the blind. Around the shank of the staple is a coiled spring which is covered with a neat cap, the effect of the spring being to push the latter outward, and so bind the wire between the cap and staple. A sectional view of this arrangement is shown at B. The blind slats may be set in any position, and are held by the wire.



Patented April 21, 1874. For further particulars regarding agencies for selling, etc., address the inventor as above.

Preservation of Wood by Lime.

M. Lostal, railway contractor, of Ferminy, has communicated to the Society of Mineral Industry, at St. Etienne, France, the results of his observations on the effect of lime in preserving wood, and his method of applying it. He piles the planks in a tank, and puts over all a layer of quicklime which is gradually slaked with water. Timber for mines requires about a week to become thoroughly impregnated, and other wood more or less time, according to its thickness. The wood acquires remarkable consistence and hardness, and it is said, will never rot. Wood has been prepared in this manner for several mines, so that the plan will shortly be tested on a considerable scale. Beechwood has been prepared in this way for hammers and other tools for several iron works, and it is said to become as hard as oak without losing its elasticity or toughness, and to last much longer than when unprepared. It has long been known that wood set in lime or mortar is preserved from decay, but no systematic plan for its preservation has until now been attempted.

A Million Dollar Hammer.

A German paper informs us that the famous steel works of Frederick Krupp, of Essen, are about to receive a very important addition to their machinery. The largest steam hammer in use at these works, at the present time, is one capable of working a mass of steel 50 tuns in weight, and erected at a cost of $560,000. It is now in contemplation to build a new steam hammer capable of beating up a mass of steel of double the weight, namely, 100 tuns. The new machine, it is estimated, will cost $1,000,000, and will be the most powerful in the world; and it may be expected that the size and weight of the German artillery will be enormously increased, as the new steam hammer will permit the working-up of larger masses of metal than, up to the present time, has been thought to be possible by scientific engineers.

SMITH'S IMPROVED SHEAVE.

The principal advantage in the improved sheave illustrated herewith lies in the pin having secured to it a cylindrical core, which is of sufficient size to bear against several of the friction rollers arranged within the disk. This distributes the strain over a larger surface, rendering the operation easier, and subjecting the parts to much less wear than is the case in the ordinary arrangement of a small pin, which may readily fall in between two of the rollers and so crush the same.

Fig. 1

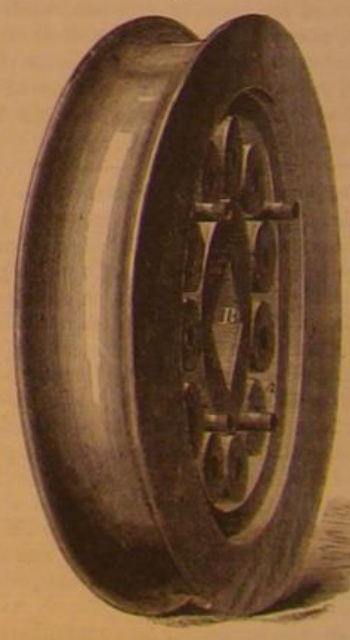
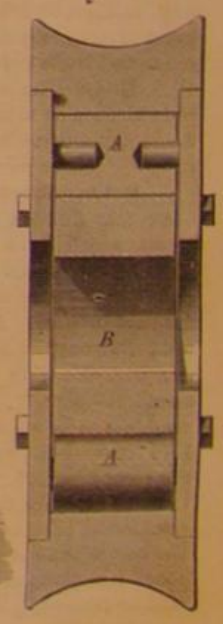


Fig. 2



The construction of the device is represented both in perspective, Fig. 1, and section, Fig. 2. At A are the friction rollers, and at B the cylindrical core above referred to. The pin which passes through the latter is square in section, and is thus prevented from turning in the block while it is confined in the strap, in such a manner as firmly to secure the ends. The sheave, we are informed, cannot run against the side of the block and wear away the same. It is a strong and durable device, one of considerable merit, and especially adapted for marine use

For further particulars address E. B. Smith & Co., Patchogue, N. Y.

AN ORNAMENTAL GOURD.

The exceedingly graceful plant which is shown in our illustration is a miniature gourd, the seeds of which were brought from Africa to Europe by Sir Samuel Baker, who states that the plant, when in a wild condition, covers dwarf trees and shrubs with its slender climbing shoots, which are loaded at every joint with pretty little fruits, which, in a young state, are bright green, striped and spotted with white; but which, when ripe, change to scarlet, a color which sets off the white spots and pencilings to increased advantage. The fruits, as will be seen, are borne in clusters of about three or four together. The foliage, being of a distinct shade of green, renders the plant effective, even when not in fruit. It has been grown in a melon house, in which it quickly covered a large trellis, and became loaded with fruits which, were it not for their white marblings, might easily be mistaken for those of *solanum capsicastrum*. Some of the African tribes use the long slender shoots of this gourd for garlands and head dresses, purposes for which its habit of growth eminently fits it. Long festoons of it, laden with fruit, might be usefully employed for garnishing stands on the dinner table, or the sprays of crimson fruit might be allowed to hang naturally and gracefully from the margins of ornamental vases. Gourds of this description, says a correspondent of the English *Garden*, well deserve more attention than they have hitherto had.

BRYANOPSIS LACINIOSA.

Fog.

Angus Smith gives an account of a remarkable fog observed at Reikjavik, in Iceland. It appears that, on a bright afternoon in July, "as soon as we left the house, a cloud came down a street from southwards, and some one said: 'Let us cross out of the way of the dust.' I looked more carefully, and, finding the cloud moving very slowly on the ground, concluded that it was smoke from a chimney, but smoke mixed with larger particles than we generally see. Gradually it came to us; there was no smell, but a distinct chill."

Perceiving that it was a fog, Dr. Smith ascended a rising ground, and saw the fog rising out of the small lake behind the town, and rolling into the streets very slowly. A similar fog rose from the sea, and rolled also into the town. Hence it appeared that the wind had nothing to do with the matter, but that both fogs rolled because they were too heavy to remain suspended. The peculiarity of the fog was in the size of its particles, larger than any the author had ever before seen, and which he estimates at from $\frac{1}{400}$ to $\frac{1}{800}$ of an inch in diameter, in the flatness with which it fell on the ground, and in its lumbering mode of rolling, whence all observers at first took it for dust. The author found that the particles were perfectly spherical, and not hollow, but concrete throughout. "They all tended downwards, they were falling, evidently; it was a falling dew, or a slight incipient rain, rapidly disappearing into the earth." Dr. Smith adds: "It seemed evident to me that, to make a distinction absolute between fog, rain, and dew, was a waste of words. There is a broad observable distinction, but no narrow line, and we cannot tell the end or beginning of either."

Examining the common opinion of the vesicular nature of clouds and mists, he declares that it "rests on a foundation too weak to be worth much attention." A vague notion that the globules of fog are analogous to soap bubbles seems to lie at the foundation. Dr. Smith has repeated the experiments of Saussure, but without meeting with any signs of vesicularity. "Indeed," he remarks, in summing up, "I see no reason for going far for a mode of keeping clouds up. Times without number I have observed, on calm summer evenings, a cloud of smoke from a steamboat funnel lying for miles in length at a hight very little different from that of the funnel out of which it issued. . . . At other times I have found the smell of a cigar, used by a person fully a quarter of a mile off, over the road, at about the same hight as his mouth, nothing being visible. In these cases, have we anything to look to but the size of the particles? They are so small that their resistance to the atmosphere is diminished to its utmost, as the resistance of the air is increased so much, in proportion to the weight, that they cannot fall rapidly."

Curiosities of Ebullition.

Dr. T. L. Phipson, in the Chemical News, says that water, strongly acidified with hydrochloric acid, and containing a small quantity of benzole, was found to enter into violent ebullition every sixty seconds; after a while the boiling ceased completely, and then recommenced suddenly every thirty seconds for some time. The flask still being kept over the spirit lamp, the periods between quiescence and violent ebullition dropped to twenty, ten, and finally to eight seconds, at which interval the phenomenon continued for some considerable time. The temperature of the vapor in the flask was 214° Fah., in the liquid 218°, during the whole time of the experiment.

When methyl alcohol was added to the above mixture of water, hydrochloric acid, and benzole, and the flask placed over a spirit lamp, no ebullition at all occurred for a very long space of time, and then it took place very suddenly and continued.

Ballooning Experiments.

Captain H. B. Dight recently ascended in his balloon Fairy from Wolverhampton, to illustrate the action of his steering apparatus prior to his experimental trip across the English Channel, for which he announces he has arranged with the British government. The ascent occasioned much interest, and drew together many thousands of spectators. The ascent, however, was not a success. In a torn state, the balloon and steering machinery fell in a neighboring meadow, after Captain Dight had been in great jeopardy.

A SPRING BUTTON HOLE BOUQUET.

The tasteful arrangement of a small bouquet of choice flowers, shown in the annexed engraving, is made up of a leaf of lily of the valley at the back, upon which lies one spray of that flower mixed with four or five very small pieces of maidenhair fern. These portions of a frond are so arranged that they break the hard outline of the leaf behind them,

and also tone down its bright green by their glaucous shade of color. In front of these is placed a fine thickly petalled bud of climbing *Devoniensis* rose. This, of course, has been properly wired, and slightly blown open. The base of the bud is concealed by two well chosen leaves from a fairy rose, by which means another shade of green is introduced into the bouquet, which not only serves to set off the rosebud to the best advantage, but also contrasts well with the foliage previously used. If it were a necessity that hardy plants be employed in making up such bouquets, some well selected leaves from *thalictrum minus* would prove such an efficient substitute for the maidenhair that ninety-nine people out of a hundred would regard it as a fern, and not as a leaf from a flowering plant. Those who do not possess means for growing *adiantum cuneatum* are strongly recommended to cultivate the hardy *thalictrum*, which does best in a calcareous or magnesian soil.

COTTAGE HORTICULTURE.

THE SELECTION OF OUTDOOR PLANTS.

The choice of flowering plants, suitable for culture in the limited space usually available for the above purpose, is comparatively limited, because of the many qualifications requisite to each plant: for instance, its hight, the length of its blooming period, and the color of its bloom. For if the flowers in a bed are of irregular hight, part of the bloom must be hid. If the arrangement of the color of the bloom is inharmonious, the effect will be anything but pleasing to the eye; and the more of the plants which are in bloom at the same time, the worse the bed will look. To those possessing a hothouse, greenhouse, or forcing beds, in which a succession of plants may be reared to supply each bed with plants so soon as the old ones have ceased to flower, hyacinths, crocuses, tulips, snowdrops, and lent lilies may be followed by verbenas, stocks, asters, etc, and thus a continuous blooming bed may be secured; but with a proper selection of plants and ordinary care in their culture, three plants (scarlet geraniums, yellow calceolarias, and the deep blue lobelias) will give us the best attainable arrangement of color and of hight, and will at the same time produce a flower garden from spring time till the frosts of winter cut them off, which qualifications are not combined in any other plants.

In selecting the plants, choose those whose leaves are of a deep green, and in all cases those which are short and bushy and have no bloom upon them. If, however, they are in bloom, cut off the flowers before planting, which will only delay the blooming a few days, and will greatly strengthen the plant. If the plants have been reared in a greenhouse or under frames, keep them a few days before setting them in the beds, placing them out of doors in the daytime, and taking them in at night, in order to make them hardy and prevent them from suffering from the cool night air. If the plants are placed in a cold frame, either before or after being planted in the beds, be careful to lift the frame during a great part of the daytime, otherwise the sweat which gathers on the inside of the glass will fall upon the plants and infallibly kill them by what is called damping off.

PLANTING.

The bright scarlet horseshoe or fish geranium, and not the pink, should be selected, and planted ten inches apart in the center of the bed. Next come the calceolarias, about ten inches from the geraniums and about ten inches apart, and then the lobelias, about six inches apart, surrounding the calceolarias. All these plants will bloom together and continuously, the geraniums growing tallest and the lobelias shortest; hence we shall not only have a true arrangement of the prismatic colors, but all the flowers will be visible from almost any point of view. The effect may be considerably hightened by planting a standard perpetual rosebush in the center of the beds; but in such case, let the standards be of various hights and the colors to a pattern if the beds are arranged to a pattern, as should be the case. For a red rose, John Hopper is one of the very best. For a yellow one, *Gloire de Dijon* is very superior. In the absence of roses, a white lily may be planted in each bed. If there are border beds, white lilies, or any of the broad-leaved, red, or variegated plants, will form a pleasing contrast.

PROPAGATING.

To propagate geraniums and calceolarias, do not let the plants flower too soon; but pinch off the first appearing bloom and pinch out the eyes of all straggling branches, which will immediately throw out side shoots, thus forming bushy and shapeable plants, besides very healthy and strong ones. Give preference to those plants which have their branches close to the surface of the soil. A strict attention to these rules is indispensable to obtaining a fine and freely blossoming plant.

TO DISCOVER INSECTS.

If the leaves of the plant turn reddish or yellow, or if they curl up, a close inspection will generally disclose that the plants are infested with a very small green insect, or else with the red spider, either of which must be destroyed. For this purpose, scald some common tobacco with water until the latter is colored to a yellow, and when cold sprinkle the leaves of the plants with it; but a better plan is to pass the stems and leaves of the plants between the fingers, and to then shake the plant and well water the bed immediately afterward. The latter operation destroys a large proportion of the insects shaken from the plant. This latter method is the only infallible one.

It sometimes happens that the fertilizer used to enrich the soil will germinate insects which destroy or impair the roots of the plants; the indications of such being the case are that the leaves will turn red or yellow, and will flag or droop during the warmer portions of the day. If this occurs while the plants are in pots, an effectual remedy is to let the mold in the pots get so dry that the leaves of the plant commence to droop; then place the hand over the surface of the mold, letting the stem of the plant pass between the fingers; then turn the flower pot upside down, and slap the bottom of the pot with the other hand. After one or two such blows, the pot may be lifted off without disturbing the mold from the roots of the plant, and the insects will be found on either the outside of the mold or on the sides of the flower pot. After removing them, the pot may be replaced, and the plant watered. If, however, the flower beds are infested with insects, the soil should be allowed to get comparatively dry, and a piece of carrot, parsnip, or turnip placed upon the surface as a bait and covered over with two or three cabbage leaves. An inspection early in the morning will discover the insects around the bait.

PEGGING DOWN CREEPING PLANTS.

To propagate lobelias and verbenas, the first bloom should be picked off, and the branches, as they extend, should be pegged down closely to the surface of the mold. The branches will then take root as they lengthen; and by thus drawing a large amount of sustenance from the soil, they will bloom very freely and cover a large space. A verbena may thus be made to cover a square yard, and a lobelia a square foot, of ground. When a plant is permitted to bloom, the growth of its branches is very seriously retarded. For example, a balsam, or lady's slipper, as it is commonly termed, kept free from bloom and continuously repotted (as the roots extend) into a larger pot, may, under favorable circumstances, be grown as large as a good-sized gooseberry or currant bush. Asters and stocks require transplanting from the seed bed so soon as the plant has six leaves, to another bed, placing them about six inches apart: then when they are large enough to set into the beds, they should be well watered both before and after removal.

TRANSPLANTING.

The object of transplanting is to check the growth of the top, and to extend the growth of the roots of the plant, thus enabling it to draw increased proportionate sustenance from the soil.

As soon as the plants in the seed bed have four leaves, the weakly ones should be removed to give room to the healthy ones, otherwise the abundance of leaves will draw the plants up, causing them to grow tall, slender, and weakly. Before removing them, however, it is well to water the bed, so that those removed can be drawn from the earth without disturbing the soil around those remaining.

Flowers require a light soil, to obtain which sand may be mixed with heavy soil. Sufficient ammonia to just taint the water will be found an excellent means of promoting the growth of the plants; soapsuds will also have the same effect. Watering should take place in the morning during the spring, and at night during the summer months; for the reason that, in the spring, the nights are apt to be cold, and the watering would make the soil still colder; and in the summer the water evaporates very quickly from the soil if applied during the day. Water which has been exposed to the open air should be used, and not that drawn from a hydrant or a well; and if after watering, the surface of the soil becomes caked, it should be disturbed with a rake, or the growth of the plants will be seriously impeded. The water should be applied in as fine spray as possible, and in no case poured upon the plants. All plants should be planted deeply into the soil, which should be pressed moderately firmly to and around the roots.

POTTING PLANTS.

The mold for potting should be light and loamy, the fertilizing material used being well decayed. If the soil is rich of itself, it is better to be either very sparing with the fertilizer or to dispense with it altogether. In the bottom of the pot, place several small broken pieces of crockery or similar material to assist the drainage; and in setting the plant, be careful to keep it well down in the pot and to press the mold moderately around the roots. The surface of the mold should be about half an inch below the level of the top of the flower pot. Slips should be planted close to the sides of the pot, and in small pots.

When a plant becomes pot-bound, that is, when the roots have become matted around the sides and bottom of the pot, the plant, so soon as it has ceased blooming, should be repotted in a larger pot. It is not necessary to remove any of the mold from the roots, but simply to fill in the space in the larger pot with new and rich mold.

Plants kept in the windows should be turned every morning, or the light, striking on one side only, will draw the plant to that side so that all its branches and leaves will turn towards the window. The water in the saucers should never be applied to the plants. In cutting slips of any plant, always choose the youngest branches; and cut off the slip at the junction of a joint or leaf, since the roots shoot more readily from such joints. If you follow these directions and put sufficient sulphate of ammonia to just taint the water applied to your plants, you may cultivate with success almost any plant, even though you are an entire novice.

Ashes and Iron for Flowers.

The observation of practical and experimental gardeners seems to confirm the fact that, to procure brilliant colors in flowers, it is necessary to supply the soil with an abundance of ferruginous constituents and silica. The latter supplies a material (says S. E. Todd, in one of our foreign exchanges) which is of vast importance in the production of that brilliancy of the petals and the dark green luster of the leaves. Then, if potash be added, or the ground be dressed round about the growing flowers with unleached wood ashes, an increased brilliancy will appear in every petal and leaf.

Any person who cultivates only a few flowers in pots, or between grassy lawns, or on spacious parterres, may readily satisfy himself of the exceedingly useful part the foregoing materials play in the production of beautiful flowers. Even white flowers, or roses that have petals nearly white, will be greatly improved in brilliancy by providing iron sand, and unleached ashes for the roots of growing plants. Ferruginous material may be applied to the soil where flowers are growing, or where they are to grow, by procuring a supply of oxide of iron, in the form of the dark colored scales that fall from the heated bars of iron when the metal is hammered by the blacksmiths.

Iron turnings and iron filings, which may be obtained for a trifle at most machine shops, should be worked into the soil near flowers; and in a few years it will be perceived that all the minute fragments will have been dissolved, thus furnishing the choicest material for painting the gayest colors of the flower garden. When there is an excess of vegetable mold in a flower bed, and a deficiency of silica or sand, the flowers will never be so rich in color, nor so brilliant, as they would be were a liberal dressing of sand, or sandy loam, worked down into the bed, where the growing roots could reach it. If wood ashes can be obtained readily, let a dressing be spread over the surface of the ground, about half an inch deep, and be raked in.

A dressing of quicklime will be found excellent for flowers of every description. It is also of eminent importance to improve the fertility of the soil where flowers are growing, in order to have mature, plump, ripe seed. Let the foregoing materials be spread around the flowers, and raked in at any convenient period of the year. When soil is prepared for flowers in pots, let some sand, some oxide of iron, and ashes be mingled thoroughly with the leaf mold.

SCIENTIFIC AND PRACTICAL INFORMATION.

TESTING TINNED PLATES FOR LEAD.

M. Fordas recently communicated to the French Academy of Sciences the following simple method of determining the presence of lead in tin vessels employed for packing articles of food. The metal to be tested is first touched with nitric acid, and then heated, when the acid evaporates. If lead be contained, stannic acid and nitrate of lead remain. Iodide of potassium is then applied, forming yellow iodide of lead; while the stannic acid is white. The yellow stain, therefore, indicates lead, the white, tin.

NEW TESTS OF STEEL.

MM. Trève and Duvassier have lately conducted extended investigations into the nature of steels, and their coercitive force. Fifteen bars of steel, divided into five series of three each and differently carbonized, each received a peculiar temper. They were then magnetized to saturation, and their magnetic force determined by the method of deviations. A bar containing 0·950 per cent of carbon and tempered in cold water gave a maximum deviation, represented by 47. Another bar, with a similar percentage of carbon, but tempered in boiling water, gave 44. A third bar, with a like percentage, but tempered in oil, at 50° Fah., gave 43. The influence of the tempering liquid is here evident.

The effect of the proportion of carbon contained in different bars was also very marked. Thus a bar containing 0·950 per cent gave a maximum of 47; another, with 0·250 per cent, gave but 13. By describing the curves of variations for the different series of bars, the influence of the carbon and of the tempering liquid becomes clearly apparent. It is a remarkable fact that the curves of elasticity and the magnetic curves of the bars are closely similar, the carbon appearing to give elasticity to the steel, and at the same time to increase its magnetic capacity.

ALLOYS OF PLATINUM AND IRON.

M. H. Sainte-Claire Deville says: On analyzing platin-iridium, iron and platinum are united in the state of oxides intimately mixed. If this matter is treated with a current of hydrogen, oxide of iridium is reduced at common temperatures from 392° to 1,112° Fah. The metals are then alloyed; for if digested with hydrochloric acid, a few bubbles only of hydrogen escape, and very little iron is dissolved, even when it exists in the alloy to the extent of 10 per cent. Iron and iridium are thus capable of combining at low temperatures, and the same is probably the case with iron and platinum. Under these conditions, the alloy is evidently not homogeneous. Breithaupt admits the existence of platinum ores containing 14 to 19 per cent of iron. Berzelius, only once however, found a specimen containing as much as 12·98 per cent; and M. Debray and the author have never found more than 12. Platinum may be freed from iron by cupellation in chlorine gas. If heated from 2,192° to 2,732° Fah. in this gas, it is volatilized in the form of brilliant crystals, and deposited in all the hot parts of the apparatus

THE utilization of the sewage of Paris on the plains of Gennevilliers, containing an area of 800 acres of light sandy soil, is now being practically carried out. A large sewer is now being constructed to carry away the sewage from the main sewer at Clichy-sur-Seine. The new sewer will be of 5 feet 6 inches internal diameter, and about 4,150 yards in length; and when completed, half the sewage of Paris will be utilized.

Paper Barrels and Boxes.

The manufacture of paper barrels, boxes, and similar vessels, for use in place of those generally made of wood, is rapidly increasing, seven patents and an equal number of factories for producing the articles being now in operation, all in the Western States.

In the first of these patents, the paper used in the fabrication is prepared principally from straw, and is pressed, several sheets at a time, into a firm, compact sheet, which when dry becomes tougher than wood. The sheet is then bent into cylindrical form, and its opposing edges, which are previously cut into dovetails, fitted together. Double pointed nails are drawn through the dovetailed ends from the outside of the barrel, and are clinched upon the inner surface of a strip of wood placed vertically along the inside of the joint. The heads are of wood, fitted into the ends with a flange resting against the edge, and are secured by nails driven through the sides of the barrel. Hoops of wood or iron are added to protect the latter from abrasion or wear, and the paper is thoroughly waterproofed.

Another mode of making the barrels is to form them directly from the paper pulp, the latter being taken from the cylinder of the wet paper machine and carried around an expanded cylinder until it becomes of the requisite thickness. The cylinder is then contracted and removed, leaving the barrel all formed and ready for passage between two rollers. These are so arranged that one presses on the inside and the other on the outside of the barrel, moving the latter between them, and at the same time compressing and hardening the paper. The vessel is then a jointless cylinder, and nothing remains but to insert the heads and secure the hoops in place.

Securing the heads in paper barrels appears to be a difficult portion of the manufacture, and there are two patents on this especial point. In one the invention consists in fastening manilla or other strong paper around the head so as to form a flexible edge. This, after the head is inserted, is crimped so as to line the rim of the barrel, over which it is bent and secured by hoops.

The second inventor proposes either to press one head into shape from paper pulp, at the time when the barrel is formed about the cylinder, or else to make the heads separate and turn up their edges around the peripheries. This turned-up portion serves the same purpose as the flexible paper in the case just described, but differs in construction, being riveted to the cask through iron hoops.

Another plan for making barrels differs essentially from those already described, in that each barrel is formed of two cylinders instead of but one. One cylinder is placed inside the other, so as to serve as a lining, and, being shorter, to form shoulders on which the heads are rested. Thick paper is interposed between the cylinders, and all are pasted firmly together. The interposing paper is carried up above the rim and folded over the edges. Paper packages for lard, butter, and similar materials are composed of sheets glued together and pressed into shape in dies. This is done while the paper and glue are still moist, and a sheet of muslin, placed under the substance in the concave die, prevents cracking or tearing at the joints.

A Large Mass of Native Copper.

A few days since, a mass of native copper, said to be the largest ever discovered, was brought from Lake Superior to St. Louis, Mo. The mass is heart-shaped, and weighs 6,000lbs., exceeding nearly double the weight of the famous copper boulder which was transported many years ago from the same region to the Smithsonian Institute. The new specimen exhibits the pure copper to the eye, and contains 98 per cent of the metal. It was taken out from an ancient digging, sixteen and a half feet below the surface, by a Mr. Davis, who had spent 25 years in copper mining. The mass, when found, had evidently been detached from its bed by the ancient miners. A number of pieces of copper were found besides the mass, weighing from 1 oz. to 171bs., which were evidently clippings by the old miners. Stone hammers weighing from ten to thirty pounds have been found in cart loads, several specimens of which were brought away with the copper.

These were the primitive tools with which these ancient miners had to do their work, and are found either perfect or broken from use, and the fragments are found scattered through the *débris*. It has been computed that two hundred of these old miners with their rude methods could barely be equivalent to two of the skilled miners of the present day. Who, and to what race they belonged, and at what time these people flourished, is not satisfactorily known, and can only be the subject of conjecture. The only plausible assumption is that they belonged to the ancient mound builders, and worked in metals, anterior to the Indian races, as evidences of their occupancy were seen by the early Jesuit explorers, and specimens which they clipped from the copper rocks are found scattered over the whole continent.

CEMENT FOR MARBLE AND ALABASTER.—Mix 12 parts of Portland cement, 6 parts of slaked lime, 6 parts of fine sand, and 1 part of infusorial earth, and make up into a thick paste with silicate of soda. The object to be cemented does not require to be heated. It sets in twenty-four hours, and the fracture cannot be readily found.

THE results of the experiments for testing the proportion of carbonic acid in the air, made during the first ascension of the Zenith, show that, at the altitude of 2,260 feet, the volumes of carbonic acid contained in 10,000 volumes of air are 2·40; at 3,200 feet, 3·00.

[For the Scientific American.]

THE ORIGIN OF COLD SNAPS.

One of Agassiz's oft-repeated expressions was: "Facts are stupid things unless they are made to teach some principle." While true Science consists chiefly in the discovery of laws and principles, these can be gained only by an abundant collation and a careful study of undoubted facts. Whether it was Nature's plan to make us study out the laws which govern them, we cannot say; but that a frequent observation of certain facts of meteorology has been forced upon us by the rigors of the past winter, none will deny. And while we are just recovering from the shivering and freezing which these entailed, it may not be uninteresting or unprofitable to consider briefly the meteoric principles upon which cold is produced.

The sun is the cause of all motion, from the wind, the rain fall, and the Niagara cascade to the muscular exertions of beast and man. And anomalous as it may seem, it is also the indirect cause of cold. The very heat that warms us so gratefully during these spring days melts the frozen matter and evaporates the water. Changes from solid to liquid, and from liquid to vapor, require an enormous amount of heat, which, being taken from the sun's rays, leaves the air damp and chilly. Thus the change from cold weather to warm is less sudden and enervating; and by a reversion of the same principle, the cold of fall is more gradual in its approach. Though this principle will produce a greater amount of cold than we are apt to suppose, it will not account for the cold snaps which drive us to the fire and into our furs and wrappings during the winter.

In a recent article in the SCIENTIFIC AMERICAN, on laws of storms, it was shown that our storms are monstrous whirlwinds covering half a continent, in which the wind, blowing from all directions towards a central point, escapes by rushing upwards, and thus diminishes atmospheric pressure. To compensate for this rise of air, there must be a descent somewhere else. As the air rises into the upper regions, it gives off into space the heat it abstracted from the earth, and its increased weight causes its return to the surface. Observations, similar to those mentioned in the article above referred to, have enabled Professor Loomis to show that, in regions of high barometer, the winds blow outwards in all directions. High barometer is often constant for days, and a week or more together, in one locality; and there the thermometer is low for about the same length of time. He attributes this to downward currents, at the center of high barometer, from the cold upper regions, and believes they are made up of air from the upward currents of low barometric centers. From this, he concludes that our sudden and long spells of extreme cold are not due to currents from a northern latitude, but to these downward currents. There seems one difficulty in his theory here. He has shown that the storm center advances at a rate varying from 228 to 1,280 miles per day; and if air from this came down and produced a region of high barometer, from which the winds diverge in all directions, we would expect the high barometric center to accompany the storm center at about the same velocity; but instead, it sometimes remains stationary for weeks.

The Professor admits that, during the cold spells of December, 1872, and January 1873, northerly winds did prevail; but he considers these as attending high barometer, according to laws already established, and that north winds alone would not be a sufficient cause of the suddenness and magnitude of the thermal depression observed. In substantiation of his views, he cites a storm which came up from the Gulf of Mexico, choosing a southern storm so that he could find observations taken to the north of it. This reached the northern coast of Lake Ontario in three days, and on the last day, in northern Florida, the thermometer was lower than it had been on either of the preceding days at Knoxville, Nashville, Cincinnati, Louisville, and Memphis. This indicates that the cold did not come from the north or northwest, but must have descended from colder regions above. The same phenomenon prevails in the far north, even in the coldest regions ever visited by man. At Melville Island, during a strong wind, the barometer fell to 29·10, and in four days it had risen to 30·75, the highest point reached during the year. During the same time the thermometer fell from —5° to —43°, the lowest temperature observed during the year. At Van Rensselaer Harbor, the same point was illustrated. At Jakutsk, Siberia, latitude 62°, the mean temperature of January is—44° Fah.; but on January 21, 1838, the thermometer fell to —76° Fah. Dove's chart records no place on the earth's surface where the mean temperature of the coldest month is much below that of Jakutsk. And if the temperature suddenly falls 32° below the mean in the coldest part of the earth, the conclusion seems almost inevitable that the cold must come from the upper regions. The distinguished investigator concludes: "If this is the true explanation of periods of unusual cold in Siberia, a similar phenomenon in the United States is doubtless to be explained in like manner."

The suddenness of thermometric changes also points with equal conclusiveness in the same direction. When, in restricted localities, the thermometer falls 18° or 20° in an hour, or, in thunderstorms, 5° or 10° in a few minutes, we are apparently shut up to the conclusion that the cold cannot be borne from the distant north, but must be due to a down rush of cold air.

Professor Loomis makes his conclusions appear quite clear and reasonable; yet at the late meeting of the Academy of Sciences, at Washington, they excited considerable discussion. Professor Ferrel, of the Coast Survey, who is investigating the laws of cyclones, and Dr. Woeikof, of Russia, announced as their opinion, based on recent researches, that descending air would produce heat instead of cold, because of the increased atmospheric pressure to which it is exposed as it approaches the earth.

The increase of pressure would diminish the air's capacity for heat, and this would be given off to the surrounding air at the rate of one degree for every 325 feet of descent. This objection seems hardly conclusive, for we have no adequate means of measuring the temperature of the air in the regions from which it descends. It may lose one degree of heat for every 325 feet of descent, and still be much colder than air at the earth's surface. Dr. Woeikof gives the hight of thermometer at several places of different elevations, which goes to show that low places are as cold as high ones. Later, he says, cold may be generated on the spot by simple radiation. This statement seems to weaken the force of his previous observations; for evidently the greatest radiation would occur in the highest regions, for there is less to obstruct it, and of course this would make the elevated regions coldest, as Loomis claims. The Russian scientist denies that cold snaps are caused—except in a few cases of special local conditions, or in thunderstorms—by cold air descending, but rather by winds from the vicinity of the meteoric poles He attributes the sudden low temperature to which the Atlantic coast is subjected to the fact that the Appalachian Mountains are not high enough to break off the currents from the meteoric pole to the northwest of these mountains.

If this theory is correct, we may conclude that the cold air from the meteoric pole, somewhere to the west of Hudson's Bay, sweeping across the unobstructing lakes and prairies, is the cause of the notoriously variable temperature of Chicago.

As doctors in the same line of scientific investigation so widely disagree, our only resource is to await future developments for a satisfactory settlement of the question.

S. H. T.

New Snow Spectacles.

Mr. William White Cooper, oculist, London, has devised a new kind of spectacles to prevent snow blindness. It is well known that a long exposure to the glare of the intense white of the snow in the polar regions is most harmful to the sight; to meet this difficulty, spectacles of green tinted glass, surrounded by gauze, have been proposed. These will, however, fail in practice, as the glass part of the spectacles is liable to get dim and cloudy, while the gauze and the wire, by means of which the spectacles are fastened behind the ears, will in an arctic climate become so cold that to the human skin they will have the sensation of being made of red-hot wire. Mr. Cooper's snow spectacles have neither glass nor iron in their composition, for they are made of ebonite, and are tied on to the head by a velvet cord. They resemble somewhat two half walnut shells fastened over the eyes. Their great peculiarity, however, is that the wearer sees through a simple slit in front of the pupil of the eye. The sides of each eye box are perforated with minute holes, in order that the wearer can get a side view of objects. These glasses will also prove useful to travelers by railway, inasmuch as they keep out the glare of the sun, and prevent the admission of dust into the eye. To engine drivers, therefore, they would be invaluable, especially when exposed during sleet, snowstorms, or very windy weather. They are also very agreeable when reading at night by lamp or gas light.

A New LifeBoat.

There has just been exhibited to the brethren of the Hull Trinity House, and to the principal ship owners of the port, a new patent lifeboat, patented by Messrs. Anderson and Burkinshaw, of Burlington Quay, and it is by them termed the "Reversible Lifeboat." As its name implies, it is top and bottom both alike; and if in launching, before it touches the water, it should, by the rolling of the vessel or any other cause, turn over, there are thwarts and seats running around the side just the same as there would have been had the boat gone in the other way up. Whichever side the lifeboat takes the water, when she is once afloat, a couple of flaps running the whole length will close and form the bottom of the boat, and there is provision for drawing a further flooring out, which will rest upon strong beams. The boat receives its buoyancy from a massive belt of cork, which is encased in canvas, and runs from stem to stern on each side, and forty separate airtight tanks, ten on each side of both the upper and lower parts of the boat. Still further buoyancy is obtained by large tanks at each end of the boat, but it is intended to use these latter compartments as storerooms for provisions, spirits, medicines, etc., the whole supply being protected from damage by either rain or sea water. On each side of the belt of cork outside the boat there are numerous life lines, which will hang in the water, so that any one falling overboard on leaving a vessel may readily gain the boat and hoist themselves on board.

Burning Iron.

A Berlin experimenter has demonstrated the combustibility of iron in a peculiar manner. He takes a straight bar magnet of some power, and sprinkles iron filings on one of its poles. These filings arrange themselves in accordance with the lines of magnetic force; and however closely they may appear to be placed, of course no two of the metallic filaments are parallel, and consequently, a certain amount of air is enclosed as in a metallic sponge. The flame of any ordinary spirit lamp or gas burner readily ignites the finely divided iron, and it continues to burn brilliantly for some time, the combustion being, apparently, as natural and easy as that of any ordinary substance. If the experimenter with this operation stands on a slight elevation and waves the magnet to and fro while burning, a magnificent rain of fire is said to be produced.

DECISIONS OF THE COURTS.

United States Circuit Court---District of Massachusetts.

PATENT CAR WHEEL.—CHANDLER NEEDHAM *vs.* NATHAN WASHBURN *et al.*

[In equity.—Before Clifford and Lowell, J. J.—Decided October, 1874.]

Opinion of the Court by Mr. Justice Clifford.

Damages are claimed by the complainant for an alleged infringement by the respondents of certain letters patent granted to him, January 3, 1871, in which it is represented that he is the original and first inventor of a certain new and useful improvement in casting car wheels, as more fully described in the specification of the letters patent.

The principal defenses upon the merits are as follows: 1. That the alleged improvement is not new in the sense of the patent law, because the patentee was not the original and first inventor of it, and because he process was well known and in public use long before the date of the supposed invention. 2. Because the respondents have never infringed the patent as alleged.

Both of these defenses make it necessary to ascertain what the invention is when the patent which secures it is properly construed. Enough may be learned from the description given by the patentee in the specification of the process which he pursues to manufacture the patented car wheel, when weighed in connection with the claim of the patent, to furnish a satisfactory answer to the inquiry as to the true nature and scope of the alleged improvement.

His first step, as pointed out in the specification, is to cast a suitable quantity of steel to form the tyre of the wheel into an annular ingot, about fifteen inches in diameter, with an opening at the center of the diameter, of four inches. He then hammers the ingot upon an anvil by means of a steam hammer, by which its diameter is extended to eighteen inches; and he gives a description of the anvil which he uses, and of the manner of conducting the hammering. Forming rolls are then employed, by which the ingot is enlarged to the proper size and shape to form the tyre of the wheel. Having formed the tyre, he then places it in a heated furnace and heats it to a bright cherry red, when it is taken from the furnace, and, having removed every foreign substance from its surface, he places it within the mold in which the body of the car wheel is to be cast, said mold having previously been formed and prepared for the purpose. Care, it is said, should be taken that the heated tyre should be properly adjusted in the mold; and when that is accomplished, the direction is that the flask shall be immediately closed, and the molten iron be poured into the mold, which, as it comes in contact with the highly heated steel, fuses the surface of the latter, thereby forming a perfect union between the two, and, as the metal cools, the body of the wheel and the tyre are welded into one solid mass. Extended remarks upon that part of the described process are unnecessary, as nothing there described is embraced in the claim of the patent; and if it had been, it would not have benefited the complainant, as every part of the process there described is substantially the same as that set forth in the patent granted to Zadoc Washburn, which was introduced in evidence, and is of prior date.

Two matters are then introduced into the specification of the patent in question, which, it is insisted, distinguish it from the invention of Zadoc Washburn, which, it is admitted, is the older of the two: 1. That the molten iron is introduced into the mold through a series of openings at the rim of the wheel, just inside the tyre, and that it flows thence to the center, carrying away from the inner surface of the steel tyre all dirt and dust, if any, which might otherwise prevent the welding of the parts. 2. Nothing is expressly set forth under the second head as a matter pertaining to the described improvement, but the patentee points out what he represents as a defect in the process of the other patent, which is that the cast iron, instead of lying still in the mold and forming a perfect weld, is agitated and caused to bubble by the gas generated by the molten iron as it comes in contact with the flux used in the process, whereby, as he states, the perfect and desired union of the iron and steel is prevented. Everything described in the patent to Zadoc Washburn is disclaimed by him in express terms. What he claims is the described method of introducing the molten cast iron into the mold, through a series of holes, directly upon the inner unfluxed surface of the cast steel tyre, by which a perfect union and weld of the metals are produced.

Car wheels manufactured by first forming a rim of cast steel, and then heating and placing it in a mold previously prepared for the purpose, and by pouring molten cast iron into the mold to complete the manufacture of the wheel, by the union or weld between the two, into one solid mass, are certainly old. Nor is that proposition denied. Nothing, therefore, but a new and useful improvement in the method or process of such a manufacture can be regarded as the proper subject of a patent. Doubtless it may be true that the molten iron was formerly poured into the mold at the center of the mold, and it may be that it is better to construct the openings in the mold for the purpose—whether they are called by that name or are called "sprues" or conduits—just inside the inner surface of the heated rim when placed in the mold; but the court is not satisfied from an examination of the product, or from any evidence in the case, that such a change, without more (even if new, which is not admitted), is the proper subject of a patent, as it is scarcely possible that it could have required any invention to make it. Changes of the kind are nothing more than common knowledge and experience would suggest, and every workman, whether skilled in the art or not, would know how to apply the suggestion. Nor can it make any difference that the patentee uses a series of such openings or holes in his method or process, as the proofs are full and satisfactory that a series of holes has been used in making such castings at a much earlier period than the date of the complainant's invention, and on several occasions, as appears by the testimony of an unimpeached witness.

2. Suppose that is so, still it is insisted by the complainant that his method or process is new and useful, because he does not use flux in making the described weld; which, as he insists, distinguishes his method or process from the invention described in the Zadoc Washburn patent, and from all others known at the date of his invention. Much reason exists for holding that the second feature of the claim is invalid, because not embraced in the the description of the method or process used by the complainant, as required by the act of Congress; but inasmuch as the alleged invention consists merely in omitting an ingredient often employed in welding steel and iron, or two pieces of iron, the court is not inclined to rest the decision entirely upon that ground. Nor is it at all necessary to do so, as the court, in view of the facts and circumstances of the case, is of the opinion that it is matter of common knowledge, that iron, or iron and steel, may be successfully welded with or without the use of flux, and that such knowledge has existed among mechanics accustomed to work at the ordinary forge, for a very long period, whereof the memory of man runneth not to the contrary. Axes, scythes, hoes, and other farming utensils were formerly made on the common anvil; and it is believed that mechanics formerly engaged in manufacturing such articles know full well that flux was often omitted in effecting a weld of iron, or iron and steel. Horseshoes were made in the same manner, and many larger articles, such as plowshares and mill cranks. Differences of opinion, it is known, have at times existed among mechanics of that class upon the subject: some maintaining that flux was useful and even necessary, and others maintaining the opposite opinion with equal earnestness and confidence. All of these suggestions, it is believed, are supported by common experience and knowledge, but it is not necessary to go out of the record to find convincing proof to the same effect. Even the complainant, in his deposition filed in the Patent Office, testified in his cross examination that he was aware that iron and steel had been so welded, and, when asked if he knew as matter of fact that iron and steel had for a long time been welded with and without flux, stated that it was said to have been so welded for a long time. Support to that view is also derived from one of the respondent's witnesses, in which he says that, in making four or five car wheels, they used four sprue holes and that some of them were made with flux, and some without; which statement is also confirmed by other witnesses.

Having come to the conclusion that the alleged improvement is not new or patentable, it is not necessary to examine the question of infringement. Bill of complainant dismissed with costs.

[*James B. Robb* for complainant,
A. K. P. Joy for defendants.]

United States Circuit Court, Eastern District of Pennsylvania.

PATENT PAPER COLLAR.—THE UNION PAPER COLLAR COMPANY *vs.* HENRY J. WHITE.

[In equity.—Before McKennan, Cir. J.—Decided April, 1875.]

McKennan, Circuit J.:

The complainants are the owners, by several mesne assignments, of a patent granted to Walter Hunt, on the 25th of July, 1854, for a new article of manufacture, consisting of a collar made out of paper and muslin, so combined, formed, and manipulated as to adapt it to use as such. This patent was duly extended for seven years from the date of its expiration, and was reissued on the 23d of October, 1872, No. 5,109. The validity and infringement of this reissued patent are the subjects of this contention.

I do not think the legal presumption that Hunt was the first and original inventor of the article of manufacture for which he obtained a patent is at all shaken by the proofs in the cause. It is true that paper and muslin or linen cloth were before united, and used as a fabric for maps, etc.; but this was not analogous to the use to which Hunt adapted them, nor was it in any wise suggestive of his invention. He was the first to discover the adaptability of this material to a use not cognate to any to which it had before been applied, and, by appropriate manipulation, to give it a useful and practical form. He thus not only supplied the public with a new article of manufacture, but he demonstrated unknown susceptibilities of the material out of which it was made. This is something more than the mere application of an old thing to a new purpose. It is the production of a new device by giving a new form to an old substance, and, by suitable manipulation, making its peculiar properties available for a use to which it had not before been applied, thereby distinguishing it from all other fabrics of the class to which it belongs. This seems to me to involve an exercise of the inventive faculty, and, in view of the great practical benefits resulting from it, to invest the product with special patentable merit.

The patent in controversy is the seventh reissue of Hunt's original patent. This multiplication of reissues is, of itself, suggestive of a purpose to cover intervening improvements, and some phrases in the specification of the last reissue may, not without semblance of reason, be treated as having that significance. It is difficult to suppose that so many reissues, with considerable intervals of time between them, were necessary to correct accidental or inadvertent mistakes in the specification and claims of the original patent. And yet the correction of these is the only legitimate purpose of a reissue. This practice has been strongly disapproved by the Supreme Court on more than one occasion.

In Carlton *vs.* Boker, 17 Wall., 471, Mr. Justice Bradley remarks:

"We think it proper to reiterate our disapprobation of these ingenious attempts to expand a simple invention of a distinct device into an all-embracing claim, calculated by its wide generalizations and ambiguous language to discourage further invention in the same department of industry, and to cover antecedent inventions."

Whatever reason there may be to suspect that the motive of the patentee was to give undue elasticity to his patent, still the law presumes that the reissue was granted to correct an inadvertent omission in the original. Because it commits to the Commissioner of Patents the conclusive determination of that question, and the only test of the validity of his action is whether he has allowed a reissue for a different invention from that covered by the original patent, or for what was not therein described, claimed, or indicated.

The claim in the reissue which, it is urged, avoids it is as follows:

A shirt collar composed of paper and muslin, or its equivalent, so united that the muslin will counteract the fragile character of the paper.

Construing this in connection with the specification, its obvious import is that the patentee sought to secure as his invention a shirt collar composed of paper and muslin, or its equivalent, united by paste, glue, or other appropriate sizing, by means of which union the fragility of the paper is re-enforced by the fibrous strength of the muslin, and the necessary cohesiveness of the fabric is thus secured."

Does the defendant infringe this patent?

Hunt's invention consists of two elements or parts: First, of a collar, with reference to the materials out of which it is made, and their union, so as to secure certain qualities; and, second, of the subsequent manipulation of this collar, by which a smooth surface is given to it, and it is rendered impervious to moisture.

The defendant manufactures and sells shirt collars made of muslin or linen cloth pasted to a sheet of paper. Fundamentally they are the same with the collar described in Hunt's patent, because they are composed of muslin (or its equivalent) and paper, so united as to utilize the same properties contemplated by Hunt in the union of the same elements. But it is sought to differentiate them, for the reasons that the defendant attaches a sheet of paper to but one side of the cloth, and that the collar is turned down with the cloth surface only burnished and exposed to view.

The first reason rests upon an undue limitation of the scope of Hunt's invention. In his original patent, in explaining a mode of carrying his invention into practice, he describes a collar with paper on both sides of the cloth. Although he does not limit himself to any form of collar, yet the description is evidently applicable to the standing collars then in fashion, and the double coating of paper was suggested as best adapted to collars of that class. But, as has already been said, his invention was more comprehensive than this, and it was clearly indicated in his original specification. It is appropriately claimed in the reissued patent in controversy, the authorized purpose of which was to protect it fully. Clearly the terms of that claim are broad enough to embrace the collars made by the defendant; but, at any rate, I do not think a double coating of paper on one side of the cloth changes the identity of the fabric described by Hunt. It is still composed of the same constituents, so united as to embody the same properties which he first proposed to utilize, and the difference is only apparent and formal. Characteristic resemblance is the fairest test of substantial identity.

Nor is there any better foundation for discrimination in the fact that the defendant's collars are turned down and the cloth surface only is exposed to observation. Hunt's patent is not limited to any particular form of collar, and the polishing of the cloth surface pertains exclusively to the manipulation of the collar, after it is made, to fit it for use. It does not, in any sense, change the fundamental character of the fabric out of which it is formed, and therefore does not affect the applicability of the first claim of the reissue.

The defendant also manufactures collars entirely of paper, with patches of muslin pasted around the buttonholes to give additional strength at these points; and these are claimed to infringe the patent. I do not think so. Hunt did not contemplate any such restricted combination of paper and muslin. His collar was composed, throughout its whole body, of paper and muslin, and this was necessary to secure and embody the properties which he intended to make available. Nor could he successfully claim such a device. He did not invent paper collars, nor the application of cloth to button holes to strengthen them. Such re-enforcement had been long before applied to buttonholes, in leather curtains, sails, and other fabrics. It merely, therefore, the application of an old device to an analogous and well known use, for which no one could obtain a patent.

The complainants are entitled to an injunction, to continue in force until the 25th day of July next, when the patent will expire, and to an account, and a decree will be entered accordingly.

[*George Harding* for complainant.
J. J Coombs and *E. Wetmore* for defendant.]

In Memoriam.

U. S. PATENT OFFICE,
Washington, D. C., April 24, 1875.

Hon. S. H. Hodges, who died on the 20th of this month, was appointed Commissioner of Patents by President Fillmore in the fall of 1852, and remained as such until the incoming administration of President Pierce.

In 1861 he was appointed a member of the Board of Examiners-in-Chief, and remained its senior member until his death.

Of the many excellent qualities of the deceased, his eminent learning, his patience, his courtesy, and deep sense of justice were the most remarked.

Out of respect to his memory the Patent Office was closed at 12 M. the 23d of this month, by order of the Commissioner of Patents.

At a meeting of the Examiners and employees of the Office, at which the Commissioner of Patents presided, the following resolutions were passed, expressive of the high sense entertained of the worth and talents of the deceased:

Resolved, That we recognize in the death of our late associate, Hon. S. H. Hodges, a grievous loss, both to the Office and to ourselves personally. His long connection with the Bureau as Commissioner and Examiner-in-Chief, his large experience in its affairs, his laborious habits, his accurate and careful observation, his just and impartial judgment and unswerving integrity, all combined to make his services invaluable. Our personal connection with him has been make pleasant by the kindness of his disposition and by our confidence in him as a man—upright and beyond reproach. His removal from us by death is no ordinary event. We grieve that we shall enjoy his society and counsels and see his venerable form no more. The memory of his character and example as a true and faithful man we shall cherish as sacred, and the best legacy that man can leave to men.

Resolved, That we deeply sympathise with his family in their affliction, and in testimony of our respect and sympathy forward them a copy of these resolutions, and will attend the funeral in a body.

Recent American and Foreign Patents.

Improved Milk Cooler.

Addison P. Myers, Prattsville, N. Y.—This invention relates to improvements in milk coolers, by which a regular flow of cold water around the pan is secured, a better support of the milk pan produced, and a tight faucet connection of pan and vat without leakage obtained. The improvements consist in supporting the vat on a longitudinal rubber-lined partition strip, and a vertical extension of the same at the partition wall between water chamber and vat, compelling the water to enter at one side of the partition and leave through a waste pipe at the other. A rubber sleeve with a top collar fits snugly around the exit pipe of the pan, and into the exit pipe of the vat, and connects the same without leakage of water.

Improved Rock Drill.

William W. Goodwin, National P. O., Iowa.—The mortises in the trimmers are so contrived, in respect of the distance from the tenons, that the lower gib will press down on the lower end wall of the mortise in the blade, while the upper gib presses the trimmers at the upper end of the mortise in them, and thus binds the trimmers firmly endwise by pressing them into the sockets, while the heads of the gibs keep the trimmers against the side of the blade.

Improved Car Brake.

Sebastian Gilzinger, Glasco, assignor to himself and Abel A. Crosby, Kingston, N. Y.—A car frame of the usual construction is provided with the common pin and link coupling. In connection with the coupling is arranged, at each end of the car, on the platform or top, a wheel and lever mechanism that is connected at one end to the coupling pin, while the other end may be placed in connection with the bell rope of the locomotive, which rope has to pass over a pulley below the lever, so as to actuate the same from the locomotive for uncoupling the drawheads whenever required in case of danger or accident. The bell rope has to be applied to the front lever of the last car; but the uncoupler may be operated also directly by the conductor or automatically by the accidental detaching of any car, so that a whole train can be brought wholly within control from any part thereof.

Improved Wagon Seat.

Sebastian Gilzinger, Glasco, assignor to himself and Abel A. Crosby, Kingston, N. Y.—This is an improved spring seat for vehicles which may be readily swung out of the way, if required, for loading, and adjusted to any desired hight above the wagon body. The invention consists of a seat hung by stationary corner braces to the ends of strong spiral springs, which are secured by their middle parts to sliding standards, which are adjustable by links and guide bands on the stationary side standards of the seat.

Improved Dental Articulator.

Charles D. Cheney, Canandaigua, N. Y.—On the lower plate is an extension, the circular edge of which is serrated and enters the slotted end of a shaft, where it is confined by the pivot pin, which allows it to be raised and lowered to form any desired angle with the shaft. The shaft is a tube, and a screw works therein, the end of which engages with the serrated edge of the extension, and thereby holds the plate in any desired position. A saddle on the shaft allows of the latter sliding and rotating when not held by the set screw. By suitable devices the two parts of the articulator may be placed (after being separated) in the exact position they occupied, and the upper plate may be turned in any position on the pivot rod and fastened wherever desired. The arrangement of the plates (or jaws) is such that they can be moved near each other, and thus diminish the quantity of plaster used in making the mold.

Improved Apparatus for Operating and Locking Switch Signals.

Smith H. Finch, care H. Moore, 7 Park Place, New York city.—The levers for locking and levers for moving the switches or signals are made to work from one side to the other side of a frame, and lock and unlock the switches and signals thereby, locking bars provided with two shoulders each catching and holding the levers. These locking bars have at each end a portion turned at a right angle, and through which portions are pivot bolts, upon which the bars turn. These angular portions have each a slot in their extreme ends, which engage with latches which work *in slots* through the frame confined by joint pins. The latches are connected together by the bars on the outside of the frame which are parallel therewith. The inner ends of the latches are curved and slotted much like the end of a wrench, and receive a staple on the levers, and thereby hold the lever in a locked position, while the bars are locked by other latches, which are thrown into the slots in the angular portions. When the other lever is unlocked, the switch or signal levers are locked.

Improved Hand Corn Planter.

John W. Cleland, Nevada, Mo.—In using the planter the handle is grasped by the hand, and, by pressing downward with the outer part of the hand, a lever will be operated to force the slide back into the seed box; then, by relaxing the grasp of the hand, the slide will be forced forward by springs, dropping the seeds into the space between the boards. The plates are then forced into the ground, and a lever is again operated, to force the dropping slide to the rearward. This movement separates the plates and allows the seed to drop into the ground. The planter is then raised from the ground, and, as it is being carried forward to the place for the next hill, the hand is again relaxed, and the seed for the next hill is dropped into the space provided. The principal advantage of the device is that but one hand is required for its manipulation.

Improved Horse Collar.

Thomas Cheal, St. Paul, Minn.—This is a wooden horse collar, consisting of two back pieces hinged at top, front pieces beveled to receive the hames, and a padding secured between the parts. The broader back piece carries the trace away from the shoulder, so as not to bruise the same. The collar is stronger and better fitting than the common kind of collars in use, and may, with suitable iron bindings, be used advantageously for the heaviest work.

Improved Detachable Ash Pan for Stoves.

Albert T. Bleyley, Conception, Mo.—A perforated bottom and drawer extends under the entire stove, in addition to the ordinary stove grate, so that the coals which drop from the stove grate will rest on the bottom, while the ashes will pass through into the ash drawer. When the grated bottom and drawer are intended only for the hearth, the hearth is made on a level with the bottom of the stove.

Improved Insertable Saw Tooth.

Erasmus Smith, Norwich, N. Y.—The saw plate and the tooth wedge are provided with openings, arranged with the joint of wedge and plate diagonally, one portion in the wedge and the other in the plate, so as to allow the said wedge to be tightened against or loosened from the tooth by keys.

Improved Hay and Grain Elevator.

Thomas Powell, Stockton, Cal.—Two sections of netting are attached to stretchers of wood. The stretchers connect the sections together by hooks and eyes, also by a revolving hook, which has a crank for turning it by a trip cord, for unlocking the sling. This crank is held fast by a spring catch until it is required to unlock it. The sling is spread upon the bed of the wagon to be loaded, with the ends so disposed that they can be connected to the derrick hook when the load is to be removed. After the load is removed and laid on the stack the two parts of the sling are unlocked by the trip cord, so as to disconnect and pull out from under the load, and leave it when the derrick chain is hoisted.

Improved Preserve Can Holder.

James Henry Winslow, Lynn, Mass.—This invention consists of a pair of rubber-lined clamping jaws, with the contrivance for opening and closing them and holding them closed; also, with clamp screws for detachably connecting the clamping jaws to a table or other support. The whole is contrived and adapted for holding glass fruit jars while screwing the covers on or off, and the holder is arranged so as to hold jars of different sizes.

Improved Carriage Spring.

William F. Dusenbury, New York city.—The wooden part of the side bar is made shorter than the space between the cross springs of the wagon, and to it is secured a steel spring, which is connected with the ends of the cross springs. A rubber block, through which the end of the spring passes, is placed in the hook of the cross spring. The ends of the springs and the rubber blocks are then secured to each other by a bolt. The rubber blocks prevent the springs from coming in contact with each other, and thus prevent wear and rattling.

Improved Bottle.

Lewis F. C. Schmidt, Pittsburgh, Pa.—In the packing of glass bottles for storage or transportation, whether they are filled or empty, it is essential that they be packed snug, and so that they cannot move about. To facilitate such packing, the bottle is made long and tapering from the bottom upward; and a heavy ring surrounds the bottle at or near the bottom of the neck, which outer surface of the ring is equal to the diameter of the body of the bottle.

Improved Drill for Drilling Metal.

John B. Shaw and Simeon H. Lucas, Chicago, Ill.—This improved drill for drilling holes in metals is so constructed that it may be used for forming a small and a large hole, that it will not clog, and will enable oil to be introduced to the point of the drill without being wasted upon the chips. In the opposite sides of the inner part of the drill are formed two grooves, the outer parts of the sides of which, for about half the depth of said grooves, are parallel with each other, and with the diameter that passes through their centers. The inner parts of the sides of the grooves incline toward each other and meet at an angle of about eighty degrees. This form of the grooves causes the chips to break in pieces, and thus prevents the drill from becoming choked. Other grooves conduct oil to the point.

Improved Cultivator.

Frederick W. Tolley, Coxsackie, N. Y.—Through the ends of the curved bars of the frame are passed rods, which are kept apart by tubular washers placed upon and interposed between the curved bars. The latter and washers are pressed together, making the whole frame firm and strong by nuts screwed upon the ends of the said rods. The draft hook is pivoted to the tongue a little in front of the forward rod. To the draft hook is pivoted a link which, when the cultivator is in working position, is hooked upon a hook placed upon the forward rod, and which, when the cultivator is in position for transposition, is hooked upon another hook attached to the tongue. The tongue is pivoted, and, with the frame, is adjustable in slotted guides.

Improved Bee Hive.

George H. Mobley, Nevada, Mo.—The bottom of the honey box is raised and is narrower than the box, to allow the bees to pass therein and up through suitable spaces.

Improved Car Stopper and Starter.

Absalom B. Sharp, Plaquemine, La.—The object of this invention is to utilize the power employed to stop a railway car by using the same to start the car. It consists in a rack which is made to mesh with a pinion upon the axle of the car wheel by means of a hand lever and crank shaft, the said rack being attached to a framework that compresses a spring to form the brake. The framework is provided with pawls which may be made to engage, through a second hand lever, with ratchet wheels upon the car wheels, and the said pawls are located upon the opposite side of the axle from the rack, so that, after the pawls are applied and the rack released from the pinion, the pressure of the spring is shifted to the opposite side of the car axle, and the car urged forward in the same direction in which it was going previous to applying the brake.

Improved Stereoscopic Print Cutter.

Thomas W. Smillie and Albert Siebert, Washington, D. C.—This invention relates to novel means for cutting, by machinery, stereoscopic pictures, which are taken in duplicate and require to be separated, trimmed, and reversed in position. It consists of two pairs of dies, intervaled and operated simultaneously by a treadle mechanism, together with holding springs, gages, and means of adjustment. It is found in practice to do its work rapidly, with great uniformity, and with but little labor to the operator.

Improved Gate Latch.

John L. Giessler, Clinton, Iowa.—This invention relates to an improvement upon the ordinary gate latch which is now so frequently opened by animals, and consists in so arranging two latches that both must be simultaneously operated in order to allow the gate to be opened.

Improved Car Coupling.

John Hardey, East Saginaw, Mich.—This consists of a drawhead which is provided with a suitably guided coupling pin, supported in raised position ready for coupling on a sliding plate operated by a slotted elbow lever, which is pivoted sidewise at suitable hight to the coupling pin, and acted upon by a band spring. The action of the link on the pivoted elbow drops the pin and couples the link, whose horizontal position for coupling is produced by end notches and shoulders of the elbow lever bearing thereon.

Improved Mechanism for Operating the Adjusting Screws of Rolls.

John Sharpless Worth, Coatesville, Pa.—This is an improved spanner, which may be readily reversed and adjusted to work both screws at a time or either singly.

Improved Apparatus for the Manufacture of Coke and Illuminating Gas.

John T. B. Bennett, Birmingham, England.—The ovens in which the coking is to be effected are arranged in connection with gas retorts, so that, by means of stop cocks and dampers or valves, communication between the said coke ovens and gas retorts may be opened and closed and controlled. Around the gas retorts is a channel through which the heated air and products of combustion from the coke ovens may be caused to circulate and heat the said gas retorts. During the first stage of the coking process, the heated air and products of combustion from the coke ovens are made to circulate around the exterior of and heat the gas retorts. When all are sufficiently heated, air is shut off from the said coke ovens. The heat of the coke ovens and their contents then causes the coking process to be continued, the volatile matters given off now being unburned in consequence of the exclusion of air. The volatilized matters are made to pass through the heated gas retorts, which are charged with gas-producing material, and thus are resolved into permanent illuminating gas, which mixes and passes off with the illuminating gas produced from the materials in the said gas retorts.

Improved Cork Sole for Shoes.

Charles Thackerey, New York city, assignor to Barrows & Boyd, same place.—The cork is secured in a die-cut box by some adhesive substance. The unbroken continuity of the box overcomes the objection to free ends—that they work loose—while, as a middle sole, it can be sewn by a machine with great facility.

Improved Cotton Seed Drill.

Henry Steckler, Jr., New Iberia, La.—This invention relates to an improvement in the class of cotton seed planters whose dropping wheel is operated by a bevel gear with a wheel which travels on the ground either in front or rear of the seed hopper. The dropping wheel is provided with a series of holes near its edge, and the wires inserted therein, and their ends projecting, to serve as teeth to draw the cotton seed out of the hopper.

Improved Filter Rack.

Moritz Leiner, New York city.—This is a rack to be placed in funnels for filtering liquids into bottles or other vessels. It is adjustable as to size, and is made in the form of a hollow inverted truncated cone, placed in an ordinary funnel, and used with filtering paper placed on the inner side, which leaves a space equal to the diameter of the wires of the rack between the paper and the inner side of the funnel for the escape of the air contained in the vessel.

Improved Washing Machine.

Thomas J. McWane, Versailles, Ill.—In this invention, the suds box is hung on trunnions and vibrated by means of a vertical lever attached to its side. The rubber does not vibrate, but is made vertically adjustable, to adapt it to rise and fall according to the thickness of the clothes which may be interposed between it and the suds box at any time during the operation of the machine.

Improved Spring Bed Bottom.

George L. Shepard, Columbus, Ohio.—Strips of metal form the top, made of spring material, and are bent down inside, so as to afford relief by straightening out to some extent whenever a section is sprung down. The invention consists, also, of a mode of connecting the strips so bent down within the volute springs by a ring laid in the bent down portions, and secured by cross pieces of wire passing over it and under the top coil of the spring, and fastened to the strips which pass over the top coil.

Improved Cut-Off for Shot Boxes.

Herman C. Wey, Hiawatha, Kan.—The discharge valve or cut-off is attached to a perforated hopper bottom, and consists of an outer guide casing with a spout, and an inner turning and sliding recessed tube, adjusted by a lug and guide slot to the open and closed position of the valves.

Improved Vine Rake.

Joseph W. Dunn, Corpus Christi, Tex.—This invention consists of a forward curved fork or double toothed rake, attached by eyebolt and braces to a common plow beam. The teeth pass under the vines and tear them loose from the ground, carrying them along until the rake becomes choked or full.

Improved Door Latch.

Jonas H. Crane, Schenectady, N. Y.—This door lock is constructed without the use of springs, and consists of a sliding bolt, which is operated by pivoted and horizontal toggle levers, in connection with a thumb lever acting thereon. The release of the thumb lever carries the toggle levers, by the action of the weight, instantly in a downward direction, and shoots the bolt forward.

Improved Automatic Fan.

Lorenzo D. Stamps, Galveston, Tex.—This consists of powerful clockwork mechanism, arranged in a bracket to be fastened to the ceiling and adapted to oscillate a vertically adjustable fan.

Notes & Queries

A. L. B. will find a recipe for cement for grindstones on p. 251, vol. 31.—A. K. can temper millpicks by the process described on p. 202, vol. 31.—D. F. B. will find a description of silicate of soda on p. 225, vol. 23.—A. N. can destroy the trunks of trees by the method given on p. 219, vol. 31.—F. B. will find directions for preparing gun cotton on p. 282, vol. 31.—R. J. can proportion cone pulleys by the rule given on p. 180, vol. 26.

(1) A. asks: Can I study chemistry without a knowledge of Latin? A. Yes.

(2) F. F. asks: What will whiten a person's skin? A. We do not know of anything that we can recommend for this purpose.

(3) A. S. asks: How can I take wrinkles out of parchment paper? A. Moisten it with water and place in a book under pressure.

I have a brass watch which has been quicksilvered. The silver comes off and leaves a nasty gray color. Can you tell me how to silver it? A. The best method would be to detach the case and subject it to a sufficiently high temperature to vaporize the mercury. You had better electroplate the case with silver. See p. 299, vol. 31.

(4) L. F. H. asks: In the substance of the cerebrum, beneath the folding of the gray matter, are various divisions and subdivisions. What special uses do they perform? A. Consult Dalton's "Physiology."

(5) A. N. W. asks: 1. What would be the cost of a Grove electric battery, consisting of 40 cells? A. $80. 2. To make the above would cast iron cells do as well as earthenware? A. No. Use glass. 3. Would tin answer? A. No. 4. What cheap material will do for inside porous cells? A. Clay cells. 5. What are the proper dimensions for a single cell? A. Four inches high by 3½ wide. 6. Is the U the proper shape for the amalgamated zinc? A. W will answer. 7. Is 1 plate of platinum inside the porous cell? A. Yes. 8. How is the zinc fastened to the cell and in the battery? Is zinc joined to zinc, and platinum to platinum, or zinc to platinum? A. The zinc of one cell is joined to the platinum of the next. 9. Can you recommend any good practical handbook on electricity? A. Yes, Ferguson's.

(6) W. Y. T. asks: I have seen it reported that cryolite has been discovered in Nevada. Is this so? A. It is probable that, if the report were true, a specimen would have been forwarded to us for examination. We have glauberite, salt, gay-lussite, borax, saltpeter, sulphur, and crytomorphite from these localities, but no cryolite.

(7) S. A. T. asks: How can I dye the enclosed sample of yellow leather black? A. Steep the leather for a short time in a strong solution of copperas (sulphate of iron) in water.

Please give me a recipe for making stick pomatum, perfumed. A. This pomade is generally composed of mutton suet, but is sometimes made of hard body, to which is added in summer 1 oz. wax for every lb. body. Lard body can also be used, but the proportion of wax must be increased. In its preparation, always melt the least fusible body first. In molding, care must be taken not to run the pomade while too hot, as cavities will occur in the center, rendering the sticks liable to break. To perfume, the usual odors are, for 1 lb. pomade, essence bergamot, lavender, thyme, orange peel, of each 1 drachm. Color with annatto.

Please give me a recipe for a waterproof cement with which I can join canvas. A. Place in a wide-mouthed bottle a number of pieces of gum rubber, and pour over them a quantity of bisulphide of carbon. Close the bottle, and allow it to stand for some time, until the rubber has all gone into solution; then add to this an equal quantity of a solution of rosin (colophony), in spirits of turpentine. Allow to evaporate in the open air until of the desired consistence.

How can I soften brushes which have become hard with paint? A. Place them in turpentine for a short time.

How can I make marine glue? A. Cut 3 parts india rubber into small pieces, and dissolve it, by heat and agitation, in 31 parts of naphtha, chloroform, or benzine; add to this 65 parts powdered shellac, and heat the whole with constant stirring until the shellac is dissolved, then pour it while hot on metal plates, to form sheets. When used, it must be heated to 248° Fah., and applied with a brush.

Can a kettle lined with porcelain be repaired in any way? The lining is burnt. A. It would be necessary to have the whole interior cleaned and re-enameled. See p. 137, vol. 27.

(8) C. D. C. asks: What is the effect of buckwheat on the blood? Does it drive the impurity of the blood to the outside, or does it make the blood more impure and, by reason of excess, cause impurities to come to the surface? A. The harm is not due to any injurious ingredient in buckwheat. It is to be ascribed to the large amounts of butter and fatty matters eaten at the same time.

(9) J. O. A. Y. says: A friend of mine and myself had a dispute as to polar or magnetic attraction. He said the needle of the surveyor's compass in all latitudes pointed to the true north. I maintain that the needle only points true north in two places. Which is right? A. The declination of the needle is very different in different places; in some places it is 10°, 20°, 30°, and even 90°, west of the true meridian, and in other places it varies as much to the east.

(10) L. P. C. asks: 1. Is metallic lead useful for precipitating quicksilver from a solution of bichloride of mercury? A. No. 2. If sulphuric acid be poured into a solution of bichloride of mercury, would it cause the precipitation of an insoluble salt of mercury, such as sulphate of mercury? A. Yes.

(11) H. L. C. asks: 1. If I make two magnets, 2½ inches long with ½ inch cores, and wind one with No. 22 wire until it is ½ inch deep, and wind the other to the same depth with No. 14 wire, which will hold the heaviest weight? A. The latter. 2. If I make the cores 1 inch in diameter and use the same length of wire, will they hold more than before? A. No. 3. If two pairs of magnets of the same kind be put in the same circuit, will the two pairs hold more than one pair, or does the extra length of wire diminish the power of one pair in proportion to what is gained by the other? A. The maximum magnetic effect is produced when the resistance of the coils of the magnet equals that of the battery.

(12) L. R. K. asks: How can I crystalize grass? A. Dry the leaves, steep in a strong solution of alum for a few minutes, and dry again.

(13) C. P. W. asks: 1. Is it because electricity accumulates on the surface of bodies that lightning rods are made flanged, so as to expose more surface? A. Yes. 2. Are the inclosed specimens copper pyrites? A. Yes, twin crystals. 3. Please explain why has a man, born in the year 1800 and now living, not lived in both the eighteenth and nineteenth centuries? A. He has. A previous answer on this subject was an error.

(14) S. H. L. says: We have a telegraph line of galvanized iron wire, about 2,200 feet long. We use four Morse sounders. How many Callaud jars, 4½x7 inches, would it take to run such a line? A. Ten.

(15) T. A. J. asks: Why will sulphuric acid become frozen? I got some a few days ago and placed the bottle in the cellar. It was not very cold, but the bottle cracked by the acid being frozen into a crystal mass. A. The phenomenon was probable due to the acid in question being quite dilute or very concentrated. If the former, there is nothing remarkable in its freezing, as strong oil of vitriol freezes at −15° Fah. The most concentrated sulphuric acid, when exposed to a temperature of 32° Fah., crystallizes and remains solid even at a temperature of 45°. When the fuming acid of Nordhausen is exposed to a low temperature, a crystalline substance separates, which is a hydrate containing one half as much water as the common liquid acid.

1. I made a battery cell according to the directions on p. 132, vol. 32. Which is the positive pole? A. The wire leading from the plate at the bottom of the jar is the positive pole of the battery. 2. Can I connect this cell to a Smee cell in silverplating, to make more current? A. Yes; connect the positive pole of this battery with the zinc of the Smee cell. 3. I have a nickel solution; and the anode will not dissolve and go on the work to be plated. Is the solution too weak, or is the battery too weak? A. Probably the former.

(16) S. asks: Is the so-called aerated bread (made light with a gas generated from nitric acid and marble dust) injurious to health? A. It has been used in vast quantities, and has always been found wholesome. It is not as palatable to many as good fermented bread.

(17) H. M. says: A young man has lately experimented on vulcanized rubber (old shoes, etc.), and has obtained (by the action of certain re-agents) several substances of different colors. I send you samples of five of those colors. What do you think about them? A. May not the colors be due to the substances put in, and not to the bodies gotten out by the various reagents? For example, the brilliant yellow color on examination proved to be chromate of lead, which certainly does not exist in old rubber shoes.

(18) H. B. asks: 1. Are the ashes of coal of any value for manure? A. Coal ashes are not of great benefit as fertilizers. 2. Will they do for walks in gardens, if put on 2 or 3 inches thick? A. They are used extensively for this purpose. See p. 50, vol. 32.

(19) F. S. asks: 1. I hear that bichromate of potash added to glue would render it insoluble in water. I see (on p. 272, vol. 32) that bichromate applied to gelatinous films and exposed to light makes them insoluble. Is it bichromate of potash? A. Yes. 2. What proportion should be mixed with glue? A. The plates are flooded evenly with gelatin and allowed to dry. They are then placed in a bath consisting of an aqueous solution of bichromate of potash, which combines with the gelatin. The film so changed, on exposure to light, is rendered insoluble.

(20) J. O. B. asks: Which is the better conductor of sound, wood or glass? A. Glass. 2. Would glass conduct sound better when resting upon glass? A. Probably. As to your other question, consult some good work on the subject.

(21) L. T. S. asks: Is it as good to soak or boil green timber in hot coal tar as to kiln-dry the timber and then coat it with the same? The timber is to be used just beneath the surface of the ground. What is the ordinary increase in durability of pine timber when prepared with coal tar? A. The decay of the timber is due to a fermentation and putrefaction which take place in the sap, and this liquid portion is gotten rid of in kiln-drying, and its place occupied in part by the tar. If retained, it is difficult to prevent the decay from going on. No definite time is given, authorities say simply: "Much more durable."

(22) F. A. says: You state that wood ashes are good to scatter over the ground about fruit trees. Would an admixture of coal or coke ashes be deleterious? A. The benefit of using wood ashes is due to the large percentage of potash which they contain; and as this is present only in minute quantities in coal ashes, the latter would not be of much service as fertilizers.

(23) C. S. F. asks: Can you give me a recipe for the cure of moles and freckles? A. Corrosive sublimate 5 grains, muriatic acid 30 drops, lump sugar 1 oz., alcohol 2 ozs., rose water 7 ozs. Agitate together till all is dissolved. Apply night and morning.

You state that coffins can be made of *papier maché* made waterproof with asphaltum. Why cannot this preparation be put on wood placed underground or in the water, to prevent rot? A. It has long been used for this purpose.

(24) D. L. B. asks: What is good for sticking leather together? A. Melt together in an iron pot equal parts of pitch and india rubber.

What kind of cement will do to take a mold from type, which will bear heating to 200° Fah.? I want to make rubber stamps. A. Plaster of Paris.

(25) J. M. L. asks: 1. How can I procure pure tin from the ordinary block tin? A. Ordinary block tin is nearly pure tin. It may be still further refined by melting and briskly agitating for some time, and afterwards allowing it to remain quiet for several hours, first having skimmed off any impurities on the surface. The upper part of the melted metal may then be run off into iron molds and considered as refined tin, most of the impurities having been left behind in the lower portions of the pot. 2. Of what is type metal composed? A. Type metal is an alloy of lead, with one third or one fourth of its weight of antimony. 3. What alloy melts at the lowest temperature? A. Newton's fusible alloy is composed of 2 parts bismuth, 1 of lead, and 1 of tin, and melts at 201° Fah., so that it liquefies readily in boiling water.

(26) P. J. S. asks: How can I dissolve silicate of soda in large quantities? A. It may be readily dissolved by boiling in water for some time.

(27) W. R. G. asks: By what process can oxygen gas be obtained, and put in a tank or vessel so that it can be taken by inhalation? A. Oxygen is obtained for this purpose as described in answer to J. H. L., p. 218, vol. 32, the only difference being the addition of a small quantity of caustic potash to the water in the wash bottle, to remove all traces of chlorine and carbonic acid. In charging the tanks, an ordinary steam gage is attached to the connection; and by means of an air pump, the gas is forced into the tank until the gage indicates a pressure of about 240 lbs. The screw valve is then closed, and the reservoir is ready for use.

(28) G. E. L. asks: What is the best way to kill a bird or other animal preparatory to stuffing it? A. Use chloroform.

(29) C. S. F. asks: Can any fluid be solidified, so as to withstand a great amount of heat? A. Boil a quantity of silicate of soda (water glass) in water for some time; allow to settle, and then decant the clear liquid. The addition of some muriatic acid to the liquid will convert it immediately into a stiff, hard jelly. This, if thoroughly washed with hot water, when heated, will resolve itself into nearly pure white sand, which will withstand a very high temperature.

(30) F. T. W. asks: What can be done to remove a bad smell from rain water? A. Allow it to be well sunned and aired. Filter through carbon filters, or deodorize with freshly burnt charcoal. Or add sufficient permanganate of potash to impart a permanent red color, raise to boiling point, allow to cool, and decant the water from the sediment.

(31) H. C. says: The pressure gage and the safety valve on my boiler do not agree. The steam blows off freely with the weight at 80 lbs. on the lever, while the gage shows but 60. The safety valve is $\frac{1}{8}$ inch in diameter. I have examined the gage and find nothing wrong. How can I calculate the proper weight for the valve? A. When you have no steam in the boiler, secure the valve stem to the lever, and attach a spring balance to the lever just over the center of the valve stem. Then raise the lever slightly, so as to get the valve clear of the seat, and note the reading of the spring balance. Then divide this reading by the area of the valve in square inches (0·5184 in your case), and the quotient will be the pressure in lbs. per square inch at which the valve opens. The attention of all who wish to test their safety valves is invited to this extremely simple and accurate method.

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

J. K.—Your medicine is rhubarb; take as much of it as you please.—V. E. Jr.—Your conclusions, drawn from the tests applied, are not in every case correct; but we have not succeeded in finding the dye.—J. McM.—It is iron pyrites.—G. J. McD.—It is magnetic oxide of iron, quartz colored red by oxide of iron, and chrysocolla or silicate of copper.—M. G. L.—It is a white talc. Use clay and silica, in proportions determined by experimenting with this material.—C. S.—The box of minerals sent contains mica, quartz, garnet,and felspar, none of which require assay, and black magnetic oxide of iron.—O. S. C.—It is remarkably fine white talc. It can be used as a lubricant, to extract grease, etc., to mark on cloth (as French chalk), and in the manufacture of certain varieties of porcelain.—W. B. L.—It is carbonate of lime, and does not necessarily indicate the presence of silver.—J. H. P.—They have the character of cement rock of partial purity, and their working qualities would have to be tested by a manufacturer of hydraulic limes.—The bottle of water forwarded by Mr. Thompson for analysis contained a considerable amount of organic matter and the chlorides and sulphates of lime, magnesia, and the alkalies. It had an alkaline reaction.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On a Marine Railway. By G. A. F.
On the Mouths of the Mississippi. By O. P. S.
On Spiritualism. By L. G. F.
On a Meteor. By P. O. H.

Also enquiries and answers from the following.

A. O.—C. G. D. Jr.—J. G. B.—D. E. W.—A. J. K.—N. F.—O. S. T.—R. N. W.—J. A.—F. C. B.—J. N. Y.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of enquiries analogous to the following are sent: "Whose is the best fan blower? Who makes induction coils, and what are the prices? What is the price of nitrate of silver in large quantities? Who sells the deodorized bisulphide of carbon? Who sells the best grindstones? Who makes the best steam engine indicators?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

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DESIGNS PATENTED.

8,284.—PICKLE JARS.—C. A. DuVivier, Summit, N. J., *et al.*
8,285.—MEDAL.—T. R. Hartel, Philadelphia, Pa.
8,286.—GLASSWARE.—G. E. Hatch, East Cambridge, Mass.
8,287 to 8,289.—SHOW CASES, ETC.—J. Lehnbeuter, St. Louis, Mo.
8,290.—BEER MUG.—J. E. Miller, Pittsburgh, Pa.
8,291.—GOBLET.—J. E. Miller, Pittsburgh, Pa.
8,292.—TOY.—J. Stidham, South Oil City, Pa.
8,293 to 8,297.—LAMP POSTS.—W. Tweeddale, Brook'n, N. Y.
8,298 to 8,300.—BREASTPIN, ETC.—L. S. Beals, Astoria, N. Y.
8,301.—TRIMMINGS.—S. Bernstein, Mount Vernon, N. Y.
8,302.—DRINKING VESSEL.—M. D. Connolly, Phila., Pa.
8,303.—MOLDING.—H. S. Searle, Rochester, N. Y.

TRADE MARK REGISTERED.

2,411.—NOTE PAPER.—J. Leach, Passack, N. J.

SCHEDULE OF PATENT FEES.

On each Caveat $10
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On issuing each original Patent $20
On appeal to Examiners-in-Chief $10
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On application for Reissue $30
On filing a Disclaimer $10
On an application for Design (3½ years) $10
On application for Design (7 years) $15
On application for Design (14 years) $30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, APRIL 22 to 28, 1875.

4,665.—C. and L. Gaouette, St. Ann de Stukely, P. Q. Varnish. April 22, 1875.
4,666.—J. S. Shaller, Boston, Mass., U. S., *et al.* Knitting machine. April 22, 1875.
4,667.—G. W. Dubuisson, Toms River, N. J., U. S. Treating jute, etc., for paper making. April 23, 1875.
4,668.—Wm. Patteson, Bramly, Ont. Self-acting milking apparatus. April 23, 1875.
4,669.—S. Brillinger, St. Catharine's, Ont. Paint brushes. April 23, 1875.
4,670.—J. B. Baugh, Detroit, Mich., U. S. Link welder. April 23, 1875.
4,671.—T. Weiss, Bethlehem, Pa., U. S. Shovel. April 23, 1875.
4,672.—H. L. Walker, Guelph, Ont. Sewing machine shuttle. April 23, 1875.
4,673.—M. Wilson, Strathroy, Ont. Sulky harrow. April 23, 1875.
4,674.—P. B. Cunningham, Freehold, Pa., U. S. Running gear for vehicles. April 23, 1875.
4,675.—Wm. Charles, Chartiers, Pa., U. S., *et al.* Nut machine. April 27, 1875.
4,676.—J. T. Lockey, Northwich, England. Calcining and evaporating apparatus. April 27, 1875.
4,677.—C. Jewell, Monmouth, Ill., U. S. Automatic grain binder. April 27, 1875.
4,678.—B. F. Britton, New York city, U. S. Duplex comb. April 27, 1875.
4,679.—C. Gullmann, Forestville, N. Y., U. S. Sewing machine. April 27, 1875.
4,680.—T. B. Doolittle, Bridgeport, Conn., U. S. Hand alarm and register. April 27, 1875.
4,681.—W. L. Walker *et al.*, Kenton, Ohio, U. S. Iron fence. April 27, 1875.
4,682.—A. Spence, Montreal, P. Q. Section boiler. April 27, 1875.
4,683.—C. Bilharz, Pittsylvania C. H., Va., U. S. Hammer. April 27, 1875.
4,684.—G. McNaughton, Brooklyn, N. Y., U. S. Steam engine. April 27, 1875.
4,685.—B. Douce, Constantinople, Turkey. Paper bag machine. April 27, 1875.
4,686.—D. P. Corey, Consecon, Ont. Car coupler and adjuster. April 27, 1875.
4,687.—S. Keirn, Altoona, Pa., U. S. Millstone dress. April 27, 1875.
4,688.—R. Nutting, Wheaton, Ill., U. S. Semi-tubular lantern. April 27, 1875.
4,689.—W. C. Edge, Newark, N. J., U. S. Swivel header. April 27, 1875.
4,690.—D. K. West, Kentish Town, London, England. Engine and pump. April 28, 1875.
4,691.—T. F. Randolph, Morristown, N. J., U. S. Ditching machine. April 28, 1875.

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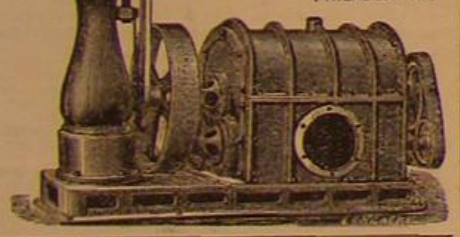

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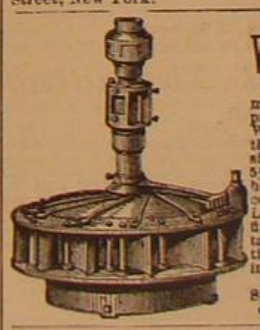

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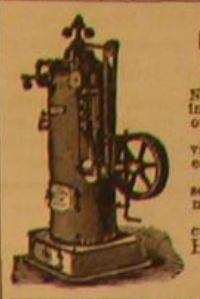

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