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CLEVELAND IRON INDUSTRY AND ITS FOUNDERS.

The rapid growth of the iron manufacture in the North Riding of Yorkshire, England, is one of the most remarkable features of the history of the trade. It commenced in 1850; in the next year 187,950 tuns of iron were taken out of the mines; in 1856 the yield was1,690,000 tuns; and in 1870, 1,695,377 tuns of pig iron was made in the district. Under this remarkable development, it is natural to expect that large fortunes have been made, new towns sprung up, and industrial establishments of all kinds organized. Middlesbrough, a town in the center of the trade, has aggregated a population of 40,000, while the whole district has increased from 20,000 to 250,000.

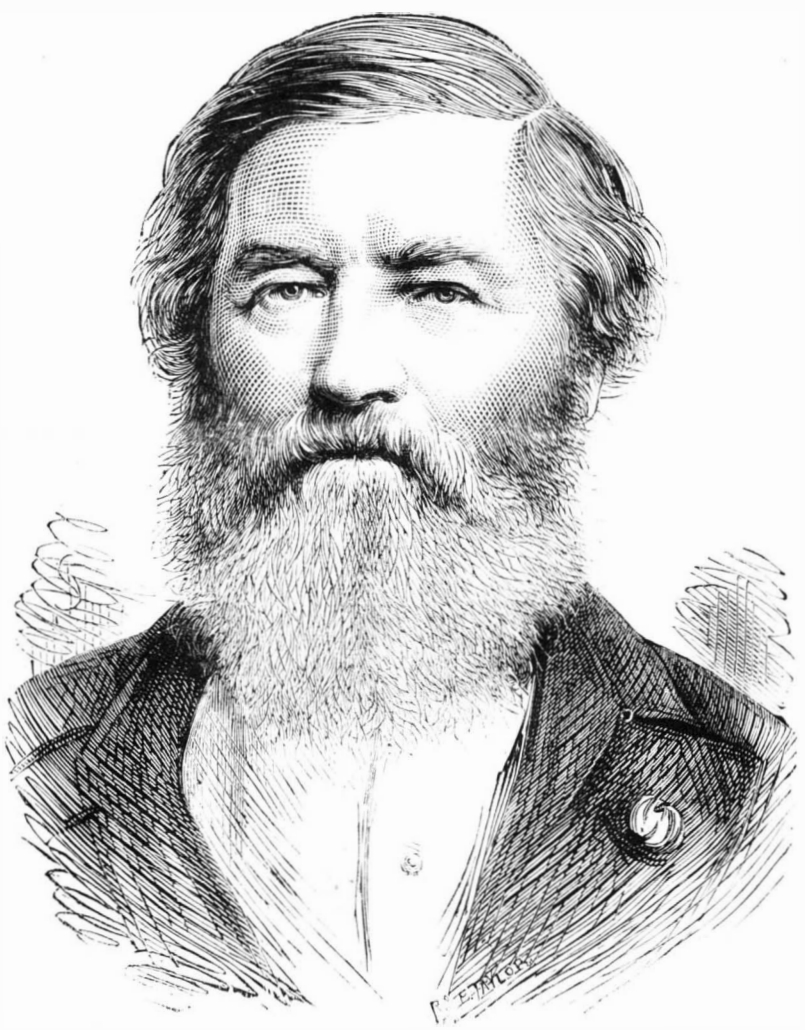
Bolckow and Vaughan have always been the chief iron-producing firm in the Cleveland district. They employed for many years not less than 10,000 hands, paying $5,000,000 a year wages, and running a large proportion of the 150 or 160 blast furnaces in the neighborhood. The business is now in the hands of a stock company.

Mr. Bolckow, who was elected, in 1868, to represent Middlesbrough in Parliament, was born at Sulten, in Mecklenburg, Germany, in 1806. In 1821, when only fifteen years of age, his parents placed him in a merchant's office at Rostock. Here young Bolckow's intellect was developed, and his powers of perception exercised. He had resolved to surmount the difficulties which threatened his further progress; and if knowledge were power, then he would obtain it. It was clear there was no royal road, and individual effort was his only hope of success. He accordingly made the best investment of his capital, which was his mind. He had resolved to make a mark in the world.

In 1827 he commenced business operations in conjunction with an intimate friend and companion, at Newcastle-on-Tyne, and was known as a man who had a high regard for commercial morality, and as possessing remarkable business qualifications. His position enabled him to exercise the splendid abilities with which he was endowed; and at the age of thirty-four, in the meridian of human life, he decided to go in search of a larger field for his labors. Middlesbrough was selected as the center of his operations, and he was fortunate in meeting with the late Mr. John Vaughan, a practical iron maker; and the two entered into partnership in the iron trade. Their capital was not large, therefore their operations were limited, and it required great prudence in the carrying out of their arrangements. The firm erected blast furnaces on a very small scale, in 1841, and commenced the manufacture of iron. The ironstone had to be conveyed a considerable distance, which necessarily increased the cost of production. Just, however, as the matter was claiming the serious attention of the new firm, Mr. Vaughan discovered the Cleveland ironstone. The two partners were delighted with the discovery, but they did not allow their feelings to overcome them. They had an object in view, and firmly united to perform it, the one undertaking the commercial management, and the other the practical part of the business. The firm continued to prosper, and as each year passed additions were made to their works; and although most of the firms were increasing their capital, few, if any, were doing this so rapidly as Messrs. Bolckow and Vaughan. It was their good fortune to prosper so that in the course of a short time they were enabled to multiply their works. Their policy appears to have been to make the most of their limited capital, to win the confidence of all with whom they came in contact, to increase their circle of friends, and, while exercising patience, to be industrious and frugal in their expenditure.

As an employer Mr. Bolckow was generally respected. Anxious at all times to promote the well being of his workmen, he never lost an opportunity of doing good. He often expressed his regret at the improvident habits of his workmen, and endeavored by every legitimate means to impress the desirability of a different course being pursued. It is recorded that he had an intense desire to see every public house closed in the district, and frequently used his efforts to prevent the sale of intoxicating liquors. Whatever may have been his expression on this subject, it is certain his habits were temperate, and he has ever taken a prominent part in the promotion of social, moral, and religious reforms, having for their object the advancement of mankind.

Anxious to improve the educational facilities of the town, he erected schools at a cost of $35,000, for the accommodation of 1,000 children. Nor is this the only act deserving our admiration. Every charitable institution in connection with the town has had its funds augmented by his liberal subscriptions. The greatest act of munificence, however, was the gift of a park to the people of the town wherein he had acquired his wealth. This cost upwards of $100,000; and in thus granting so large a portion of his profits, it is an evidence that he was not unmindful of the masses who had contributed to his immense wealth.



H. W. F. BOLCKOW, OF MIDDLESBROUGH.

The Odorless Excavating Apparatus.

We notice, with pleasure, that the odorless excavating apparatus, illustrations and descriptions of which were published on page 255 of our Volume XXIX., is meeting with a success which appears to substantiate fully the important claims made by its introducers. It has received full indorsement in the reports of the Boards of Health of Washington, Baltimore, and Philadelphia, and is now in constant employment in the cities of Boston, Providence, Pawtucket, New York, Brooklyn, Wilmington (Del.), Baltimore, Washington, Georgetown (D. C.), Charleston (S. C.), Savannah, Memphis, and New Orleans. The safe removal of soil is a matter of such sanitary moment, especially in large communities, that inventions for the purpose, proving really meritorious, deserve careful public consideration.

Manufacture of Plate Glass.

The manufacture of plate glass, as now conducted by the Thames Plate Glass Company, at Blackwall, London, is as follows:

The principal successive operations necessary to convert a mixture in the pot into a finished sheet of plate glass are six in number, and may be described under the heads of melting, rolling, annealing, grinding, smoothing, and polishing. The pots are of Stourbridge clay, made on the premises, and are filled with the mixture, the chief ingredients of which are silica, sand carefully dried, lime, sulphate of soda, broken white glass, and a little arsenic. The sand is obtained from Germany. After remaining in the furnace for about sixteen hours, the contents of the pot are fit for removal. The molten mass is then run over the surface of the rolling table, and the roller passed quickly over it. The glass commences to solidify almost immediately; and while in a thick tenacious condition, and of a rich golden tint, is rapidly transferred into the annealing furnace. The rough sheet, as it may now be termed, is taken from the annealing furnace to the grinding room of these there are several, containing about a dozen grinding stones, or, more properly, beds or tables, upon which the plate is laid flat. The grinding frames consist of wooden boards joined together and armor-plated, so to speak, at intervals over the rolling or grinding surfaces with strips of wrought iron. These strips, when first screwed on to the frames, are half an inch in thickness, and when removed measure less than one eighth inch. The frames are mounted upon a spindle, and a see-saw, semi-rotary movement is imparted to them by shafting running underneath the beds. They are also capable of being shifted by a simple slot connection so as to work over any part of the surface of the sheet as required. The grinding beds are of stone, and measure about 16 feet by 11 feet. The materials used as the grinding agents are coarse sand, fine sand, and emery. A jet of water plays on the surface of the sheet during the whole of the operation.

Between the grinding and polishing processes there is an intermediate process called smoothing, in which two sheets of glass are employed. One is laid over the other and caused to move over it in a manner similar to that in grinding. Emery is placed between the two surfaces. On entering the polishing room, the attention of a visitor is at once arrested by the reddish tinge of everything, extending to the dresses of the men and women engaged therein. This is due to the use of the red oxide of iron which is the polishing agent. The sheet to be polished is laid flat on a table, so as to be perfectly flush with the edges. The rubbers are of flannel and mounted on a frame, which carries them backwards and forwards over the sheet. The table, at the same time, has a lateral reciprocating motion, so that the whole surface of the sheet comes successively under the action of the rubbers. The largest plates measure about 15 feet by 10 feet, and the maximum thickness is about 1½ inches. One eighth of an inch is allowed for loss in the operations we have described. A nest of six boilers, and three vertical steam engines, two of 70 horse power and one of 60 horse power, supply the necessary motive power.

On September 2, the volcano Etna, in Sicily, was in violent eruption, which showed no signs of abatement.

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Contents:

(Illustrated articles are marked with an asterisk.)

PROFESSOR TYNDALL'S ADDRESS BEFORE THE BRITISH ASSOCIATION.

A most remarkable speech from a most remarkable man. Masterly in thought, profound in learning, keen in logic, it is startling in the boldness and vigor with which its author declares his faith in a materialistic doctrine and in the hardihood with which, asserting that forms of religious opinion have ever impeded Science, he claims for the latter unrestricted rights of research, while relegating the former to the sphere of the emotions. Such is Professor Tyndall's address delivered at the recent session of the British Association for the Advancement of Science at Belfast; and its utterances, if we mistake not, will arouse as acrimonious debate and call upon the head of the author as fierce denunciation as did the publication of his famous opinions on the "prayer gage." The time and place incident to the delivery of the discourse give to it additional weight; for in addition to its being the personal views to which he, as an eminent scientist, has been led by lifelong thought and study, it is an *ex cathedra* pronouncement of the President of the greatest and most influential of British scientific associations, which, unless distinctly repudiated, renders that body, in the eyes of the world at least, more or less responsible for its promulgation.

To understand the position which Professor Tyndall has taken in this sudden invasion of the neutral territory lying between scientific and religious thought, the reader finds himself called upon to reconcile views which at first sight appear at wide variance. "Abandoning all disguise," says the speaker, "the confession that I feel bound to make before you is that I prolong the vision backward across the boundary of the experimental evidence, and discern, in that Matter which we, in our ignorance, and notwithstanding our professed reverence for its Creator, have hitherto covered with opprobrium, the promise and potency of every form and quality of life."

This, standing alone, is unquestionably the most open materialism: but its force is modified when the assertion follows that "the whole process of evolution is the manifestation of a Power absolutely inscrutable to the intellect of man. As little in our day as in the days of Job can man by searching find this Power out. Considered fundamentally, it is by the operation of an insoluble mystery that life is evolved, species differentiated, and mind unfolded, from their prepotent elements in the immeasurable past. There is, you will observe, no very rank materialism here."

There is no negation of a creative power, while the affirmation of a sustaining cause repels the notion of atheism. The challenge is hurled at the theologians, the advocates of the science of divinity, and not the simply religious whose nature impels them to the belief in and leads them to love and reverence for their Creator.

Professor Tyndall demands for Science freedom of thought in every department of knowledge. He denies, in fact, the right of theology to compel us to accept in blind faith truths susceptible to the investigation of our own reasoning faculties.

In thus noting the views of a distinguished thinker, we chronicle an event of no common importance: albeit it is one of which the wisdom will be widely questioned, and the expedience (of directly bringing into popular controversy thoughts likely to disturb the faith of many) denied, even by believers. It must not be lost sight of that the large majority of people never think, but receive the faith of their ancestors unquestioningly; others are incapable of thinking for themselves, others too indolent and careless regarding the whole subject. These have regarded the agitations of the great theories of evolution and the like, which have deeply moved the scientific world, with indifference, and classed them with the older doctrines of Comte, Spinoza, and similar writers, which they abhor as atheistical and subversive of all religion and piety. On such people, the unmistakable utterances of Tyndall, dispersed broadcast by the public journals and not buried in technical publications, must have their effect; but whether the seed thus sown will fall on good ground and produce broader, wider ideas of the ineffable greatness of the Creator, or be choked by the tares of a belief undermined, resulting in skepticism and infidelity is a question which every individual must answer according to his own conscience.

A WOMAN WITHOUT BONES.

The social developments across the water show a lamentable state of affairs due apparently to no other cause than a deficiency of backbone in one or two individuals.

When such disastrous consequences proceed from the weakening of a part only of the human framework, we sincerely trust that there may be no spreading of the disease lately developed across the ocean in the person of an Irish woman, who lived to see her entire skeleton waste away until it was but a fourth part as heavy as a new born babe.

The case occurred in Dublin, and may truly be called extraordinary. The victim, forty-five years old, was a patient in an insane asylum. For five years she was confined to her bed, complaining of no pain, but gradually becoming weaker, while dwindling in stature until she lost half her hight.

As the disease progressed, her limbs were coiled up in every possible shape, the bones becoming extremely light, soft, fragile, and atrophied in every respect. At death, all that was left of her skeleton, including the skull, weighed two pounds and a half. The number of fractures was prodigious. The ribs were in a hundred fragments. The head of the humerus was bent; the fibulæ were curved; the thigh bones and pelvis were huddled together; the bones of the vertebræ were thinned and worn away across the front of their bodies; the lower jaw was atrophied and broken into three pieces; the base of the skull was cribiform all through. Had she lived a little longer, it was thought that not a vestige of a bone would have been left in her body. What ailed her no one could tell, the disease being almost unheard of and difficult to diagnose, treat, or even name. Professor R. W. Smith, of Dublin University, who brought the case before the Pathological Faculty, looked upon the condition of the bones not as a disease but as a manifestation of a diseased condition as yet unknown, possibly related to rickets.

LIVING BAROMETERS.

That is a curious instinct which a large number of animals possess, of predicting the weather and signifying the approaching change by peculiar movements or sounds. Some of their actions in this respect appear to be more governed by reason than by mere instinct, others are clearly due to the moisture in the air or various atmospheric influences, while some, which occur under conditions which prevent their being referred to the latter cause, offer an interesting field for the investigations of the naturalist. The presence of the barometer in almost every farmhouse, together with the weather bulletin or the dictum of "Old Probabilities," good for the next twenty-four hours, render such homely knowledge as that which governed the labors of the farmers and sailors of the last century almost superfluous in this advanced age; but the subject, like all topics which relate to the sagacity of the lower animals, is of itself an interesting one. And besides, it is not entirely impossible that some farmer to whom the barometer, if he had one, would be incomprehensible, and whose location prevents his obtaining the weather reports, may, by some odd action of his own cattle, of some insect, or of some bird, as described in the following lines, be forewarned of a coming storm in time, and save perhaps a crop during the present harvest months.

We have said that certain movements on the part of the animals, before a change of weather, appeared to indicate a reasoning faculty. Such seems to be the case with the common garden spider, which, on the approach of rainy or windy weather, will be found to shorten and strengthen the supporting guys of his web, lengthening the same when the storm is over. There is a popular superstition in England that it is unlucky for an angler to meet a single magpie; but two of the birds together are a good omen. The reason is that the birds foretell the coming of cold or stormy weather; and then, instead of their searching for food for their young in pairs, one will always remain on the nest. Sea gulls predict storms by assembling on the land, as they know that the rain will bring earthworms and larvæ to the surface. This, however, is merely a search for food, and is due to the same instinct which teaches the swallow to fly high in fine weather, and skim along the ground when foul is coming. They simply follow the flies and gnats which remain in the warm strata of the air. The different tribes of wading birds always migrate before rain, likewise to hunt for food.

There is a large variety of actions of which it is hardly possible to give a satisfactory explanation. Coming rain is foretold by the peacock uttering frequent cries, by the woodpecker lamenting, by parroquets babbling, by pintados perching, and by geese running around uneasily. So also it is said that, when a storm is at hand, swine will carry hay and straw to hiding places, oxen will lick themselves the wrong way of the hair, sheep will bleat and skip about, hogs turned out in the woods will come home grunting and squealing, colts will rub their backs against the ground, crows will gather in crowds, crickets will sing more loudly, flies come into the house, frogs croak and change color to a dingier hue, dogs eat grass, and rooks soar like hawks.

It is probable that many of these actions are due to actual uneasiness, similar to that which all who are troubled with corns or rheumatism experience before a storm, and are caused both by the variation in barometric pressure and the changes in the electrical condition of the atmosphere.

PLUMBERS' CARELESSNESS.

The Prince Consort of England was killed by typhoid fever generated by foul sewer gases, due to carelessness and ignorance in the plumbing work of his residence. The Prince of Wales nearly lost his life through the same insidious means, due to the same inexcusable cause. One of the grandest and most venerable of English cathedrals, that of Canterbury, was badly injured and nearly destroyed through sparks from a carelessly managed plumber's furnace igniting the roof. The magnificent Alexandra Palace, just completed and containing works of art of immense value, quite recently fell a victim to the flames, again originating among the plumber's working apparatus. Later still, the burning of the Liverpool landing stage, the greatest floating platform in the world, is now stated to have been due to the carelessness of the plumbers employed in joining the gas pipes below the flooring. The dangerous qualities of carelessness and ignorance, which are inherent to the workman of the trade, are therefore very justly coming in for their full share of reprobation from the English journals.

"Are we to spare a prince for every step of progress, or will our plumbers learn for the future without? They burn down cathedrals and music halls with unflinching impartiality by means of a system of soldering long ago abandoned by other nations. Thinking a good 'wiped joint' the perfection of human ambition, the plumber takes a long time over it and admires it lovingly from every side before he can make up his mind to part with it. This choice production of human skill is perhaps laid in the earth or built into a wall, and has no need of this fine art finish, but gets it, nevertheless." So says a correspondent of the English *Builder*. We echo his remarks with a grim sort of satisfaction, for it is not very long since we experienced one of the advantages of these lovely wiped joints, artistically molded by a bungler's paw. The completion of the work was the signal of a series of complaints (by the occupants of the building) that the water refused to run, except in a miserable little stream, from any of the faucets. Then we hired more plumbers to find out the mistakes of the first ones, and these overhauled pipes, and poked sticks and wires down them, and nosed around the cellar, and went on the roof, and ripped up the street. This was to the tune of something over a hundred dollars—still the water would not come; then the plumbers went at it again, and probably would have been struggling with wires and wrenches and spades and pincers up to the present time, had not some one suggested to look at the joints, and then the evil was found. One important wiped joint had had the solder squeezed into it so as to block up nearly the whole bore, and of course but very little water could pass through.

We hired another of the craft not long ago to look after a furnace, from every register of which horrible smells were emitted. We had a man and a helper; the duty of the latter was to hold a candle and converse with the man on appropriate and interesting topics, for which we paid him some dollars per day. This pair of worthies we turned loose in the house, with instructions to find out and eradicate the trouble. They got into the furnace, and poked brooms up into the flues, and took off the registers and poked brooms down. Then they pulled out several pieces of flue and soldered them over again, nobody ever could divine what for. Then they upset a furnace on a heap of kindling wood and nearly burnt the house down; and finally, after some days' tinkering, brought us an astonishing bill. We paid it, supposing that the work was thoroughly performed; but on lighting the furnace, again came the odor. On making a personal investigation, the first door that we opened (that in the brick casing of the furnace, which these individuals never thought to touch) revealed the cause in the shape of a bushel of dead rats. To make matters worse, the flues, which they had pulled out and fixed, had come to pieces, and we had to hire more plumbers to solder them with something besides rosin.

A few pages further on, in the same issue of the journal from which we clip the extract given in the beginning, is the report of the conflagration of some fine tenement houses in Edinburgh, due to a plumber's carelessness. The man left his furnace with a bright fire in it on the leads and went to dinner. A strong breeze blew it over, and the igniting of the building was the natural result.

We have no space to go over the series of outrageous botches which have been foisted upon us, coupled with enormous charges from plumbers, in this city. We have seen traps put in waterclosets, of not the slightest use in keeping down the noxious emanations. Water pipes run up the back walls instead of between the party walls, of course freezing at the first frost; new joints are made between floors, through which, the moment water was let on, the leakage poured out, to the ruin of our ceilings.

In fact so often have we been ruthlessly victimized that

when we do obtain a plumber that does his work in an honest, workmanlike, and substantial manner, at moderate cost, we shall be disposed to cherish him as a jewel of rare price.

QUICK AS WINK.

Our notions of the value of time are altogether relative. Ordinarily a minute more or less is a matter of little moment. A would-be passenger, who arrives at a railway station just in time to be too late, realizes that even a less interval than a minute may materially affect his calculations. To the timer of a closely contested race, a second is important; it may be a quarter of a second will make all the difference between fair speed and the "fastest on record." To the astronomical observer, a quarter of a second is a very long time, as an uncertainty of that amount might render worthless an observation which he can never hope to repeat, and for which he may have journeyed thousands of miles.

In some cases an interval so brief as that required for the movement which stands proverbially for instantaneous action may have a material effect on the accuracy of a calculation; indeed it is at times not only necessary to know and make allowance for the time of movements as quick as winking, but to know substantially how much quicker one man winks than another.

Though the movement of the eyelid is so rapid that there is no apparent interruption of vision, the act really involves half a dozen distinct physical and mental operations, the duration of each of which can be closely measured. If the movement is reflexive or involuntary, time is required for the transmission of the impelling sensation to the sensory center, time for its reflection to the winking muscle, time to overcome the inertia of the muscle—the period of latent excitation, as it is called—and lastly time for muscular contraction. That the sum of all these periods is something considerable can be roughly proved by counting the number of winks one can make in a second, or by timing the act by the ticking of a watch.

The purely reflexive part of the act of winking has been ingeniously timed by Dr. Sigismund Exner, who chose this act as the one best adapted to enable him to determine the time required for a complete reflex action. His apparatus consisted of a very light lever of straw, terminated at one end by a bristle which was applied to the eyelid, the other end being connected with the usual contrivance for exactly registering the beginning of muscular contraction. The stimulus was an electric spark, applied in two ways, by passing in front of the eye and thus acting on the optic nerve, or by exciting the nerve of sensation by striking directly on the cornea. He found the interval between the spark and the beginning of motion (that is, the time occupied in the transmission and reflection of the sensation, with the period of latent excitation in the muscle) to vary, with the intensity of the stimulus, from about $\frac{1}{18}$ to $\frac{1}{24}$ of a second, the stronger the spark the quicker the action. The period of latent excitation of muscle in man has never been precisely determined. Dr. Exner estimated it at about a hundredth part of a second, which would reduce the time required for the purely reflexive part of the act of winking to about $\frac{1}{22}$ of a second for a weak impression, and $\frac{1}{27}$ of a second for a stronger stimulus.

For a voluntary wink, a slightly longer time appears to be required, since a measurable interval is occupied in the act of volition.

WHAT MAKES THE APPLES ROT?

Our worst enemies are the smallest. All the ravenous beasts in the world, mad dogs included, probably destroy fewer human lives than are destroyed in this city alone by the ravages of those minute but virulent organisms of the genus *micrococcus*, to which we owe small pox, diphtheria, and some other malignant diseases. Simularly, the thousand sturdy weeds which annoy the farmer, the caterpillers and grasshoppers which occasionally devour his crops, are relatively innocent and harmless compared with the numerous microscopic pests which rust his grain, rot his potatoes and fruit, and otherwise levy their burdensome taxes without making themselves visible.

Just at this season, not the least interesting of these individually insignificant, collectively enormous, nuisances are the two forms of fungus growth which have most to do with the untimely destruction of fruit—*mucor mucedo* and *pencillium glaucum*.

Our apples decay, not because it is their nature to, as Watts might say, but because it is the nature of something else to seize on them for subsistence, as we do, at the same time making of them a *habitat*, as we do not. Kept to themselves, apples and other fruit never rot; they simply lose their juices by evaporation, shrivel, and become dry and hard, or, if kept from drying, remain substantially unchanged, as when securely canned. It is only when invaded by the organisms we have named that they lose color and quality, take on offensive tastes and odors, become covered with white or green mold—in short, develop rottenness and decay.

Formerly this process was thought to be no other than a continuation or exaggeration of the natural process of ripening, the chemical changes which produce the odor and flavor of the ripened fruit simply going on to their legitimate though less delightful end. But this theory overlooked the very common and important facts that fruit may rot without ripening, and that ripe fruit will not rot if properly protected.

It was not until the microscope was brought to bear on the problem, and the conditions of decay were so convincingly demonstrated, by Davaine, that the real nature of the process became clear. Now we know that, so far from being the complement of growth, the antithesis of life, decay is in reality the taking on of a more rapid though specifically different growth. It is synonymous not with death, but with intensely active life.

In general structure, the numerous microscopic fungi are very much alike, consisting mainly of a network of colorless cells and filaments, called the *mycelium*. This is the vegetative part. There is, besides, a reproductive part, in which is produced the seed or "spore," the structure of which is different in the different genera. In the mucor each reproductive filament bears a globular swelling at its superior extremity, in the interior of which the spores are developed. In the pencillium glaucum the reproductive filament bears a tuft of from four to eight branches, which, in turn, produce upon their extremities a chaplet of small oval spores. It is called *pencillium* on account of this pencil-like tuft of its spore-bearing filaments, and *glaucum* from their bluish green tint. The mold so frequently seen in oranges is produced by this fungus. It is comparatively of slow growth, and the alteration it produces in the properties of the fruit it lives in and upon is not so marked as that caused by the mucor.

When a fruit is invaded by either of these fungi, the vegetative filaments send their branches among and around the fruit cells, and rapidly envelop them in a network of mycelium, absorbing the substance and juice of the fruit, and producing the chemical transformation characteristic of decay. All this goes on in the interior of the fruit, the fructification of the fungus taking place only on the surface, in contact with the atmosphere. For this reason fruit covered with a firm, fine skin, like the apple, may be a mass of what we call corruption within—in other words, thoroughly decomposed by fungus growth—while no visible mold—the fructifying part—appears on the surface. On the other hand, thin-skinned fruits like the strawberry, which are easily pierced by the reproductive filaments, are often covered with an abundant fructification in a very short time, for the fecundity of these microscopic fungi is sometimes as marvelous as the rapidity of their growth. For example: A single zöospore of the *peronospora infestans*, which causes the potato rot, will envelop the cellular tissue of a potato leaf with mycelium filaments in twelve hours, and fructification will be completed in eighteen hours longer. One square line of the under surface of a leaf, where the fructification naturally takes place, may bear as many as three thousand spores. Each spore supplies half a dozen zöospores, individually capable of originating a new mycelium. From one square line, therefore, there may come, in less than two days, nearly twenty thousand reproductive bodies, and a square inch may yield nearly three millions! No wonder the disease spreads rapidly.

In the case of fruit, decay may be originated in two ways, and two only: by direct contagion or by wind-wafted spores. With firm-skinned fruit like apples, still another condition is essential, namely, a break in the skin of the fruit to allow the parasite to enter and take possession. In every case of decay in apples, the center of disturbance will be found at a bruise, scratch, or puncture; and unless such a way be opened, the apple may hang until it is dry as leather, or it may lie for weeks in direct contact with rottenness, and remain perfectly sound.

To this it may be objected that the constant presence of the fungus in decay is no proof that it is the cause of that condition, on the contrary, the breaking down of the fruit tissue by violence, and subsequent chemical action owing to access of air, may rather make the growth of the fungus possible by preparing a suitable soil for its development. The objection has been met in the investigations of Davaine. The evidence that the fungus precedes and causes the changes which we call decay is of the same character as that which establishes the connection between a vaccine pustule and inoculation by vaccine virus. When sound fruit is inoculated with the spores of pencillium, decay begins at and spreads from the point of inoculation. Apples similarly wounded, but not inoculated, remain the same.

FAT IN FORAGE PLANTS.

To any one not a chemist or a quadruped, the last place to look for fat would be a hay mow or a stack of straw; yet it appears from recent investigations that fat is not only an essential constituent of hay, straw, and similar forms of vegetation, but one of considerable economic value.

In the lower leaves of oats in blossom, Arndt found as much as ten per cent of the dry weight to consist of fat and wax, the latter appearing as the bluish bloom so conspicuous on the leaves of luxuriant cereals. In fodder crops, generally the greatest proportion of fat is found in young and thrifty plants. Thus Way found early meadow grass to contain as much as six and a half per cent of fat; while in that of the same meadow, collected in the latter part of June, there was but a little more than two per cent. The proportion of fat is increased by nitrogenous manures: the grass of a sewaged meadow at Rugby contained above four per cent of fat, while similar grass, not sewaged, afforded less than three per cent of fat.

The nature of this sort of vegetable fat was investigated some little time ago by the German chemist König, who found that by treatment with strong alcohol the fat of grass and clover hay could be separated into two parts, one a solid waxy substance, the other a fluid fat, soluble in alcohol. At first he considered the latter to be a true glycerin, but changed his mind after the investigations of Schulz, who proved that, though it contains the same proportion of carbon and hydrogen as ordinary fat, the fluid fat of hay is something quite different, since no glycerin can be obtained from it.

König has since confirmed these results and carried forward the investigation, showing that the fat of oats, rye, and vetch seed is similarly constituted. In all these forms of vegetation, hay, oat straw, the grain of oats, rye, vetches, and possibly others, he finds oleic and palmitic acids, not combined with glycerin but in a free state; and as these acids in their combinations are well known as large ingredients of nutritive fats and oils, it is likely that they have a considerable influence on the value of these plants for fodder.

König also finds in hay and in oat straw the important ingredient of animal bile, *cholesterin*; still further, cerotic acid, a waxy body which forms twenty-two per cent of ordinary beeswax; and two fatty substances new to Science, one fluid, the other solid. They are distinct compounds, having the character of fatty alcohols. Another interesting discovery in hay fat is the presence of a hydrocarbon, the relations of which are not fully made out. In several respects, it agrees with some of the paraffins.

SCIENTIFIC AND PRACTICAL INFORMATION.

EFFECTIVE POWER OF ANCIENT WEAPONS.

A curious and interesting series of experiments recently took place in France, under the auspices of the Directors of the Museum of St. Germain, which consisted in tests upon ancient war engines constructed after the basreliefs found on Trajan's column.

An onager—variety of catapult—threw stone balls to a distance of 640 feet. Bolts from another kind of catapult traveled 960 feet in six seconds of time, showing a velocity of projection of 160 feet per second. The range and adjustment of the engines were readily calculated, and accurate shots were made at a distance of 480 feet. It would seem therefore that ancient Roman artillery included weapons of by no means contemptible effect, particularly since the muskets of seventy years ago failed to carry with accuracy over a distance equal to but little more than half that last mentioned.

NEW PROCESS FOR MAKING SILVERED TELESCOPIC MIRRORS.

M. A. Nicole states that he has succeeded in producing telescopic reflecting mirrors cheaply and easily by the electroplating process. He takes the mold of a concave surface, made of a mixture which is either an electrical conductor itself or else a non-conductor metallized by the aid of nitrate of silver and phosphorus dissolved in sulphide of carbon. In either case the mold is plunged in a bath of galvanic silver, where the current, conducted very slowly to the mold determines a deposit of excellent quality.

When the silver has reached a thickness of 0·015 inch, the bath of that metal is replaced by one of copper, so as to obtain a solid backing. The mold is then dissolved or melted and the mirror removed, nothing further being necessary than a light polishing. M. Nicole adds that he has produced perfect mirrors of four inches in diameter in this manner.

COMBUSTION OF POWDER.

As the result of their extended series of experiments, details of which we have from time to time published, Messrs. Noble and Abel conclude that the explosion of gunpowder determines a temperature of 4664° Fah., comparable to that of the fusion of platinum. The products of the explosion consist in 57 per cent of solid matters and 43 per cent of permanent gases, the latter consisting of carbonic acid, nitrogen, carbonic oxide, and sulphuretted hydrogen. Small grained powders give less gas than those of large grains: but generally the variations are so great that it is impossible to express the reaction by any chemical formula. The solid matters are mainly carbonate, sulphate, and hyposulphite of potash.

MUSCARINE.

This is the poisonous principle extracted from a mushroom of the genus *agaricus*. According to Dr. Prevost, of Geneva, when it is administered in a very weak dose it acts with force upon the pancreatic and biliary, while lessening the urinary, secretions. It is known that the sulphate of atropine produces exactly the contrary effects, so that these two poisonous substances are therefore antidotes to each other.

PARAFFINIC ACID.

Submitted to the action of fuming nitric acid at 47° B., or to that of a mixture of sulphuric acid and fuming nitric acid, paraffin oxidizes and becomes transformed into an oily liquid, of a light yellowish green color, which M. Champion has named paraffinic acid, and to which he ascribes the formula $C^{26}H^{26}N\,O^{10}$.

The composition of the paraffinic acid permits paraffin to to be certainly designated by the formula $C^{48}H^{50}$. It may therefore be regarded as a clearly defined compound, and not as a mixture of different carburets of hydrogen.

ACTION OF ATMOSPHERIC VAPOR ON THE LUMINOUS AND OBSCURE HEAT OF SOLAR RAYS.

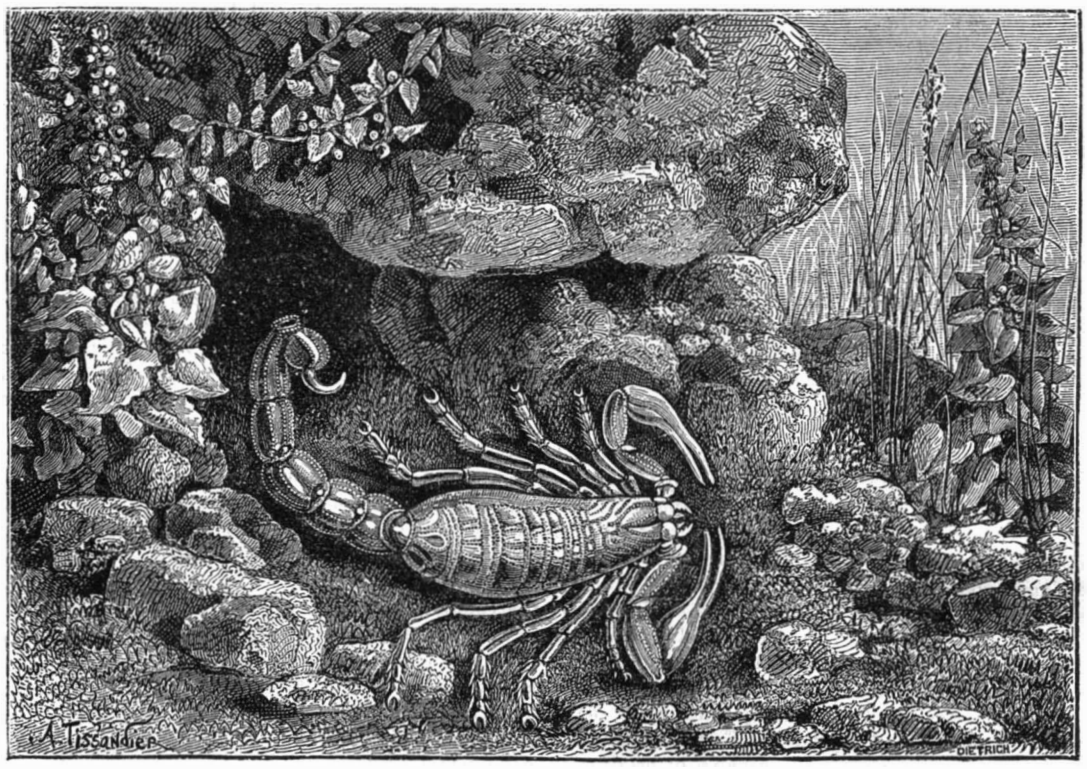
Father Provenzali, as the result of investigations on the above subject, finds that the luminous heat and the obscure heat do not maintain a constant relation, but that, while the former diminishes, the latter increases, and *vice versa*. The luminous heat diminishes in proportion as the quantity of vapor in the atmosphere augments. Such is not the case with obscure heat; for during days of the greatest absolute humidity, the obscure rays are almost always the strongest. This is ascribed to the radiating power of the aqueous vapor, which, after having absorbed the luminous rays, emits them under the form of obscure heat.

The conclusion reached is that photometric observations, continued over a long period, may be a useful means of determining the hygrometric state of the superior regions of the atmosphere.

NEW INVESTIGATIONS UPON SCORPIONS AND THEIR VENOM.

Some interesting and novel investigations have recently been made by Doctor De Bellesme into the nature and effects of scorpion venom upon the blood. We may here observe that, although the name of the scorpion is common enough, it has become so more through connection with groundless fables and superstitions than from any knowledge of the manners and habits of the insect. There are various species, of many of which the sting produces a painful wound; and among which there is one variety, however, the *scorpio occitanus*, which, it is stated, is capable of inflicting a deadly injury upon man. This insect is found in the south of Europe and probably in portions of Central America. It is nocturnal in its habits, avoiding the light and living in moist places, frequently under large stones, in little cavities dug in the earth.

While the sting of the less harmful variety of the insect results in no more pain than the similar wound of the wasp or hornet, that of the *occitanus* is followed by inflammation, swelling, and tumefaction around the lesion, together with strong nervous convulsions, often resulting in death. The insect strikes with its tail, or, more properly speaking, a prolongation of its abdomen, composed of a number of rings, the sixth and last of which constitutes the venom sac, terminating in a sharp curved point, from which the poison escapes through two connecting glands. The mere bite of the scorpion is harmless since there is no connection between the venom organs and the mandibles. When quiet, the insect lies upon its side, as shown in our engraving, where it is represented of its natural size. Once aroused, however, its whole aspect changes; the prehensile claws project forward, and the tail is carried in advance beyond its head, striking in every direction with lightning rapidity.



THE VENOMOUS SCORPION—(SCORPIO OCCITANUS).

The natural prey of the scorpion is small insects and especially spiders, which it kills by its poison. The latter is its most useful weapon in its repeated struggles with other venomous insects, to the bite of which it would itself succumb.

Dr. De Bellesme finds that when the scorpion is aroused, as above described, the venom appears at the extremity of the sting in a very minute drop. By collecting an infinitesimal portion of the substance daily, he was enabled to obtain a sufficiency for his experiments. He noted that if the orifice in the scorpion's tail were closed with a drop of varnish, the sting became harmless, and, further, that the venom, once collected, preserved its poisonous qualities indefinitely.

A large number of experiments were conducted upon frogs, dogs, and pigeons; 0·009 of a grain of fresh venom, injected into the thigh of a frog, caused the skin to become violently inflamed and the animal to die in great agony in fifty-seven minutes. On examining microscopically a drop of frog's blood, in connection with a minute portion of venom, the investigator found that the globules became deformed and agglomerated into a viscous mass. Fig. 2 represents this effect. At 1 are the normal globules; 2, the same beginning to undergo alteration, and 3, their appearance after five minutes' action of the poison.

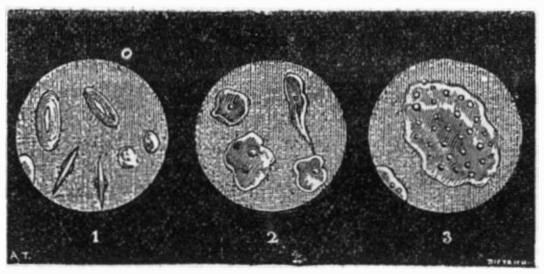


Fig. 2.—FROG'S BLOOD ENVENOMED.

The globules appear to lose their normal properties and to run into each other, forming clots which stop the circulation of the blood. The sting of the scorpion is, therefore, of a very serious nature, since there is no known remedy which will cause the globules, when thus agglomerated, to return to the condition necessary for the sustenance of life. We are indebted to *La Nature* for the engravings referred to above.

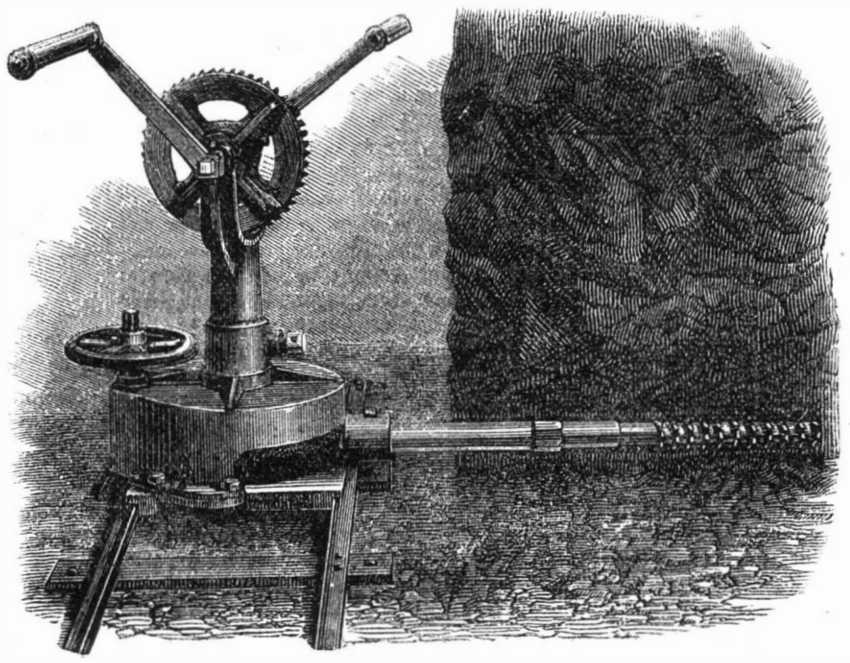
The True Course for Employees.

The *Mercantile Journal*, of this city, has a sensible editorial on this subject, which we copy in part as follows:

The true question for an employee is not how much he can get forthwith, but how he can keep steadily employed. The men who get rich are not usually the strikers who refuse to work for particular wages. Strikers are apt to waste in idleness, in the course of a year or two, time wherein they could have earned more than the amount for which they strike. Those who increase their income are the men who accustom themselves to regular industry, who keep steadily at work for such compensation as they can get, live within their means, save money, and invest it. Thus they keep up a good income and increase it from year to year; quite as fast, in most cases, as they become able to manage it with judgment. The employee who takes the most pains to find out exactly what service his employer wants, to render that service carefully and generously, and who, having mastered the details of his work, does not leave it to go into some other employment where a larger but uncertain compensation is promised, is the man who is morally certain to rise. When hard times come, or when his employer is unfortunate and is compelled to retrench, he is the man who will not be dismissed, and who will not lose time in seeking work, when he would, of necessity, be eating up his savings till he finds it. When vacancies occur in the establishment, he is the one who will be intrusted with the most valuable work, which commands the highest pay. When his employer wants a partner, he is the man likely to be chosen. When others are discharged for incompetency, he will be retained; for his knowledge of the work and his known reliability make for him a good position in which he is sure to be able to do well. True, this way of life is not always easy; it requires self-control, conscience, and steadfastness; but it is the way to self-respect, honorable standing, legitimate wealth, and happiness.

A HAND COAL CUTTER.

This machine is practically a combination of inclined circular saws mounted upon a revolving rod, so that the groove cut by each saw runs into the groove cut by the next, thus thoroughly under-cutting a seam. The saws are set on the rod obliquely, and provision is made for retaining them at a proper distance from each other, and in the most suitable position on the rod, the end of which has a screw thread cut upon it, by means of which it is fastened into the spindle and bearings. Another form of cutting apparatus may be formed from a flat bar of steel, with saw teeth along both of its outer edges, and so twisted that the toothed edges are formed into spirals. By this arrangement the cutter readily clears itself from the slack which it cuts away. A revolving cutter of this kind may be worked in two ways. It may be caused to sweep in the arc of a circle into and out of the coal, so as to cut out a groove in it, the spindle of the cutter being for that purpose carried by a frame turning upon an axis, such axis being also traversed forward from time to time in a line parallel with the face of the coal operated upon. Alternatively the frame carrying the spindle of the cutter may simply be caused to move forward continuously in in a line parallel with the face of the coal, in which latter case a groove will be produced of a depth equal to the length of the cutter. But if the cutter is caused to sweep round in the arc of a circle, a groove of any desired depth can be cut, irrespective of the length of the cutter itself.



JONES' HAND COAL CUTTER.

The cutters can be driven either by hand power or by compressed air.—*Iron.*

Bugs.]

It is said that a chemical firm in Indianapolis has recently advertised for 100 lbs. of potato bugs. The insects are stated to possess qualities which render them a good substitute for the Spanish fly. This is interesting but, unfortunately, not authenticated. The man, however, who does discover a mode of utilizing the potato bug may rest assured that his fortune is made.

Another "shaky" item which is traveling the rounds of the press is about an insect which eats up iron pillars. This remarkable bug is about the size of a common house fly, and finds no difficulty in boring its way into solid iron, ejecting the chips from the place of its entrance.

Speaking of bugs reminds us of a pleasant little anecdote told of Canon Kingsley, the celebrated English author, who has been lecturing through the country. While at Colorado Springs, in the midst of the delivery of a discourse, a bug, of some species of *coleoptera* new and strange to the speaker, alighted on his manuscript, and at once attracted his attention. Mr. Bug sat still for a moment or two, during which time Canon Kingsley—who is an enthusiastic and very clever naturalist, by the way—quietly proceeded to study its form and structure; but while these investigations were in progress, and his language rolling forth to the delight of his hearers, the insect began to expand its wings as if to fly away. The reverend speaker saw the motion, and deftly caught the bug in his hand. Going right on with his line of argument, he continued his examination for several moments, until, having settled everything to his own satisfaction, he let the insect buzz away about its own business. To any ordinary man the presence of such an intruder would have resulted in its being quickly brushed away; but the great English divine, trained to such close habits of observation and thought, could not forego the opportunity, even in the midst of his lecture, to study the points in a new species of bug, his mental discipline enabling him to carry on in his mind two trains of ideas at the same time.

Salt as Manure.

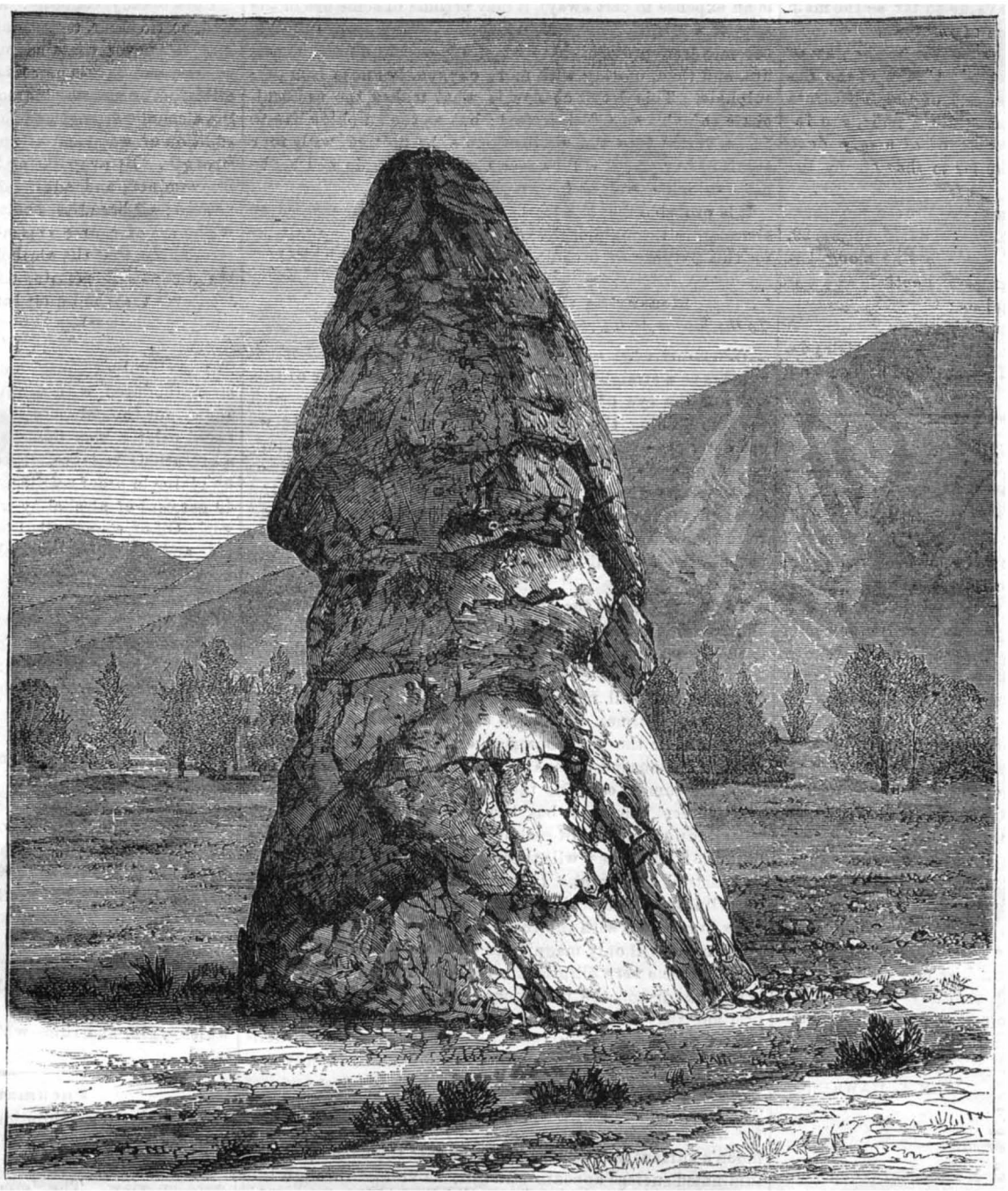
Various experiments, says the *Journal of Horticulture*, have been made by M. Peligot and others, to test the value of salt as a manure. The following summing-up seems to have been arrived at: Salt should never be applied other than in a pulverous state, and never employed on impervious, cold, and humid soils. The best manner to use it is to combine it with other manures, a dose of two hundred weight to the acre being sufficient. When selected to destroy insects, it should be applied before sunrise. In the case of cereals, salt strengthens the stems and causes the ears to fill better, and favors the dissolution and assimilation of the phosphates and silicates. It acts vigorously on potatoes, and can be detected in their ashes to the extent of one half or one per cent. Asparagus is a veritable glutton in the presence of salt. A dose of three cwt. per acre acts without fail on beet, injuring its value for sugar purposes, but enhancing it for the feeding of cattle. Colza has as marked a predilection for salt as asparagus; and in Holland, where the culture of peas is so extensive, salt is something like a necessity. Mixed with hay in the proportion of 4 ounces to a 100 weight, the fodder is more appetizing; but the best way to feed it to animals is to allow them to enjoy it in the form of rock salt.

THE YELLOWSTONE HOT SPRINGS.

We publish herewith engravings of two of the most remarkable natural features of the Yellowstone region in Wyoming Territory, for which we are indebted to the *Illustrated London News*. This district abounds in geysers or boiling fountains, and in marvelous incrustations of calcareous or siliceous matter.

Congress, two years ago, passed an act reserving this portion of its dominion, fifty-five miles broad and sixty-five miles in length, from private agricultural or other occupation, in order that the wonders and grand beauties of its scenery may always be enjoyed by visitors from every part of the world. In the neighborhood of Gardiner's River, which joins the Yellowstone, are the Mammoth Hot Springs, the subject of one of our illustrations. Here the hot water flows down steep walls of rock from a terrace above, and fills the beautiful white basins it has hollowed out in each ledge of the cliff. These basins are from 4 feet to 8 feet wide, and 2 feet or 4 feet deep, making perfect natural baths, of different degrees of warmth. The white deposit covers the entire side of a mountain 1,000 feet high, and extending one mile in length.

Not far from this is an extinct geyser, which has built up a cone of lime, 42 feet high, and 22 feet in diameter at the base, formed of the successive deposits of matter from its old eruptions of boiling water. This cone, of which we also give a view, is called "The Cap of Liberty," from the fancied resemblance of its shape to that of the emblematic head dress worn by the revolted slaves of ancient Rome.



THE CAP OF LIBERTY, YELLOWSTONE REGION.

THE MAMMOTH HOT SPRINGS, GARDINER'S RIVER, WYOMING TERRITORY.

Sounding the Pacific.

Commander Belknap, of the U. S. S. Tuscarora, now engaged in deep sea soundings in the Pacific Ocean, has recently transmitted a report to the Navy Department, from which it appears that the first efforts made only served to prove the impossibility of laying a cable over the bed of the Pacific ocean. The course last taken was on a great circle passing through the island of Tanaga, of the Aleutian group, from Yokohama to Puget's Sound. Hardly 100 miles of this route had been traversed when an extraordinary shelving of the bottom occurred, the lead making a descent of 1,594 fathoms in a 30 miles' run. On the next cast no bottom was reached at 4,343 fathoms, or nearly five miles depth, at which point a heavy current tore the fine sounding wire apart. This settled the question as to laying a cable in that direction; for it was evident that if the force of the current were strong enough to break the fine wire, it would quickly destroy the large line.

The Tuscarora then returned to shore and started off on a new great circle from Point Komoto. Great depths were again encountered, at which such pressures existed as to crack and crush the thermometers sent down. Currents also caused the loss of large quantities of wire, so that Commander Belknap abandoned the second attempt.

The investigations thus

far described, while of but negative value so far as the main object of the search is concerned, are of interest and importance to hydrographic science, as establishing the fact of depths in the sea hardly to be expected in view of the numerous soundings of the Challenger and of the Tuscarora herself, over wide expanses of the Atlantic, Pacific, and Indian Oceans, and confirming the existence of a very deep trough under the Japan stream, similar to that cut by the Gulf Stream on our own coast.

Commander Belknap's third attempt has proved more successful; and in a telegram from Ounalaska, dated August 29, he announces the practicability of a shore line along the coast of the Kurile Islands. The greatest depth found was 4,037 fathoms, 80 miles from Aggalton; the next greatest depth, 3,754 fathoms, 120 miles east of Kurile's Straits. A ridge is reported between Kurile and the Aleutian Islands, the least depth of which is 1,777 fathoms, and at Tenega a fine harbor and beach exists.

Correspondence.

Hardening and Tempering Tools.

To the Editor of the Scientific American:

The query of your correspondent J. T. N., "is this true," (referring to the colors produced on the surface of steel in the process of tempering) is very certainly answered in the affirmative, Nobili to the contrary notwithstanding, when it is remembered that these colors appear as readily upon pure (wrought) iron, in which, of course, there is no carbon, as upon steel. In facts similar effects are produced upon many other metals, and always during an elevation of their temperature.

It is true, as he states, that the hardness of a piece of steel varies with the carbon contained, but not so with the temper, the latter being simply a degree of softening produced by elevation of its temperature, of which softening the colors are taken as a measure; and this measure holds good for any grade of steel.

It is well known, also, that a coating of oxide upon the surface of any metal greatly retards the further rusting, instead of accelerating it, as J. T. N. asserts. But for this fact, the value in the arts of most of the oxidizable metals would be greatly diminished, and iron would be one of the most perishable of substances, even at ordinary temperatures. This fact, then, accounts for the protection afforded to metallic surfaces by the presence of such a film, and does not require that the infinitesimal quantity of carbon resident in steel should have any credit for it. JOHN T. HAWKINS.

62 Cannon street, New York city.

To the Editor of the Scientific American:

Mr. Rose's papers on "Practical Mechanism" come right down to an intricate knowledge of practice and its theory. I find in them solutions of things that had often puzzled me, and explanations of things which I thought I understood, but now find I did not. In speaking of tempering taps, etc., Mr. Rose gives three methods, which include all our present shop practice, to which a Mr. Hawkins objects. What plan does he want to substitute?

We do not care why the color comes; but if there is a new way to temper, any better than the old one, I for one would like to know it. G. S.

New York city.

Swimming with the Clothes On.

To the Editor of the Scientific American:

After perusing your valuable article on learning to swim, I gave swimming with the clothes on a trial, and I must say I fully agree with you as to its value. I felt nervous at first, thinking that I would not be able to swim at all; but after making an attempt, I was astonished to find but little trouble in keeping upon the upper surface of the water. My clothes seemed to act as if they were filled with air, assisting to keep me up rather than to pull me under. I find that confidence and coolness are of great value. Many good swimmers are lost for want of these. W. A. HUTCHINSON.

Albany, N. Y.

A New Disinfectant.

To the Editor of the Scientific American:

The deodorizing and disinfecting properties of the protosulphate of iron have been long enough known, and immense quantities of it have been used for such purposes during the past three or four years. Still the odor of the city of Cologne can be distinctly discerned in every town and city; and there are few abodes of men where there is not still needed some chemical agent for making the air tolerable The stable, the pig pen, the privy, are all offensive, and probably will be until that scientific millenium comes, when cleanliness and healthfulness will be cared for first. I have had my attention drawn, to a new source for disinfecting purposes, by an accident. Last winter I had brought to me, in a load of bituminous coal, a bushel or two of that slaty sort which is filled with iron pyrites. I had it thrown into a heap at the time, upon some sod. It remained there some months, slowly decomposing into flakes and white efflorescence. At last a heavy rain came and washed a quantity away into the grass; and wherever it went it killed the grass, turning it black to the point. This led me to think of the chemical changes which had taken place, from which I concluded that it might be useful as a deodorizer, and I had the rest thrown into a privy vault, with the result that the odor was so completely removed that no one would suspect the place from it. As this sulphide of iron is so abundant throughout the United States, and especially as it is got out in large quantities in the great coal fields (where it is not only worth nothing, but is an expense to cart away), it may become of some use in the way of a disinfectant and deodorizer. The iron sulphide becomes iron protosulphate when exposed to air and moisture, and then, uniting with more oxygen, becomes iron persulphate. This latter change is what makes the protosulphate valuable as a disinfectant; but as the sulphide has to be converted into the protosulphate by uniting with four atoms of oxygen, it will be seen that the sulphide will be the more valuable, weight for weight.

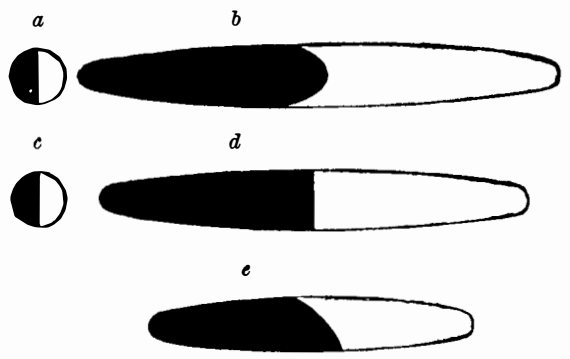
It is probable that the iron sulphide, found in masses so abundantly throughout the country, could be made available for this purpose by crushing it. A. E. DOLBEAR.

Measuring the Distance of the Sun.

To the Editor of the Scientific American:

When one edge of the illuminated surface of the moon appears as a straight line, the line joining the center of this line and the eye of the observer forms a right angle with the line joining the centers of the sun and moon. If we can determine the exact time when the edge of the illuminated surface appears as a straight line, we can measure or calculate the angular distance between the centers of the sun and moon; and taking the moon's accepted distance from the earth as a base line, we have only to find the hypothenuse of a right-angled triangle for the distance to the sun.

To find the exact time when the right angle is formed: The common telescope, with spider lines, is not suitable for the purpose, for the edge will appear rough and straighter than it does to the naked eye. I propose to use an instrument that will make the edge of the light appear, say, one thousand times as crooked as it does to the naked eye; so that when the edge becomes exactly straight, in being made one thousand times as crooked it will still be straight. This instrument contains the same number of lenses as an astronomical telescope, but the surface of the lenses must be cylindrical instead of globular, and rectangular instead of round. Such lenses will throw parallel rays of light to a line instead of a point. In adjusting the instrument, these focal lines must coincide. One spider line should be placed so as to coincide with the focal line of the eyepiece. This instrument will only magnify in one direction. It will make round objects very elliptical. To determine whether a line is straight or not, the instrument must be placed in such a position that the direction of the magnifying power will form a right angle with the line. The edge of the illuminated surface appears smooth when magnified in only one direction. By making observations at both the first and last quarters, and comparing the results, corrections can be made for the small irregularity of the general curvature of the moon's surface, at the very moment that the edge of the illuminated surface appears straight, as viewed through this instrument. The sun's and moon's right ascension and declination must be known, from which we can obtain the required angle. I hold that by this method the distance to the sun can be measured with greater accuracy than by the common method, because the base line is so much longer.



a To the naked eye when edge of light is not quite straight.
b As moon appears through the instrument at same time.
c To the naked eye when edge of light is exactly straight.
d With the instrument when the edge of light is exactly straight.
e With the instrument, when the focal line is not quite parallel with the straight edge of light.

California College, Cal. L. LILLARD.

Undetectable Adulterations.

The public has been so frequently cautioned against the poisonous compounds sold under the name of liquors, at even the more pretentious drinking saloons, that warnings are taken as a matter of course and set down as part and parcel of the well known though incontrovertible arguments of the teetotallers. While we should scarcely expect to awaken new interest by reverting again to the quantities of fusel oil, benzine, and kindred abominations entering into the composition of the liquids retailed, there is certainly sufficient of novelty and importance to arouse thought and attention in Professor J. F. Babcock's excellent article on testing wines and liquors, recently published in the *Laboratory*, particularly since the writer positively asserts that artificial liquors may be made, the difference between which and the genuine, chemical analysis cannot detect, and which are excelled only by the very finest brands.

Distilled liquors are at first colorless, because the coloring matter of the substances from which they are distilled, being non-volatile, remains behind in the still, while only water, alcohol, and the peculiar compound ethers to which the different liquors owe their flavors pass over. By keeping in an oak cask, an amber tint is obtained from the wood, and also a small portion of tannin, augmenting the astringent properties.

Pure brandy contains: Alcohol, water, traces of acetic acid, acetic ether, œnanthic ether, coloring matter, and tannin. It never contains over fifty per cent of alcohol by weight, and to this percentage it owes its intoxicating properties. The last five ingredients impart flavor. By testing the alcoholic strength of the liquor, we may find either the addition of water, or of spirit, or that it is of the proper strength. By evaporating to dryness, the solid residue may be examined, and adulterations of glycerin, capsicum, etc., noticed; all brandies contain coloring matter and tannin, which are of course present in the residuum. But the determination that the alcoholic strength is exactly right, and that the residue contains no foreign ingredients, is no proof whatever that the liquor is not a gross imitation. Chemical analysis is powerless before the two common frauds of reduction and imitation. It cannot tell that perhaps twenty-five per cent of spirit and water, of the proper alcoholic strength, dosed with tannin and coloring matter, has been added, for the only effect is to impair the flavor. Experienced palates may detect the fraud by taste; but this is but a precarious reliance. So-called British brandy is prepared by giving to proof spirits, made from molasses and possessing 49 per cent of alcohol by weight, an imitation of brandy flavor. Oil of cognac, distilled from the lees of wine with water, and dissolved in alcohol, is often used in the spurious manufacture.

Professor Babcock gives the following formula for an artificial brandy, which, he states, contains nothing but what may be found in genuine Cognac. No chemical analysis can prove it to be an imitation; and for all practical purposes, he sees no reason why it should not have all the medical virtues of the original:

Cologne spirit is diluted with water till it stands at proof. Of this 12 gallons are taken and mixed with 5 gallons of water; ¼ lb. of crude cream tartar, previously dissolved in 1 gallon of boiling water, is added, together with 6 fluid ozs. of acetic ether, 2 quarts of wine vinegar, 5 lbs. of prunes (bruised), and a small quantity of oil of Cognac, sufficient to flavor the mixture. After standing for a fortnight with occasional agitation, the mixture is placed in a still and 15 gallons distilled. The distillate is put into a clean brandy cask, and a small quantity, say 1 lb., of oak shavings is added to produce the desired astringency. After standing for a week, it may be drawn of and colored with a solution of caramel.

What has been said of brandy applies equally well to whisky, gin, and rum, which may all be successfully imitated.

Pneumatic Telegraphy.

An interesting exhibition of telegraph machines, worked exclusively by air, was lately given in London by Mr. Guattaris, the inventor. A number of different instruments were on view. The impulse is produced at one end of a tube by the operator, and performs the mechanical work at the other end, either by ringing a bell or turning a needle round a dial. The rapidity and precision can be made equal to the electric telegraph, the conducting tube being able to be laid under or over cover in the same manner as the ordinary telegraph. Attached to each machine is a bell and dial, and the message is transmitted by the moving of a small lever which drives the air through a pipe to the other operator. As the lever is moved up and down, the dial, which stands where the message is destined for, registers whatever the words may be. Each dial is supplied with a needle: and as each spurt of air presses against the works of the machine, the needle is moved exactly the number of times that the lever is pressed. Each instrument can receive or send a message about 400 yards. The instruments exhibited were designed for intercommunication between large coffee houses, offices, hotels, and vessels.

Nickel Mines in Australia.

The Sydney *Morning Herald* notes recent analytical tests of a rich vein of nickel, found at Noumea, New Caledonia The substances present are oxide of nickel, magnesium, silica, iron, aluminum, and calcium. The nickel ore is a silicate of nickel and magnesium, with certain impurities, and the brown serpentine accompanying it is an impure silicate of magnesium, containing a small proportion of oxide of nickel.

The development of Australian mines of nickel will have no small effect upon the quantity and consequent value of that metal now in existence. It will be remembered that, not long since, the German manufacturers of German silver petitioned their government not to use nickel for coinage, on account of its scarcity and the greater need which existed for its application to other purposes.

RAILWAY STATISTICS.—A Parliamentary return just published states that in 1873 there were in all 15,814 miles of railway in the United Kingdom. The total authorized capital amounted to $3,383,432,930, of which $2,941,601,540 was paid up. The number of passengers, exclusive of season ticket holders, was 455,320,188. The total receipts from all sources amounted to $288.710,000, of which fifty-five per cent was from goods traffic, and forty-one per cent from passenger traffic. Fifty-three per cent of the gross receipts was consumed in working expenditure, leaving $134,945,760 for net receipts. This was 4·59 per cent on the total paid up capital.

G. R. B. says: "To restore the burnt steel point of a pick, drill, or any similar tool, do not touch it with a hammer; but while it is still emitting sparks, plunge it into cold water and let it remain until cold. Then reheat to the proper degree, and work it: you will find it as good as before it was burnt."

DENTISTRY IN THE UNITED STATES.

MANUFACTURE OF ARTIFICIAL TEETH.

No. 1.

An artificial tooth, says "an expert," in *Old and New*, is made of porcelain ("ceramic dentistry" is the elegant title to which some of the more elegant in the business aspire); which porcelain differs from the material of a stone pot, a china teacup, a Wedgewood ware match safe, or a Parian statuette, in the same way as they differ from each other. In its manufacture are chiefly used felspar, quartz, and kaolin; oxides of titanium, gold, manganese, cobalt, uranium, and silver; platinum; glass of borax; and sal tartar. The tooth is made somewhat as follows: Mix into a putty-like mass, with water, calcined and pulverized silex and felspar, and kaolin properly washed and dried, for the "body" of the teeth; with oxide of titanium or other selection or combination of oxides for coloring matter (there may be sixteen hundred different sorts and shades of colors). For the enamel, mix in like manner felspar, platinum sponge, and a flux of quartz, borax, and tartar. The teeth, either separate or in "sections," are shaped in a brass mold, which is about one fifth larger than the tooth, to allow for shrinkage. When the materials are all ready, the molds are greased; the platinum pins for fastening the teeth to their bases are placed in the holes made for them in the mold; the enamel is laid first in a thin coat on the inside of the mold; and the "body" of the tooth, in a properly shaped lump, put inside of this coat of enamel; then the top of the mold is put on; the whole is laid under a press, which compacts the mass; and then mold and all are exposed to a slow heat until perfectly dried. The teeth will now drop out of the mold when it is opened, but are extremely tender. Next they are "carved," or trimmed and finished, and laid on coarse quartz sand on small slides or trays, of fire clay. These are slid into a "muffle" or firing pot: this is run into the furnace; and after it is in place, the muffle is closed and carefully luted hermetically tight; and the heat is put on. The only way to know when the teeth are done is by the judgment. If over fired, they are injured; if not fired enough, they must be quickly put back, and heated longer. There are many variations in combining the "body," the enamel, the flux, etc., and in the subsequent manipulations; but the above brief summary will sufficiently show what sort of process is used.

The average annual sale of artificial teeth, in the six New England States, in the three years 1870, 1871, 1872, was three hundred and forty thousand sets; though it does not follow that all these were made up and actually used. Two and sometimes three sets must be made and tried, before the patient is satisfied. As the set made for one mouth will not fit another once in twenty-five thousand times (I know personally of but one case, and have heard of two more, about one of which I doubt), all these rejected sets are wasted A set is also frequently cracked or broken in mounting it on the base to which it is to be attached, which accounts for a further proportion of loss. Again, partial sets are sometimes required; and if the operator does not find a good match among his promiscuous teeth, he takes one out of some full set in order to make a perfect case. The chances are five hundred to one that he will not be able to use the rest of the set thus broken, along with any other set, as size, color, or shape will fail in some minute particular; and thus another set is lost. These various losses reduce the number of sets of teeth actually put into use each year in New England, from three hundred and forty thousand to about two hundred thousand.

The Western division of the country yields a better crop to the dental farmer (if so he may be called, and indeed his operations of pulling, digging, transplanting, and so on may reasonably well admit it) than either New England or the South. In the West, more sets are made up in proportion to the population, and fewer are lost out of the number sold. This greater demand seems to depend upon two circumstances. The Western people, as if they considered false teeth not merely useful and ornamental, but also as evidence that the wearer has money to invest in luxuries, are in the habit of informing their neighbors that they are using a set; and they also mention the name of the dentist who made them, and what they cost; so that they advertise their "bene factor," and increase his business. Secondly, the Westerners are not so fastidious as their fellow countrymen about a fit, or about their teeth looking "too natural;" and thus the operator can induce them, by honeyed words or positive assertions, to accept the set he has made for them, and to pay for it. As the patient is thus generally satisfied, a large per centage of loss is prevented. It is not intended to deny that the profession consists of honorable men in this more than in the other two sections; but taking them at an average, they certainly manage to use their stock cleaner than in the Eastern or Southern sections. There are certainly also in this division more "butchers" than in the others; men who, instead of being benefactors to their patients, might be justly termed their despoilers. It is notorious that there are such persons, who will extract sound teeth, as well as loose and decayed ones, for the sake of making room for a full set, as they are quacks, and cannot make a good partial set. Estimates made from personal observation of the traffic in this section show the sales for an average year to be, in round numbers, seven hundred and twenty-eight thousand sets, with a shrinkage in losses of two hundred and nine thousand, leaving five hundred and nineteen thousand sets used. The Southern division, including, for the present convenience, the rest of the United States, is at this time, for the most part, an entirely new field for dental operators, though part of it has been well worked over, insomuch that the amount of sales in it rolls up to one hundred and eighty two thousand sets, from which must be deducted a greater discount than elsewhere for losses, for the reason that the work has been done by young and inexperienced dentists, or, indeed more properly, dental students. The "practising" of these enterprising young gentlemen has resulted in the loss of one hundred and seventeen thousand sets, leaving only sixty-five thousand actually used.

There are five extensive manufacturers of artificial teeth in the United States, besides numerous smaller ones. They turn out, in all, about a million and a quarter sets of teeth every year.

Carrier Pigeons.

"One of the most curious incidents connected with modern journalism," says *Land and Water*, "is the regular employment of carrier pigeons in collecting intelligence for the daily and weekly newspapers. In the competitive exertions to procure the latest intelligence, it has been found that for short distances newspaper reports can be sent readier, cheaper, and quicker by press carrier pigeons, flying a mile per minute, than by the postal telegraph. These aerial postmen are entrusted to resident correspondents in various places, ready to be despatched at any moment, while others are sent out by reporters to places where important events are transpiring. It is now no uncommon thing to see reporters at police courts, inquests, public meetings, etc., despatch folio after folio of "copy" by press carrier pigeons tossed through the nearest window, or thrown out of a train or steamer going at full speed. The attachment of these birds to the place of their birth, and the ability to find their homes from marvelous distances, are, of course, their distinguishing characteristics. A "columbier," or home, is established at the various newspaper offices, and whenever a bird arrives with a message, the act of the pigeon entering its cot sets a call bell ringing in the editor's room, the bell machinery continuing in motion until attended to.

Carrier pigeons, though as a rule only used for short distances, in competition with the electric telegraph, can be specially trained to distances of 500 miles, and frequently fly to England from Dublin, Brussels, Paris, Lisbon, and even Rome. The utilization of the instincts of birds for press purposes is being carried even further than this. An ocean homing bird of great docility, intelligence, and spirit has been found in Iceland, and it flies at a meteor-like speed of 150 miles an hour, and is able to find its home, over sea and land, from any part of the habitable world. A pair of these birds, a few days ago, brought despatches from Paris to a lonely spot, congenial to their nature, in a wild and rocky part of Kent, within ten miles of London, in 1¼ hours. Press carrier pigeons took the despatches on to the city, the whole distance from Paris to London, by actual parcel mode of conveyance, being done within 1½ hours."

The New York *Sun* was the first newspaper, we believe, to employ the aid of carrier pigeons for the rapid transmission of news. Thirty years ago, before the electric telegraph had come into vogue, the *Sun* concern had a large pigeonry upon the roof of its building, just over its editorial rooms, corner of Nassau and Fulton streets, in this city, where many carrier pigeons, of the best procurable breeds, were maintained. In those days the public were often surprised by the appearance of important news, brought by the birds, in advance of the ordinary mails. The advent of the telegraph superseded the *Sun* pigeons, and the department was sold out.

At the present time, the telegraph business here is in the hands of competing private companies, who take especial pains to transmit the news despatches of the press with the greatest promptitude, and at very low rates. But when the telegraphs pass into the hands of the government, as in Great Britain, the press will no longer have the advantages of this promptness and economy. Lazy officials will then govern the sending of telegrams on the red tape system, and our newspapers will doubtless find an advantage in using pigeons, as they are now doing in England.

Chrome Steel.

With the exception of eighteen pieces, all the metal used in the superstructure of the St. Louis bridge is chrome steel, this alloy being selected by the engineer, Captain Eads, on account of extended experiments thereon showing the highest tenacity under tension and the utmost refractoriness under compression. The steel was made by the Haughlin process, belonging to the Brooklyn Chrome Steel Company, of Brooklyn, N. Y. The following details regarding the metal, we find in the St. Louis *Railway Register:*

The quantity of chromium required in the steel is so small, relative to the quantity of iron, that the cost of the alloy is not greater than that of the usual grades of carbon steel. In a pure and crystalized state, it is a grayish, very hard metal, not oxidizable by any acid nor reducible in any furnace.

It is quite probable that the mixture of chromium and iron is truly chemical. As far as can be learned, there is no gathering together into separate crystals, nor congregating in spots, as in the case of carbon; and it would, indeed, appear that, after combination, separation in whole or in part is almost impossible. From this stability of the alloy, it is possible to grade the mixture in exact accord with proportions of ingredients, and to judge of character with much precision.

The most useful property of chrome steel, next to its stability, is the ease with which it may be welded. No wrought iron excels it in this; and moreover, sand and borax may be entirely dispensed with, since the effects of the heat—for a white heat may be used without fear—are to glaze the surface with a film of chromium, which, being unoxidizable, presents no obstacle to the full and entire union of the parts. Such springs as those used in vises need, when made of chrome steel, no tempering, but may be put in place direct from the anvil. Watch springs could, it is believed, be made from it, of extra quality. A ⅝ inch bar can be bent double when perfectly cold with the same certainty as with the best wrought iron. For anvil and hammer faces, and hammers and mauls, it is peculiarly fitted, because of its homogeneity and the exact equality of hardness over the surface. Blocks of four inches may be drawn out into a crowbar; any welding or upsetting necessary can be done, and the bar finished, with the same facility as though formed of the clearest iron.

As a test of toughness, a bar of chrome steel five eighths of an inch square has been twisted cold until the angles of the bar lay around a cylinder, resembling a wire cable strand. Seventy turns to the inch made on a cold bar of steel is sufficient evidence of toughness. The results of tests made at the West Point Foundery give for the material an average strength of 180,000 pounds to the square inch. This is considerably in excess of the figures given by authorities as the highest strength of carbon steel, namely, 131,909 pounds per square inch.

New Explorations in Central America.

Few persons are aware of the important exploration which has been going on for a year or two past in Costa Rica, under the direction of Professor William M. Gabb, a geologist and explorer of Philadelphia, well known for his excellent scientific work, especially in connection with the geological survey of California, under Professor Whitney. The special object is an investigation of an entirely unknown region of Southeastern Costa Rica, inhabited only by savages, but known to contain rich treasures of minerals, worked by the Spaniards in the early day of the conquest: this knowledge being only by traditions. Although the party has consisted only of Professor Gabb and four assistants, it has already gathered a great deal of important information and material in reference to the economical, scientific, and political history of the region investigated. In the course of his labors, Professor Gabb found the people less savage than had been supposed, and he has already succeeded in winning their confidence to such an extent as to induce their chief to accompany him on a visit to San José. As might have been expected, the geological structure of the country has occupied a large share of Professor Gabb's attention, and enough has been discovered to warrant the belief that the mineral resources are of great importance. The greatest interest attaches, however, to the discovery of two previously unknown volcanoes, not less than 7,000 feet high, in the main cordillera just northwest of Pico Blanco. Of these he is about to make a thorough examination. The natural history collections made by the Professor are of unusual magnitude and value, embracing all departments of zöology, and especially rich in mammals, birds, reptiles, and insects. Of fish there were but few species, but all that could be found were secured. The ethnology and philology of the country have been attended to very thoroughly. Material illustrating the manners and customs of the people was also gathered in great quantities, and important discoveries made of *huacos*, or prehistoric graves. In addition to these, Professor Gabb is on the track of an ancient buried city, of which no mention is made in any history of the country. The natural history and ethnological collections made have been sent to the National Museum, where they form a conspicuous feature in the Central American series. The material thus collected by Professor Gabb will, on his return, be made the subject of an elaborate work, in which he hopes to present the whole subject of the physical and natural history of the country in its fullest detail. An important geological discovery made by him is that the appearance of dry land on the isthmus is of tertiary date, and that it is coeval with the period of volcanic excitement in the Californian sierra.—*Nature.*

Trees for Avenues.

For avenue planting, those two near relatives, the cucumber tree (*magnolia acuminata*) and the tulip tree (*liriodendron tulipifera*), combine many excellent qualities. They are rapid growers, beautiful in foliage and flower, of perfect form; hardy, excepting in the extreme north, not particular about soil or situation, and comparatively free from insects and diseases. They are readily grown from seeds, gathered and sown at once in the autumn, or, as some prefer, preserved moist until spring. When two years old, they are generally sufficiently large to plant out with a protection; or if intended for the street, they may be cultivated in nursery rows for three or four years, until they are tall enough to be beyond the reach of animals. A long line of either of these trees forms a magnificent sight when in bloom, and for shade, combined with beauty, will satisfy the most fastidious. One of the greatest mistakes in street planting is the selection of an improper kind—for instance, a first class tree, such as we have named, for a narrow street, and a small slow-growing species for a wide avenue. Each is equally out of place, and never looks appropriate, no matter how handsome the individual specimens may be.—*New York Tribune.*

ERASIVE SOAP, TO REMOVE GREASE AND STAINS FROM CLOTHING.—Two pounds of good Castile soap, half a pound of carbonate of potash, dissolved in half a pint of hot water. Cut the soap in thin slices, boil the soap with the potash until it is thick enough to mold in cakes; also add alcohol half an ounce, camphor half an ounce, hartshorn half an ounce; color with half an ounce of pulverized charcoal.

IMPROVED WATER WHEEL GOVERNOR.

The apparatus herewith illustrated is used in connection with the governor, where there is a variable head of water and when it is desirable to keep up the head though at the sacrifice of speed. Its greatest utility is realized where steam power is employed in connection with water power. The water governor being speeded to run the line a trifle faster than the steam governor, the engine is relieved of its weight so long as there is an available head for the supply of the wheel; but when the water is drawn down to a given point, say from three to twelve inches, the governor automatically closes the gate sufficiently to allow the water to regain the lost head, and, when at the available point, automatically resumes its natural action. All this is accomplished by very simple means, as shown by the engravings. The reservoir is placed so that the high water line in the flume is within three inches of the top of the reservoir.

Our engravings represent opposite sides of the apparatus; and in Fig. 2 is shown the reservoir and float in connection.

The operation is as follows: Water is admitted from the flume through the pipe, I. The float, B, in the reservoir, A, rises with the water, and the cord is slackened, which leaves the governor to its natural action. As soon as the water lowers to any given point (regulated according to length of cord), the pawl shifter, C, is drawn down, throwing the closing pawl, F, into action, and the water is closed off. The machinery being all in motion, the gate would become closed, with a tendency to go beyond, but for a stop motion which limits the hoisting and closing of the gate, and which is simply a sliding bar inside of the bracket D, and operated by the worm, E.

Another feature of the governor is an adjustable weight connected to an arm of the pawl shifter, C, but not shown in the engraving (other parts of the machine being in front of it). By means of this sliding weight the speed of the governor may be changed from 140 revolutions to 165—a great convenience in many establishments, particularly in the case of wheels driving paper machines, where an adjustable speed is indispensable.

These governors have been in use, it is stated, now about six years, in some of the largest as well as in the smallest establishments, and attached to all kinds of wheels (even overshot and breast wheels), with heads varying from seven feet to seventy-eight feet, including the largest cotton mills in the world, in iron rolling mills, and down to one set woolen factories. The manufacturers add that they have yet to learn of the first complaint of them.

The latest improvements of this machine were patented May 26, 1874, and the improved machines are manufactured solely by Wm. T. Horrobin, Cohoes, N. Y., under the personal supervision of Mr. H. D. Snow, the patentee.

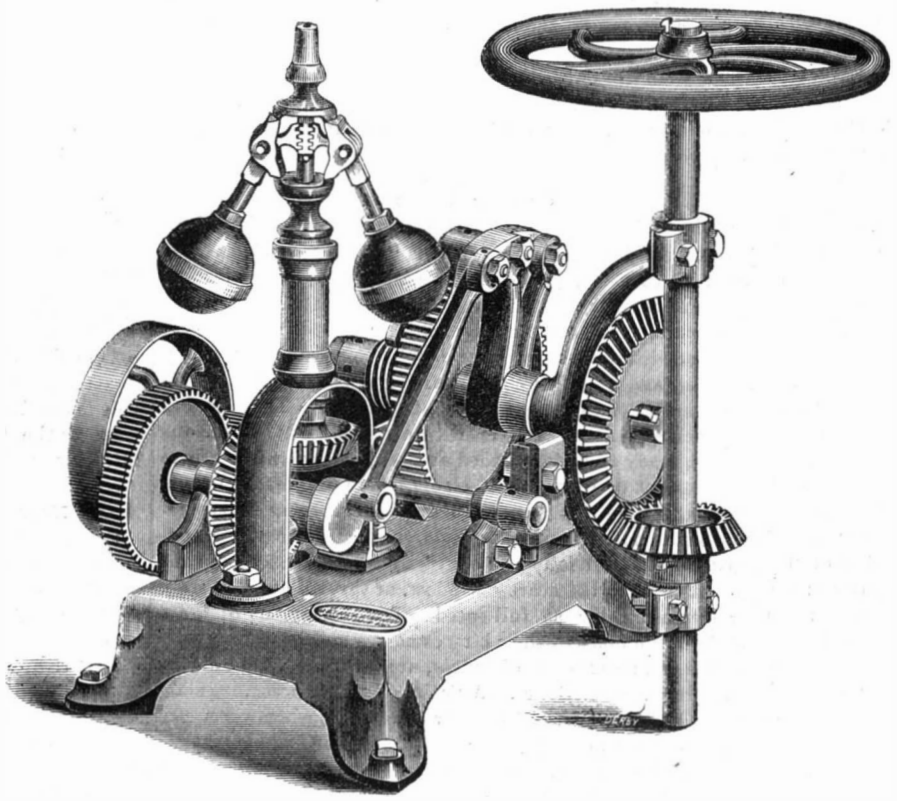
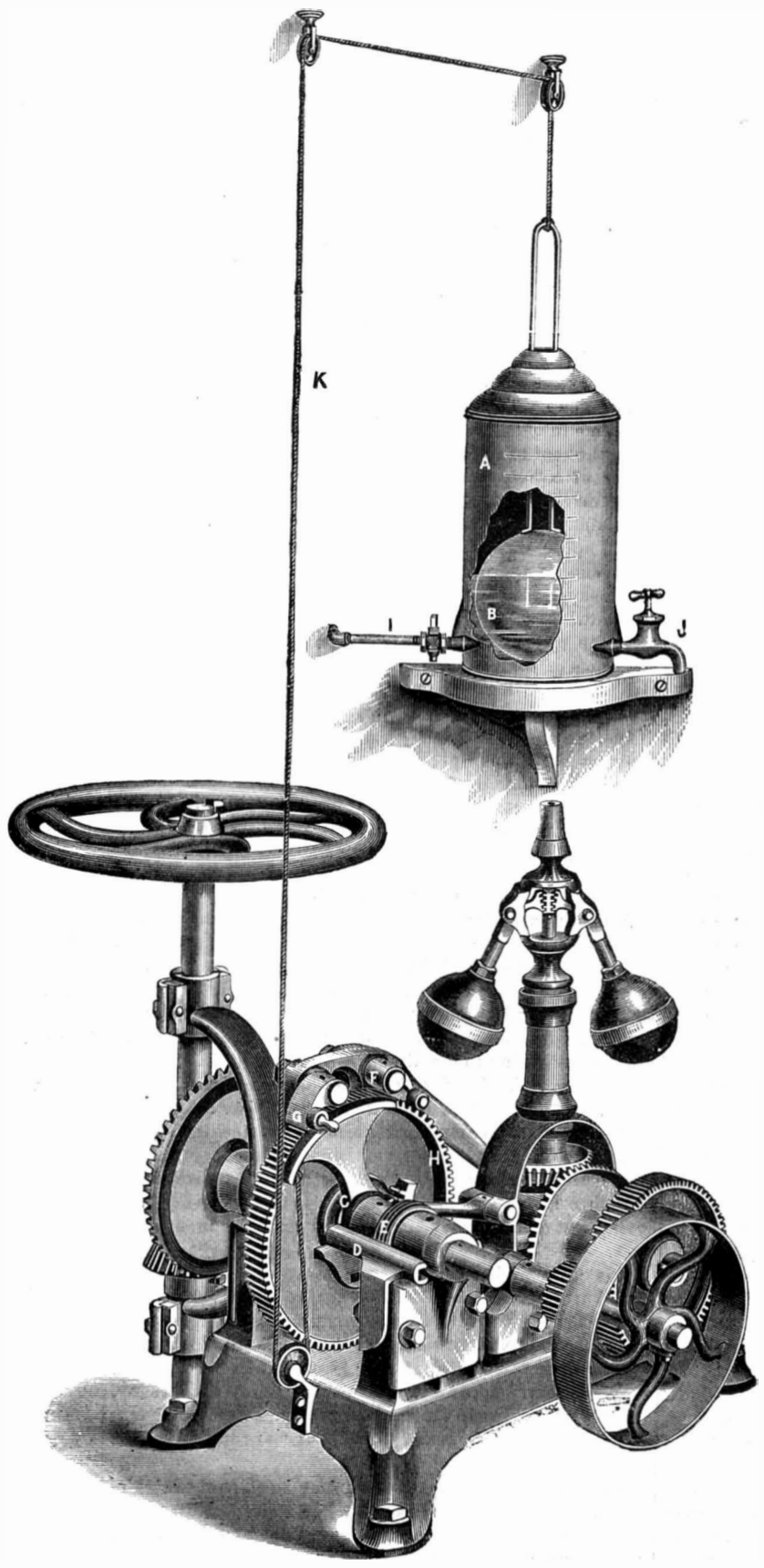


Fig. 1.



SNOW'S STANDARD WATER WHEEL GOVERNOR.—Fig. 2.

How to take care of China and Glass Ware.

In the average household few things suffer more from ill usage than porcelain and glass, especially the finer kinds of such ware. We copy from the Boston *Journal of Chemistry* a few practical suggestions on the best methods of cleansing and preserving these fragile materials:

One of the most important things is to season glass and china to sudden change of temperature, so that they will remain sound after exposure to sudden heat and cold. This is best done by placing the articles in cold water, which must gradually be brought to the boiling point, and then allowed to cool very slowly, taking several hours to do it. The commoner the materials, the more care in this respect is required. The very best glass and china is always well seasoned, or annealed, as the manufacturers say, before it is sold. If the wares are properly seasoned in this way, they may be washed in boiling water without fear of fracture, except in frosty weather, when, even with the best annealed wares, care must be taken not to place them suddenly in too hot water. All china that has any gilding upon it may on no account be rubbed with a cloth of any kind, but merely rinsed first in hot and afterwards in cold water, and then left to drain till dry. If the gilding is very dull and requires polishing, it may now and then be rubbed with a soft wash leather and a little dry whiting; but this operation must not be repeated more than once a year, otherwise the gold will most certainly be rubbed off and the china spoilt. When the plates, etc., are put away in the china closet, pieces of paper should be placed between them to prevent scratches on the glaze or painting, as the bottom of all ware has little particles of sand adhering to it, picked up from the oven wherein it was glazed. The china closet should be in a dry situation, as a damp closet will soon tarnish the gilding of the best crockery.

In a common dinner service, it is a great evil to make the plates too hot, as it invariably cracks the glaze on the surface, if not the plate itself. We all know the result—it comes apart; "nobody broke it," "it was cracked before," or "cracked a long time ago." The fact is, when the glaze is injured, every time the "things" are washed the water gets to the interior, swells the porous clay, and makes the whole fabric rotten. In this condition they will also absorb grease; and when exposed to further heat the grease makes the dishes brown and discolored. If an old, ill used dish be made very hot indeed, a teaspoonful of fat will be seen to exude from the minute fissures upon its surface. These latter remarks apply more particularly to common wares.

As a rule, warm water and a soft cloth are all that is required to keep glass in good condition; but water bottles and wine decanters, in order to keep them bright, must be rinsed out with a little muriatic acid, which is the best substance for removing the "fur" which collects in them. This acid is far better than ashes, sand, or shot; for the ashes and sand scratch the glass, and if any shot is left in by accident the lead is poisonous.

Richly cut glass must be cleaned and polished with a soft brush, upon which a very little fine chalk or whiting is put; by this means the luster and brilliancy are preserved.

Household Hints.

The following recipes have, most of them appeared in this paper, but to the *English Farmer* is due the credit of printing them in the following order:

If you have been pickling or handling acid fruit and have stained your hands, wash them in clear water, wipe them lightly, and, while they are yet moist, strike a match and shut your hands around it so as to catch the smoke, and the stain will disappear.

Wet the spots of iron rust on muslin or white dress goods thoroughly with lemon juice, then lay in the hot sun to dry. Repeat the same if the color is not removed by one application. When dry, rinse in clear, cold water. Lemon juice cannot be used on colored goods, as it will take out printed colors as well as stains. It will remove all kinds of stains from white goods.

Dusting articles of steel, after they have been thoroughly cleaned, with unslacked lime, will preserve them from rust. The coils of piano wires thus sprinkled will keep from rust many years. Table knives which are not in constant use ought to be put in a case in which sifted quicklime is placed, about eight inches deep. They should be plunged to the top of the blades, but the lime should not touch the handles.

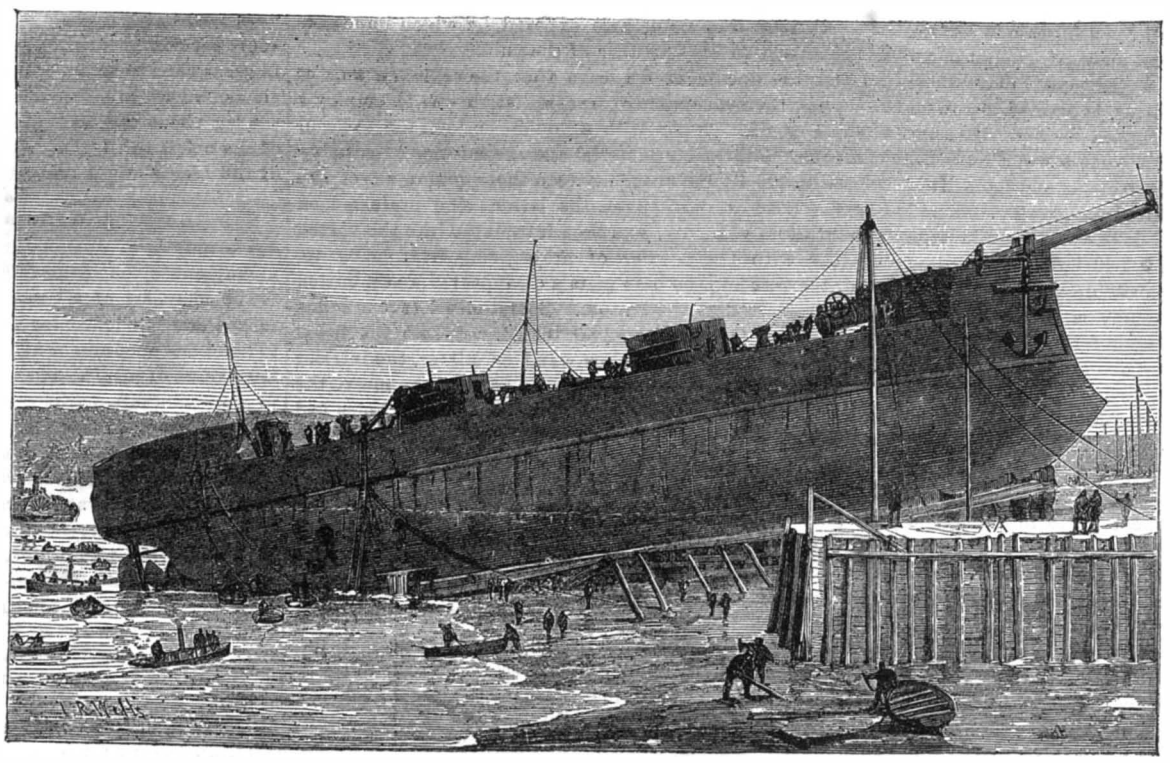
To remove mildew, make a very weak solution of chloride of lime in water (about a heaping teaspoonful to a quart of water), strain it carefully, and dip the spot on the garment into it; and if the mildew does not disappear immediately, lay it in the sun for a few minutes, or dip it again into the lime water. The work is effectually and speedily done, and the chloride of lime neither rots the cloth nor removes delicate colors, when sufficiently diluted, and the articles rinsed afterwards in clear water.

The white of an egg has proved, of late, the most efficacious remedy for burns. Seven or eight successive applications of this substance soothe pain, and effectually exclude the burn from the air. This simple remedy seems preferable to collodion or even cotton. Extraordinary stories are told of the healing properties of new oil, which is easily made from the yolks of hens' eggs. The eggs are first boiled hard, and the yolks are then removed, crushed, and placed over a fire, where they are carefully stirred until the whole substance is just on the point of catching fire, when the yolk will yield nearly two teaspoonfuls of oil. It is in general use among the colonists of South Russia as a means of curing cuts, bruises, and scratches.

At this season of the year, it is important for all housekeepers to be on their guard against the insidious attempts of the various species of ants and the detestable cockroaches to invade the kitchen and pantries or store rooms. Sprigs of wintergreen will make the small red ants leave their cherished haunts. Borax powdered and put into the crevices where cockroaches abide will finally cause them to disappear; but we have found concentrated lye, melted into a sort of paste and applied with a knife, a more expeditious mode of destroying these noxious insects. Scalding alum water is also certain death to cockroaches.

DISASTER IN LAUNCHING A TURRET SHIP ON THE THAMES.

The ironclad man-of-war and steam ram Independencia, just built for the Brazilian government at Dudgeon's yard Blackwall, London, is now lying, to all appearance, a wreck on the foreshore close to Cubitt Town Pier, with the tide at high water washing over her decks, having met with a disaster in launching. The ship is 310 feet long and very broad, having a beam of 63 feet, and she is of 5,000 tuns burden, builder's measurement, which is equivalent to a displacement of 10,000 tuns when armed and afloat. She has two turrets on deck; the decks are of iron covered with wood, and the sides are covered with a belt of 12 inch armor plates to a depth of about 14 feet. The armor being nearly all fixed while the ship was on the stocks, the weight of the hull was little short of 6,000 tuns, and the operation of launching was therefore felt to be one of considerable difficulty. Hydraulic rams were employed to start the ship, which went safely down the slips for about her own length, and then stuck fast. The rams and all manner of appliances were brought to bear, but failed to move the ship further; and when the tide fell she settled down with her stern in the bed of the river, about a third of her length only having left the ways. Her position is a critical one, and the outer shell of her double bottom has given way in the bilges. We give a representation of her as she remains fast on the ways, extracted from the *Illustrated London News*.



THE FRIGATE INDEPENDENCIA AFTER THE ATTEMPTED LAUNCH.

BURNISHING SURFACE COLORED PAPERS.

Marbled and other papers which have color laid on one side have been hitherto burnished or glazed by rubbing with a polished flint or other stone, worked over the surface by hand. Many attempts have been made to substitute glazing rolls and other appliances for the tedious process, but no good result has ever been achieved. M. Alauzet, of Paris, exhibited at Vienna a machine for manipulating the burnishing stone, and thus economizing the cost without impairing the beauty of the imparted surface. This machine, which may be used for dyed and undyed paper, is double acting; the sheets of paper are represented by *e*, while *a* shows the burnishing steel or stone guided and moved by the bar, *b d t*, and the rod, *g*, which is connected with the crank, *f*. The weights, *t* and *l*, may be increased or diminished according to requirements.

We are indebted to *Engineering* for the engraving.

Lawn and Pleasure Grounds.

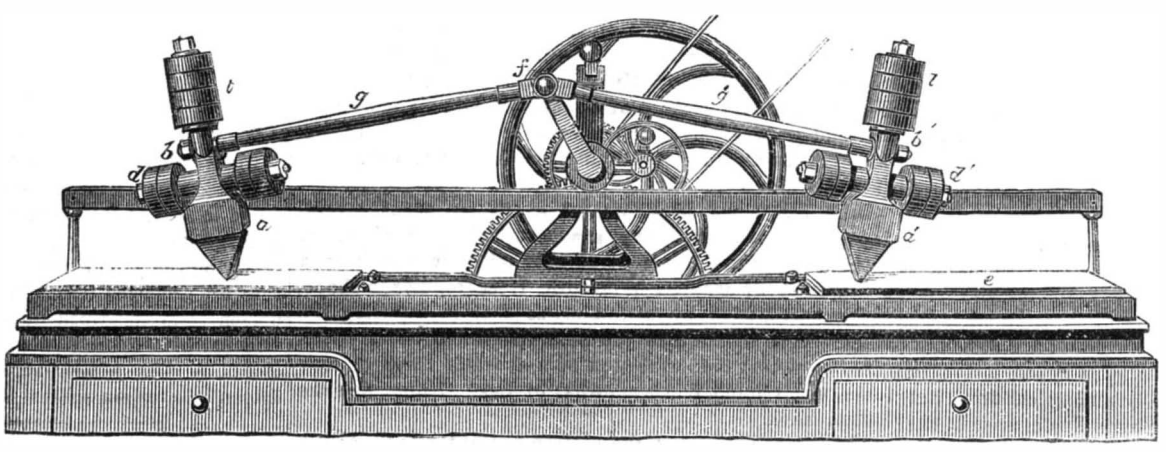
A writer in the *American Farmer* for September reiterates, what we have often stated, that the love and taste for horticultural pursuits is rapidly growing in this country. He also states the generally known fact that, up to the present time; the great majority of thorough practical gardeners in the United States are foreigners, and even those, however well educated in that profession at home in their native land, have, under a different climate and other influences by which they are surrounded in this land of their adoption, to pass through another term of apprenticeship before they can make their services acceptably available; we speak here of thoroughly educated men in the profession, and not of that crowd of one-year pretenders by which the country is overrun. It has been often remarked that very few native born Americans take to horticulture as a profession; and that when they do, it is usually to enter upon the higher or lighter branches, or follow it as a mercantile or money-making pursuit. Yet it is true, beyond all dispute, that the love of horticulture is growing rapidly, as may be seen by the millions of fruit trees put out as orchards, and tens of millions of flowers used annually in the flower garden, together with the ornamental trees and shrubs which are sought after with avidity.

The residences that formerly stood isolated on the plain are now seen nestling in groves of umbrageous trees, embracing the noblest and most desirable kinds to be found in all temperate climes; now this state of things is pleasing for all lovers of Nature to contemplate, and should not every laudable incentive be used to further its growth? As having a tendency in that direction, we would remind those situated in the Middle States that during the present month is a good season to transplant evergreens, and this work is best performed soon after a good rain, or when the ground is mellow enough to admit of getting as many perfect roots up as possible, but by no means permitting the trees after being lifted to be long exposed to the action of the sun or drying winds; cloudy weather is desirable for this work; and should the ground to be planted be light and dry, give a good settling of the earth about the roots with water, finishing the filling in around the stem with loose earth, which prevents the surface from cracking, should a drouth follow.

Cuttings made of the present year's growth root freely at this season, of such hardy shrubs as wigelias, forsythias, spiræas, and deutzias; make the slips about 3 to 6 inches long, removing the leaves entirely from the lawn half, and those on the upper half cut back so as to leave about one inch of the leaves and petioles; then plant them in a sandy soil in some shady place, observing to press the earth close to the cutting; these, when rooted, can remain until next spring, against planting out permanently.

Samples of seeds of choice border plants should be from time to time collected, and placed in a cool airy place to dry; if the kinds collected are pure, and have not been contaminated by impregnation of worthless sorts growing close by, then you are stocked for next year and will have the pleasure also of helping your friends to a few, as the votaries of Flora ought by all means to eschew anything that would border on selfishness. When the flowers in your beds or borders become unsightly from decay, have them removed and the ground raked clean and smooth. Such articles as dahlias should be tied up neatly to stakes. For ourselves, we prefer training them so that they will lie upon the ground, where a greater number of finer flowers will be produced; we attribute the difference to the ground being kept cooler and more regularly moist during the heat of summer.

Toward the end of the month, prepare beds in which to plant tulips, hyacinths, narcissus, crocus, and lily roots; a sandy soil, made rich by well rotted cow manure, suits them best.



PAPER BURNISHING MACHINE.

Wood the Most Costly Building Material.

Four fires on the 11th and 14th of July, in Illinois, Wisconsin, and Iowa, destroyed wooden buildings, which cost originally $350,000, and an aggregate of $5,080,000 property. These buildings cost about $70,000 less than brick ones would have done. The wooden buildings burnt at Chicago, July 14, first cost $150,000, but carried with them property to the amount of $4,000,000. The wooden buildings burnt in the great fire of 1871, when the entire loss was $200,000,000, were worth $2,000,000, or one per cent of the whole. Wood is thus shown to be one of the costliest of building materials

Herb Cultivation.

The London *Garden* contains the following account of herb raising for commercial purposes, at Mitcham, England, a place long celebrated for its herb fields, from which the London herbalists derive their mint, sage, licorice, and similar herbs. Of these, as a rule, distillations are made by the growers, and they are disposed of in a semi refined condition, or the herbs themselves are brought into market as soon as they are harvested.

Chamomile.—To this several acres are devoted, the double flowered kind being preferred on account of the weight of the produce; but both single and double sorts are grown. In March, old and somewhat spent plantations are broken up and the plants divided into good rooted slips, which are planted in well prepared ground in rows 2½ feet apart, and 2 feet asunder in the rows. A common practice, however, is to plant as thick again as this, and to thin out the plants afterwards to the distances just named. The plantations are intercropped with lettuces in spring. As soon as the blooms begin to expand, they are fit for gathering, and from that time, as long as they yield sufficiently to pay, the flowers are gathered several times in a season by women, who are either paid a regular day's wages, or a penny, or thereabouts, per pound for picking.

Lavender.—This is extensively cultivated at Mitcham, both farmers and cottagers bestowing special attention on it; and this district presents a lovely sight in the last fortnight of July, when the different fields of it are in full bloom, the air for miles around being loaded with its fragrance. Lavender is increased by means of rooted slips, planted out, in rows about 18 inches apart and half that distance asunder, in March or April. Sometimes the sets are planted as wide in the row as the drills are apart. For the first year the produce amounts to but little; and, therefore, parsley or lettuce is planted between the rows. As soon as the plants have grown sufficiently to become crowded, every alternate row, and also every alternate plant in the rows left, is lifted—say in spring—and transplanted into another field, so as to form a new plantation. Thus the plants stand 3 feet apart each way, or 3 feet one way and 18 inches the other. Coleworts, lettuces, or other early and quickly matured crops, are raised among the lavender in the early part of the year; but, after June, all such catch crops are removed. The flowers are usually harvested in the first fortnight of August, and, as has been stated, are distilled at the farm on which they are grown.

Licorice.—This was once largely grown at Mitcham, but, although it is grown in considerable quantities, it is not now so extensively cultivated there as formerly, on account of the cost attending its culture. It entirely occupies the ground for three years, and during that time requires great attention in the way of cleaning, besides the ultimate cost of trenching out the roots, or, rather, underground stems. The ground, being deep, is heavily manured in autumn or winter, when it is trenched and laid up in ridges, in a rough state, till spring. It is then leveled, marked off in drills about 2 or 3 feet apart, and some 3 or 4 inches deep, and in these the sets are planted in March. The sets consist of finger length pieces of the old root stems, each containing an eye or two. During the first year the ground is usually intercropped, as is also the case in the earlier portion of the second year; but after the middle of the second summer, and throughout the whole of the third year, the licorice requires all the room. When the stems are matured in the autumn of each year, they are cut over close to the ground; and if time can then be spared, the soil between the rows is forked over, some well decayed manure being occasionally worked into it at the same time. The lifting of the crop, which usually takes place in the end of the third season, is a difficult operation, involving much labor. A deep trench is cast out, lengthways, alongside the first row, and by means of forks, pulling ropes being even sometimes employed, the root stems are extracted. In this manner the whole of the rows are treated, until all are successfully lifted. The roots may then be stored in sand or pits, like beets, carrots, or potatoes. Growers of licorice do not always harvest the crop; on the contrary, they some-

times sell it as it stands in the field, and the purchaser lifts it himself.

Mint —Both spearmint and peppermint are largely grown at Mitcham, particularly the latter; indeed, this crop ranks second in importance only to lavender. It is first planted in rows 13 inches apart each way, and in the end of the next two seasons it is plowed in. The plantations are kept free from weeds during the summer by means of hoes; and about the end of the first week, or during the second week of August, is the usual time for cutting mint for distillation. In the Fulham fields, and in other districts in which market gardening is carried on, mint is largely grown for sale in a green state. For this purpose the dampest piece of ground is selected for its culture, if it is to be a permanent plantation; but it will grow in almost any soil. It is planted in rows a foot apart, and the ground is intercropped the first year; but afterwards it runs through the soil in such a way that it becomes a complete mass of undergrown stems and roots. It is cut and bunched for market as required, the greatest demand for it being during the pea season. It is also forced in large quantities. "I have seen a range of 43 light frames filled with mint alone. These beds are made up in December or January, when the ground they occupy is excavated to a depth of 20 inches, and filled in with fermenting manure packed firmly. A few inches deep of soil are then added, and in this the mint roots are thickly planted. Linings of manure are also placed round the frames, the sashes during the night and in cold days being also covered with it."

Poppies.—Of the white kind, several acres are grown. They are sown in rows in spring, some 20 or 24 inches apart, and require no further care, beyond a little thinning and cleaning, till August, when their seeds ripen.

Sage.—This forms an important crop, which, under favorable circumstances, is pretty remunerative; the stalks being cut over, bunched, and sent to market at once. New plantations are formed with rooted slips, obtained by dividing the old plants; they are inserted, late in spring, in rows 1 or 2 feet apart, and about a foot asunder in the row. During the the first season parsley or lettuce forms an inter-crop, which also occupies the ground during the earlier part of the succeeding ones. Except hoeing and cleaning, the plantations need no care so long as they continue in a thriving condition; and when the lines get broken, and blanks and sickly plants occur, the plantation is broken up. Both the reddish and green-leaved kinds are cultivated.

Squirting Cucumbers.—These are raised in frames, like vegetable marrows, and are planted out, about the end of May, in rows some 4 or 6 feet apart, and 4 feet asunder in the row. They flower and fruit at the same time, and the fruits are gathered before they are ripe, otherwise a mere touch would burst them. The fruits are usually distilled by the growers.

The Physical Failure of the Hawaiians.

Dr. Nathan Allen, in an interesting paper upon the decadence of the Hawaiian race, makes the following observations: The census of 1872 returned the whole number of the inhabitants, 56,897—males 31,650, and females 25,247.

In 1820, when the missionaries first landed upon these islands, the population was estimated at from 150,000 to 200,000, but may not have exceeded much the first mentioned number. We have, then, in a little over fifty years, a loss of full two thirds of the whole inhabitants.

The efforts of the missionaries were attended with remarkable success. A government of the people has become firmly established, education is generally diffused among all classes, and family instruction has for a long time been established upon a sound basis. In fact, all the advantages of a Christian civilization seem to be enjoyed in an unusual degree by this people.

But, notwithstanding these conditions, the population has kept steadily decreasing every year. Now, what can be the cause? It cannot be from any fault or change in the climate, which has always been represented to be remarkably pleasant and wholesome. It cannot be for the want of good government or for any outward conditions that are unfavorable to growth. It surely has not been for the want of food, as there has never been any complaint from this source; food has been provided in abundance, a variety in kind—cheap and healthy. There certainly have been no wars, pestilence, earthquakes, famines, or calamities of that kind to account for this change. It is true the small pox, the measles, and the leprosy have prevailed there at times, carrying off large numbers, but by no means enough to account for the change.

There is no evidence that there has been any extraordinary mortality on these islands, especially among children, but there is evidence that there has been a steady decrease in the number of births. The decay goes steadily on, and from all present indications it seems likely to continue, till, as a race, they become extinct.

Dr. Allen believes that the great primary cause of this degeneracy is not external to the body, but internal—affording strong evidence that the true law of propagation is based upon physical organization, and that external agents are only incidental conditions or secondary causes. The change of population going on at these islands affords a most fruitful theme for study.

N. O. says: "Your plan for clearing telegraph wires of kitetails, etc., by burning has at least one serious objection, and that is that wooden tenements prevail where kitetails most abound; and in burning them off, there is danger of destroying houses: at least the writer found it so in New Orleans, where he tried it several years ago. It is also a slow process, for rags, when wrapped tightly, do not burn quickly."

The Transmutation of Metals.

In the seventeeth century faith in transmutation was unbroken. Helvetius declares that he saw a stranger convert an inferior metal into gold, at the Hague, in 1666. Even Glauber, the discoverer of the salt that bears his name, was a believer in the attractive delusion, and it is said that the discovery was made while endeavoring to find the philosopher's stone among the *terra damnata* of chemical operations. At last suspicion was generally aroused regarding the claims of the alchemists; and in a report read by Geoffroy before the Royal Academy of Sciences at Paris, on the 15th of April, 1722, the tricks were exposed by which impostors had practised on the credulity of the public.

From this document we learn that the ordinary way of producing the appearance of transmutation was to employ a crucible or melting pot with a double bottom, the exterior being of some infusible material and the interior of suitably colored wax. In the space between these gold or silver was placed. Lead or quicksilver, the latter being preferred on account of its volatility, was then introduced into the vessel, together with the powder of projection. Heat being applied, the wax and the base metals disappeared, and a button of gold remained at the bottom. Sometimes a true crucible was used, and the gold or silver introduced into the fused materials by means of a hollow wand or stirrer, the interior of which had been filled with the powder of the metal the production of which was desired. Lead, in which holes had been drilled and filled with gold and then closed up, was also employed; or a piece of gold was washed with mercury and then transmuted into pure gold by an acid.

Where only a part of the baser metal was to be converted, nails, or bars, consisting half of gold or silver and half of iron or some other metal, were prepared, the gold or silver being painted to resemble the other metal. The removal of this coating or transmutation was accomplished by means of alcohol or some liquid that could dissolve the paint. A nail of this description was at one time preserved in the museum at Florence; and the knife that belonged to Queen Elizabeth, which was half gold and half steel, was of the same nature. Such objects as coins, half gold and half silver, were at one time very common, and were distributed by alchemists as evidences of their power, in order to entrap the credulous.

The Austro-Arctic Exploration.

M. Sidoroff, says the *Eastern Budget*, member of the Geographical Society of St. Petersburgh, has addressed a report to the Russian Admiralty with regard to the Austrian Polar Expedition, of which nothing has been heard since August, 1872. M. Sidoroff says in his report that the *Tegethoff* was last seen by Count Wiltczek in a gulf near Cape Nassau, whose outlet was then being choked up with ice. Since that time various seamen coming from Novaya Zemlaya have reported that the quantity of drift ice in the Icy Sea had considerably increased, and that in the summer of 1873 it was extraordinarily abundant. Formerly the ice on the coast of the above island only extended to a distance of five versts in the month of June, while in midsummer, 1873, the width of the icy zone amounted to about 100 versts. M. Sidoroff believes that if Cape Nassau had been free of ice, the *Tegethoff* would certainly have gone round the northeastern point of Novaya Zemlya, which is only a day's journey from Cape Nassau, and thus reached the Gulf of Yeniseisk with difficulty. It is therefore probable that the expedition is frozen up and in want of provisions and M. Sidoroff accordingly recommends the Russian government to send food, etc., by land to Cape Nassau, adding that he will contribute $500 to the expenses of the undertaking. The Admiralty has approved of this proposal, and is now taking the necessary steps for carrying it out.

The Lake and City of Van.

The city of Van, on the extreme eastern border of Turkey in Asia, is a new station lately occupied by American missionaries. The Rev. Dr. Barnum writes home, to the New York *Observer*, an account of a journey lately made by himself and party from Harpoot, eastward over the Taurus mountains, a distance of 300 miles, to the city of Van. The author says:

Lake Van, along the shores of which we spent several days in going and returning, is a beautiful sheet of water, without any outlet, sixty or seventy miles in length, and perhaps twenty or thirty in breadth. It is irregular in shape, and is surrounded by mountains, so that in traveling the whole length of the lake you obtain sectional views, which give one almost the impression of a series of three or four lakes, and remind one somewhat of Lake George and the Italian lakes.

The city of Van lies at the eastern end of the lake, and is surrounded by a wall and moat. Just back of the city is a high bluff which is surmounted by the most picturesque castle which I have yet seen. On the rocks are several inscriptions in the cuneiform character, but in the Armenian language. The city is said to have been founded by Semiramis, nearly 4,000 years ago; but I believe this distinguished queen is coming to be regarded by historians as a myth. At any rate the city is very ancient, whoever may have been the founder. Stretching away from the city and the lake for several miles toward the mountains on the east are beautiful orchards and gardens, and here the majority of the people live. The Armenian population of Van and its surrounding villages is very large.

TO RESTORE OLD ZINC WHITE.—If kept for a long time zinc white becomes granular and gritty, and useless for painting. It may be restored by ignition in an earthen crucible.—*M. A. Speidel.*

Leg Locomotion.

At a recent meeting of the French Academy, M. Marey communicated an account of some new researches on human locomotion. With his usual experimental skill he succeeds in recording the movements of the legs, on a rotating blackened cylinder (in reduced form, by means of wheel work). Weber supposed that, in walking, the leg was displaced merely by the action of gravity, and performed a pendulum movement. This has been variously disproved (by Duchienne and others); and now M. Marey demonstrates that the movement of transport is uniform throughout nearly its whole duration; in rapid paces it commences and terminates with short periods of variable velocity. This uniformity is due, in great part, to action of muscles of the leg, but two other elements have to be considered: 1, the angular movement of the leg about the pelvis, and 2, the horizontal translation of the pelvis itself, that is to say, of the point of suspension of the leg while it oscillates.

A Monument to Liebig.

The pupils of Justus Liebig propose to erect a fitting monument to the memory of their master, and now appeal to the chemists of all nations to aid them in the effort to raise a sum sufficient for the purpose. It has been decided to erect one monument at Munich, where Liebig spent the later years of his life, and, if the fund subscribed shall suffice, to place another—perhaps a copy of the first—at Giessen, the scene of his earlier labors.

Subscriptions in this country may be sent to either of the undersigned, who will forward the sums contributed to the Central Committee at Berlin:

Professor J. Lawrence Smith, Louisville, Ky., Professor E. N. Horsford, Cambridge, Mass., Professor Wolcott Gibbs, Cambridge, Mass., Professor C. A. Joy, Columbia College, East 49th street, N. Y., or Professor C. F. Chandler, Columbia College, East 49th street, N. Y.

One Hundred and Twenty Years Old.

There are certain portions of Virginia which have long been celebrated for the healthfulness of climate and the longevity of the inhabitants. Here is the latest example:

Mrs. Katie Shepp, living in the Massanutten Mountain, near Keezeltown, five miles east of Harrisonburg, Va., has, it is stated, now reached her one hundred and twentieth birthday. Mrs. Shepp was married in the year 1774, at the age of twenty. Her husband, who has been dead about sixty years, was in his twenty third year at the time of his marriage, and he was a wagoner in the war of the Revolution. Mrs. Shepp remembers many of the incidents then occurring in the vicinity. Her mind is clear, and she does the work of the family she lives with, as well as her own sewing, and has never used spectacles.

A Russian International Exposition.

A permanent International Exposition of machinery is to open at the Museum of the Imperial Polytechnic Society in St. Petersburg, Russia, on the 15th of October next. The object of the exhibition is to promote the introduction and employment throughout the empire of new and improved tools and machinery, whether of domestic or foreign manufacture, by demonstrating their advantages through public experiments. The enterprize is also intended to establish closer relations between the Russian manufacturers and those of other countries. Full particulars may be obtained by addressing Colonel Sytenko, President of the Russian Imperial Polytechnic Society, 2 Rue Panteley Mouskaia, St. Petersburgh.

Fishing by Means of Explosives.

A method of catching fish, employed for years by poachers in England, is to fill a large stone bottle with quicklime, then to pour in water enough to nearly fill the jar, and cork it up, securing the cork to the neck of the bottle by copper wire. The bottle is thrown into the water, and the pressure, caused by the working of the lime, explodes the bottle and stuns the fish, which then float helplessly on the surface of the water.

PHENIC ACID FOR THE PRESERVATION OF WOOD.—It is admitted that, if tar increases the durability of woods exposed to air and moisture, this property is owing to its phenic acid and its creosote. It is, then, rational to believe that, in replacing the sap of the trees with slightly phenic water, they are protected from rot. But phenic acid is insensibly driven from the wood under the influence of water. M. Boucherie considers that phenic acid can only be rendered useful by mixture with sulphate of copper, to defend stakes driven into the sea against the attacks of the *teredo.*

THE British government is spending $50,000 at Woolwich on a new 80 tun gun, which, when finished, is expected to beat the world. With a sixteen inch projectile, weighing 1,650 pounds, and a maximum charge of 300 pounds of powder, it will pierce the best iron plates, twenty inches thick, at 500 yards, sixteen inch plates at 5,300 yards, and will pitch a sixteen inch shell into a ship or fortress at a distance of 10,300 yards. The steel block forming the inner tube was the largest ever cast, weighing over twelve tuns; while the trunnion piece, about eighteen tuns, was the largest forging ever produced at the arsenal.

UTILIZATION OF WASTE SOAP LYES AND OILY LIQUORS.—Instead of separating the fatty matters from the water by means of mineral acids, the author proposes to treat them with salts of magnesia. Magnesian soaps are thus formed, containing 60 per cent of fatty matter, and which may be used in the manufacture of gas for lighting purposes.—*M. M. Vohl.*

Predatory Chickens.

One Max Adeler describes a novel method he adopted for ridding his garden of a neighbor's chickens. We copy the article from the London *Garden*, but we suspect it emanated from this side of the water, and we would not wonder if the *Danbury News* man was its author. It certainly reads like him; but no matter where it originated, the invention is made, and in Adeler's case it proved useful.

He says: "We had a good deal of trouble last summer with Pitman's chickens; as fast as we planted anything in our little garden, those chickens of Pitman's would creep through the fence, scratch out the seed, fill up, and go home. When the radish bed had been ravished in this manner for the fifth time, we complained to Pitman. He was not disposed to interfere. 'Adeler,' he said, 'I tell you it does 'em good; and it does them beds good to be raked over by chickens. If I had radishes, give me chickens to scratch around them and eat up the worms. Radishes that haven't been scratched ain't worth a cent.' Then we climbed over the fence with the determination to take the law in our own hands. We procured half a peck of corn and two dozen small fish hooks. Fastening the hooks each to a grain of corn, we tied wire to each hook. Then we scattered the whole of the corn on the radish bed, and fixed the ends of the wires to the biggest sky rocket we could get. The rocket stood in a frame about 10 yards away from the hooks. That very morning Pitman's chickens came over, and instantly began to devour the corn. We were ready; and as soon as it was evident that the hooks were all swallowed, we applied a match to the rocket. It is regarded as probable that no barnyard fowls that have existed since the days of Noah ever proceeded toward the azure vault of heaven with such rapidity as those did. A fizz, a few ejaculatory cackles, a puff of smoke, and Pitman's roosters and chickens were swishing around the celestial constellations without their feathers, and in some doubt respecting the stability of earthly things. Pitman never knew what became of his fowls; but when we read in the paper next day that twenty-four underdone chickens, with fish hooks in their craws, had been rained down by a hurricane in New Jersey, we felt certain that that sky rocket had done its duty."

Gas Light.—Average Prices.

The following information, showing the average net price of gas throughout the United States, has been procured by the Washington, D. C., Gas Light Company:

1. Maine	$3.87	20. Mississippi	$5.25
2. New Hampshire	3.96	21. Michigan	3.43
3. Vermont	4.80	22. Wisconsin	3.87
4. Massachusetts	3.86	23. Ohio	3.32
5. Rhode Island	3.35	24. Indiana	3.54
6. Connecticut	4.03	25. Illinois	3.87
7. New York	3.88	26. Kentucky	3.92
8. New Jersey	3.80	27. Tennessee	4.06
9. Pennsylvania	3.46	28. Minnesota	4.31
10. Delaware	3.95	29. Iowa	4.52
11. Maryland	3.59	30. Missouri	3.95
12. Dist. of Columbia	3.16	31. Arkansas	5.00
13. Virginia	3.89	32. Louisiana	4.50
14. West Virginia	3.11	33. Texas	5.75
15. North Carolina	6.67	34. Kansas	4.55
16. South Carolina	3.80	35. Colorado	5.00
17. Georgia	5.07	36. Utah	4.00
18. Florida	8.00	37. California	6.11
19. Alabama	4 83		

Total average net price of gas in the United States..$4.32½.

Proposed Statue to Daniel Webster.

Gordon W. Burnham, a wealthy resident of this city, proposes to erect in the Central Park, at his own expense, a bronze statue of Massachusetts' late statesman, Daniel Webster. Mr. Burnham has a special taste for bronzes, and his residence on Fifth Avenue contains probably the choicest collection in the country, The Central Park has already a handsome group (Eagles and Chamois) presented to it a number of years ago by Mr. Burnham.

The Park Commissioners have, we understand, requested that a model of the statue be submitted to them before they will consent to set apart for it the conspicuous and appropriate site on the Mall, suggested by the donor. The form of a renowned and representative American statesman, whose fame belongs to this country, deserves, we think, at least as prominent a position as that of Sir Walter Scott. It is to be hoped that Mr. Burnham's generous offer will not be withdrawn through any difference of opinion as to where in our everywhere beautiful Park his gift is to be displayed. The people will appreciate it, and heartily thank him for it, no matter whether it be located (as it should be) on the Mall, or half hidden in the shrubbery in some by-path of the Ramble.

ROPE CORDAGE.—Recently a very interesting experiment was made at Kirkaldy's Testing Works, Southwark street, London, as to the relative strength of handspun yarn rope, machine yarn rope, and Russian yarn rope. Mr. Plimsoll, M. P., Captain Bedford Pim, M. P., and others attended the test, which lasted over three hours. There were nine pieces of rope, each 10 feet long, being three of each of the above classes. The ultimate stress or breaking strain of the Russian rope was 11,099 lbs. or 1,934 lbs. strength per fathom; machine rope, 11,527 lbs. or 2,155 lbs. per fathom; handspun rope, 18,279 lbs. or 3,026 lbs. per fathom. The ropes were all of 5 inches circumference, and every piece broke clear of the fastenings. The prices paid per cwt. were: Russian rope, $11·75; machine yarn rope, $11·75; handspun yarn rope, $11·00 all described as best cordage and London manufacture. It will thus be seen that the handmade was cheaper by 75 cents per cwt., and broke at the testing strength of 7,180 lbs. over Russian, and 6,752 lbs. over machine made rope.

DECISIONS OF THE COURTS.

United States Circuit Court---District of New Jersey.

PATENT SHAWL STRAP.—GEORGE CROUCH *vs.* HENRY SPEER, REINHOLD SPEER, AND EGBERT MATTNER.

[In equity.—Before Nixon, Judge.—Decided April 27, 1874.]

NIXON, *Judge:*

This suit is brought for an alleged infringement of a patent for "Improvement in shawl straps," originally granted to the complainant, and surrendered and reissued March 7, 1871. *

The patentee states in his schedule that before his invention straps had been used to confine a shawl or other similar article in a bundle, and a leather cross piece, with loops at the ends, had extended from one strap to the other; and above, and attached to this cross piece, was a handle: that the cross piece or connecting strap was liable to bend, and allow the straps to be drawn toward each other by the handle in sustaining the weight; that hence the bundle was not kept in the proper shape, and the handle was inconvenient to grasp; and that his invention consisted in a rigid cross bar beneath the handle, combined with suspending straps that are to be passed around the shawl or bundle, such straps passing through loops at the ends of the handle. *

The defendants' first allegation is that there is nothing new or useful in the complainant's patent. If they mean by this that it is not the subject matter of a patent, the objection must be examined and answered in the light of the provisions of the 24th section of the patent act of 1870 (16 Stat., 201). That section authorizes a patent to be granted for "any new and useful art, machine, manufacture, or composition of matter, or any new or useful improvement thereof." It will be seen that utility and novelty are the requisite conditions. The invention or the improvement claimed must have both, or the letters patent secure nothing for the patentee. Whether it is useful in the sense of the law is not whether it is not mischievous or hurtful or frivolous or insignificant, but whether it is capable of use for a purpose from which some advantage can be derived. If it be useful in this sense, the degree or extent of its usefulness is altogether unimportant. It is not necessary, in other words, that it should be the best means of producing a desirable result, but a means, although inferior to others, of producing it. (Curt. Pat., sec. 449)

Testing the complainant's patent by this principle, it is undoubtedly useful. The rigid cross bar and the loops holding the straps, securing them in their place, and made of the leather of the handle, if new, add neatness and finish and value to the manufacture; and this is shown by the fact that these defendants, active business men and alive to the public demands, gave these methods of manufacturing a preference over others in finishing and furnishing shawl straps for the markets.

The defendants' second allegation is the want of novelty in the complainant's patent. *

In considering the case, it should be remembered that the patent is *prima facie* evidence that the patentee was the original and first inventor. Any one who controverts this assumes the burden of proof and undertakes to show affirmatively that there was a prior knowledge and use of the alleged invention under such circumstances as to give to the public the right of its continued use against the patentee.

This the defendants have failed to do. The evidence introduced by them is frequently contradicted, and is inconsistent with itself and many well established facts.

There is ground for reasonable doubt in regard to its correctness. Where such doubt exists the complainant's *prima facie* case, even if uncorroborated, must prevail.

But it does not stand without corroboration. The complainant called William H. Cleveland, William Roemer, Peter Martens, Jacob Lacowitz, Joseph R. Davis, and Philip P. Lynch to testify as to the state of the art. They seem to be intelligent and disinterested witnesses; have been for years, more or less, connected with the manufacture and sale of shawl straps, and they all trace the origin of the rigid cross bar to the invention of the complainant, or deny its existence or use prior to 1868.

Upon the whole case, I am of the opinion that there should be a decree sustaining the validity of the complainant's patent, and giving him profits and damages for its infringement since March 7, 1871, the date of the reissue, and also an injunction, restraining the defendants from further infringement. *

[*Jonathan Marshall*, solicitor and counsel for complainant.
James M. Scovel, solicitor and counsel for defendants.]

United States Circuit Court---Southern District of New York.

COMBINED RUBBER AND METAL SPRING.—THE NATIONAL SPRING COMPANY *vs.* THE UNION CAR SPRING MANUFACTURING COMPANY.

Blatchford, Judge.

This suit is brought on reissued letters patent granted to the plaintiffs Dec. 13, 1870, as assignees of Erastus T. Bussell, for an "improvement in combined india rubber and steel springs," the original patent having been granted to Bussell, as inventor, November 29, 1853, and extended for seven years from November 29, 1867.

A patent for a spring for cars and other vehicles composed of a column of india rubber and a spiral metal spring, which encloses it and cooperates with it, and also prevents it from spreading, is valid, notwithstanding a previous patent for a spring composed of a hollow column of india rubber enclosing a spiral metal spring, and prevented from spreading by metal rings around it.

A reissued patent held valid which claimed a spring constructed of an india rubber column enclosed in a spiral metal spring, although it was conceded in the original application that such a spring was described in a previous patent, it appearing that it was not so described.

Although the original patent everywhere represented the india rubber column as deeply fluted, yet a reissued patent was sustained which claimed an india rubber column in unqualified terms, without alluding to the fluting.

The reissued patent was held valid, although it claimed the rubber column whether solid or hollow, and the original patent made no mention of a hollow column.

It was held to be no objection to the reissued patent, because it suggested that any material which was the equivalent of india rubber might be used instead of it, such as animal or vegetable fiber, gutta percha, etc., although these materials were not mentioned in the original.

The validity of a patent is not impaired because the invention is embraced in a prior English patent, if, previous to the date of the latter, the American patentee had reduced the invention to practice.

Where the assignees of the inventor filed and completed their application for a reissue before July 20, 1870, it was held that their oath to it was sufficient without that of the inventor.

Under the act of March 3, 1871, the oath of the assignees is sufficient upon an application for the reissue of a patent originally issued before July 20, 1870; the oath of the inventor is required only when the original patent issued after that date.

[*J. P. Fitch* and *George Gifford*, for plaintiffs.
H. C. Woodruff, for defendants.]

Recent American and Foreign Patents.

Improved Waste Valve and Overflow.

James Foley, Brooklyn, N. Y.—The end of the pipe leading to the basin is coupled with a casting or T, in the lower part of which is formed a conical valve seat, and with its lower arm is coupled a pipe leading to the sewer. The upper part of the T coupling is connected with the end of a larger pipe, which is secured to a stand. Within the large pipe is placed a smaller pipe, around the lower end of which is formed a ring flange, upon which is placed a rubber ring to form the valve. By this construction, when the valve is closed and water admitted into the basin, it will rise in the large pipe until it reaches the level of the upper end of the small pipe, when it will flow off through the same. When the pipe is raised, opening the valve, the water will flow off through the sewer pipes, having a wholly unobstructed passage, in which there is nothing for hairs or other rubbish to lodge against and thus obstruct the outflow.

Improved Mechanism for Operating Punches, Shears, etc.

Charles H. Reynolds, Williamsburg, N. Y., assignor to himself and Henry C. Richardson, of same place.—In this machine, when the free end of a lever is moved to the rearward, the arm of the lower jaw will be moved downward and the arm of the upper jaw will be moved upward, bringing the jaws together with immense power. An illustrated description of the apparatus will be found on page 102 of our current volume.

Improved Signal Light.

James C. McMullin, Chicago, Ill.—The object of this invention is to furnish a signal lamp for railroad trains and other purposes, which indicates by the successive appearance of the light thrown through lenses of different colors or sizes from one burner, the distance of the light to be determined by the gradual appearance and relative position of the lights. The invention consists of a signal lamp which is provided with one or more tubular arms, with reflectors and lenses of different colors at their ends, spread at suitable distance, and lighted by one common burner. A signal lamp is provided with one or more tubular arms. At the distance of one, two, or more feet, are a reflector and lens. The reflector is preferably placed under an angle of forty-five degrees to the axis of the arms, so that the whole body of light is thrown forward through the lens as the rays are reflected under the angle of incidence of the light. Lenses of different colors or sizes may be employed, and thereby the distance of the train determined by the successive appearance and position of the lenses. It has been found by practical tests that in a signal lamp having red and white eight inch lenses placed at a distance of thirty-four inches from each other, nothing but the red light is shown at a distance of one and one fourth miles. At a distance of one mile, red is shown with a rim or fringe of white at that side where the white lens is situated. At three quarters of a mile, red and white are both shown distinctly and separately; and at a distance of half a mile a considerable space appears between them. Any number of lenses can be illuminated at the same burner if placed at the ends of the connecting arms.

Improved Children's Carriage.

Julius Sues, Louisville, Ky.—A child's carriage is supported on front wheels by curved sills or bars and strong lateral springs, firmly bolted to the body and also to the rear end of the bars, the front end carrying the axle of the front wheels. By placing the front part of the body on springs, not only an up and down motion, but also a rocking motion, of the carriage is obtained, and the elasticity of the same increased. The hind part of the body is supported by two additional curved springs, of swan-necked shape, which are interposed between the usual elliptic supporting springs and the body. The front end of the spring is firmly attached directly to the body of the carriage, or to an intermediate bracket-shaped casting. The rear part of the spring is attached to the back of the body, near the upper part thereof. The support of the body by the springs is thereby strengthened, and the constant upward jarring of the springs arrested.

Improved Sleigh.

John A. Seigfrid and Chester B. Borden, Seneca Falls, N. Y.—The knees and the hub are cast in a single piece, and the hub fits on the beam as an ordinary wagon wheel fits on an axle. Traces are attached permanently to the knees and to the under side of the beam, so that they may be readily detached from the beams. The hubs are made about the length of ordinary wagon hubs, so that the wheels will fit on the beams in place of the runners. The beams then become axles. The change from runners to wheels and from wheels to runners is very readily made.

Improved Stop Valve.

Richard S. Gillespie, New York city.—This invention is an improvement upon double seated valves, some of which are provided with a headed pin or spreader and two disks by the introduction of rollers that may act on the principle of a toggle joint. When a valve is forced down, a pin strikes the bottom of the case and forces another pin up against the lower end of the valve stem. As the valve stem moves further down, both pins are forced inward against the outer rollers, which force the middle rollers outward, forcing the faces of the valve against the valve seats. The rollers thus operate as a double toggle joint, pressing outward in lines at right angles with the valve stem. In raising or opening the valve, the first movement of the valve stem removes the pressure of the pins from the rollers, the pressure of the rollers from the parts of the valve, and the pressure of the valve faces from the valve seats, so that the valve can be raised without any friction between its faces and seats.

Improved Reading and Copying Stand.

Charles E. Wells, West Pawlet, Vt.—The book to be exposed on the rack is securely fastened thereto, after being placed on the projecting lugs at the lower end by carrying a top slide piece with top lugs down. The slide piece moves in a central slot of the rack, and is also provided with pivoted arms having a lateral piece at their end with sliding book fasteners. Similar arms with upward extending fasteners are applied along the lower part of the rack. These rods are swung forward as required by the thickness of the book, and the fasteners then applied to hold the leaves till they are turned over. As the fasteners rest only lightly thereon, the turning and placing in position of the leaves will occasion no difficulty.

Improved Carriage Wrench.

Henry Cutler, Ashland, Mass.—The adjusting handle consists of two parts, one chambered out to receive an eccentric, which is thus turned. The eccentric is governed in position, as it is revolved, by a pivot, where it enters a hole in the stock head. The jaws are levers, and the eccentric operates on their upper ends, the fulcrums being the pins. A spring between the jaws keeps them spread apart; but when the eccentric is turned, the outer ends of the jaws are forced toward each other to gripe and hold the nut. With this wrench a nut may be removed and replaced without touching it with the fingers.

Improved Method of Retouching Photographic Negatives.

Claude L. Lambert, Paris, France.—A large negative, after having been properly exposed, developed, fixed, and finished, is covered on both sides with a sheet of thin paper or other semi-transparent material capable of retaining the coloring matter to be afterward employed. Wherever necessary, either on the collodion side or on the reverse side, an impalpable galvanoplastic powder, or other finely pulverized substance answering the same purpose, is applied with a stump. The effects of light and shade may thus be modified, toned, or hightened, and such a high degree of finish imparted as will render any subsequent retouching of the positive paper print unnecessary, the sharpness of the lines being restored by the aid of a lead pencil. The negative, after thus being treated, is placed in the pressure frame with a sheet of ordinary sensitized paper, prepared either with salts of silver or of chromium, to obtain a perfect positive. Should the lines of the negative be too sharp or well defined, they may be softened in the positive proof by first partially printing it in contact with the large negative, and then completing the impression after having interposed a sheet of very thin glass between the negative and the paper.

Improved Seed Dropper.

Hermann Koeller, Camp Point, Ill.—To two cross bars are attached runners and seed hoppers, to the middle parts of which is secured a tongue. A slide receives a reciprocating movement to drop the seed from the revolutions of gear wheels, and may be adjusted to a longer or shorter stroke. To one small gear wheel is attached a wheel consisting of arms, the outer ends of which are notched to receive a chain, and to the lower side of which is attached a ring to support the same. In using the machine, in coming to the end of the field, the driver slips a spring ring upon the link that dropped last to the ground, after dropping the last hill before turning, for a mark. He then counts the links that lie crosswise, and puts another spring ring in the link he wishes to begin to drop from, for a mark in starting. After turning around, the flanged chain wheel should be set so that the machine will begin to drop at the marked link. This will bring the hills in accurate check row.

Improved Combined Throttle and Governor Valve.

Allan Talbott, Richmond, Va.—This invention relates to novel means to be used in connection with a governor for starting, stopping, or instantly changing the speed of a steam engine without the employment of shifting belts or other mechanism.

Improved Bath Tub.

Aso C. Brownell, Brooklyn, N. Y.—This tub frame is so constructed that the sheet metal lining cannot buckle by influence of shrinkage or swelling of the body of the tub.

Improved Combined Check and Martingale.

Louis Barron, Woodstock, Vt.—The object of this invention is to provide a combined check and martingale, or in other words a check rein which, by an easy adjustment, is adapted to serve the purpose of a martingale. It consists of a strap split into two other smaller straps, the single strap fastening by means of a ring to the check or water hook, and the two smaller straps passing through keepers on the crown piece of the bridle, connected by a sliding loop on the face of the horse, and fastened to opposite sides of the bridle bit by means of detachable fastenings.

Improved Wheel.

Lewis H. Rogers, South Avon, N. Y.—The object of this invention is to provide a wheel for vehicles of such an elastic construction as shall facilitate the easy movement of vehicles, and which shall at once be strong, light, and durable. It consists of a metallic hub having two sets of screw-threaded stems projecting radially from the same, to which are fastened small plates held to said stems by a nut and washer, there being between the said washer and plate an elastic pad. Said plates are attached on each side of the stems to metallic spring spokes, and said spokes securely fastened to clips that are riveted to a metallic felly. Said felly is preferably made with a concave periphery, and between the felly and the tyre is placed a rim of rubber or other elastic substance.

Improved Portable Fence.

William C. Kay, Como, Miss.—This invention relates to that class of wooden fences which are portable. It consists of but two essentially different parts, the rails and the improved connection for the same, which latter consists of two symmetrically formed sections, made of inclined stakes, to which are attached strips of stuff varying in length from about three feet at the bottom to one foot at the top. Said stakes cross each other at about eighteen inches from the top, and are braced by a rail resting in the fork formed thereby. Said strips are securely fastened at one end to the stake; and as they incline toward the earth the strips of one stake cross those of the other, forming locks thereby into which the rails are placed.

Improved Spring Chair.

William T. Doremus, New York city.—To the front and rear parts of a chair seat are attached two iron bars which are made with a bend to pass through slots in the end of a plate framed upon the head of a screw. Bolts pass through holes in the bars and plate, through rubber blocks placed above and below said bars and plate, through small rubber blocks interposed between the bars and the plate, and through washers placed above and below the blocks, and have hand nuts screwed upon their lower ends, so that, by turning said hand nuts in the one or the other direction, the rubber blocks may be compressed, more or less, to give any desired elasticity to the chair. The small blocks operate as a yielding but positive stop to the forward movement of the chair seat, while the larger blocks allow it to have a greater and more elastic rearward movement. The screw screws into a long socket which has a flange upon its upper end and a screw thread cut upon the outer surface of its lower end, to receive a nut. The pedestal is made in sectors, meeting in its center around the socket. The parts of the pedestal are firmly held together, and the screw socket is so firmly supported that it cannot work loose.

Improved Combined Sulky Plow and Cultivator.

Newton J. Skaggs and Lorenzo W. True, Talladega, Ala.—The main framework of this machine has a space through which rows of plants or grain can pass, so that the machine can be drawn over said rows without injuring said plants or grain. Three plow beams are placed in each frame. The ends of the beams are connected by bolts which pass through them and through blocks interposed between them, and between them and the side bars of the frames, so as to keep the said beams in their proper relative positions. The forward ends of the beams are pivoted to the frames, so that the rear end of the beams rise and fall as the unevenness of the ground may require, and enable the plows to be raised from the ground when necessary. The beams may be adjusted at a greater or less distance apart, according as larger or smaller plows are to be used. The plow standards fit into semi-cylindrical recesses formed in the lower sides of the beams. By raising inner standards and leaving the outer standards in working position, the machine will be adjusted for marking off the land.

Improved Range Chimney Bottom Plate.

Hamilton C. Garwood, Jersey City, N. J.—A rod extends directly through the front wall of the chimney, for working a valve at the opening of the top of the chimney bottom plate for effecting the ventilation. The rod is connected to the valve by a slotted arm and a stud pin.

Improved Shirt Bosom.

William Hay, New York city.—This is a shirt bosom reënforced or lined and strengthened with a coarse material in such a way as to make the bosom more durable. The side plaits are made of fine linen folded so as to be of three thicknesses. The central plait is formed of one thickness of fine linen in its middle part, but has its edges folded so as to be of three thicknesses. The middle plait is made in one piece with one of the side plaits, and has a strip of coarser material inserted in it, the edges of which enter the edge folds of the said plait.

Improved Seal Lock.

Solomon Wright, Pownal, Vt.—A metallic flanged box contains a bolt having a stem upon which there is a spiral spring. This spring bears against a partition plate. Another plate has an arm which extends to or past the bolt. There is a pin in the bolt with which the arm engages when the lever plate is turned upon its hinge. This action of the plate throws back the bolt and releases the cap. The cap is a flanged box having an aperture, and is rigidly attached to the hasp. The cap is placed over the box, thus confining the seal, leaving so much of it exposed to view as is seen through the aperture. When the cap is placed on the box, the edge of the recess in the cap strikes and forces back the bolt; but when the cap reaches the bed flange of the box the spiral spring reacts, and the end of the bolt enters the recess and securely fastens the cap and confines the seal card. To prevent the card seal from being replaced after it has been cut and the lock opened, on the outside of the lever, ribs run longitudinally on the face of the plate, which force the card outward when it is cut or torn. When it is desired to open the car, the seal is broken with the end of the finger, which allows access to the end of the lever plate. The seal card may be cut or torn, so that the plate can be pulled out, thereby drawing back the bolt and releasing the cap.

Improved Horse Detacher.

Amos Barker, Nebraska City, Neb.—On the ends of the whiffletrees are two lugs to receive the tug eyes, and they have a hole formed through them to receive bolts, which also pass through the tug eyes, and thus connect the horses. The bolts are pivoted to a lever, which is pivoted to the center of the whiffletrees, and to it is attached a cord which passes back to the dashboard of the vehicle, so that, by pulling upon the cords or straps, all four of the tugs may be instantly disconnected from the whiffletrees. Similar arrangements are attached to the neck yoke for securing the breast straps to it. By this arrangement the tongues are disconnected from the whiffletrees, and the breast strap from the neck yoke, at the same time. The ring of the bridle bit is secured in place by a hook formed upon the end of a lever pivoted to a block. By suitable construction, as the neck yoke drops, the strain will operate the lever to release the bit ring, and at the same time the strap will slip from the said lever, thus detaching the cross reins and freeing the horses from each other at the same time they are freed from the whiffletrees and neck yoke.

Improved Trunk.

William J. Large, South Brooklyn, N. Y.—This improved trunk is so constructed that the operation of raising the lid will also raise the tray to give free access to the interior of the body of the trunk, and will enable the lid to be locked in place when only raised sufficiently to give access to the tray.

Improved Ice House for Preserving Meats, etc.

Daniel T. Conklin, Brooklyn, N. Y.—The roof is pyramidal in form. The sides of the ice box are provided with doors sliding in grooves in the corner posts of said box, so that all or part of them can be raised, more or less, according as a greater or less cooling effect is required to be produced. The articles to be preserved are hung in the space between the walls of the house and the ice box. The roof of the ice box is also made pyramidal in form, and its peak extends up to the peak of the house. The peaks of both roofs have holes formed through them for the escape of impure air, etc. With this construction the space in the upper part of the ice house and ice box to be cooled uselessly is very greatly diminished, so that the same quantity of ice will produce much better effects than in ice houses constructed in the usual manner. The corned beef vat is placed between the forward end of the ice box and the front side of the house.

Improved Sawing Machine.

John M. Linnell, Monticello, Iowa.—A treadle pivoted to an ordinary saw horse is extended to one side to project beyond the horse standard, and provided with an inclined lever arm which is connected with the bifurcated end of the saw frame. The rear part of an extension of the lever is connected to a crank wheel shaft and balance wheel at the opposite side of the saw horse. The balance wheel is weighted at one side for the purpose of carrying the crank wheel into position to be readily moved by the treadle and arm, avoiding the position of the same on one of the dead points for starting. A reciprocating motion is imparted to the saw frame by the arm and extension. Said frame is made of curved shape with a saw blade cutting in both directions, clamped adjustably and detachably therein. The machine is operated by rocking the treadle platform with the feet, pressing with one hand the upper part of the saw frame, and feeding with the other hand the sticks to the saw.

Improved Rotary Pump.

Hiram L. Houghton, Charlestown, N. H.—This invention consists of a hollow cylinder with closed ends, containing a rotary disk in the middle portion. The disk carries blades in longitudinal and radial slots, both in itself and in the shaft. These blades are shifted forward and backward by cams on each end of the cylinder to cause them to press the cut-off and rims over the suction pipe, and carry the water up to and deliver it at the discharge pipe. The suction pipe is divided, and a branch enters into that chamber in which the blades are thrown to pass the cut-off in the principal pumping chamber; and a passage is formed through the cut-off to a branch of the discharge pipe, whereby whatever effect may be obtained by the blades in that chamber is utilized.

Improved Heating Stove.

Silas Cook, Magnolia, Iowa.—In this invention the products of combustion are caused to take a circuitous route to the escape flue, in order to secure more perfect utilization of heat, that is to say, they are returned through the stove to be reheated, after passing through an exterior vertical flue, and their course at starting directed upward from the grate, or downward through the same.

Improved Bolting Reel.

Moses French, Harrodsburgh, Ind.—The cloth has strips arranged along the seams to attach it to rods which are suspended from the ribs by other rods. The cloth strips are connected to the rods by hooks, and the rods are arranged to turn and roll the cloth on them for stretching it transversely. By this arrangement the cloth can be stretched tight at any time after it has stretched so as to bag without unfastening and readjusting it. The inside is relieved of the ribs of wood which carry up the meal and throw it down, so as to force through the brown and dark matters which discolor the flour; and the bolting cloth, being entirely untouched by the ribs, will not cut or be injured by insects which gather in the cracks, as in the common reel.

Improved Vehicle Seat.

Darwin V. Miller, Weedsport, N. Y.—This invention consists in an improved spring seat formed of two sets of spring slats slotted at their ends and drawn together at their centers over a frame interposed between them. An upper set of spring slats are attached by cross bars to the middle set, and have bars at their ends to keep the persons sitting upon the seat from slipping off.

Improved Automatic Gas Lighter and Extinguisher.

George S. Dunbar, Pittsfield, Mass.—A metal case screws on the lamp post, and has a passage for the gas to pass along one side of the chamber to the burner, in which passage is a stop valve to shut off the gas and extinguish the light, when it is let fall, by a cam which is turned for the purpose by the clockwork contained in the chamber. The cam is connected to the shaft of the clock gear by its hollow journal which extends from the gas passage into the chamber. The valve has a pressure spring above it for pressing it firmly on its seat when the cam lets it fall. Strong clock springs turn the train. A wheel turns the cam back to set at the same time that it winds up the springs. The extent to which it is turned back determines the time the clock will run before extinguishing the light, and the extent to which it is turned back is governed by an adjustable collar. The cam may be set for dropping the valve at any predetermined time by shifting the collar to the mark on a scale corresponding to the time wanted. A bar is provided with match-holding fingers to carry a match at the same time that it is used to wind up the clock, and strike it against a striking plate, and then present the burner to ignite the gas jet; thus allowing the winding and setting of the clock and the lighting of the gas all to be accomplished by one operation.

Improved Washing Machine.

Charles Bagnall, Amity, Iowa.—Levers are oscillated by working a frame. To the inner end of each of the levers is pivoted a bow. To the ends of each bow are attached the ends of a bar to which are pivoted three tubes. The shanks of presses are fitted into the lower ends of the tubes, and are held in place by coiled wire springs placed in the upper part of the tubes. By this construction the presses can yield to accommodate themselves to the different thicknesses of the mass of clothes that may be in the boiler.

Improved Car Coupling.

Charles F. Wilkinson, Reuben Mochamer, Jacob B. Ziegler, and Charles Snyder, of Latimer, Pa.—This consists of a draw hook with inclined front part, fitted rigidly to the car frame, and set into a recessed bumper frame. A link-shaped clevis is pivoted to the hook, and a curved latch piece closes over the end of the same. The link slides, on the approach of the cars, over the hook, and drops into the recess back of the hook, forming thereby the intimate coupling. For uncoupling, the link is swung up, and taken out of the hook, and the drop latch is then placed in an inclined position on the outer side of the latter, ready for the detaching of the cars without any chance of recoupling.

Improved Car Brake.

Edmund I. Hockaday, Pleasant Hill, Mo.—A sliding bar is applied to the under side of the car, provided at both ends with buffer heads. Its whole length is somewhat less than the distance from drawhead to drawhead, in order to allow for the compression of the drawhead springs. It connects with the brake mechanism by a chain with double end parts, so that the brake may be operated by pulling the sliding bar in either direction. The tender is provided under the rear drawhead with a short sliding buffer rod, which is operated, by means of a pulley and chain, from a brake shaft and wheel at the forward end of the tender. The buffer rod is guided under suitable inclination back of the rear truck of the tender, and projects, when in regular position, beyond the drawhead far enough to take up nearly the entire slack space between the tender and first car. On the discovery of sudden danger, the engine is reversed, or its motion is retarded, so that the momentum of each car carries it forward the full length of its slack, and produces the action of the buffer rod of the tender on the sliding bar and brake of the first car, which carries back that of the second, and so on till the whole train is acted upon by the brakes in a perfectly automatic manner. In order to release the brakes and back the train, the engine is slightly moved forward, and a brake wheel connecting chain is released, so that the buffer rod drops out of position and discontinues its action on the sliding bar.

Improved Boot Blacking Machine.

Bartly Palmer, Armonk, N. Y.—This invention consists of a horizontal shaft, which is rotated by a hand wheel or treadle, and provided with two wheel-shaped brushes, of which one takes up the blacking from a box placed adjustably on a pivoted bracket, transferring it to the boot, while the other wheel, of rounded V shape or concaved cross section, polishes the boot when brought in contact therewith.

Improved Cotton Seed Huller.

Paul J. Martin, Paris, France.—This invention relates to a construction and arrangement of screws and wedges for securing the knives of the concave in place, and for adapting them to be adjusted toward the cylinder. The effect of the operation of the machine on the cotton seed, which passes from a hopper down between the stationary concave and revolving cylinder, is to remove its fibrous outer covering or envelope by the grinding or rubbing action of the knives or sharp-angled bars fixed on said concave and cylinder.

Improved Roller for Winding Paper.

Brantley G. Read, Lyons, Iowa.—This invention consists of a rod for fastening the end of a paper sheet to a roller on which the sheet is to be wound. The rod is connected to the roller by a swinging arm at each end, which are pivoted eccentrically to the roller, and so as to let the rod drop into a little groove in the side. The paper sheet is attached by raising the rod, folding the paper sheet over it, and letting it fall back into the groove. The tension of the paper holds the rod in place as it passes under when the roller is set in motion to wind on the paper, and the arms by which the rod is connected keep it from shifting around.

Improved Washing Machine.

Daniel C. Mitchell, San Marcos, Tex.—The suds box has a false bottom. Four perforated upright boards are hinged together to form a clothes box, which rests upon the false bottom. In using the machine, the clothes to be washed are placed in the clothes box and a crank is operated, the effect of which is to work the boards upon their hinges, alternately compressing the clothes in opposite directions, and allowing them to become again saturated, washing them clean in a very short time.

Improved Chimney Cap.

David Boyd, New York city.—The flue has an enlarged portion attached thereto by making a series of small V-shaped openings in its lower end, and then compressing the end to the flue. A collar surrounds this connection, forming a sort of cup to catch the condensed gases which run down upon the flue, and discolor and stain whatever they touch. The liquid which adheres to the inside surface of the enlarged portion runs down and passes through the opening into cups and is carried off.

Improved Hot Air Furnace.

Charles Clark, Minneapolis, Minn.—A horizontal conical distributing radiator, with top extension cones, extends at the top of the fire box along its full length, and is connected, by cylindrical or conically enlarged top flues, with the same. Vertical tubes extend sidewise from the top radiator to horizontal drums, which are placed longitudinally sidewise of the fire box. The front ends of the base drums are provided with doors for cleaning. The rear ends carry a lateral radiator of pyramidal shape. The rear drum has a series of air flues passing through the same in the longitudinal direction, and is also connected near its top part by a direct flue with the top radiator, and by a curved top flue through the shell to the chimney.

Improved Churn.

James C. Babb, Knowlton, Wis.—Arrangements are provided so that a complete circulation of air is established through the milk being churned. By suitable construction, when the crank is turned, shafts and their attachments will be revolved in opposite directions, the milk will be thrown into violent agitation, and a current of air will be forced through it, bringing the butter in a very short time, and developing all the butter there may be in the milk.

Improved Toy Pistol.

Charles Nelson, East New York, N. Y.—This is a toy revolver with a solid rotating cylinder, having a number of annular side recesses, into which paper caps are securely placed and discharged in regular order by the action of a hook-shaped hammer striking thereon through a recessed slot of the top part of the revolver.

Improved Axle Skein.

Jeremiah J. Hutchins, Red Oak, Iowa.—This invention consists of a hollow cast metal thimble skein, having the hollow portion screw-threaded to screw on the axle for attaching the skein thereto. The threads are made right and left for different sides of the wagon, in order to have the pitch so that the skeins will not work loose by friction of the wheels revolving on them when the wagon moves forward.

Improved Burglar-Proof Skylight.

Moses T. Williams, New York city.—The opening is protected by a burglar-proof grating, formed of bars of iron attached to the frame, which are fixed for covering one half of the opening. The other half is covered in a similar manner, but the bars are attached to a sliding frame, which, when closed, is secured by a hook. The windows on the sides of the skylight swing to a horizontal position and are self-closing. The cover of the sky light is mounted on rollers and traverses back and forth over the stationary part of the roof; and the hatch is operated by means of two cords. The window cords also extend down into the apartment below, so that one or more may be opened by night or day for purposes of ventilation. The opening in the roof may therefore be left open at all times and protected from burglars when the windows are open as well as when they are closed

Improved Hand Rest.

Hosea Willard, Vergennes, Vt., assignor to Frederick W. Coe, of same place.—This hand rest and memorandum book is composed of several tablets, made of any suitable material, which are hinged together so that they open and close similar to a book. The rest is adjustable, as to thickness by raising and throwing back one or more of the leaves.

Improved Medical Compound or Bitters.

Homer D. Torbit, of Waynesborough, Ga.—This remedy, for rheumatism neuralgia, dyspepsia, liver diseases, and similar complaints, consists of powdered podophyllin, nitrate of potash, gamboge, and powdered sugar mixed with rye whisky.

Improved Artificial Flower.

Philipp Knorpp, New York city.—The term brilliants is given to articles produced in a variety of different forms by a suitable alloy of lead and tin, into which, when in a molten state, the dies are dipped. The dies are cut of the cheaper kinds of precious stones of suitable size, which are faceted in any conceivable design, so as to impart to the surface of the alloy the appearance of brilliants. In the present invention, leaves are made with a brilliant surface, in any desired size, shape, and design, as described. A series of such leaves are then arranged together and fastened at the center, and rows of smaller leaves arranged at the inside, with a pistil in the center. To the under side of the flower is then soldered a pin, by which the brilliant flower may be readily attached to the costume.

Improved Whip.

Dexter Avery and Charles C. Pratt, Westfield, Mass.—This invention consists of a whip the body whereof is composed of fibers arranged or built upon a small center core of whalebone, and glued and compressed, the whalebone being in the upper part and projecting beyond the termination of the tapered body for forming the body of the lash.

Improved Neck Yoke.

Minor S. Trowbridge, Platteville, Wis.—This invention consists of sliding breaststrap connections to a neck yoke, for extending or shortening the connection of the horses to allow them a certain limit of lateral play. The object of this is to accommodate the animals, to some extent, to a choice of the roadway. The connections are coupled to an equalizing rocking plate at the middle of the yoke, so as to cause them to shift alike, and thus always balance, so that one horse will not have an undue advantage of the other in respect of the leverage of the yoke.

Improved Road Scraper.

Peter C. Post, Paterson, N. J.—This invention consists of two scraping blades arranged for scraping the earth together in a ridge. They are pivoted at the middle to draft bars, and connected at the front end by chains to said bars. At the rear they are connected by chains, and the draft bars are joined together by an adjustable bar, all so that the scrapers can be adjusted to certain different conditions adapted for different conditions of the road. This scraper is especially designed for scraping the earth from the gutters along the side up to the middle portion, for rounding up the road bed.

Improved Hub or Vehicles.

Moise L. Poirier and Delphis Guimont, Green Bay, Wis.—This is an improved attachment for hubs and axles, which prevents the oil from escaping from either end of the hub and running over its outer side, and also prevents sand and dust from getting in and causing the axle arm and box to wear. It consists in a band made with an inwardly projecting shoulder or flange upon the middle part of its inner surface to adapt it to be attached to the inner end of a hub. A rubber sleeve placed upon the axle arm fits into the flange of the band, so as to prevent the escape of oil. A cap made of rubber also fits into a band at the outer end of the hub.

Improved Subsoil Plow.

Andrew L. Manning, Booneville, Miss.—The slotted rear end of a bar rests against the rear side of the standard, opposite the rear end of the beam. The bar is then bent forward at right angles, and extends along the side of the beam, and is slotted so as to be secured to the side of the beam adjustably, in order that it may be conveniently moved forward and back, to adjust the pitch of the subsoiler, as may be required. The subsoiler can be readily raised and lowered to adjust it to work at any desired depth in the ground.

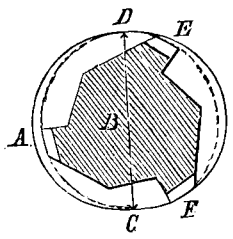
Improved Derrick.

Elias O. Long, Farmington, Cal.—This invention consists of a base-supporting part of suitable strength, to which is firmly secured a mast with a sliding extension piece, having pivoted top arms and brace ropes swiveled thereto, and suitable steadying brace ropes connecting its top with the ground. When the derrick is placed in position for hoisting, a rope, passing over pulley blocks of one arm and the base part, raises and lowers the load, as required, while the other is braced for relieving the side strain. For the purpose of transferring the derrick, the extension standard is lowered down alongside of the mainmast, which causes also the swinging down of the pivoted arms sidewise of the same. The top brace ropes are then released with their stakes and suitably wound up, and the derrick may then be drawn away to be placed into position at any other point, as desired. For storing the derrick entirely out of the way, the standard may be detached from the base part and bundled up thereon.

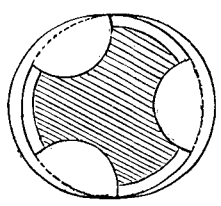
ANSWERS TO CORRESPONDENTS

J. G. H. can keep his cistern water fresh by the means described by M. A. G. on p. 156 of our current volume.—J. P's mineral specimen has not reached us.—J. H.C.'s query as to an amalgam is not intelligible.—F. H. F. will find a description of the Wilson process of making steel direct from the ore on p. 35, vol. 30.—C. A. B. does not send sufficient data as to calculating the power of a locomotive engine.—C. will find directions for waterproofing cloth with rubber varnish on p. 282, vol. 29.—A. H. Y. will find directions for making nickel salts on p. 187, vol. 28.—C. P. H. will find a full description of the first locomotive in Smiles' "Life of George Stephenson."—J. C. T.'s wife will find a description of painting on glass on p. 123, vol. 30.—F. G. will find a recipe for liquid glue on p. 250, vol. 30, and an explanation of the pressure of the wind on p. 378 vol. 30.—X. X. X. will find directions for polishing meerschaum on p. 155, vol. 31.—S. H. S. should consult a soap boiler.—N. G. N. should apply to D. Van Nostrand for Auchincloss' book on "Link and Valve Motions."—W. N. can galvanize castings by the process described on p. 59, vol. 24.—C. D. E. can kill ants by the means described on p. 234, vol. 27.

(1) A correspondent says: I have read with much interest the very able articles on "Practical Mechanism," written for your valuable paper by Mr. Rose; and find that they contain much information, useful not only to apprentices but also to men who have worked for years at their trade. But I beg leave to differ from Mr. Rose on some points of the article published under date of August 15, in which he says: "The only clearance necessary is to ease off the top of the teeth backwards from the cutting edge, which will give the teeth sufficient clearance to make them cut clean, and leave the sides of the thread to fit the thread being cut." I maintain that it is necessary to have clearance on the top, bottom, and sides of the teeth of a tap, in order to make it cut freely; otherwise it will jam its way through instead of cutting. I think that all practical machinists, who have used taps with clearance only on the top of the teeth, as proposed by Mr. Rose, especially for tapping steel, will agree with me on this point; such taps require as much power to turn them back as to force them in, and will frequently snap off in the hole. In another part of the article, Mr. Rose says: "Three flutes are all that are necessary to small taps, which leave the top stronger and less liable to wobble, especially in holes that are not round, than if it had four flutes. Taps of a larger size may have more flutes, but the number should always be an odd one, so that the tap may do its work steadily." My experience has been that, for a hole not round, a tap with four or more flutes is better than one with three. The engraving



represents the outline of a hole not a true circle. B is a section of a tap with three flutes. When in the position shown, the point, A, does not touch, and the diameter of the hole being greater across C D than where the other two flutes, E, F, of the tap are cutting, the tap will be forced back until the point, A, touches, and each tooth in succession, as it comes around, will drop into the same place; thus the tap will follow the irregularities of the hole. A spiral form of flute is the best. A. Taps will cut freely and clean without having clearance on the sides or bottom of the thread, as evidenced



in the celebrated Whitworth taps. If the teeth have clearance on the sides, the cuttings are apt to jam the top in turning it back. Again, a tap without clearance will back out as easily as is compatible with a closely fitting thread. A tap with three flutes only has more of the circumference of the thread guiding it in the hole, and hence is steadier in using and less liable to wabble or to follow any inequalities in the configuration of the hole. A spiral form of flute is difficult and expensive to cut, and must be sharpened by hand instead of by the much more rapid and desirable method of the emery wheel.

(2) F.C.M. asks: What difference is there in the nature of the power disengaged by the action of dilute acid on the metallic plates, as in a cell battery, and that evolved by the friction machine commonly used for medical purposes? A. There is still much uncertainty as to the real effects of electricity on the human system, the cases in which it is to be applied, and the best mode of applying it. Practical men prefer the use of currents to that of statical electricity, and, except in a few cases, they prefer discontinuous to continuous currents. There is, finally, a choice between the current of the battery and that of induction. Electrical currents should not be applied in therapeutics without a thorough knowledge of their various properties. They ought to be used with great prudence, for their continued action may produce serious accidents. Matteucci, in his lectures on the physical phenomena of living bodies, expresses himself as follows: "In commencing, a feeble current must always be used. This precaution now seems to me the more important, as I did not think it so before seeing a paralytic person seized with almost tetanic convulsions under the action of a current from a single element. Take care not to continue the application too long, especially if the current is energetic. Rather apply a frequently interrupted current than a continuous one, especially if it be strong; but after 20 or 30 shocks at most, let the patient take a few moments' rest."

(3) G.R.McC. asks: Is there any simple method by which glass and china ware may be marked with a name or initials? A. Glass ware may be indelibly marked by means of a diamond, or very hard steel.

(4) W. H. M. asks: What is the meaning of cold pressed castor oil? A. Castor oil is made by pressing the castor oil bean in a cold or warm state. When pressed cold, it is called cold pressed castor oil.

What work on chemistry do you consider the best? A. If you desire an elementary work, we would recommend Bridge's edition of Fowne's "Elementary Chemistry." A more advanced work is Miller's "Elements of Chemistry."

(5) C.O.D. asks: 1. How can I keep the head of a banjo from becoming dry and wrinkled? With what can I clean the fly dirt off without injuring the head? A. Try a small quantity of powdered rosin. 2. Does it damage the strings to always keep them in tuning order, and to leave the bridge always in a standing condition? A. Yes.

How can I remove flesh worms from the face? A. Bathing the face with bay rum has been recommended, but perhaps the better recipe would be to abstain from intemperate diet and eat only plain food.

(6) I. I. Y. asks: 1. What can I use to harden butter in summer instead of ice? A. Numerous devices for the production of a low degree of temperature by artificial means have been fully described in the SCIENTIFIC AMERICAN, many of which might be made applicable to your purpose. 2. What can I use to color butter yellow? A. Butter is often artificially colored by aid of annatto, turmeric, or infusion of calendula flowers.

(7) C. H. M. says: You stated recently that the artificial employment of electricity would aid, sometimes induce, and accelerate the crystalization of substances. Please explain, more specifically, under what arrangement or circumstances this is the case, and to what extent. A. Every metal is thrown down in a crystaline state, when there is no evolution of gas from the negative plate, and no tendency thereto.

(8) S. H. G. asks: Do the born blind ever "see stars," resulting from a blow or strain? Pressure with the thumb and finger on the closed eyelids can be made to produce sensations of color. These tints, in certain conditions of the nervous system, are exquisitely beautiful, and have no connection with the memory. They are simply colored pictures evolved out of the darkness by mechanical pressure upon the ball of the eye. Are the blind susceptible of this? If so, they may have ideas of color without having ever seen a ray of light. A. Violent concussion will produce "stars" even in a blind person. You could obtain better answers to the remainder of your question by consulting a person devoid of sight, than from us.

Can the locust crop out west be utilized for stock, or otherwise? A square acre of solid living meat ought to be worth something in this age of the world. A. As far as we know, this has not yet been done.

(9) O. H. asks: Can you give me a recipe for making gelatin, such as is used in making molds for molding plaster of Paris? A. Gelatin is formed by the action of boiling water on white fibrous tissue, cellular tissue, the skin, organic constituents of bone, etc. When the solution is evaporated to dryness, it leaves the gelatin as a brownish yellow mass. Common glue is an impure form of gelatin, and is generally employed for making such molds as you speak of.

(10) H. asks: Does the color black attract heat? A. A black substance is one which absorbs all rays of light which fall on it, and converts them into heat, with a corresponding rise in temperature.

(11) F. H. asks: In a discussion on the advance of chemistry, I stated that one chemist had succeeded in making alcohol from its elements. On being asked what the substances used were, I named graphite, hydrogen, and oxygen. One gentleman objected and said graphite was not an element. I insisted it was. Is graphite an element in the sense in which I used it in the discussion? A. No. Graphite, though a form of carbon, is not pure C, as most specimens contain iron. Instead of graphite, you should have said carbon.

(12) A. D. B. says: I have a large barometer hanging on the wall; just under it, about 4 feet away, are the steam pipes which heat the room. As the barometer does not indicate rightly, can the steam pipes underneath have any influence on it? A. In all observations with barometers, whatever be their construction, a correction must be made for temperature. Mercury contracts and expands with different temperatures; hence its density changes, and consequently the barometric hight, for this hight is in the inverse ratio of the density of the mercury; so that, for different atmospheric pressures, the mercurial column might have the same hight. Accordingly, in each observation, the hight observed must be reduced to a determinate temperature the choice of this is quite arbitrary, but that of melting ice is always adopted. By the aid of tables, which have been prepared for this purpose, the hight of the barometer is readily reduced to zero.

(13) H. W. says: I am told that a 1 inch belt running at 1,200 feet per minute will transmit one horse power. I am using a 4 inch belt. Am I using 4 horse power? A. There have been careful experiments made which show how much power a belt will transmit under average conditions; but it is difficult to say how much a belt does transmit, in any particular instance, without a test. See p. 257, vol. 28.

(14) E. B. asks: Does each point on the circumference of a wagon wheel, as it touches the ground, come to a perfect rest? A. Yes.

(15) T. A. J. says: In silver plating German silver spoons, the battery seems to work well; but when I come to burnish the spoons, the coating peels off. Can you tell me how to make a good job of it? A. Place the articles to be plated in strong lye water to remove all grease, and then for a moment in dilute sulphuric acid. Wash in clean water and place immediately in your bath. Care should be taken to handle the work as little as possible in placing it in the bath.

(16) C. H. M. says: We have a hand car worked by a perpendicular rod from a walking beam. Will the car run any easier with this power applied at the end near the perpendicular rod than at the other end? A. No.

(17) T. C.W. asks: Which is the coldest, ice 10 inches thick with snow on one side of it, or ice 26 inches thick, solid? A. The ice which is made from the coldest water will last the longest. 2. Does not lake ice frozen in or near Chicago last longer in a water cooler than ice frozen in Kentucky? A. Yes.

When water is boiling, can it be made hotter by having a heavy fire under it? A. No.

What is that liquid which barbers use in shampooing? A. Borax is commonly the principal ingredient of the compound.

Can a locomotive be constructed to run 75 miles an hour? A. It is doubtful whether the locomotive could be kept upon the track at such speed.

(18) F. D. B. asks: Can I make a miniature electric machine with a glass plate only 1½ inches in diameter? Will it produce electric sparks in fifty (or less) rapid revolutions? A. If perfectly constructed, electrical action would undoubtedly take place, as in larger machines; but on so small a scale, we doubt much if any visible phenomena would occur. The presence of electricity might be determined by the use of a delicate electrometer.

(19) B.A. J. says: I have a wire connection between a water wheel and my house, which is 500 feet distant. Do the wires increase the danger of the house from lightning? A. Yes. You should have an extension from the wire into the ground, and the terminal should have an enlarged surface in the ground. As to your other question, try the experiment.

(20) H. H. asks: How are carbon cylinders or plates for galvanic batteries made? A. Powdered charcoal is put into a mold, then plunged into a concentrated solution of sugar, after which it is dried, and exposed to an intense heat in a covered vessel. As to your other queries, address a manufacturer.

(21) J. McC. says: I am running 4 hydraulic pumps, using linseed oil for getting on the pressure The diameter of plunger is ¾ inch, with 5½ inch stroke. Each pump has a receiving valve and check valve. The openings in pipes are ⅜ inch, with an average length of about 10 feet. Safety valve 1 lb., lever 2 lbs., with a weight on it 30 lbs; distance of fulcrum 1½ inches; distance from center of safety valve to where the 30 lbs. weight is fastened on, 13¼ inches. Opening under the safety valve, ⅜ inch. The hydraulic press cylinders are 14⅝ inches in diameter. How many lbs. pressure does it take to raise the safety valve off its seat, so as to allow the oil to escape through an opening above the seat? How many lbs. pressure are there on the 14⅝ inches press cylinder, and how many to the square inch when the pump raises the safety valve, loaded in the above way, off its bearing? A. You do not send quite enough data; but the pressure is about 2,500 lbs. per square inch when the valve is lifted.

(22) A. P. S. asks: What publication would be of the most use in helping me to run an engine? A. We do not know of any work that will aid you very much. You will find many useful hints in Bourne's "Catechism of the Steam Engine." We may add that a person who learns to run an engine by reading a book will have to learn it over again when it comes to the actual practice. At least, this is true in the present condition of the literature of the subject.

(23) J. H. G. says: I have a lead-lined tank, the seams of which are soldered and are corroding. Please tell me what kind of varnish to use to prevent this, and also to prevent injurious effects of lead in newly lined tanks. The varnish must be insoluble in water. A. Tinning will be the best resource.

(24) W.E.B. says: In your issue of August 29, in your answer to G. T. P., you give the following formula: $A° = \frac{360a}{2Pi\ R}$, and $C = \sqrt{2R^2 - 2R^2 \cos. A}$. In place of the latter, I think the following much more simple in practice: $C = 2R \sin. \frac{1}{2} A$.

(25) W. M. K. says, in reply to B. H. S., who states that his steam pipe is 5 inches, and his connection from the boilers to the steam drum 3 inches in diameter: If you make your connections to the steam drum 6 inches, you will have no more trouble. It will equalize the pressure in the three boilers. [We believe that the best way to fix the boilers is as we have already indicated: Arrange them so that the water cannot be forced from one into the other.—EDS.]

(26) H. L. M. says, in answer to I. S.N., who asked how to straighten a rifle barrel: Take two pieces of hard wood, one about 30 inches long and thick enough to stand the pressure required. Take off about half an inch of the thickness in the middle, leaving it full on the ends. Put your rifle barrel with its hollow side against it. Then take the other piece of wood, 3 or 4 inches long and about ½ inch thick, and put it on the other (the round) side of the barrel, and then put the whole in a strong vise, and screw up till the barrel is straight.

(27) C. B. says, in answer to T.S.S. who asked as to wooden linings to locomotive drive wheel tyres: Locomotive drivers do sometimes have linings of wood beneath the tyres. According to a recent method the wheel is cast with a number of projections, like teeth, distributed at short and regular intervals on the periphery. Into the spaces between these teeth are driven blocks of wood somewhat thicker than the length of the teeth, and over these blocks the tyre is shrunk on.

(28) A.McQ. says, in reply to G. W. S., who asks if there is any device for taking steam out of a boiler by a tube, and conveying it under the grates of the fireplace to keep the fire down when the engine is stopped: In some steam fire engines, a small tube from the upper part of the boiler conveys steam and discharges it over the top of the flues for the purpose of checking or extinguishing (as the case may be) the fire in the fire box.

(29) J.A.M. says: To soften the tone of a violin, string it up to the required pitch; take a small gum elastic band, and make it fast to one side of the violin

bridge; then stretch it over the strings close to the bridge, carrying it down to one of the notches on the other side, and make it fast there. The tension of this small band, being supported by the strings, produces almost the effect of the common mute, with the difference that the power of the tone is preserved in its full purity, while it seems that this small band absorbs all that harsh noise which is more the result of friction than any musical quality contained in the instrument. I have tried this effectually on all the different sizes of instruments, from the smallest down to the double bass, and I find that the effect is very pleasing, and would, I think, by good players on any of the instruments, be pronounced beautiful. The tone may be gradually diminished by the use of additional bands, without lessening its real purity.

(30) A. C. H. says, in reply to F., who asked if there were such a flower as the thousand dollar plant: There is a plant called the thousand gulden (not dollar) plant; it grows in Switzerland, and is used to a great extent in medicine. The botanical name is *erythrea centaurium*. It has red or white flowers, and is about 1 or 2 feet high.

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

B. B.—It is iron pyrites, of no value.—S. R.—If you wish to know the value of an ore, you must send the ore, not the reduced metal. The specimens sent are reduced zinc.—H. V.—It is granular sulphide of iron.—W. H.—It is an iron ore, containing a large percentage of silica and sulphur, and a small percentage of manganese. It contains none of the precious metals.—R. W. B.—They are grasshoppers (Packard) or *caloptenus spretus*. Mr. Scudder states that a third (whether belonging to the same species or not is still uncertain), has invaded at different times nearly all the country lying within the boundaries of the United States between the Rocky Mountains and the Pacific Ocean. The smallest one sent by you is probably the one referred to by Mr. Scudder.—J. W.—They are rings from the fossil stems of various species of crinoids.—I. H. S.—It is a hard sandstone, inclosing scales of sulphide of iron.—T. J. R.—No. 1 is a silicious rock, inclosing fine particles of iron pyrites. No. 2 is a small and regular crystal of quartz.—A F. M. A.—The acorn-shaped mineral is a deposit of sulphide of iron. Your well water must contain a large percentage of iron.—A. J. H.—It is laumontite, or a hydrous silicate of alumina and lime.—C. H. W. & Co.—It is a very rich quality of iron pyrites.—D. R. B.—It is a coarse quartzoze sandstone, utterly unfit for a fertilizer.—A. V. V.—Ten of your specimens are sulphuret of lead distributed through limestone. No. 11 is sulphuret of lead in quartz rock. No. 12 is iron pyrites in quartz rock.—J. W. S.—It is a special variety of white cast iron, known as spiegeleisen. It is largely used in the manufacture of Bessemer steel.—A. H.—Magnetite is magnetic oxide of iron, of a certain crystaline form and chemical composition, containing, in the purest varieties, 72·4 per cent of metallic iron. We regret the loss of your specimens, but must again repeat, to you and other correspondents, that we report immediately on all minerals received by us.—We have received a blue pasteboard box, 2x3 inches, without any label or name. It contains many small specimens of quartz rock, through which are disseminated specks of altered muscovite, of no practical use.

P. J. K. asks: What is the best method to destroy a lot of rats that infest my house?—G. U. F. asks: Who are the best writers on ventriloquism, explaining the art in full?—W. F. B. asks: Is there any way by which a person can tell if his own breath is offensive?—A. B. asks: Can any one give me information concerning the history, past and present, of the children and grandchildren of Robert Burns, or his brother Gilbert?

COMMUNICATIONS RECEIVED.

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

On Channeling the Bars of Rivers. By O. P. S.

On Locusts and Grasshoppers. By H. J. S.

On the Weight of the Atmosphere. By J. B. T.

On Sea Sickness. Ry W. M.

On Drawing a Parabola. By F. H. R.

On Making Copper Alloys. By A. E. O.

On Some New Galvanic Batteries. By L. B.

On a Discovery in Missouri. By C. I.

On Bees and Honey. By W. A. B.

On Practical Mechanism. By W. H.

On Small Engines. By N. T. W., and by N. G. N.

On the Locust Plague. By J. W.

Also enquiries and answers from the following:

W. H.—J. E. D.—H. V. M.—E. C. M.—J. M.—H. M.—H. F.—F. L.—W.—J. W. S.

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: "Please to inform me where I can buy sheet lead, and the price? Where can I purchase a good brick machine? Whose steam engine and boiler would you recommend? Which churn is considered the best? Who makes the best mucilage? Where can I buy the best style of windmills?" All such personal enquiries 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.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED IN THE WEEK ENDING

August 18, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued Patents.]

Addressing machine, J. Blocher 154,212
Animal fat, treating, J. Hobbs 154,251
Axles, turning, W. K. Stevens 154,197
Bale tie, cotton, W. S. Davis 154,229
Bale tie, cotton, R. D. McIlwaine 154,267
Ballot box, Omensetter & Parker 154,148
Bed bottom, spring, W. H. Austin 154,210
Bed bottom, spring, Comstock & Lupton 154,124
Beefsteak tenderer, M. Trowbridge 154,198
Bell, door, E. B. Sims 154,288
Belt, W. Mullee 154,270
Belt coupling, adjustable, W. H. Robarts 154,282
Bleaching hemp, Sneed & Mount 154,292
Boiler attachment, wash, Henry & Dennis 154,137
Boilers, tube and flue for steam, J. H. Wilkinson 154,203
Boot heels, forming, E. Fisher 154,236
Boot soles, drying, J. T. Jeffers 154,143
Boots, making, Fearey & Chickering 154,134
Bottle, caster, C. P. Crossman (r) 6,015
Bronzing machine, W. D. Cooke 154,226
Buckwheat scouring machine, J. Klaer 154,144
Burner, locomotive head light, S. M. Davies 154,172
Cap, H. Kuhlman 154,145
Car axle box, J. S. Sanson 154,194
Car brake, C. Adams 154,112
Car coupling, B. Almonte 154,207
Car coupling, W. H. Darling 154,127
Car coupling, T. D. Gambrill 154,136
Car doors, operating, A. C. Goodell, Jr. 154,241, 154,242, 154,243
Car mover, Lewis & Overton 154,261
Cap, safety passenger, J. T. Worley (r) 6,020
Car shoe, safety, L. B. Stilson 154,159
Car, sleeping, J. Woodruff (r) 6,019
Car track, C. J. N. Rebour 154,280
Car wheels, casting, Sax & Kear 154,284
Cars, pole coupling for street, W. Leaf 154,259
Carpet, measuring, T. M. Brintnall 154,170
Carpet stretcher, S. C. Calhoon 154,122
Carriage axle nut, E. W. Ives 154,255
Carriage spring, T. H. Wood (r) 6,018
Cartridge primer, T. J. Powers (r) 6,022
Case and sample box, H. Westphal 154,307
Chair, W. Goforth 154,240
Chamber case, W. Hinman 154,140
Churn, K. Nolan 154,187
Churn, G. Shoup 154,287
Corn husking implement, Cavender & Dallis 154,218
Corn husking machine, E. Ellison 154,132
Corset, T. S. Gilbert 154,238, 154,239
Culinary vessel, Neale & Booth 154,272
Culinary vessel, J. H. & N. Weare 154,305
Cultivator, C. Kinsey 154,257
Curd worker, W. C. Smith 154,290
Curry comb, L. Sawyer 154,154
Digger, potato, J. M. Whitman 154,201
Dis illation, treating grain for, A. Woolmer 154,314
Document stitcher, C. C. E. Van Alstine 154,302
Door check, F. Linsel 154,262
Dyes, treating anthracene, Rumpff *et al* 154,158
Egg beater, D. D. Mackay 154,263
Egg carrier, J. L. Stevens 154,294
Elevator, J. B. Chynowith 154,221
Elevator, J. F. Marsh 154,264
Elevator, ice, R. R. Reynolds 154,152
Elevator, water, Reed & Blythe 154,190
Engine, rotary, A. Dietz 154,231
Engine, rotary, J. H. Teal 154,298
Engine, rotary steam, H. Boettcher 154,118
Engine, steam, J. W. Hayes 154,248
Eyeglass holder, A. Wild 154,204
Faucet, beer, L. Poh (r) 6.017
Feather renovator, L. W. Powls 154,151
Fifth wheel, M. Christianson 154,220
Fire arm hook, I. Merrill (r) 6,021
Fish hooks, making, Court *et al* 154,228
Fishing rods, spring attachment for, B. Hill 154,141
Fishway, J. D. Brewer 154,216
Food for infants, H. Hensch 154,14
Fork for platting hedges, H. Hollingsworth 154,252
Furnace, L. C. England 154,133
Gas apparatus, J. D. Patton 154,277
Gas process and apparatus, W. Elmer 154,131
Generating heat, Allen & Harris 154,166
Glass mold, J. Zihlman 154,164
Glassware mold, J. E. Miller 154,184
Governor, electro-magnetic, J. M. Bradford 154,214
Grain drill, P. Bostrom 154,169
Grain drills, feed roller for, J. H. Cook 154,227
Grate, L. M. Chipley 154,219
Grate, Lee & Parker 154,146
Harness, A. McCraken 154,266
Harness pad, G. W. Vosburgh 154,303
Harrow, J. Wheeler 154,308
Harrow and seeder, R. McAdams 154,265
Harvester, A. R. Reese 154,281
Harvester cutter, B. C. Rockwell 154,192
Harvester rake, E. L. Hutchinson 154,253
Hatchways, closing, Spaulding & Tuttle 154,196
Hedge fork, H. Hollingsworth 154,252
Heeling machine receiver, W. F. Trowbridge 154,160
Hemp brake, Dulin & Burgan 154,174
Hops, preserving, T. A. Breithaupt 154,215
House, wooden, J. R. Perry 154,188
Hubs, core box for metallic, C. G. Allen 154,165
Hydrants, stop-valve for, S. H. Brown 154,121
Index, C. F. Thomas 154,299
Indicator, electro-magnetic station, C. W. White 154,309
Jack, lifting, B. Harrison 154,246
Kiln, brick, E. V. Wingard 154,310
Knife, butter, S. J. Chadwick 154,123
Lap board, J. E. Cotton 154,126
Lathe, wood turning, N. T. Melvin 154,183
Lathes, chuck for metal, J. H. Vinton 154,162
Leather-scouring machine, J. Head 154,249
Lime kiln, F. Strayer 154,296
Locomotive, T. B. Smith 154,289
Loom shuttle box, M. A. Furbush 154,237
Loom weft stop, T. Isherwood *et al* 154,354
Lubricating compound, Eggleston & Rich 154,130
Lumber, etc., drying, G. Woods 154,205
Marble, imitation, J. H. Wright 154,163
Measuring machine, carpet, T. M. Brintnall 154,170
Mill and press combined, cider, S. M. Firey 154,235
Millstone dress, J. D. Mines 154,268
Millstone friction gear, C. J. Shuttleworth 154,156
Mitering machine, E. Everett 154,234
Motion, preventing back, J. H. Race 154,189
Mowing machine, J. H. Elward 154,232
Nail-driving machine, H. Dunham 154,129
Nail extractor, G. J. Capewell 154,217
Neck tie box, S. Orth 154,274
Paper barrels, making, J. L. Thomson 154,300
Paper box, F. D. Stone 154,295
Paper stock, G. B. Walker 154,304
Pelerine, J. Popovits 154,278
Pianoforte agraffe, Behning & Diehl 154,116
Pipes, exhaust trap for steam, S. Conrow 154,125
Pipes, making cement lined, J. E. Halladay 154,245
Planing machine, I. F. Thompson 154,801
Planter, corn, F. Bolduc 154,213
Planter, potato, H. J. Kent 154,180
Plow, B. C. Bradley 154,119
Plow point and share, J. F. Herring 154,139
Plow, rotary, W. E. Bleecker 154,168
Plow, sulky, W. Starling 154,293
Plow gage wheel, Matteson & Williamson 154,182
Plows, sulky attachment for, T. Weaver 154,306
Press, copying, S. Selden 154,286
Press for hay, cotton, etc., B. L. Robinson 154,191
Press, hay and cotton, E. T. Armstrong 154,209
Printing, plate or die for, J. Dickson 154,230
Pump and fire engine, A. Paget 154,149
Pump, ship, L. Egleston 154,233
Pump, siphon, H. Coll 154,223
Pump, steam siphon, H. Coll 154,224
Punching machine, metal, G. W. Vankirk 154,161
Purifier, middlings, Cole & Marpole 154,222
Railway signal, automatic, S. Nunamaker 154,273
Railway, removing snow, P. and J. H. Baker 154,114
Range, cooking, P. J. Ackerman 154,206
Rein guard, Levy & Christian 154,260
Rein holder, A. Applegate 154,208
Roofing, metallic, S. Taylor 154,297
Sash fastener, J. Park 154,276
Saw gummer, S. H. Vosburgh 154,200
Sawing machine, J. N. Voris 154,199
Sewing machine, E. D. Smith 154,291
Sewing machine braider, etc., S. A. Davis 154,173
Sewing machine case, F. R. Wolfinger 154,311
Sewing machine guide, W. Baglin 154,113
Sewing machine shuttle, R. Blake 154,117
Sewing machine table drawer, Anderson *et al* 154,167
Sewing machine treadle, J. T. Jones 154,256
Sewing machine wax thread, E. E. Bean 154,115
Shawl strap, W. Roemer 154,283
Ship, etc., hull of, C. G. E. Hennig 154,250
Shoe leather board, etc., Moore & Rogers 154,185
Skates, O. Edwards 154,175, 154,176
Spear, casing, F. J. Fox 154,135
Spindle, G. Draper (r) 6,016
Spoke-tenoning machine, G. M. Combs 154,225
Spoon, sheet metal, G. I. Mix 154,269
Stamping apparatus, J. I. Quaid 154,279
Steam brake, vacuum, J. C. Wightman 154,202
Swing, A. Panyard 154,275
Tap and faucet, M. Kreiss 154,181
Telegraph insulator, C. L. LeBaron 154,258
Thill coupling, E. P. Jandell 154,142
Tin from tin scrap, removing, H. W. Hauberg 154,178
Toy, L. Schultze 154,285
Trap, fly, Dickson & Cole 154,128
Trellis, house and garden, G. C. Setchell 154,155
Trunk lid stay, C. H. Parliman 154,150
Type cabinet, wood, T. C. Hacker 154,244
Valve for hydrants, stop, S. H. Brown 154,121
Valve, poppet, J. P. Flanders 154,177
Valve, stop, C. F. Murdock 154,271
Vehicle spring, W. H. Haskell 154,247
Vehicle spring, J. Smith 154,157
Vehicle sleigh runners, M. S. Brooks 154,120
Veterinary instruments, A. V. Rueff 154,193
Walls and ceilings, lining, W. Smith 154,195
Walls, plastering, P. G. Hubert 154,179
Water from the ocean, drawing, D. C. Snooner 154,158
Well tube point, F. Herington 154,138
Wheelwright machine, M. C. Buffington 154,171
Whips, manufacture of, Avery & Pratt 154,211
Windmill, D. Negrotto, Jr 154,186

APPLICATIONS FOR EXTENSION.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

30,685.—SEED DRILL.—H. Moore. Nov. 4.

EXTENSIONS GRANTED.

29,760.—HAMMER.—R. Boeklen.
26,785.—SEWING MACHINE.—D. Haskell.
29,789.—CULTIVATOR.—E. S. Huff.
29,790.—CATTLE TIE.—G. Hull.
29,816.—PRINTING PRESS.—J. E. Priest.

DESIGNS PATENTED.

7,634.—RUBBER OVERSHOE.—E. F. Bickford, Malden, Mass.
7,635.—CAP.—J. Harney, Brooklyn, N. Y.
7,636 to 7,646.—CARPETS.—O. Heinigke, New Utrecht, N. Y.
7,647.—FUR JACKET.—M. Hillas, New York city.
7,648 to 7,661.—CARPETS.—H. Horan, East Orange, N. J.
7,662 to 7,669.—CARPETS.—L. G. Malkin, New York city.
7,670 to 7,674.—CARPETS.—E. J. Ney, Dracut, Mass.
7,675 to 7,679.—CARPETS.—H. Nordmann, New York city.
7,680.—CARPET.—G. W. Piggott. New York city.
7,681 to 7,684.—CARPETS.—W. H. Smith, Enfield, Conn.
7,685 to 7,687.—CARPETS.—J. H. Smith, Enfield, Conn.
7,688.—PLOW BEAM.—W. H. Wilder, Washington, D. C.
7,689 to 7,691.—CARPETS.—L. G. Malkin, New York city.
7,692 to 7,705.—CARPETS.—J. T. Webster, Phila, Pa.
7,706.—SPOON HANDLE.—G. Wilkinson, Providence, R. I.
7,707.—SKIRT.—J. W. Blackham, Brooklyn, N. Y.
7,708.—DRAWER PULL.—P. E. Guerin, New York city.

TRADE MARKS REGISTERED.

1,932.—BEER.—Cin. Bottled Beer Co., Cincinnati, O.
1,933.—IMPLEMENTS.—Keystone Manf. Co., Sterling, Ill.
1,934.—TOOTH CLEANSER.—D. G. Strawn, Boston, Mass.
1,935.—GAS REGULATOR.—Ward & Co., St. Louis, Mo.
1,936.—WATERPROOF GARMENTS.—A. K. Young *et al.*, Boston, Mass.
1,937 to 1,940.—WHISKIES.—Elias Block & Sons, Cin., O.
1,941.—WINES.—I. Bush & Co., St. Louis, Mo.
1,942.—WHISKY.—Hoffheimer Bros. Cincinnati, O.
1,943.—TIME PIECES.—F. H. Mathez, West N. Brighton, N. Y.
1,944.—WHISKY.—Shields & Co., Cincinnati, O.

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On application for Design (14 years)	$30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA AUGUST 13 TO 22, 1874.

3,758.—G. W. Harrison, Lansing, Mich., U. S. Improvements on pitman connections, called "Harrison's Pitman Connection." Aug. 13, 1874.

3,759.—T. E. Mullins, Hopewell Corner, New Brunswick. Improvements on steam cooking apparatus, called "Mullins' Improved Family Steamer and Condenser." Aug. 13, 1874.

3,760.—J. W. Herington and J. W. Stoakes, Mill Point, Ont. Improvements on horse collars, called "Herington's Improved Horse Collar." Aug. 13, 1874.

3,761.—R. Christie, Hamilton, Wentworth, Ont. Improvements on reaping and mowing machines, called "Christie's Improved Tilter and Guard for Reaping and Mowing Machines." Aug. 13, 1874.

3,762.—J. N. Miller, Bellefontaine, Ohio, U. S. Improvements on shifting seat buggies or convertible carriages, called "Miller's Convertible Buggy." Aug. 13, 1874.

3,763.—H. E. Wells, Van Wert, Ohio, U. S. Improvements on lumber drying kilns, called "Wells' Lumber Drying Kilns." Aug. 13, 1874.

3,764.—R. Teats, Central City, Colorado, U. S. Improvements on furnaces for roasting ores, called "Teats' Ore Roasting Furnace." Aug. 13, 1874.

3,765.—S. S. White, Philadelphia, Pa., U. S., assignee of N. Stow, Binghamton, N. Y., U. S. Improvements on dental engines, called "S. S. White's Dental Engine." Aug. 13, 1874.

3,766.—W. Watson and D. Watson, Somerville, Middlesex county, Mass., U. S. Improvement on friction mechanism for loose pulleys or gears, called "The Watson Pulley Friction Clutch. August 22, 1874.

3,767.—W. Abercrombie, Hamilton, Ont., assignee of R. L. Greenlee, Chicago, Cook county, Ill., U. S. Improvements in sash and door clamps, called "Greenlee's Sash, Blind, and Door Clamp." August 22, 1874.

3,768.—P. Wallace, London, Middlesex county, Ont. Improvements on machines for making matches, called "Wallace's Self Feeding and Racking Match Making Machine." August 22, 1874.

3,769.—J. Spratt, Fer Emina, St. Martin's, Guernsey, Channel Islands, and now of London, England. Improvements on solidified tea, called "Spratt's Solidified Tea." August 22, 1874.

3,770.—H. Harmer, Southamoton, Bence county, Ont. Improvements on the working of railway switches, called "The Safety Switch Guard." August 22, 1874.

3,771.—J. H. Cleveland, Buffalo, Erie county, N. Y., U. S. Improvements on tuckers for sewing machines, called "J. H. Cleveland's Tucker." August 22, 1874.

3,772.—C. F. Gardner, London, England, and E. Pocock, Paris, France. Improvements on machines for lasting the uppers of boots and shoes, called "Gardner & Pocock's Boot and Shoe Laster." August 22, 1874.

3,773.—G. S. Lacy, New York city, U. S., and U. C. Allen, Glen's Falls, Warren county, N. Y., U. S., assignees of A. C. Crondal, New York city, U. S. Improvements in gas regulators, called "Crondal's Improved Gas Regulator." August 22, 1874.

3,774.—H. Beauchamp, Montreal, Montreal Dist., P. Q. Améliorations aux machines a laver, dite "La Laveuse a Valve de la Puissance." August 22, 1874.

3,775.—W. Franz, Bucyrus, Crawford county, O., U. S., & W. Pope, Crestline, Crawford county, O., U. S. Improvements on knitting machines, called "Franz & Pope's Improved Automatic Knitting Machine." August 22, 1874.

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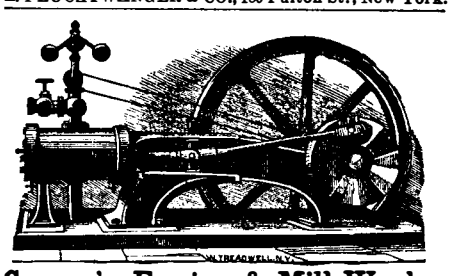

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