SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXI.—No. 17. [NEW SERIES.] NEW YORK, OCTOBER 23, 1869. $3 per Annum, [IN ADVANCE.]

CONCRETE BUILDING.

Much interest has been taken throughout many sections of the country in the subject of concrete building. We have several times given outlines of the processes employed, and have discussed the merits of the method to some extent. Our readers will have gathered from what we have already said that we regard the me thod with considerable favor, and though doubtless in this, as in all attempts at improvement, there will be more or less failure at first, it is evident that this mode of building is growing in favor, both in this country and in Europe. The annexed engraving, from the *Irish Farmers' Gazette*, gives a most excellent idea of the manner in which the system known in England as Tall's system of constructing walls, houses, etc., in Portland cement concrete is conducted.

This system has been used in the construction of a large number of houses in Paris, erected under the directions of the Emperor, who takes great interest in the improvement of the dwellings of the working classes, and has also been applied in other parts of Europe, and to some extent in the United States.

The work can be performed by ordinary laborers, who, after a four or five day's experience, acquire all the requisite expertness. Even boys have been successfully employed in this kind of building. The only skilled workman necessary is a common carpenter, whose duty is to adjust the frame-work or apparatus to receive the successive courses of material, and place joists, doors, and window-frames properly.

The apparatus is designed to construct 18 inches in hight daily over the entire extent in hand. What is done in the evening of one day is hard next morning, and quite strong, the best proof of which is, that the wall itself, as it rises in hight, supports the necessary scaffolds, as shown in the accompanying engraving. A double curb entirely surrounding the upper part of the walls, serves to hold the plastic material in place, until it acquires sufficient hardness to support itself.

The material consists of one part of Portland cement to eight parts of coarse gravel. The cement and gravel are first well mixed together in a dry state, and when this is done, it is damped by means of a large watering pot, and again mixed by a pronged drag such as is used for dragging dung out of a cart, until the entire heap has been wetted and mixed together. It is then put in iron or zinc pails, and poured into the frame, where it is leveled by men stationed for the purpose. In order to save concrete, large lumps of stones or brickbats are put into the center of the wall, and covered over and about with concrete. Frost does not affect the concrete after it has once set, which, with good cement, will be in about five or six hours. Nor do heavy rains appear to injure it in the slightest degree, though they may chance to fall ere the concrete has hardened. The walls can be made straight and even as it is possible for walls to be, and the corners as sharp and neat as if they had been formed of the most carefully dressed stone.

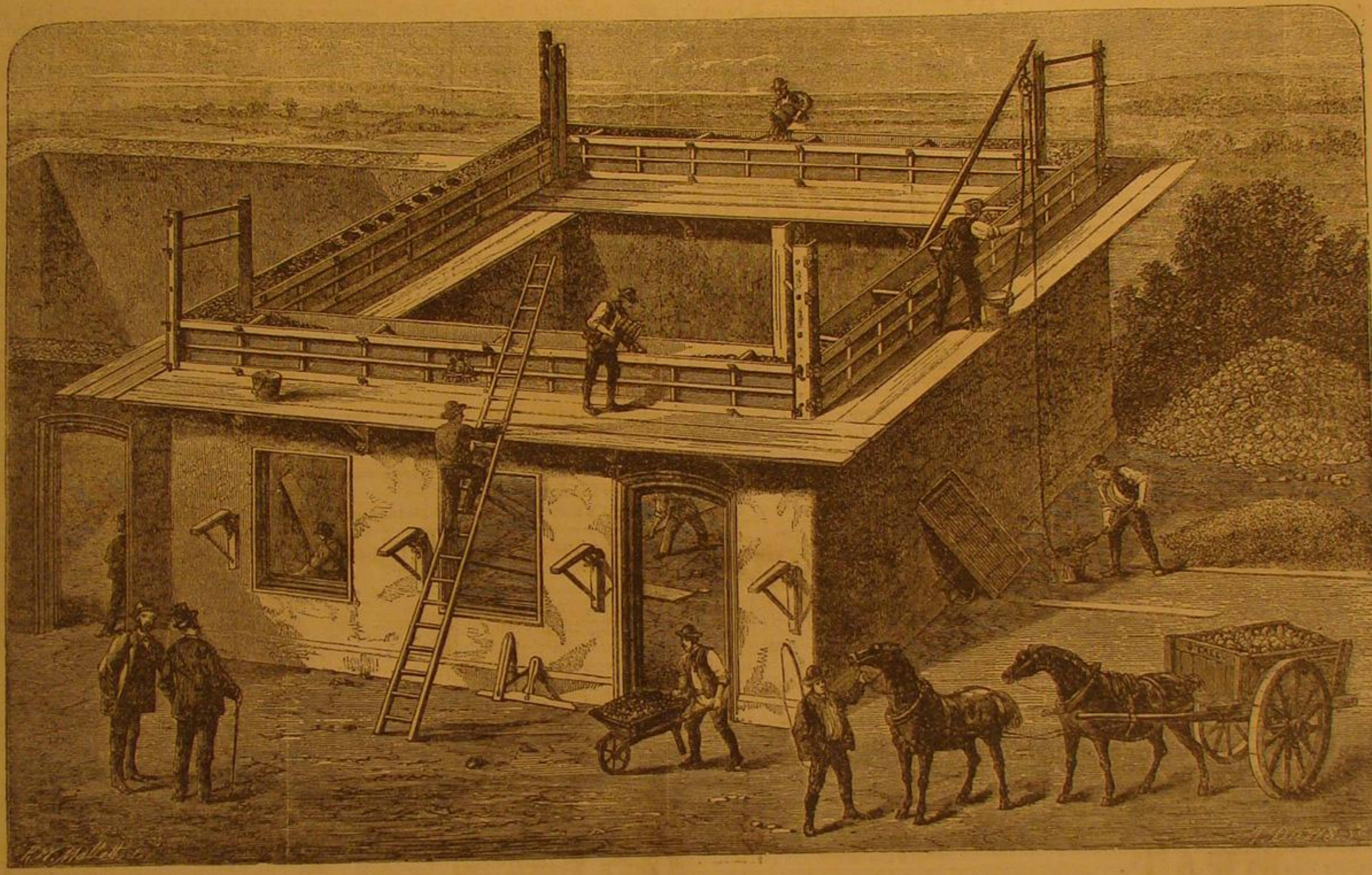
Concrete makes excellent floors, and the walls and floors are quite impervious to vermin of all kinds, and also to wet. Many kinds of building bricks will absorb water; hence brick houses, when the walls are saturated with water, are cold. This is not the case with houses constructed of concrete, as it is non-absorbent of moisture, and such houses must be, therefore, more healthy.

This novel mode of building homes has excited great interest in the neighborhood of Runnamoat, Ireland, and the proceedings have daily attracted numbers of people from all parts.

While concrete may be used in constructing buildings of every description, it is peculiarly adapted, from its cheapness, for the construction of cottages for laborers, and also for farm buildings. Its cost is not more than half that of brickwork; almost any material can be used along with the cement, and as we have already shown, the most ordinary class of country laborers are quite competent to carry out the details of the system. With reference to its adaptability for large buildings, we may mention that a warehouse 70 feet long, 50 feet wide, and 60 feet high, five stories in all, has been erected on Mr. Tall's system for Mr. H. Goodwin, Great Guildford street, Southwark, England, and that gentleman testifies in the warmest terms to its satisfactory character, and is making arrangements at the present time for the construction of another similar building. The warehouse already erected has attracted universal admiration from the practical and scientific gentlemen who witnessed its erection.

The chief element of success, when the cement is of good quality, seems to be the thorough mixture of the dry materials, to secure uniform strength, the whole process is extremely simple, and by the aid of our illustration cannot fail to be readily comprehended.

We are informed that some dwellings of this character are soon to be erected by Mr. Charles Kamlah, at Rutger Park, Belleville, N. J., on ground purchased by the New York Co-operative Building Lot Association, a short distance from New York, on the Newark and Paterson branch of the New York and Erie Railway.



MODE OF CONSTRUCTING CONCRETE BUILDINGS.

BALLOON MAKING.

From Once a Week.

The great Captive Balloon, which has for some months past been exhibited at Ashburham Park, near Chelsea, has been removed from London—to the sea side, we hear—and having availed ourselves of a tolerably clear day, for making an ascent in it, during the last week of its stay, we propose to furnish our readers with an account of our aerial journey; and further, to exhibit the progress of aeronautic science, by prefacing our account of M. Giffard's balloon, with a few words about the first aerial machines that were seen in this country and in France. We have lately received from San Francisco accounts of a machine combining the qualities of a balloon and a ship, which is propelled by steam, and is said to be easily steered in any direction at the pleasure of the man at the wheel. If so, the great problem of aerial navigation has at last been solved, but until we see the aerial ship successfully brought into port, we shall not be inclined to believe the stories circulated by the San Francisco journals.

Since the days when Daedalus and Icarus made their fabled flight over the Ægean, on wings fastened on their shoulders with wax, down to the present time, the construction of a machine, as fitted for navigating the air as a ship is for sailing on the sea, has been a task essayed by many men of scientific pursuits and mechanical ingenuity, and their efforts, as everybody knows, have hitherto been anything but successful; indeed, the history of aeronautic science is a story of failures. The first inventor of a balloon discovered the practicability of ascending into the atmosphere, and the latest professors of aerial navigation have been able to show us but little more. A good deal of interest attaches to the early balloon ascents; the Montgolfiers were the first persons who constructed a balloon; although scientific men were acquainted with the principles upon which such apparatus should be constructed for some years before 1783, when the brothers Joseph and Stephen Montgolfier exhibited their balloon at Annonay, a little town in France.

It was on the fifth of June in that year, when the members of the provincial meeting of the States of the Vivarais were assembled in the town, that the Montgolfiers made their first public experiment. Their balloon was merely a spherical bag, made of pieces of coarse linen, loosely buttoned together, and inflated with rarified air, produced by kindling a fire underneath it. The fire, having been lighted, was constantly fed with small bundles of chopped straw until the balloon was sufficiently distended, when it was loosed from its stays, and rose with an accelerating motion until it had reached a considerable elevation, when its velocity became constant. It rose to the height of about a mile, and then gently descended, falling in a vineyard without the town of Annonay, having been suspended in the air for the space of ten minutes. This successful experiment delighted all who witnessed it, and the two Montgolfiers were rapturously applauded by their fellow townsmen. In Paris on the 27th of August, in the same year (1783), a similar ascent was shown to a great crowd of people assembled on the Champ de Mars: this balloon was constructed by MM. Robert and Charles, and was made of thin silk, and inflated not with rarified air, as the Montgolfiers' had been, but with hydrogen gas. The success of this experiment was complete, as the balloon rose rapidly into the air, and after traveling fifteen miles in three quarters of an hour, fell in a field near Ecouen.

Shortly after this the brothers Montgolfier were invited by the Academy of Sciences to repeat their experiment of Annonay on a larger scale in Paris. The invitation was accepted, and accordingly on the 19th of September, they sent up a balloon from the grounds of the palace at Versailles. On this occasion a sheep, a cock, and a duck were put in a basket attached to the balloon, and were the first animals ever carried up in the air in this way. They came down safely enough from their voyage, and this probably suggested to M. Pilatre de Rozier the idea of making a similar experiment in his own person; for when the Montgolfiers next sent up a balloon, he boldly leaped into the car or basket just as the machine was leaving the earth, and enjoys the fame of having been the first man who ventured upon an aerial voyage. The account of these balloon ascents in France of course reached England in due time, and created great excitement among the scientific and the curious. The accounts given in the London *Chronicle* at the time are very amusing.

The first balloon seen in England was constructed by an ingenious Italian named Zambeccari; it consisted of oiled silk, and was about ten feet in diameter, and its exterior was entirely gilt. It made its first ascent in November, 1873. It appears to have attracted the attention of George III., for on the 25th of the same month we find this account in the *Chronicle*: "By His Majesty's desire, Mons. Argeue, a Prussian, had invented one of these celebrated air balloons, and on Tuesday, about noon, the whole apparatus was brought into the Queen's garden at Windsor, in near y the following order: A large tube of about five feet in diameter, about one-third filled with water, and in that a close vessel of considerable less size. Near to these was placed a large table, on which were put several bottles, supposed to contain a variety of chemical preparations, and with them the (Wonder of the World) the air balloon, which bore an exact resemblance to a bladder that was void of air or water." The balloon was then inflated with gas, and, "as soon as the business had gone thus far, a string was fixed to the balloon. His Majesty then took hold of the string, and in proportion as he gave it scope or pulled it down, the ball rose or returned. The King finding it so manageable, went under the window where the Queen and the Duchess of Portland were, and gave the globe a space of string till it rose to the hight of the window, and there kept it in poise for a considerable time. From thence he went to the window where the Princess Royal, Princess Augusta Sophia, and Princess Elizabeth were, and let it up again: then brought it down and taking it on his hand, said, 'Now, it goes.' It accordingly ascended in a perpendicular manner for upwards of three minutes, when having taken a southerly course, it was lost to the sight of the numerous body of spectators."

While his Majesty King George was treating his wife and daughters to an ocular demonstration of the truth of the stories told about balloons, is subjects remained very incredulous on the subject, particularly having doubts as to whether anybody was foolhardy enough to go up in them; accordingly the *Morning Chronicle* takes the trouble to get reliable information about the French balloons, and on the 11th of December, 1783, has an article headed "Air Balloons," from which we make a short extract:

"As many persons in this kingdom still discredit the relations conveyed in the French papers respecting the air balloons, we have the authority to use Dr. Lettsom's name for the following genuine communication from his correspondent at Paris, dated the third of this month: 'On Monday, an air balloon made of taffety, covered with a solution of gum-elastic, was filled with inflammable air, under the direction of Messrs Charles and Robert, and was let off from the Tuileries. It had suspended to it a basket, covered with blue silk and paper finely gilt, in the shape of a triumphal car or short gondola, in which Mr. Charles and one of the Roberts embarked, and mounted up into the air, from among many thousands of people of all ranks and conditions. Besides the Duke de Chartres and a great part of the French nobility, there were present the Duke and Duchess of Cumberland, the Duke and Duchess of Manchester, and many other foreign princes and nobility. The triumphant cars of Venus, Medea, and various others, seemed to be realized; with this difference, this was neither drawn by peacocks, doves, or dragons; neither was it mounted on a cloud; it was, however, a most majestic spectacle.'"

This authentic narration of a balloon ascent in France was calculated to allay suspicion, and prepare the public mind for a further draft upon their credulity, to which the *Chronicle* treated them to the following effect:

"It is well known that a pair of wings and a tail of the most curious workmanship are constructing for a person, who, in the spring, is to be sent off upon an air balloon. They are to extend twenty yards each way, and in form to be similar to those of a bat, having silk instead of feathers. With the help of the wings and tail, the man, when extended on the air balloon, will be able to guide himself to whatever part of the country he may wish to go. The wings above mentioned are making at the instance of a person of very high rank in Paris, and who has betted 5,000 guineas that the foreigner who has undertaken this scheme makes a safe passage from Dover Cliff to Paris."

W at became of the poor foreigner who proposed to emulate the feat of Daedalus and fly across the sea, we do not know; but we think we may say with certainty that the person of very high rank lost his wager and his guineas.

Soon after this, balloon ascents became common enough in England. The first person who went up in a balloon on the 21st of September in the following year, and from that this side of the Channel, was a countryman of Count Zambeccari's, named Lunardi, who made an ascent from London on time to this no very important improvement in the arts of constructing aerial machines has taken place; the grand desideratum is to discover a means of steering them. Fans or paddles have been made to answer the purpose in the still atmosphere of a covered building, but heretofore all efforts to make a rudder capable of withstanding strong currents of wind have altogether failed of success.

Johnson's remarkable acumen displayed itself in the discussion of the practical value of the new machines as a means of locomotion. He writes to his friend and physician, Dr. Brocklesby, September 29, 1784: "On one day I had three letters about the air balloon. . . . In amusement, mere amusement, I am afraid it must end, for I do not find its course can be directed so as that it should serve any useful purpose." And again in a letter addressed to the same gentleman, and dated Oct. 16, Dr. Johnson says: "The fate of the balloon I do not much lament; to make new balloons is to repeat the jest again. We now know a method of mounting into the air, and I think are not likely to know more; the vehicles can serve no use till we can guide them." And in the art of guiding them no progress has been made during the eighty or ninety years that have elapsed since they were first constructed. They are, what they were, nothing more or less than ingenious toys; and during that interval the history of balloons is but an account of ascents, either as a holiday attraction or for the purpose of scientific inquiry into the state of the atmosphere at different hights from the earth's surface. In connection with these the names of Messrs. Glaisher and Coxwell deserve a word of recognition. A new interest, however was given to the subject, by the arrival in London of a balloon of gigantic size, designed by M. Giffard, a French engineer, at the beginning of last summer. The novelty in this instance consisted in the great balloon being held captive by a conical rope, equal to a strain of five and twenty tuns, 2,150 feet in length, and paid out and coiled again by steam engines of 200-horse power. A certain amount of danger had attended ascents in the old balloons, as when once in the air it was a matter of the purest conjecture where and how you might alight again on ground. But M. Giffard, by attaching a rope to his balloon, offered the opportunity of an aerial voyage unattended by such risk, as you were lowered again into the amphitheater of wood and canvas whence, a quarter of an hour before, you had started on your journey.

With the exception of one little escapade—a run down into the Vale of Aylesbury with no one on board—the balloon has worked very satisfactorily, although the season has been very unfavorable for aerial navigation. Having chosen a fine day, we proceeded to Ashburham Park, and arrived there at about four o'clock in the afternoon. On entering the amphitheater, of course the object that prominently struck you was the balloon, fastened by the rope to a pivot wheel in the center of the arena. It is an enormous spherical bag, made of three layers of canvas, inclosing one layer of india-rubber, and is inflated with pure hydrogen gas, made in retorts on the premises at Ashburnham. The cost of filling it is upward of £600; and this will give some idea of the magnitude of this monster balloon. After a delay of about an hour, owing to the state of the wind, about five o'clock the balloon made a trial trip, having in the car M. Aymos, and three others of the assistants. All working smoothly and well, she was lowered again into the circle, and about twenty persons, of whom seven or eight were ladies, entered the car; and the great balloon having been let slip from her stays, we rose with an easy and majestic motion into the air. After reaching a hight of about 400 feet, at a signal from the car—a white flag—the engines were stopped and we remained stationery for some minutes. We were now at about the hight of the cross on St. Paul's, and the view was extensive and beautiful. At a signal from the car, we again mounted into the air; and, after a second halt, we finally rose to a hight of about 1,500 feet, the balloon being drifted slightly in an oblique direction by the wind. This was about four times the hight of St. Paul's. Unfortunately, the day was anything but clear, and so the panorama visible from that elevation on a perfectly clear day was much curtailed; but we could see Highgate, Richmond, Brentford, and Wimbledon, in a northern and western direction; while Eltham was pointed out to the east, and Greenwich and Woolwich to the south. Having remained for a few minutes at that hight, we were slowly lowered again into the arena. As we descended, the bridges on the river looked in some places scarcely further apart than the rounds of a ladder. Neither in ascending or descending was the motion at all unpleasant; and the ladies seemed to apprehend no cause for alarm.

After having spent about twenty-five minutes in the clouds, we safely disembarked again at Ashburnham, much gratified with our aerial trip, and with nothing to regret but the hazy state of the atmosphere, which, to a great extent, curtailed the prospect we should otherwise have enjoyed at so unusual an elevation from the busy world.

The Influence of Weather on Sickness.

Dr. Ballard, in his Report on the health of Islington, for 1867, thus aphoristically states the influence of the weather on sickness:

1. That an increase of atmospheric temperature is normally associated with an increase of general sickness. 2. That a decrease of atmospheric temperature is normally associated with a diminution of general sickness. 3. That for the most part the increase or decrease of sickness is proportional in amount to the extent to which the atmospheric temperature rises or falls. 4. That it is an error to suppose (as is popularly held) that sudden changes in temperature are (as a rule) damaging to public health. A sudden change from cold to hot weather is indeed very damaging; but a sudden change from hot to cold is one of the most favorable circumstances that can occur when sickness is regarded broadly as respects a large population. 5. That, remarkably enough, these influences are most marked in the directions I have mentioned in the colder season of the year, and more certain in the winter than in the summer. 6. That rises and falls of temperature are more certain and effectual in their special operation upon public health when at the same time the daily range of temperature is lessened, than they are when the daily range is at the same time increased; rises of temperature increasing sickness more certainly and markedly, and falls of temperature decreasing it more certainly and markedly. 7. That a fall of rain lessens sickness generally, sometimes immediately, sometimes after a short interval, and that, as a rule, the reduction of general sickness is greater when the fall of rain is heavy than when it is light. 8. That drought, on the other hand, tends to augment general sickness. 9. That wet weather in the summer season operates more certainly in improving public health than it does in the winter season.

Retarding the Growth of Strawberry Vines.

George Burson, of East Palestine, Ohio, has recently patented the following for the above purpose:

The plants are carefully packed in boxes, two feet six inches in depth, which are filled with sufficient soil to prevent the roots from being exposed to the air, and at a sufficient distance from the surface of the ground to secure a uniform temperature of from 40° to 42°. This should be done late in the fall or early in the spring, and is, of course, impracticable, except in the vicinity of abandoned mines.

The second method consists in placing the plants in boxes, as above described, in early spring, and packing them in sawdust and ice within an ice-house, but as ice-houses are not always convenient or accessible, this method also possesses some objectionable features, which, however, do not exist in the third method, which can be employed in all sections of the country, except in the extreme Southern States. The vines, are, as before, packed in boxes in the fall, and after being slightly covered with sawdust, are exposed to the weather until the soil is frozen hard, when the boxes are piled together, covered with from eight to ten inches of sawdust, and exposed until March, when they should be thickly covered with straw. When thus treated, the plants will remain in a frozen condition until late in summer, or until fall. While kept in this condition, vegetation remains suspended, and in order that a continuous supply of strawberries may be had, from their usual seasons until late in the fall, it is only necessary to remove from the boxes a sufficient number of plants each week, which must be placed in the ground and cultivated in the usual manner.

What is claimed as new is the herein-described treatment of strawberry plants for the purpose set forth.

Cement.

Edward Heylyn, of Rochester, N. Y., has lately patented the following cement:

Melt forty-six pounds of resin, and five pounds of linseed or other oil or grease in an iron pot; and, when nearly melted, put in eighty-four pounds of dry calcined plaster of Paris, twenty pounds of white sand or brown sand, and twenty pounds of the refuse matter from the pipes and retorts of gas works, said dust being both of a brown and black color. Let them boil, and while boiling mix the ingredients by stirring and mixing, with an iron fork with a wooden handle, and when all mixed, pour the same into casks or molds ready for use.

Depositing Metals on Fibrous Materials.—Silk, muslin, or other fibrous materials, may be covered with silver, copper, or gold, by the electro-plating process, thus: Make a solution of sulphate of copper in liquid ammonia; dip the materials in this, and dry them; then place them in a solution of honey or grape sugar in water at a warm temperature. The sugar will thus decompose the copper salt, and deposit metallic copper on the fiber. The silk or muslin may now be transferred to the electric bath, and receive a deposit of such metal as is desired.—*S. Piesse.*

APPLICATIONS OF PHOTOGRAPHY TO ASTRONOMY.

In taking celestial photographs the telescope is used as the camera, the sensitive plate being usually placed in the focus of the object-glass or mirror, and receiving the image directly upon it. From the impression thus produced enlarged copies may be subsequently taken. Sometimes the image is enlarged by a secondary magnifier before it is received upon the plate. Either the telescope or plate-holder must, of course, have a uniform motion communicated to it during the exposure corresponding to the motion of the object. A negative, when obtained with a clear and tranquil atmosphere, and free from all imperfections—such as are caused by a floating atom of dust, or the slightest tremor of the instrument, or pinholes in the collodion film—may be enlarged so far as to make apparent the minute granules of deposited silver used in the photographic process; but here is an end to the advantage gained by increase of size, no more detail being furnished by any further enlargement.

WONDERFUL RAPIDITY OF PHOTOGRAPHIC ACTION.

The image of the full moon can be fixed in less than one-fourth of a second, and that of the sun "instantaneously." According to the experiments of Mr. Waterhouse, a space of time no longer than one twenty-seven-thousandth of a second is required to fix the solar image. Even this small fraction, however, inconceivably short as it appears, is a tolerable length of time compared with that in which photographs are taken by the electric flash. The duration of the illuminating spark, according to the beautiful and trustworthy experiments of Mr. Wheatstone with his delicate chronoscope, does not exceed the *millionth* part of a second, and yet a clear and distinct photographic image is obtained by a single electric discharge. By this means may be shown the real form of objects to which a deceptive appearance is given by their rapid movement. If a wheel on whose side any figure is drawn in conspicuous lines be made to rotate with the greatest possible velocity, the figure will present to the eye only a series of concentric bands of different shades. Let it now be photographed while in motion by the electric flash, and the wheel will appear stationary with the figure perfectly well defined. A vein of water issuing from a small orifice, which appears to the eye as smooth as a stem of crystal, if seen or photographed by the light of the electric discharge, is shown to be composed of drops variously disposed and of various forms, some being elongated, others flattened, and others almost spherical.

THE MOON AND PLANETS IN THE STEREOSCOPE.

In combining pictures of the moon for the stereoscope, two photographs of the same phase are taken, but with an interval of one or more months between, in order that it may present in the latter picture its disk slightly turned from its position in the former, making the difference of libration from five to ten degrees—the two pictures, in fact (placed in a stereoscope), representing the moon exactly as it would appear if our eyes could be separated thirty thousand miles apart and each view the moon through a telescope at the same time. By the effect thus produced, the *globular form* of our satellite is demonstrated as a physical fact, being made as apparent to the eye as is that of an orange held in the hand. The telescope exhibits the inequalities of the moon's furrowed surface only as differences of light and shade, while the stereoscope reveals them as actual elevations and depressions, making as manifest the long mountain ranges and deep valleys, the isolated peaks and numerous saucer-like cavities or craters, as they would be in a bird's-eye view to a lunar inhabitant.

Ordinary stereoscopic pictures of the moon represent it as magnified from twenty to twenty-five times; a common stereoscope further magnifies it about one and a half times, so that it is seen under a power of about thirty-five.

The configuration of Jupiter's belts, and the diversity of light and shade on the surface of Mars, have enabled stereographs to be produced of those planets, the presence of detail or variety in the appearance of a body being necessary to their production. Mr. De La Rue hopes to obtain a sterograph of Saturn and his rings by the aid of the latter's periodical change of appearance in opening and closing. An interval of several years between the two photographs will be necessary. The planet itself will probably present only the appearance of a flat disk from the want of sufficient detail on its surface.

At Kew Observatory, near London, the sun's photograph—we might say autograph—is taken once or twice every day when the sky will permit. By this means we are obtaining a continuous history of the changes in the spots and faculæ on its face more accurate and more instructive than could be procured in any other way. An investigation of these sun-pictures is fast setting at rest many disputed points pertaining to solar physics. The existence of a comparatively cold atmosphere around the sun, outside of the luminous matter, and the connection of the solar spots with planetary influence (chiefly that of Venus and Jupiter), have been already established by them. Other questions relating to spots on the sun, and their connection with terrestrial magnetism, it is thought, will soon be solved, and perhaps all those concerning the movements of the supposed ring of asteroids (or, possibly, single planet) within the orbit of Mercury. An investigation is now being made with the view of determining with greater exactness the angular diameter of the sun.

MAPS OF THE HEAVENS.

But perhaps the most desirable application of photography, to the accomplishment of which the hopes of astronomers are strongly turned, is its employment in mapping the sidereal heavens. Mr. Rutherfurd, with his eleven-inch photographic object-glass, has carried the work in this direction to the farthest extent yet attained, having photographed stars of the ninth magnitude. He has taken one cluster of twenty-three stars within the space of one degree square, and another (the Pleiades) of forty-three stars, many of these being of the ninth magnitude, with an exposure of from three to four minutes. With a delicate micrometer, which he designed expressly for the work, Mr. Rutherfurd took careful measures of the star images in his photograph of the Pleiades. From these measures Dr. B. A. Gould has deduced the relative position angles, and distances (in arc) of the stars, and a comparison of his results with those obtained by Bessel from his observations of the same stars proves both the accuracy of Bessel's measures and the trustworthiness of the new method, while at the same time it shows the small amount of relative change which has taken place in this group during the last quarter of a century. The observations made by Bessel extended over more than eleven years, while the observations of Mr. Rutherfurd were made in a single night.

ADVANTAGES OF PHOTOGRAPHIC OBSERVATIONS.

The advantages of this method of observation, when so extended as to apply to the smaller telescopic stars, as stated by Prof. Bond, are its entire immunity from personal errors, errors of judgment or from want of skill on the part of the observer, with less liability to ordinary mistakes in reading and recording the indications of the micrometer. Besides which, the permanent record can at any time be re-examined to clear up doubtful points. Another advantage, equally decisive, is the extraordinary rapidity with which groups or clusters of small stars would be delineated, saving months and years of labor.

"The possibility," says M. Faye, "of dispensing with the observer (whose 'personal equation' varies not only with years, but from one moment to another, with the troubles of digestion, circulation, or nervous fatigue) has been fully demonstrated. The method consists in substituting for the eye a photographic plate, and in automatically registering by electricity the instant when the light is admitted to the dark chamber attached to the telescope." By this means M. Faye obtained in twenty seconds ten complete observations of the sun. Again, while the observer, in looking at an object, scrutinizes closely only the parts which specially interest him at the moment of observation, and nearly always permits the rest to escape his attention, the photograph, on the contrary, permanently registers every thing alike.

A recent example has shown that it is not always safe to rely on the appearance of exactness even in science which boasts of its perfection. It was supposed that the observations of the last transit of Venus across the solar disk in 1769 gave the sun's mean distance from the earth very correctly. But it is well ascertained to-day that the adopted value of this distance, which is the astronomer's measuring rod for celestial spaces, is too great by more than three millions of miles. Transits of Venus will again occur in 1874 and 1882, and it is proposed to employ the new and more accurate method in observing the phenomenon, though not designed that it should supplant observations with the eye.

It is well known that "the eternal and incorruptible heavens," as they were termed by Aristotle, are undergoing continual and marked changes. The so-called fixed stars—the "landmarks of the universe"—have their own proper motions not accounted for by that of the solar system. Sirius—as that wonderful aid to physical astronomy, the spectroscope, reveals—is shooting through space at the rate of a thousand million miles a year. The star known as 61 Cygni has a transverse motion alone of one thousand four hundred and fifty million miles a year. Many stars, more distant still, may even exceed this rate. Cooper's recent catalogue of stars shows that no fewer than seventy-seven stars previously catalogued are now missing. This, no doubt, is to be ascribed in part to the errors of former observations; but it is certain that to some extent at least it is the result of changes actually in progress in the sidereal system. Of temporary stars, about twenty have been observed, and more than six times that number are known to be variable. It appears quite certain also that some of the nebulæ have undergone a change for both form and brilliancy. When the celestial lamps shall by their own light record their history on the photographic page, our knowledge of these mysterious luminaries, whose fires wax and wane, or go out in utter darkness, will be less involved in doubt.

GREAT TELESCOPES NOW BEING MADE.

Mr. M. De La Rue is having a lens constructed of thirteen inches in diameter, soon to be in operation, from which, in the hands of so skillful a director, much is expected. Prof. Henry Draper has very nearly completed a new silvered glass reflector of twenty-eight inches diameter (the largest of the kind yet constructed, except one by Foucault). With this instrument the original negatives will be taken six inches in diameter, with provision for extending them to nine and a half inches if desirable. Such pictures will, of course, contain an amount of detail not possible in those taken with ordinary instruments, which vary from one to two inches in diameter, according to the size of the telescope. Prof. Draper expects thus to obtain photographs of larger size and sustaining higher magnifying power than any that have yet been produced. The amount of advantageous enlargement will not be limited by the appearance of the silver granulation, but will depend wholly on the sharpness of definition obtained in the original picture.

There is now being erected (if not already completed) at Melbourne, in Australia, a powerful reflecting telescope four feet in diameter, of the Cassegrain form, which will be supplied with the necessary apparatus for photography, as well as for spectroscopic investigation. This derives its importance chiefly from the fact that the work will be prosecuted in rich fields of the southern hemisphere.

THE BEST PLACES FOR OBSERVATION.

It was suggested by Newton that the serene and quiet air which is so often found on the tops of mountains above the grosser clouds would very much favor celestial observations. Such elevated stations would seem to possess peculiar advantages for the application of photography, since the atmosphere is not only less subject to disturbance, but is also more favorable to the chemical action of light. The results of the expedition to Teneriffe in 1856 prove these suppositions correct.

In a paper presented to the British Association in 1863, Prof. Piazzi Smith, who had charge of the expedition, states that the chief object at Teneriffe was to ascertain the degree of improvement in telescopic vision at a high elevation. Observations were taken at various points, reaching an altitude of eleven thousand feet, or a little more than two miles. At that hight the majority of clouds were found to be far below, the air dry, and in a very steady and homogeneous state. A photograph taken near the sea level could not be made to show the detail on the side of a distant hill no matter how marked the detail might be by rocks and cliffs illuminated by strong sunshine. Even the application of a microscope brought out no other feature than one broad, faint, and nearly uniform tint. But on applying the microscope to photographs of distant hills, taken at a high level, an abundance of minute detail appeared. Each little separate bush could be distinguished, though the hill side was four and a half miles from the camera.

The important results obtained by this expedition has led to the establishment by the Russian Government of an astronomical observatory at an elevated station on Mount Ararat, near Tiflis.—*Professor Merriman in the Methodist Quarterly.*

Teleiconographe.

M. Revoil, an architect well known in France, in the course of his attempts to arrive at exactness in the drawings of distant objects, by the aid at one time of the camera lucida, and at another, of the ordinary telescope, has invented an apparatus combining the principles of the two instruments. This instrument he calls the Téléiconographe. The principle involved is that of allowing the image transmitted by the object glass of a telescope to pass through a prism connected with the eye-piece. The rays of light that would in the ordinary use of the telescope be transmitted direct to the eye, are refracted by the prism, and thrown down upon a table placed below the eye-piece. The distance between the prism and the table determines the size of the image projected on the latter, and it is easy for the observer to trace on a paper placed on this sketching table the actual outlines indicated by the refracted light. The telescope has both vertical and horizontal motion, and is so constructed that a connected drawing can be made of a larger area than can be included in the object-glass at one view; in fact, an entire panorama can be traced, if the relative positions of the axis of the telescope and the surface of the sketching table are undisturbed. The account from which the above description is taken, states that by means of this instrument a perfect drawing of the summit of one of the towers of Notre Dame Paris, was made at the distance of 300 yards, and also that two mountain peaks, in Provence, were most admirably sketched. For the faithful delineation of objects so distant as to require the use of a telescope to distinguish their details, for military surveying, &c., its services promise to be of great value.

Wasteful Mining in California.

The San Francisco *Bulletin*, speaking of mining interests in that region, says:

"It will be well for the State when all of our mining interests shall pass into the hands of private individuals, for then there will be no question as to the right of taxation; and besides, the sooner the timber throughout the mountainous regions of California shall be protected, the better it will be for the people.

"Waste has been going on in the mines since 1849. There have been waste in working mines, waste on timber lands, and in fact waste in nearly everything throughout the mining region of California. There has even been wastefulness by erecting temporary buildings. Chinese have run over the placers, exhausting them of their gold, and with very little to the people. We wish to see every foot of land, not only that fit for farming purposes, but that in which there is a particle of gold, belong to individuals. When this comes about, the interior may be expected again to prosper."

THE FLOODS.—Accounts reach us of much damage caused by the recent heavy rains. All along the upper Hudson, in the Connecticut Valley, in New Hampshire, in New Jersey, and further South, we hear of broken dams and canals, damages to telegraph lines, and "wash-outs" in railway tracks. In some instances houses have been swept away and loss of life has resulted. A recently arrived passenger states that out at sea the weather was calm on the day of the heavy rain-storm which caused the floods, but there has been some damage to vessels along the coast. The storm has, however, been more beneficial than destructive, as many sections visited by it were parched with drought up to the date of its occurrence. New York city may thank the rain for cleaner streets than it has seen for six months past.

MESSRS. GRAEB AND LEIBERMANN, of Prussia, have recently obtained a patent in this country for the preparation of alizarine. They state that their process consists in first preparing bibromanthrakinon, or bichloranthrakinon, and then converting these substances into alizarine.

FOSTER'S INDIA-RUBBER DECOY DUCK.

This is a rubber duck of full size, and accurately formed. When not in use it can be collapsed by allowing the air which distends it to escape through a valve provided for that purpose and through which it is also inflated when it is wanted for use.

A ballast weight is fixed to the center of the belly. The resemblance to a real duck is very striking. Sportsmen will appreciate this invention, and the convenience afforded by the portability of these decoys over the old cumbersome wooden ducks. A dozen may be packed so as not occupy more space than a single wooden one.

Patented August 3, 1869, by Jacob Foster, who may be addressed for further information, 328 Colowhill street, Philadelphia, Pa.

DIFFICULTIES TO BE SURMOUNTED IN WORKING THE SUEZ CANAL.

We find in *Lippincott's Magazine*, a paper from the pen of Edward B. Grubb, relating "what he saw of the Suez Canal during a trip from Timsah to Port Said last winter. In this article we find set forth some of the difficulties to be surmounted in the navigation of this canal, which though possibly not insuperable, must more or less obstruct trade for some time to come. We make some extracts from this interesting narrative particularly bearing upon this subject:

"Where the canal enters Timsah from the north the cuttings are deep, and the great heaps of sand lie on either side sixty or seventy feet high. The channel through which the water runs is not one hundred feet wide and the depth not over twelve feet. Hydraulic engines of enormous power were at work dredging up and pouring out immense volumes of mud and sand. Hundreds of men, mostly Arabs, with barrow, pick, and shovel, were moving the huge heaps, or waist-deep in the water, turning from our path their uncouth boats; for much traffic is even now done upon the canal, and besides the boat-loads of stores and provisions belonging to the company, we saw many a cargo that reminded us of the sutlers' stores in the 'Army of the Potomac.'

"The Timsah cutting extends for perhaps half a mile, and then the desert is scarcely above the level of the water, and in fact in many places it is below it, so that the water covers many hundreds of acres, and the course of the canal is buoyed out sometimes for nearly a mile. As we left the hills of Timsah the wind struck us sharply, and ever and anon a quantity of the light sand of the desert would be caught up by it and sent whirling into the water; and looking closely, we could see where it had drifted little capes and promontories into the canal. Let us repeat what our captain said upon this subject, being asked:

"'Yes, monsieur, this drifting in of the sand certainly seems to be one of our greatest difficulties, for the wind blows across the canal all the year round—six months one way, six months back. One ounce of sand per square yard amounts to five hundred tuns for the whole canal. If it came in at that rate, it would be a long time before the company would pay any dividend. But we do not intend to let it come in; and this is how we prevent it. This sand only extends to the depth of from nine to twelve feet; below this is a stratum of blue mud, mixed with a sort of clay, in which, by the way, we find great quantities of beautiful shells and fossil fish. Well, then, do you see those two huge engines which we are approaching—one an hydraulic dredger in the middle of the canal, the other an iron *shute* (it looked like the walking beam of an immense steamer), near the edge? Do you see how the vast masses of sand, mud, and water, come up from the dredger, are poured out into the "shute," and thence on the ground sixty or eighty feet from the edge of the canal? Do you see how quickly the great heaps rise, and how they extend, almost without a break, all along? Well, monsieur, you would find these heaps almost immediately baked hard by the sun, and as they are firm enough to bear the railroad we intend putting upon them the better to expedite the mails from India, so we hope they will be high enough to keep out the sand drifts from the canal.

"And what are your other great difficulties, mon captaine?"

"Well, monsieur, at Chalouf, near Serapéum, we have struck a peculiar hard stone at the depth of twelve feet, and are obliged to blast to clear it out (it is axolite). Then the deposit of the Nile mud near Port Said will always keep us dredging. But what we fear most is the Red Sea. For a long distance from Suez it is extremely shallow; then, lower down, it is very rocky; and while this is nothing to steamers, which can easily keep the narrow channel, yet with the wind blowing six months one way and six months the other, it will not be easy for a heavily-laden clipper to keep off the ground. Yet these things will all be set right, for trade will take the shortest route, and the Suez Canal will be a success, although no nation now believes it except France, and (with a bow) America.'

"A few words now upon the canal in general. Whether or not the idea originated with Pharaoh, Napoleon I. acted upon it, and actually had a survey made, when it was reported that there was a difference of thirty feet in the level of the two seas; and for that and other reasons the project was abandoned, and lay dormant until about 1854; upon the 30th of November of which year the contract between the Egyptian government and "Compagnie Universelle du Canal Maritime de Suez" was signed. Its duration is ninety-nine years from the day of the opening of the canal for traffic. The Egyptian government is to receive fifteen per cent of the net profits, and holds a large proportion of the company's bonds. Egypt conceded to the company all the lands which might be irrigated by the fresh-water canal, and in 1868 bought back its own concession for a sum equal to ten millions of dollars.

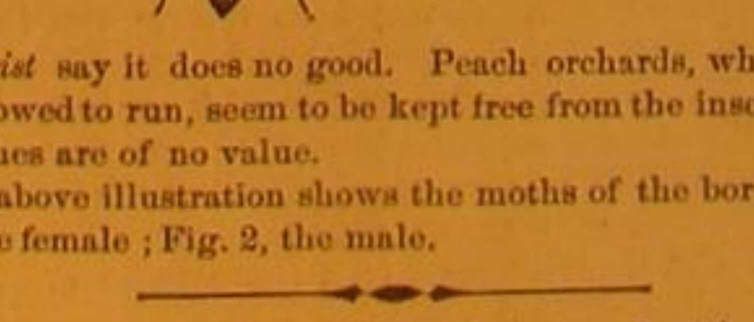
"Kantara is thirty-one miles from Port Said, and the canal is almost perfected thus far; that is to say, although the dredges are still at work, yet for this distance the canal is one hundred yards wide and of an average depth of twenty-six feet; and these are to be the dimensions for its entire length. A curious feature, which is visible along the narrow parts of the canal, is a current flowing in from the north at the rate of one and a half knots per hour. Although it is many months since the water attained its level, yet this current still continues. Our captain attributed it to evaporation and absorption. It must be remembered that all the cuttings have been from the Mediterranean towards Suez, and that the main body of the men employed, numbering eighty-five hundred, are working at the head of the canal, which is now advanced as far as Serapéum. Here it is necessary to cut through a number of sand hills to the Bitter Lakes, which are a series of depressions in the desert, in the lowest parts of which are marshy ponds. They are twenty-five miles in extent, and it is expected that, when the water is let in, an area of one hundred and forty thousand acres will be covered. (This has since been done). Then comes the Chalouf cutting to Suez, sixteen miles, and the seas meet.

"On the 1st of January, 1869, there were at work eighty-five hundred men. These men are obliged by the Egyptian government to work on the canal, but are paid by the company at the rate of two francs per day. The engines for dredging are sixty in number. Each cost two hundred thousand dollars in gold. The expenses amount to one million dollars in gold per month, and the work has already absorbed forty millions of dollars. It is said that the rates of toll are to be ten francs per tun. The company is a private one, and has not been publicly recognized or assisted by the French government.

"With regard to the rocks, the calms, and the tortuous channels of the Red Sea, mentioned before as the chief obstacle to the use of the canal by the larger class of merchant-men, plans have already been elaborated in England, with a view to the building of a class of vessels suited to this trade, and carrying each sufficient steam power to assist her through the canal and down the Red Sea. For the dispatch of mails and the transport of troops, this route will be immediately available; and although it will take time to conquer English prejudices and predilections, yet in time the bulk of the India trade must come this way."

THE PEACH TREE INSECT.

The "Peach Borer" is becoming extinct in many parts of the West, and the peach trees are beginning to thrive again. Mounding up the trees with earth has been long practiced, as a preventive against the borer worm; but writers in the *Entomologist* say it does no good. Peach orchards, where hogs are allowed to run, seem to be kept free from the insect. Lime and ashes are of no value.



1 2

The above illustration shows the moths of the borer. Fig. 1 is the female; Fig. 2, the male.

ARTIFICIAL stone is made by mixing sand with a concentrated solution of silicate of soda. The pasty mass thus formed is placed in the mold of the desired shape. It is then dried, but is yet as brittle as biscuit. It is next saturated with a solution of chloride of calcium. In about an hour the chemical change takes place, and the whole mass becomes as hard as stone; finally, it is washed and dried.—*S. Piesse.*

"THE WELCOME STRANGER" NUGGET, FOUND NEAR DUNOLLY, IN AUSTRALIA.

Attention has been already directed to the many large pieces of gold which have been found in the neighborhood of Dunolly; and, when the printing of this work was nearly completed, on the 5th February, 1869, there was unearthed by John Deason and Richard Oates a nugget weighing more than 2,280 oz., 10 dwts., 14 grs. It was found on the extreme margin of a patch of auriferous alluvium trending from Bulldog Reef. According to information furnished by Mr. Knox Orme, it appears that this mass of gold was lying within two feet of the bed-rock (sandstone), in a loose, gravelly loam, resting on stiff, red clay. It was barely covered with earth. It was about twenty-one inches in length and about ten inches in thickness; and, though mixed with quartz, the great body of it was solid gold. The annexed engraving has been reduced from a large sketch made by Mr. Francis Fearn, which was certified by the discoverers as a fair representation of the nugget found by them. Comparing it with a photograph of a sketch made from memory by Mr. Charles Webber, it would appear to represent not incorrectly the outward appearance of the "Welcome Stranger."

It is to be regretted that a cast or a photograph was not made, and the weight and specific gravity of it ascertained when it was first dug out of the ground. The discoverers appear to have heated it in the fire in their hut, in order to get rid of the quartz, and thus to reduce its weight before conveying it to the bank at Dunolly.

The melted gold obtained from it was 2,268 ozs., 10 dwts., 14 grs., but a number of specimens and pieces of gold (weighing more than 1 lb.) were detached from it before it got into the hands of the bank manager; and what was broken off in the hut while it was on the fire, it is useless to guess.

Mr. Birkmyre says: "The gold of this nugget, from the crucible assays, I found to be 98·66 per cent of pure gold. It thus contains only 1·75th of alloy, composed chiefly of silver and iron. The melted gold, with that given away to their friends by the fortunate finders, amounted to 2,280 ozs., or 2,248 ozs. of pure gold—its value at the Bank of England being £9,534."

The neighborhood of Dunolly is almost unprospected country. For many miles there are out-cropping reefs which have yielded very large pieces of gold: and it is not at all improbable that other pieces of gold will be found as far exceeding the "Welcome Stranger" in weight and value as that nugget exceeds any yet recorded.

Near the spot where this mass was found there were unearthed two nuggets weighing respectively 114 ozs. and 36 ozs. Very heavy gold is characteristic of this district; and large nuggets are found nearly every day.—*From R. Brough Smyth's "Gold Fields and Mineral Districts of Victoria."*

THE HOLSTEIN INTERMARITIME CANAL.

EARLY ATTEMPTS FOR DIRECT INTERMARITIME COMMUNICATION.

The idea of constructing ship canals across narrow strips of land, for promoting commerce, is not new. From a work of Antonio Galvao, entitled "*Tratado dos Descubrimentos*," we note the fact that the opening of a ship canal between the Atlantic and Pacific Oceans—"the mightiest event, probably, in favor of the peaceful intercourse of nations which the physical circumstances of the globe present to the enterprise of man"—was proposed to Charles the Fifth in 1528. And, strange as it may seem, the inquiries, instituted at that time, led to the recommendation of the same lines that were planned in 1825. Still older is the project of the opening of ship canal across the Isthmus of Corinth in the Mediterranean. It engaged the attention of Periander, Demetrius, Julius Cæsar, Caligula, Herodes, and Atticus, but it was reserved for Nero to take the first active step toward the accomplishment of this end. He completed a canal half way, as lately ascertained by the explorations of the learned Frenchman, Mons. Grimaud de Caux. This isthmus connects the peninsula of Morea with the province of Attica, in Greece. By means of a canal cutting through this narrow strip of land, the route from the Ionian Sea to the Archipelago would be considerably shortened. Such a canal would be of great importance, as enormous quantities of grain are exported from the borders of the Black Sea to the seaports of the Adriatic.

The project of uniting the Baltic with the North Sea by a navigable ship canal dates from the zenith of Lubeck's commercial prosperity, and was suggested first as early as

1390. This project occupies at the present moment the attention of the North German Parliament, and, being one that may safely be ranked among the gigantic engineering enterprises of the present age, we have endeavored to collect such accurate knowledge with regard thereto as existing sources admit.

WHY THE PROJECT WAS STARTED.

Two reasons call peremptorily for the accomplishment of a navigable route between the North Sea and the Baltic, to wit: gain in time and safety. The distance between the English canal to the open Baltic Sea around the promontory of Skagen is about 880 miles. It would be shortened for two fifths of its whole length if a straight route from one shore of Holstein to the other could be chosen. Steamers would thus be enabled to make the voyage from London to St. Petersburgh in five days, instead of seven, while sailing vessels would gain from one week to one month, according to circumstances.

The second reason for the building of a ship canal is still more important. According to even very incomplete statistical data, the annual number of losses of vessels in that portion of the sea is greater than that of any other equally large portion of the globe. This is the more to be deplored as the route around Cape Skagen is the only one from the North Sea to the coasts of Sweden and Finland, as well as to the very heart of Russia. Indeed, it has been ascertained that the yearly loss experienced on the old sea way amounts to three millions rix dollars, or about two million dollars in gold. This sum is certainly a large one, but it must be remembered that the cargoes of many vessels are exceedingly valuable. For instance, the cargoes of the American bark *Joseph Clark* and the English steamer *Arctic* amounted to half a million dollars in gold; the former vessel was shipwrecked in 1857, and the latter in 1860. These accidents mainly occur on the western coast, especially on the sand banks of Skagen, which, for this reason has been denominated "the graveyard of ships." Indeed, small and large wrecks are seen there in every condition and at every time of the year.

It may be remarked that there are now two channels across the isthmus of Holstein; they are, however, altogether inadequate to the existing demands of navigation. The one is the so-called Strekenitz canal, begun in 1390 and completed in 1398. It is one of the oldest in Europe, and connects the river Elbe with the Trave, uniting with the former just above Lauenburg, and with the latter above Lubeck. The second artificial water communication is known under the name of the Schleswich-Holstein, or Eyder Canal, and may be found on any good map.

THE PROPOSED LINE.

This has been submitted to the world in the form of an anonymously published pamphlet, entitled, "The Cutting of of the Isthmus of Holstein between the Baltic and the North Sea." Lubeck is proposed as the eastern terminus of this route, while it is thought that the most feasible point for the western terminus would be Gluckstadt upon the Elbe. This line, as shown by accurate and reliable surveys, would require no locks. It is proposed to follow the river Trave from Lubeck to a point where it approaches the Hemmelsdorf Lake. This lake belongs to the most remarkable water reservoirs of the Baltic countries; originally an inlet, as most of the other lakes of the Baltic, it is now separated from the sea by a narrow strip of maritime deposits. Hills of about one hundred feet in hight protect it against all winds in such a manner that Napoleon I. designated it for a winter harbor for his Baltic fleet, when, by the catastrophe of 1813, the whole project fell into oblivion. Moreover, this natural harbor is situated in the midst of one of the most populous, prosperous, and best cultivated districts; it is surrounded by a circle of charming villages, and only awaits the completion of the projected canal to become an excellent seaport. The length of the section from this lake to Gluckstadt is forty-eight miles; adding thereto the distances through the lake and from Lubeck to the Baltic, we have a total length of fifty-three miles, or over half the length of the Suez Canal. The cost of the execution of this work, including the construction of harbors at Gluckstadt and Lubeck, has been estimated at $23,720,930, in gold.

Should a work of this kind be executed, a yearly passage of from twenty to thirty thousand vessels through the canal might safely be predicted. Such a strait would open to the ocean the immense territory in Russia; and, besides this, the Prussian coast, which is over half the length of that of France would be made directly accessible to the open sea.

Taken all in all, the cutting of the isthmus of Holstein may safely be contrasted with that of Suez. In shortening an old way of traffic it will contribute of transforming the slow march of civilization in the northern European countries into one worthy of this century of steam.

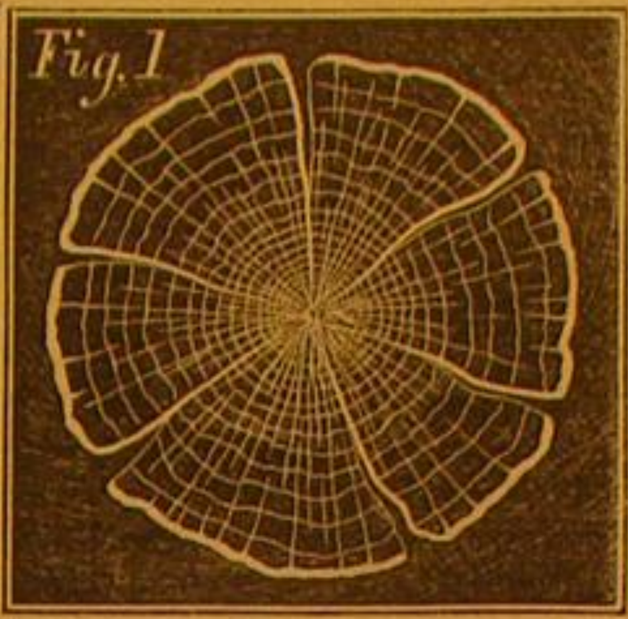
THE CONTRACTION OR SHRINKING OF TIMBER.

In a lecture delivered by John Anderson, C. E., at the "Society of Arts" in London, some information was given on the contraction of timber which we deem of sufficient interest to reproduce from *The Builder*, together with the diagrams illustrative of the subject.

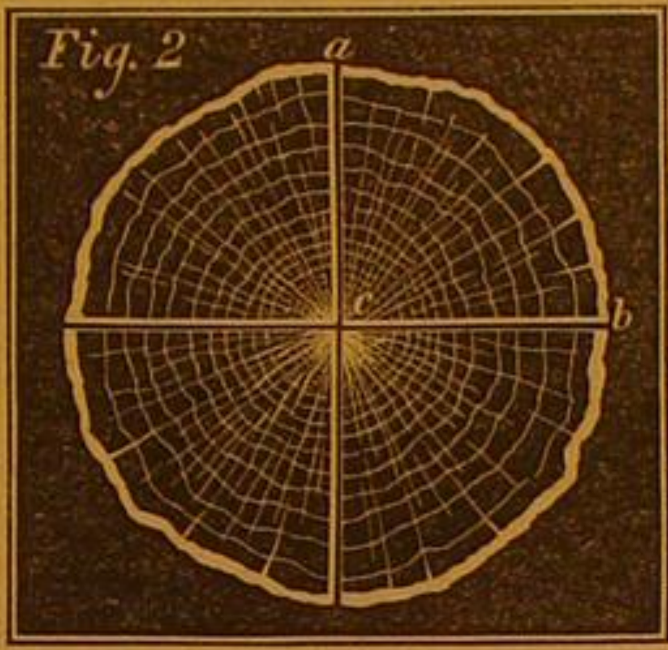
The lecturer, after some introductory remarks proceeded as follows:

The wretched state of the floors, doors, and shutters in many of the London houses too plainly gives ample and complete evidence of persistent disobedience to the natural law of shrinkage, and the only hopeful consolation is that we do not go unpunished, as the penalty inflicted in time may lead to improvement.

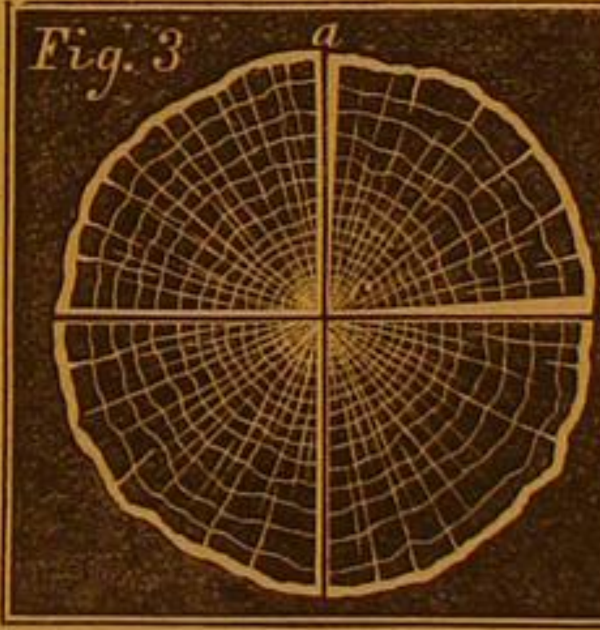
An examination of the end section of any exogenous tree, such as the beech or oak will show the general arrangement of its structure. It consists of a mass of longitudinal fibrous tubes, arranged in irregular circles that are bound together by means of radial strings or shoots, which have been variously named; they are the "silver grains" of the carpenter, or the "medullary rays" of the botanist, and are in reality, the same as end wood, and have to be considered as such, just as much as the longitudinal woody fiber, in order to understand its action. From this it will be seen that the lateral contraction or collapsing of the longitudinal, porous, or tubular part of the structure, cannot take place without first crushing the medullary rays, hence the effect of the shrinking finds relief by splitting in another direction, namely in radial lines from the center, parallel with the medullary rays, thereby enabling the tree to maintain its full diameter, as shown in Fig. 1.

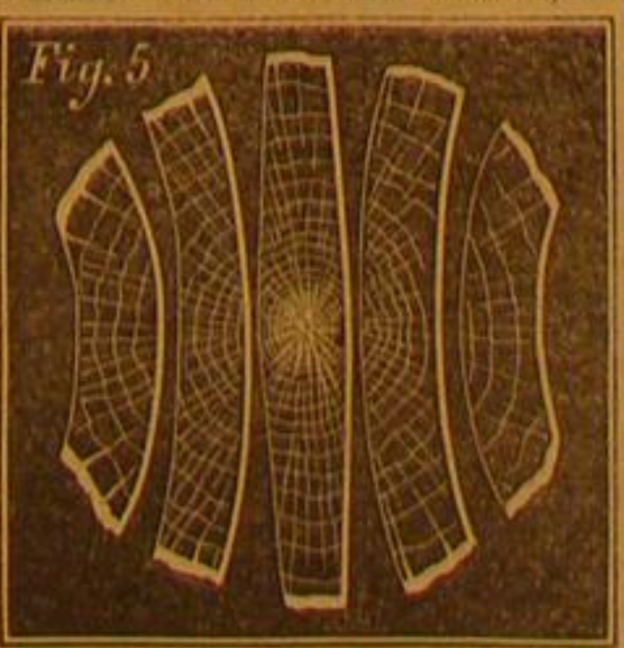


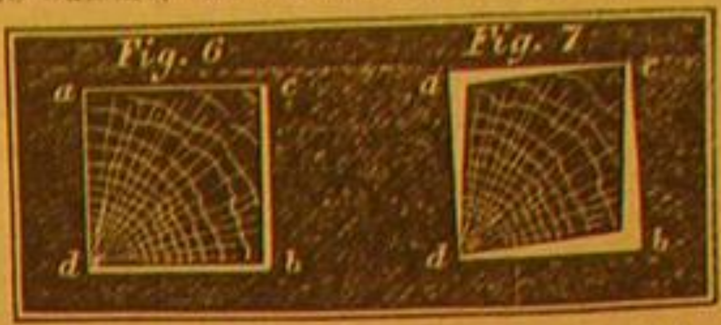
If the entire mass of tubular fiber composing the tree were to contract bodily, then the medullary rays would of necessity have to be crushed in the radial direction to enable it to take place, and the timber would thus be as much injured in proportion as would be the case in crushing the wood in the longitudinal direction. If such an oak or beech tree is cut into four quarters, by passing the saw twice through the center at right angles, before the contracting and splitting have commenced, the lines *a c*, and *c b*, in Fig. 2 would be of the same length, and at right angles to each other, or, in the technical language of the workshop, they would be square; but, after being stored in a dry place, say for a year, it would then be seen that a great change had taken place both in the form and in some of the dimensions; the lines *c a*, *c b*, would be the same length as before, but it would have contracted from *a* to *b* very considerably, and the two lines *c a*, and *c b*, would not be at right angles to each other by the portion here shown in white in Fig. 3. The medullary rays are thus brought closer by the collapsing of the vertical fiber.



But, supposing that six parallel saw cuts are passed through the tree so as to form it into seven planks, as shown in Fig. 4, let us see what would be the behavior of the several planks. Take the center plank first. After due seasoning and contracting, it would then be found that the middle of the board would still retain the original thickness, from the resistance of the medullary rays, while it would be gradually reduced in thickness toward the edges for want of support, and the entire breadth of the plank would be the same as it was at first, for the foregoing reasons, and as shown in Fig. 5. Then, taking the planks at each side of the center, by the same law their change and behavior would be quite different; they would still retain their original thickness at the center, but would be a little reduced on each edge throughout, but the side next to the heart of the tree would be pulled round or partly cylindrical, while the outside would be the reverse, or hollow, and the plank would be considerably narrower throughout its entire length, more especially on the face of the hollow side, all due to the want of support. Selecting the next two planks, they would be found to have lost none of their thickness at the center, and very little of their thickness at the edges, but very much of their breadth as planks, and would be curved round on the heart side and made hollow on the outside. Supposing some of these planks to be cut up into squares when in the green state, the shape that these squares would assume, after a period of seasoning, would entirely depend on the part of the tree to which they belonged; the greatest alteration would be parallel with the medullary rays. Thus if the square was near the outside, the effect would be as shown in Fig. 6,







namely, to contract in the direction from *a* to *b*, and after a year or two it would be thus, as seen in Fig. 7, the distance between *c* and *a* being nearly the same as they were before, but the other two are brought by the amount of their contraction closer together. By understanding this natural law, it is comparatively easy to know the future behavior of a board or plank by carefully examining the end of the wood, in order to ascertain the part of the log from which it has been cut, as the angle of the ring growths and the medullary rays will show thus, as in Fig. 8.

If a plank has this appearance, it will evidently show to have been cut from the outside, and for many years it will gradually shrink all to the breadth, while the next plank, shown in Fig. 9, clearly points close to the center or heart of the tree, where it will not shrink to the breadth but to a varying thickness, with the full dimensions in the middle, but tapering to the edges, and the planks on the right and left will give a mean, but with the center sides curved round, and the outside still more hollow.

The foregoing remarks apply more especially to the stronger exogenous woods, such as beech, oak, and the stronger home firs. The softer woods, such as yellow pine, are governed by the same law, but in virtue of their softness another law comes into force, which to some degree affects their behavior, as the contracting power of the tubular wood has sufficient strength to crush the softer medullary rays to some extent, and hence the primary law is so far modified. But even with the softer woods, such as are commonly used in the construction of houses, if the law is carefully obeyed, the greater part of the shrinking, which we are all too familiar with, would be obviated, as the following anecdote will serve to show: It was resolved to build four houses, all of the best class, but one of the four to be pre-eminently good, as the future residence of the proprietor. The timber was purchased for the entire lot, and the best portions were selected for house No. 1, but by one who did not know the law, and to make certain of success this portion of the wood had an extra twelve months' seasoning after it was cut up. The remainder of the wood was then handed over to a contractor for the other three houses, who han an intelligent young foreman, who knew the structure of wood as well as how to obey the law, and who, therefore had the wood for the three houses cut up in accordance therewith. The fourth house was built the following year by another man; but long before ten years had passed to the great surprise and annoyance of the proprietor, it was found that his extra good house, No. 1, had gone in the usual manner, while the other three houses were without a shrinkage from top to bottom. As Solomon says, "Wisdom is profitable to direct."

A similar want of correct knowledge of the natural figure and properties of the structure of wood, such as the oak, is constantly shown by the imperfect painting to resemble that wood, as exhibited on the doors and shutters of many of the houses of this metropolis. If we cannot afford to have genuine wainscot doors, as in France, but yet desire to have an imitation, it would surely be worth the trouble to have a block cut from the quarter of an oak tree, and to have each of its six sides planed and polished, in order to make plain their several features. The house painter would then see what nature really is, and thus save us from the ridicule of other nations, when we mix up "silver grains" and all the other natural features upon one side of a board or panel.

On Cotton-seed Oil, and its Detection when mixed with other Oils.

Mr. Reynolds believes that nearly the whole of cotton-seed oil is used in the sophistication of oils of older repute. The probability that the supply will now continue and increase is especially indicated by a consideration of the source of the oil. The weight of seed yielded by each cotton plant is about three times as great as the cotton obtained from it, and up to the present time nearly the whole of this seed has been wasted, or returned to the soil as a fertilizer. The present price of the refined oil is less than three shillings per gallon, and, considering the large porportion of seed that has yet to be utilized, it is probable that it will long continue to be the cheapest fixed oil in the market. Hence the desirability of our giving some attention to a substance which is pretty sure to present itself to us in our daily avocations in some shape or other.

After describing the methods of preparing and purifying cotton-seed oil, Mr. Reynolds adds some remarks upon the detection of this oil when mixed with olive oil. A well-known chemist, whom he regarded as the highest authority upon the subject of the adulteration of oils, told him that he did not know of a test for this purpose.

The experiments which he made induced him to regard the nitrate of mercury test as affording sufficiently clear reactions to enable him to find this oil when mixed with olive oil.

He used Pontet's test as follows: 6 parts of mercury are dissolved in 7½ parts, by weight, of nitric acid, 1·36 without the application of heat, and form the test solution. The tubes for making these experiments are merely strong test tubes of 7 inches in length, and holding about a fluid ounce. They are roughly graduated by pouring in 30 minims of water and scratching a line upon the glass; another line is made at the point reached when a total of 6 drachms of water have been poured in. The lower line is marked "test," the upper one "oil." Pour in first the test to its mark, and fill up with the suspected oil to the other line; shake well and set aside, shaking again about an hour afterwards. In from three to twelve hours, according to the temperature, etc., a genuine olive oil will have solidified entirely, the product after the latter interval being quite hard when touched by a glass rod. Cotton-seed oil, when similarly treated, will not solidify, but remains fluid. A mixture of 25 parts of cotton-seed oil with 75 parts of olive oil gives an intermediate condition. The contents of the tube become solid, but if a little be taken out with a glass rod, it is found to be soft, pasty, and without any friable character. On the other hand, when pure olive oil is so treated, the product is hard, friable, and not pasty. Comparative trials should always be made, and caution exercised in accepting the apparent conclusions. Where only 12½ per cent of cotton-seed oil is present, the reactions are not so distinct as with 25 per cent., but Mr. Reynolds considers them usually sufficient to decide the case.—*Druggists' Circular.*

THE MANUFACTURE OF SULPHURIC ACID.

From the Report of J. Lawrence Smith, United States Commissioner to Paris Exposition.

Black Ash—Mond's Process for Obtaining Sulphur.—I propose giving a tolerably full account of Mond's process, as described by himself, in using the waste from the black-ash generally employed in England, and which allows of more rapid operation than the more compact waste of most continental works.

In place of the set of four vats generally in use for lixiviating black-ash, he employs a set of ten or twelve. All of these are connected by pipes in the usual way, so that the soda liquor runs from the bottom of one vat to the top of the next one, and by special pipes and taps which allow the sulphur liquor to run out of the bottom of each vat to the top of any other vat in the set. Besides this, they are provided with extra taps and shoots to convey the sulphur liquor to wells or settlers. The lower parts of all the vats are connected with a fan (capable of producing a pressure of about seven inches of water), by pipes furnished with dampers, which regulate the quantity of air passing through.

A noiseless fan of Schiele's construction twenty inches in diameter, price $50, propels a sufficient quantity of air for the treatment of the waste resulting from 100 tuns of salt cake per week. Four of the vats are always filled with black-ash in the course of lixiviation; the other six or eight with waste to be treated according to the invention. As soon as the black-ash is completely spent, and the weak liquor is well drained off, the connection with the fan is opened. The waste soon begins to heat, the temperature gradually rising above 200° Fah., and gives off quantities of steam, becoming greenish, and afterward yellow on top, gets more and more dry, and would take fire if the air was passed through long enough. The time for discontinuing the passing of air, so as to have the best results, must be ascertained in each establishment by experiments, and varies according as much or little hyposulphite in the hydrosulphide and bisulphide of calcium are formed, which are afterward oxidized into hyposulphite. A part of the hyposulphite is again decomposed into sulphur and sulphite, which is very insoluble, and cannot be extracted by lixiviation. Carrying the oxidation too far would therefore entail a serious loss. On an average the time of exposure will be limited to between twelve and twenty-four hours. The waste is now lixiviated systematically with cold water, the weaker liquors passing from one vat to the next one in course of lixiviation, so as to obtain only strong liquors, which operation can be easily performed in six to eight hours. When this lixiviation is finished, air is again passed through the waste in exactly the same way as before; the waste is again lixiviated, and the same treatment is repeated a third time. The vat is then ready to be cast, and is again filled with black-ash. When the operations have been well conducted, sulphur equal to about 12 per cent of the weight of the salt cakes used in making black-ash is obtained in solution from the waste. The waste contains only traces of sulphide of calcium, and is principally composed of carbonate of lime, sulphite, and sulphate of lime, which, far from being noxious, make the waste, on the contrary, a valuable manure. In separating the sulphur from the liquors thus obtained, by adding muriatic acid, I met with much more difficulty than I had anticipated from such a reaction.

The oxidation of the waste is regulated so as to obtain a liquor, which contains as nearly as possible to every equivalent of hyposulphite two equivalents of sulphide. This liquor is decomposed by first adding to a certain small quantity of acid an excess of liquor, until there is a trace of sulphide in the mixture; then a quantity of acid sufficient to neutralize the whole of the calcium is poured in; a new quantity of liquor equivalent to this last quantity of acid is added, and then acid again and liquor again, and so on until the vessel is nearly filled. To the last liquor only one half of the required acid is added, and steam introduced until the liquid shows a temperature of about 140° Fah. Practically speaking, the liquor and acid are poured at the same time into the decomposing vessel in nearly equivalent proportions, the workmen taking care to keep a small excess of liquor up to the end of the operation. This part of the process is carried on in covered wooden tanks connected with a chimney in order to carry off any sulphureted hydrogen which may be evolved by mistake of the workmen. If properly carried out there should be, however, no appreciable quantity of that gas evolved.

The practical result of this mode of working is simply precipitation of nearly the whole of the sulphur in a pure state.

$$Ca\,O, S_2\,O_2 + Ca\,S_x + 3\,H\,Cl = 3\,Ca\,Cl + 3\,H\,O + (2 + x)\,S.$$

The details of the reaction are, however, very complicated, almost all the different acids of sulphur being probably formed during the process.

In practice, about 90 per cent of the muriatic acid, calculated according to the above-described method, is required to thus effect the complete decomposition of a well-proportioned liquor. If it contains more hyposulphite than above indicated, less acid is, of course, to be used. About 90 per cent of the sulphur contained in the liquor is precipitated in an almost pure state, and settles exceedingly well within two hours. The supernatant clear solution of chloride of calcium is then drawn off, and another operation directly commenced in the same vessel as soon as a sufficient quantity of sulphur is collected in it, which will depend on the size of the vessel and on the strength of the liquor, ranging from 4 per cent to 7 per cent of sulphur; it is drawn out by means of a door at the lower part of the vessel into a wooden tank with a double floor, where the chloride of calcium is washed out by water, and the sulphur is then simply melted down in an iron pot. The product thus obtained contains only from one tenth of one per cent to one per cent of impurities, and is thus by far superior to any sort of brimstone in the market, though it has sometimes a rather darker color, caused by traces of sulphide of iron, or a little coal dust, which latter may have been suspended in the muriatic acid.

The total yield of sulphur obtained by the process amounts thus to 10 or 11 per cent of the weight of the salt cake used in making black-ash, or to about one half of the sulphur therein contained, and to about 60 per cent of the sulphur contained in the waste. It is still hoped, however, to considerably increase this quantity after some more years of experience.

The cost of production is inconsiderable. In the different continental and English works, where the process has now been working for years, the expense for wages, fuel, and maintenance amounts only to $5 per tun of sulphur, and the outlay for the apparatus will be more than covered by the net profits of the first year. An establishment making three tuns can save at least $2,000.

(To be continued.)

For the Scientific American.

THE RELATION OF MECHANISM TO ART.

[BY W. L. ORMSBY, JR.]

The facility for duplication produced by mechanical processes has aided signally in the perpetuation of artistic productions. In the single department of casting, the varieties of artistic forms that are multiplied become illimitable. The commonest articles of domestic use, with the aid of mechanism are embellished by the *perpetuation* of the work of artists. Even so ordinary an object as a parlor stove is now decorated with scrolls and flowers and other devices not unworthy the chisel of a sculptor. The application of the same principle of casting gives us beautiful ornaments in gas fixtures, chandeliers, picture frames, cornices, type, and a million other devices of the plastic art.

Likewise the wonderful improvements in printing have perpetuated the achievements of the draftsman and engraver, until the cheapest book is incomplete without its complement of artistic illustrations.

In articles of dress, too, the combination of mechanism and art is peculiarly striking; see the exquisite texture and patterns of brocades, of embroideries, of laces, and even of the cheaper goods. How beautifully is the universal taste for regular forms ministered to, while in even the cheapest calicoes are seen some productions of great artistic skill.

Take the single article of carpets, of all the varied products of the loom, and we find that in the combination of colors, the delineation of objects, the art of the painter is often fairly rivaled. The cheapness of duplication by mechanical means is also an essential requisite for its success in multiplying artistic forms. Take, for instance, paper hangings—the finest of which are almost undistinguishable from fresco painting—a day-laborer can paper the walls of his dwelling almost as cheaply as he can whitewash them.

The difficult and expensive art of engraving affords one of the most striking illustrations of the point in question. Few persons are aware of the immense expenditure of time and money and artistic ability that are necessary to produce an ordinary bank note or a common stamp. The elegance that marks them would be absolutely unattainable without the wonderful mechanism through which an expense of a hundred thousand dollars is made available on each two cent letter stamp.

Nor should we overlook in this connection the beautiful shapes that are furnished by such absolute mechanism as the turning lathe. The ornamentation of bank notes, of the backs of watches, of furniture, machinery, and tools, by the simple operations of the lathe are familiar examples.

And now, in obedience to a great law, and following in the train of mechanical triumphs comes chromo lithography, perpetuating the skill of the painter as printing has perpetuated the skill of the engraver.

The whole subject is suggestive of the correlation of the arts. Just as individuals cannot improve without improving the nation, so one art or science cannot advance without carrying the sister arts and sciences in its train. The triumph of mechanism has been the perpetuation of art.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

The California Fairs.

MESSRS. EDITORS:—While waiting to keep an engagement in this *Fair* building of the Mechanics' Institute of San Francisco, I am reminded that your readers might be pleased to see even a hasty sketch of the two California Fairs—the State Fair at Sacramento recently closed, and this one at San Francisco, recently opened.

Of the State Fair at Sacramento I cannot say too little; while of this one I can scarce say enough, in the little space at your disposal for such a purpose. To say that the State Fair, so much and so loudly heralded, was a disgrace to California, and would have been unworthy as an exhibition of the industry and productions of any fourth-rate county within her borders, is to speak a simple truth.

The one thing which seems to have engrossed the faculties of the managers, was the half-mile race course. The entire machinery department consisted of a boiler, engine, and shafting—all the requisites for machines in motion, without a single machine of any kind to be thus exhibited; a part of the space set apart for this purpose was used for the display of a slim collection of agricultural implements.

Pleasanter far is the duty of calling attention to this Fair of the Mechanics' Institute, held in a building some 250 by 150 feet, provided with double galleries on each side of the nave (which is not far from 75 feet wide and 50 feet high) constructed for the purpose, and well filled in every part with articles of use and novelty.

The central feature of the main exhibition room is an oval shaped fountain, around which, and freshened by the ceaseless play of the waters, the most tempting fruits are displayed—fruits of all seasons and of almost every clime. Beans and blackberries, apples and apricots, grapes and lemons, melons and oranges, pears and pomegranates, peaches and pumpkins, plums and potatoes, peppers and quinces, strawberries and squashes. Turnips and vegetables, of every kind, are exhibited in great profusion, while pilfering fingers are restrained by the intervention of coarse wire nettings. Flowers and plants, too, of number and variety uncounted, are assigned places in the immediate vicinity; and behind them again are stands, where new cider is made, which, with California Vichy water, slakes thirst for the thirsty.

The general effect of the decorations of the room is excellent. Indeed the exhibition of taste in the arrangement of draperies and in the classification of articles is well worthy the attention of our American Institute managers. Without attempting to particularize, I will content myself with a partial enumeration of articles which attract my attention as especially novel or useful. Not the least of these is the Patent Agency—where a variety of quaint models appear, and behind them two specimens of printing presses, one a power and the other a hand press. On the latter is being printed a facsimile of Ben Franklin's first newspaper, copies of which are in very good demand at a dime each.

A suspension bridge connects the galleries near the fountain, and enlightens the otherwise ignorant as to the modes of making and using wire cables for such purposes. The bridge is the joy of all juvenile and many senile visitors.

Did you never think of the advantages of windows without weights? Here is Sullelt's ball window catch which holds either upper or lower sash at the precise point desired—a more simple and effective appliance for the purpose than I have heretofore seen.

Dreamed you never of an endless band saw for scroll as well as heavy work? Many a time have I, and my dream here has substantial shape in the contrivance of Otis Jackson. The wheels upon which the saw moves are about five feet diameter, made of iron, tired with leather; and the ends of the saw are skillfully brazed together, forming, substantially, an endless belt. Have you broken your back at your father's wood pile? Then you *would* look with pleasure on Noel's application of crank power to a common buck-saw, worked in connection with a common buck for the wood.

And if the pump were as absolute a necessity in New York as it is in California, your eyes would sparkle at sight of Atwood & Bodwell's self-regulating wind-mill for operating it, and also at that of the Gerrish submerged force pump as a substitute for the usual style of the article.

Had you plowing to do, and California soils in place of the stony hardnesses of New England, you would debate less upon the instrument itself than upon the ease of the seat. The several gang plows in use here do their work well, and all of them provide a comfortable seat for the driver, while the work goes on. Nearly a dozen different specimens of gang plows, the work of as many different makers, are here on exhibition. They consist of two plows managed in connection with a two-wheeled vehicle on which the driver rides.

If the construction of water and sewer pipes required your consideration, you would doubtless respect the asphaltolin pipes, and wonder why the same material might not be applied to tunnels of large caliber.

A blower on Root's plan, built at the Globe Works, Stockton, would not seem wonderful, because you will find a larger instrument in your city.

Enough, however, of machinery, and almost enough of the Fair. Let us enter only, before we leave, this large room built and lined with the different kinds of wood which grow in California. The wood riches of all the earth are seemingly gathered here, so many are the kinds and so well polished the specimens. Strahle & Hughes, who exhibit, call it the "Laurel Palace," and a palace it certainly is—worthy the Fair and worthy the State. B.

San Francisco, Sept. 27, 1869.

On the Assimilation of Inorganic Substances in the Animal Economy.

MESSRS. EDITORS :—The idea that inorganic substances are not assimilated in the animal organism, advanced by a correspondent, pages 166 and 230, current volume, is a favorite theory of the so-called vegetable or Indian doctors, to which class his authority, Dr. Bellows, appears to belong. The theory in question is founded on the obscure notion that some mysterious change takes place when an inorganic compound is absorbed in a vegetable, that it is vitalized, and that only vitalized compounds can be appropriated by living animals. Unfortunately this theory is not borne out by the facts; the very contrary is true. It might, with some slight chance of success have been defended many years ago, when the sciences of synthetic organic chemistry and biology were yet unborn ; but since we have learned to compose many so-called organic compounds, for instance, alcohol, gum, sugar, etc., and even urea and several other animal substances, out of their constituent elements—without the aid of living organisms—and that these thus artificially manufactured substances are perfectly identical, to all intents and purposes, to those derived from the usual organic channels, and act on the animal system in the same manner, the doctrine of the so-called "vitalism" is exploded.

We know now, also, that there is no difference whatever between phosphates, sulphates chlorides, etc., if made by art or derived from vegetable sources, so that, for instance, the phosphate of lime or soda, naturally found in the bran of flour is not in the least different from any other compound of that name, from whatever source it be derived, provided it be pure.

In regard to the main point, the absorption and assimilation of inorganic matter, in the animal body ; this is a so well established fact as to make the contrary assertion almost unworthy of contradiction. Water is certainly an inorganic compound, and this is so largely assimilated that the great portion of the bodies of all animals consists of water ; the salts contained in the divers mineral waters, are so thoroughly assimilated as to cause changes in the constitution of the individuals using them, even the external applications in the shape of sulphur and other baths, have similar effects ; and lead, mercury, arsenic, etc., either externally or internally, are so thoroughly assimilated as to cause painters' colic, the mirror-makers' paralysis, and the finding of arsenic in the very bones of the subject. In such cases the antidotes must also be assimilated in order to find the poisons and perfect a cure.

It may be asserted that these cases must not be called assimilation, and are only an absorption, because such substances do not belong in the living organism ; by the following facts, however, I will prove that if substances belonging to the organism are absorbed in the same manner, they finally perform all the functions of assimilated ingredients.

The cause of chlorosis is that the digestive apparatus is unable to absorb the small amount of iron present in many kinds of food. Now experience has taught, in general, that if certain necessary substances are not absorbed, all that we have to do is to present these very substances in large quantities, and that finally the system will be compelled to absorb them. So in chlorosis, iron is administered with the food, either as a metallic powder, an oxide, or as a chalybeate mineral water ; if inactive, the dose is simply increased, and finally in some cases the disease is only overcome, by giving extraordinary large doses, which compel the system more forcibly to absorption. If once absorbed the difficulty is overcome, assimilation follows at once. Recent investigations have shown that a small quantity of manganese is always present in the blood with the iron, and as the iron administered is always chemically pure, it was suggested that some cases of failure in the iron treatment might be due to the absence of the necessary manganese. The idea was at once acted upon, and now, in case of non-success of the iron treatment, all physicians who are posted up in regard to the progress of their art, add a small quantity of manganese or a suitable manganese compound to the iron, and always with perfect success. The iron and manganese pills, or quinine and manganese pills, have, in fact, become a standard prescription.

If any one still doubts assimilation of inorganic substances by the blood, let him try to take phosphate of iron daily. Many individuals will soon find that their blood becomes so rich under this treatment that it shows itself in pimples over the face and elsewhere. Many potash compounds have the same effect.

The above will suffice, I believe, to settle the point in question, and I will only add that the assimilation of inorganic compounds seems highly probable, if not proved, by the following facts : The rapid cure of sore gums by internal use of chlorate of potash ; the prevention of morbid profuse perspiration by the internal use of mineral acids ; the cure of epilepsy by sulphate of zinc ; the blue coloring of the skin by internal use of nitrate of silver ; the sedative effect of bromide of potassium ; the resultant brittleness of the bones by the prolonged use of iodides ; the nourishing effect of lime water, if added to milk or certain other kinds of food.

P. H. VANDER WEYDE, M. D.

Tyndall's Theory of Comets.

MESSRS. EDITORS :—In your notice of the ingenious theory of Dr. Tyndall (p. 219), in relation to comets, I find a corroboration of a belief of my own that "all space is filled with imponderable matter except the small part occupied by the planets—which are themselves pervaded by the same—and that this ungravitating matter is the medium for the action of the imponderable agents, electricity, magnetism, etc., which agents are the manifestation of different elements of that matter."

The nucleus of a comet is no doubt ponderable, as it observes the laws of gravitation, but is so rare and transparent that it obstructs only the calorific rays, while the actinic, passing through, precipitate the imponderable matter of space, rendering it visible, the same as they precipitate invisible vapor of water or other matter, this being again dissipated as soon as the shadow is removed.

If the nucleus were an opaque body the shadow would be a cone, unlike a comet's tail, but being transparent the rays passing through are more or less refracted and reflected, causing this pseudo-penumbra to assume various shapes, according to the nature of the interruption or the varying direction of the deflection.

May not the "luminous envelopes" which surround the nucleus, and which you say are not accounted for by his theory, be, on the other hand, a corroboration of it; if it is admitted that the sun's actinic rays may be reflected from the surface of the nucleus, or from surfaces within it, into the spaces immediately around it, with even greater power than have those which pass through with but little refraction ? This theory, if correct, makes of the sun almost a creator, realizing the dreams of the magi.

As the "vortical" theory of Laplace and Herschel, if true, demonstrates that there was a *time* when creation commenced, and therefore a power which instituted at that time a new sun, so I do not despair of our yet finding out the way in which it was done. Because we know that gravitation was infused into some matter, it does not follow that all matter is subject to it. CHARLES BOYNTON.

How to Kill the Fleas and the Dog.

MESSRS. EDITORS :—Your correspondent, G. W. B., on page 230 of the present volume, says that "a mixture of carbolic acid with water—one fourth acid, three fourths water—put on a dog will kill fleas at once." There is a somewhat important omission here—it will kill the dog also.

Your correspondent undoubtedly means one fourth of the *saturated aqueous solution* of carbolic acid, three fourths water. Carbolic acid is a crystalline substance (chemically an alcohol rather than an acid), which is soluble only to the extent of 5 per cent in water. A solution for the purpose of killing parasites on animals should contain little more than 1 per cent of carbolic acid to 99 per cent of water.

There is a very dangerous concentrated fluid carbolic acid in the market, consisting often of 90 per cent of the pure acid, dissolved in some of the hydrocarbons associated with it in the process of manufacture. I have purchased this of a druggist of the highest reputation in the city of New York under the name of "solution of carbolic acid," and have suffered accidentally in consequence from its cauterizing effects. I have been cognizant also of several serious accidents from confounding this concentrated fluid with the *saturated aqueous solution* of carbolic acid, which is perfectly safe and strong enough for all applications, except surgical, to the living subject.

It is important that some nomenclature should be agreed upon, and rigidly adhered to, to distinguish these preparations. Otherwise, in the extended use of carbolic acid, fatal accidents will be liable to occur.

WM. F. CHANNING, M. D.

Providence, R. I.

Demuth's Improvement in Glass Window Lights.

MESSRS. EDITORS :—I call your attention to an error in your notice of Demuth's Glass Window-lights, published in your edition of October 16. You state that the illuminating power of the light transmitted through the rods is not materially impaired, whereas it is not only not impaired but on the contrary materially increased, or at least concentrated to such a degree that the back part of an apartment will become nearly as light as the front containing the lights. The refracting power of the rods, which like so many lenses collect the radiating rays into a parallel beam, produces this effect, which can never be obtained by flat panes, and which, with rods of different tints, is exceedingly beautiful.

By publishing the above correction you will oblige

New York city. VICTOR E. MAUGER.

Fresh Water at the Seaside.

MESSRS. EDITORS :—Through the constantly shifting sands of Cape Cod, sixteen to twenty feet from high water and not more than three feet above it, is sunk an iron tube to a depth of fifteen feet, at which point is found fresh water of the sweetest quality and in inexhaustible quantity, which rises and falls in the tube regularly with the tide of its near neighbor the Atlantic ocean.

Yet though more than one hundred barrels have been pumped from it at one time, not the slightest trace of saline matter has been found to mar the freshness of its taste. Of such fine quality is it that vessels supply themselves for a sea voyage from this well.

I think the above facts may prove themselves a curiosity to others as well as myself, and that you will be able to give an explanation of the phenomenon through your columns.

North Brookfield, Mass. JOHN Q. ADAMS.

Glass Manufacture in the United States.

MESSRS. EDITORS :—Some singular statements get into newspapers sometimes. Here is one copied from the Boston *Commercial Bulletin* of Sept. 11, that for accuracy is not much to be depended upon. Under "Pittsburgh Items" it says, "In June last, Redick & Co. began the manufacture of extra annealed flint glass lamp chimneys—they are the only manufacturers who anneal their chimneys—which process renders them strong and clear."

It is most assuredly the first time that the wonderful revelation has been made that glass is rendered clear by annealing, and the *savans* who have made researches upon this subject have been sadly in the dark if we are to believe Messrs. Redick & Co. Yet Réaumur, Dartigues, Dumas, Bontemps, and others, all agree that glass slowly cooled (annealed) may be devitrified, that is to say, that in cooling glass slowly, the elements arrange themselves in such a manner as to form a certain refined crystalline silicate, which separates from the remaining mass and produces thereby a milky and rough grained glass.

If the object of publishing such a statement is to sell the wares, it is a poor kind of a puff ; and instead of recommending the goods it advertises the ignorance of the manufacturers.

While on this subject of glass, let me say a word in regard to the comparative degree of efficiency between European and the American manufactories. It is universally conceded, that although we have vastly progressed in this country, especially in pressed glass ware, we are still sadly behind hand in many branches. It is true we are making a very fair article of plain window glass, but have we yet made any colored window glass ? Can we compete with the French, the English, for fine cut glass ? Can we imitate or excel the Bohemian in fancy colored glass ? Can we rival with the French, English, and Belgian manufacturers in making plate glass ? Do we generally produce as fine an article of glass as the French and Bohemians do ? Have we ever applied etching to glass as it is now so extensively done in France, or have we yet made any trials in applying photography to ornamenting glass ? With the exception of one or two cases, have we used the Siemens furnaces with as much success as they have in Europe ? Can we imitate the artistic *chefs d'œuvre* of production that are to be seen in Europe in the chandelier and fountain line ? Do we gild and paint glass like the French and Bohemians ? Can we generally produce those marvelous articles blown by the French, so thin, so brilliant, and so regular in workmanship ?

To the above and to many other questions I fear we must give a negative answer. The aim of most of our glass manufacturers has been to improve simply in pressed wares ; a very worthy object it is true, yet it is well known that pressed glass can never attain the perfection of blown and cut wares. An inexperienced person will soon be able to distinguish one from the other, and there is a limit beyond which improvements in pressed wares can not go. Improvements in presses have been made to render them easy to work and to adapt them to different sizes of molds. Molds have been made with combinations to mold all sorts of shapes. Some have been quite successful, but for all that, all pressed glass bears its stamp and can not be compared to blown and cut glass. Is is not time then for some of our glass manufacturers to devote their time and intelligence to other purposes ? With the exception of one or two Eastern manufacturers, we have but little or no colored glass made in this country. Where is the fault ? It cannot be the cost for we have plenty of materials and at reasonable prices. I fear it is not this but the want of the skillful labor they have in Europe. It is a crying shame that we should send to Europe for all the plate glass we use, and we use a large quantity of it, while we have everything in profusion in this country to make glass. Attempts have been made in this country to make plate glass but so far have been unsuccessful. Another attempt is now being made at New Albany, Indiana, according to a communication printed lately in the SCIENTIFIC AMERICAN. Let us hope that this, like the others, will not be a failure, but I think I can say, almost positively, that the non-success of these enterprises is not due to disadvantages in materials, but is attributable to an over-confidence and self-reliability in the knowledge of those who undertook it without having skilled and experienced hands to help them. Mr. Lockwoode, in the communication above referred to, says, that "there is no such word as fail in the dictionary" of the gentleman at New Albany. Let us hope that he may not be called to print it.

Washington, D. C. C. COLNE.

Testing Boilers.

MESSRS. EDITORS :—Sometime since a correspondent suggested a boiler test, to be tried at the present Fair of the American Institute. It consisted in connecting the boilers to be tested to a 40-horse power engine, arranged to drive an immersed screw propeller ; the boiler which would produce the greatest number of revolutions of the propeller with a given amount of coal, to be adjudged the "champion boiler."

There would, doubtless, be some fallacies involved in a test of this kind. The power required to put a propeller in motion is dependent, to a great extent, upon the velocity with which it revolves, varying nearly as the square of the velocity. For example, it would require one hundred times the power, per revolution, to communicate one hundred revolutions per minute to the propeller, that it would take to communicate ten. Consequently, if the proposed test were put in practice, the "champion boiler" would be the one which fired slowest and ran the propeller at the lowest velocity. F. G. FOWLER.

Bridgeport, Conn.

Improvement in Farm Gates.

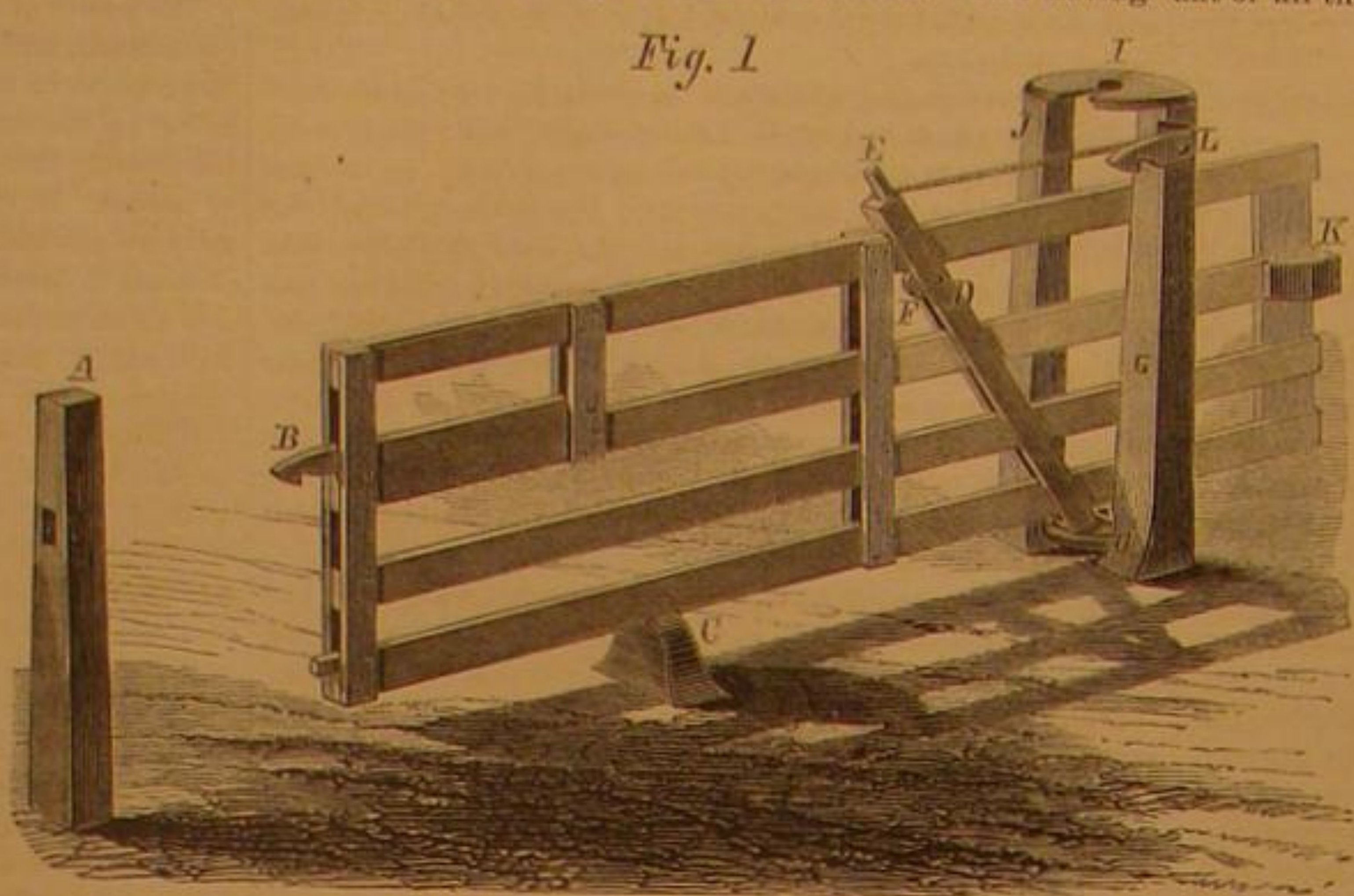
Nothing is more unsightly around a farmer's house than a dilapidated farm gate. Many improvements have been patented, but the one illustrated herewith is among the latest. As these modern gates have been adopted by farmers a vast improvement in the appearance of country homes is apparent. The gate shown in the annexed engraving is claimed to possess advantages not to be found in any other in use.

Fig. 1 shows this gate partially opened; and Fig. 2 shows it entirely opened, and held from closing by a latch. In Fig. 1, if the gate should be slid to the left it would meet the post, A, and the latch, B, engaging with the post would fasten it shut. When partially opened, the gate rests on a block, C, at the middle of the bottom, with a notch at the top to admit the bottom rail of the gate, the first motion in opening being a sliding to the right.

It has a wooden hinge bar, D, composed of two pieces of timber playing on each side of the gate, with a gudgeon or hinge pin, E, at the top and a similar one at the bottom. This hinge bar stands at the angle shown in Fig. 1, when the gate is closed, and remains in that position until the middle vertical bar of the gate meets it as the gate is slid open.

A roller, F, between the two parts of the hinge post, D, allows the gate to be slid back to the position show in Fig. 1 without disturbing the position of D. A cord running from the post, G, to the top of D, limits the inclination of the latter.

In opening the gate after it has reached the position shown in Fig. 1, it engages with the hinge post, D, the bottom of which is held by, and plays in a step H. The hinge post is then thrown back to a vertical position, lifting and carrying the gate with it until the gudgeon, E, enters a slotted bearing, I, nailed on to the tops of the posts G and I. These posts are not set one directly in front of the other, but one a little to one side of the other to allow the gate to swing between them.

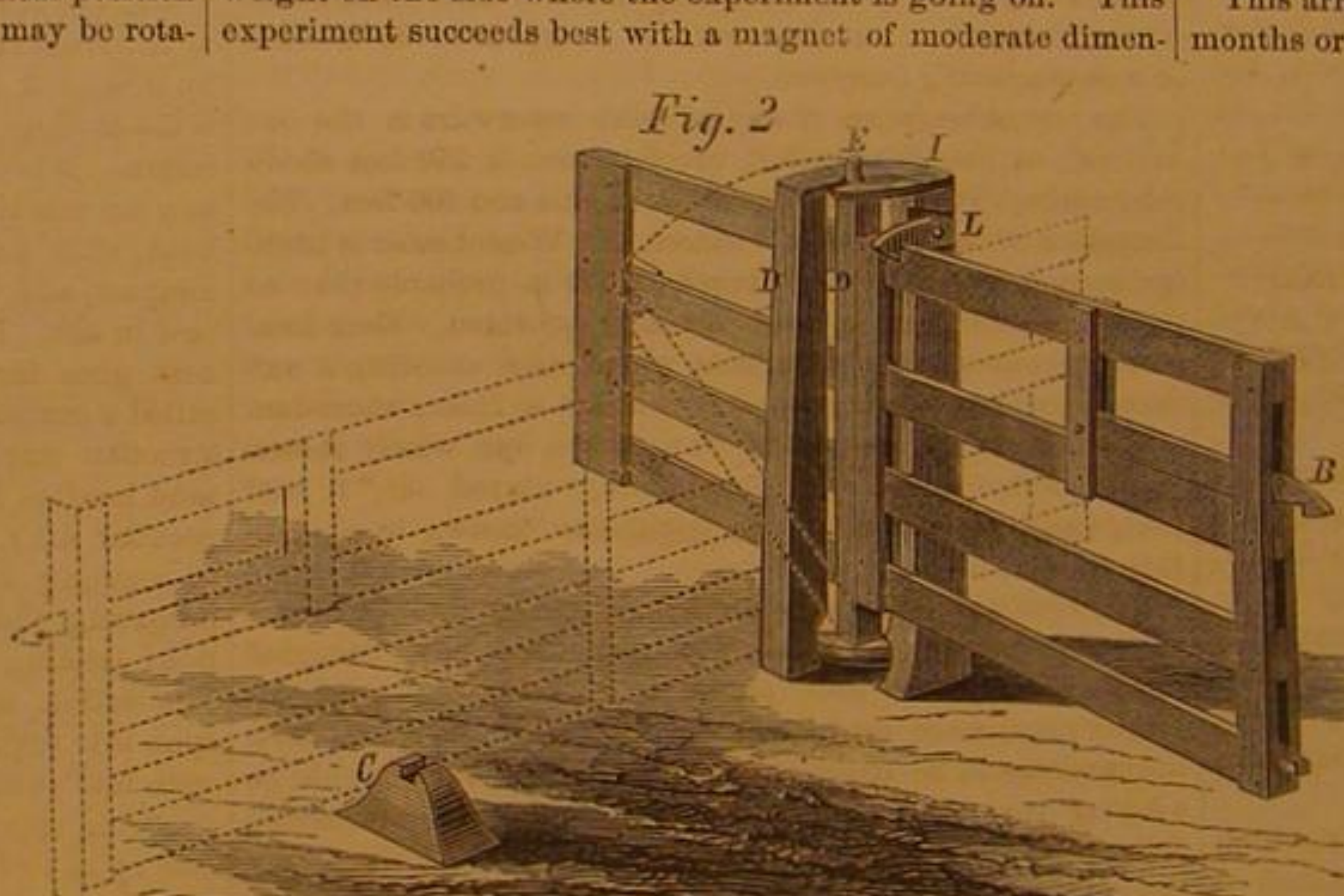


MOXLEY'S FARM GATE.

As soon as the hinge post, D, reaches the vertical position the gate is balanced on its center of gravity, and may be rotated upon D until it reaches the position shown in Fig. 2, in which it is held by the latch L.

Fig. 2 shows by the dotted lines the first position of the gate and also exhibits the positions of the different parts when the gate is fully opened.

The hinge post, D, may be made of a proper length to elevate the gate above snow in winter, and the gate may be unhung as readily as gates with the common hinges. Nothing but wood and common nails are employed in its construction.



Patented April 27, 1869, through the office of the Scientific American, by J. T. Moxley, whom address for further information at Owasso, Mich. See advertisement on another page.

Suspension Bridges.

In the construction of suspension bridges, the ties, or ropes from the main cable, sustaining the roadway, are of twisted wire as well as the main cable. With the alleged advantages of twisted wire ropes, for this purpose, over straight iron rods, I am not aware that the less expansion and contraction of the wire ropes, by changes of temperature, have been recognized.

A hempen rope will contract in length when wetted, owing to the minute particles of water acting as wedges, increasing the width and the convexity of its spiral curves. The fibres of the same hemp laid straight, will not be shortened by wetting, but when in small fragments, as when made into paper, will be expanded in a similar manner by wetting.

An iron rod and wire rope of equal lengths would expand equally by heat, waiving the above referred-to property, but the wires of the rope being in contact, and expanding laterally, would, by an equivalent wedge-like action, increase the convexity of the curves and tend to shorten the rope. By a reverse operation cold contracts and flattens the spiral curves, and tends to lengthen the wire rope, as with the hempen rope, when dried and stretched.—*T. W. Bakewell.*

Steam Boiler Incrustations.

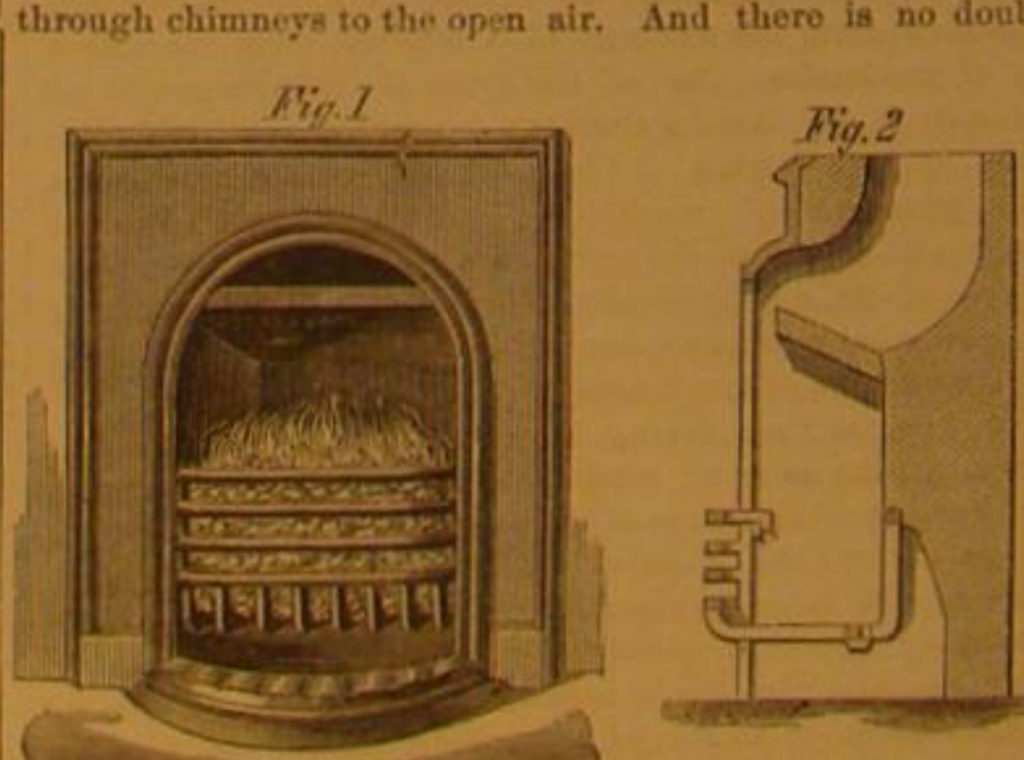
According to the *Chemical News*, M. E. Wiederhold states that the hardest incrustations of this kind are formed when the quantity of carbonate of lime amounts to from 20 to 25 per cent of the entire mass. He has found, by an experience extending over several years, that some kinds of clay, among these the substance known as *kieselschiefer* (a peculiarly fatty clay), when suspended in the water, contained in steam boilers, prevent the particles of carbonate and sulphate of lime dissolved in the water, even if the latter is very hard, to cling together, and become fixed to the sides of the boilers, forming there a hard incrustation. A series of experiments, made on purpose, and continued for a sufficient length of time to yield a reliable result, has fully proved that the addition to the feed-water of the steam boilers of fatty clays, especially the kind known as fuller's earth, entirely prevents boiler incrustations, even where, of necessity, very hard water has to be used as feed water. A loose, soft mud is deposited as soon as the motion of the water, due to the boiling, ceases on cooling. This mud readily runs off on opening the sludge valve of the boiler.

Increase of Weight During Combustion.

The *Chemical News* gives a description of an interesting experiment. A small horseshoe magnet is hung up at the beam of a balance sufficiently sensitive to turn with centigrammes; the poles of the magnet are immersed for a moment in the *limatura ferri* of the chemists' shops, and a beard of small particles of iron is caused to adhere to the poles; by means of proper weights placed on the scale-pan at the other end of the beam the equilibrium is restored. This having been done, the finely-divided iron is kindled, by approaching to it the flame of a Bunsen gas burner, and continues to burn. While burning, it will be seen that the arm of the balance on which the magnet is suspended considerably deviates from the horizontal position, thus indicating an increase of weight on the side where the experiment is going on. This experiment succeeds best with a magnet of moderate dimensions; the horseshoe magnet applied in this instance weighed, without its armature, 210 grammes, and can bear a load of 12·5 grammes of iron; when this is altogether converted in magnetic oxide, by combustion, the increase in weight will be about 4·7 grammes.

IMPROVEMENT IN OPEN FIRE GRATES.

Great as have been the improvements in all kinds of domestic heating apparatus, we all know that a very large proportion of the available heat still eludes us and passes through chimneys to the open air. And there is no doubt



also that much of the combustible matter is distilled rather than burned, and passes off as gas, not only failing to give its share of heat but taking with it a portion of the heat furnished by that which is consumed.

Our engravings exhibit a form of grate called by the inventor a Perfect Combustion Grate, calculated to obviate these losses, by securing more perfect combustion, and using to greater advantage the heat produced.

To secure these ends the grate is constructed as shown in front elevation, Fig. 1, and in section, Fig. 2. It will be observed that the mason work at the back of the grate is recessed to allow the air to flow freely up around and to enter the interstices of the grate as well at the back as the front. By similar means the air also enters the ends of the grate to supply all parts of the incandescent coal equally with the oxygen necessary to combustion. The air also becomes heated in this chamber previous to entering the fuel, and is thus in the best condition to favor combustion.

The ashes, when the grate is stirred, fall back into the recess instead of pouring forth into the apartment, and thus one of the objections to the use of grates, which has greatly retarded the employment of this most wholesome and pleasant of all the means employed for burning coal in dwellings is removed. The inventor claims that the use of this grate will cure smoky chimneys on account of the more perfect draft secured.

The back is made separate, and can be used with ordinary baskets, in grate fronts of any pattern and with all grates by re-setting. It is simple in construction, and not liable to get out of order. The inventor also states that air-heating compartments are successfully used in connection with it.

State and county rights may be obtained on application to the inventor, who will also furnish full-sized patterns gratis to purchasers.

Patented through the Scientific American Patent Agency, August 25, 1868, by G. H. McElevy, Newcastle, Pa., who may be addressed for further information.

Lurmann's Blast Furnace.

Engineering states that a considerable number of German ironmasters have, during the last two years, applied to their furnaces the system of Mr. Lürmann, the manager of the Georg-Marien Mining and Iron Company, of Osnabrück, Prussia, the improvement consisting in closing the front of the hearth, thereby dispensing with the dam stone, tymp, etc. A scoria outlet is set in the closed breast at a distance of about 6 in. below the tweers, and through this outlet the slag runs off regularly and constantly. The tapping hole is placed where the heat is greatest.

This arrangement has been successfully worked for six months or more at the Old Park Iron Works, Shropshire, and more than one of our leading ironmasters have expressed their intention of adopting it. Its advantages are thus enumerated:

1. The slag discharges itself through the scoria outlet at about the same level, therefore there are no vacillations of the slag in the hearth, and the corroding of the wall is diminished.

2. As there is no fore-hearth, there are of course no repairs, and no breaking up of the scoria crust in the same. This is equal, as shown above, to a saving of at least twenty days per year. Suppose a large furnace produces forty tuns per day, the same will yield at least eight hundred tuns per year more, if built on Mr. Lürmann's principle than if it were of the ordinary construction.

3. As there are no interruptions, the furnace does not cool. It works more regular, as the heat in the furnace is always the same.

4. The doing away with the dam and the fore-hearth allows the removal of the tapping-hole from the former into the wall of the hearth. The opening of the tapping-hole is then easy, as it is close to the greatest heat.

5. The completely-closed hearth allows a considerable increase of the pressure of the blast, because a throwing out of materials has become impossible.

6. The increase of the pressure is always of great importance, but especially where pit coal, anthracite, etc., are used; and where the layers are compact. The number of charges can be greater, effecting a corresponding increase of produce.

7. The augmentation in the number of tweers, and the equal distribution of them, made feasible by the doing away with the forepart of the hearth, allow a better and equal distribution of the blast in the hearth; the furnace therefore works better, and a greater quantity of ore is smelted, provided there is sufficient blast.

8. The number of hands may be lessened, as the operations are few and easy; the same need not be of great skill and experience. No fire clay and other refractory materials for the repairs, and less tools are wanted. It may be mentioned that formerly the smelters of Georg-Marien-Hütte, when working, were almost stripped; now they are always in full working dress.

To Clean Oilcloth.—An oilcloth should never be scrubbed with a brush, but, after being first swept, should be cleaned by washing with a soft flannel and lukewarm or cold water. On no account use soap or water that is hot, as either would have a bad effect on the paint. When the oilcloth is dry, rub it well with a small portion of a mixture of bees' wax, softened with a minute quantity of turpentine, using for this purpose a soft furniture polishing brush. Oilcloth cared for in this way will last twice the time than with ordinary treatment.—*Septimus Piesse.*

We have received a number of communications on the subject of street crossings, none of which seem to us to contain any practicable suggestions, they are therefore declined with thanks.

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK

O. D. MUNN, S. H. WALES, A. E. BEACH.

☞ "The American News Company," Agents, 121 Nassau street, New York.
☞ "The New York News Company," 8 Spruce street.

VOL. XXI., No. 17...[NEW SERIES.]... *Twenty-fourth Year.*

NEW YORK, SATURDAY, OCTOBER 23, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

FACTS ABOUT THE CROTON WATER SUPPLY.

One of our cotemporaries says, very irreverently, of the Croton, that it is "played out," and recommends resort to Artesian wells.

The aqueduct which conveys the Croton to the city is constructed to bring down 60,000,000 gallons per diem, but when the pressure is ample at the dam, which it is for ten months in the year, it delivers as much as nine or ten millions of gallons in excess of that quantity, and at the same time a vast amount of water runs over the lip of the dam.

Mr. Jarvis, some years ago, gaged the river at its supposed lowest point, and estimated the minimum supply at about 32,000,000 gallons, or about one half of the quantity required, and he recommended storage reservoirs to satisfy the wants of a future large population.

It will be recollected that in providing for its transmission over the High Bridge, the Commissioners then in charge laid but two iron pipes capable of carrying only a part of what the aqueduct brought, it being then supposed that the city would not require a larger quantity; but during Mr. Craven's administration of the Department additional pipes were laid equal to the whole power of the aqueduct. The growth of population and the use of the water for manufacturing purposes made this additional provision necessary.

Under the auspices of Mr. Craven, the Croton valley, which consists of 328·82 square miles, was carefully examined to ascertain its capacity to accommodate a still larger population, with its additional manufacturing wants, and it was found that in Putnam and Westchester counties there were fifteen places at which storage reservoirs might be conveniently constructed.

On the Muscoot, which receives the outlet from Lake Mohopac and falls into the Croton near Katonah; there were four of such sites. A, containing 485 acres, capable of storing 5,211,015,625 gallons. B, of 192 acres, capable of storing 1,701,835,207 gallons. C, 730 acres, capable of storing 6,589,-101,562 gallons; and F, 600·75 acres, capable of storing 6,120,-335,937 gallons. On the west branch of the Croton, which, after receiving the middle branch, unites with the east below Croton Falls village, there are three: D, covering 1,008 acres, and capable of storing 9,033,632,812 gallons; E, of 303 acres, to hold 3,369,206,857; and K, immediately above Croton Falls village, consisting of 512·74 acres, to contain 5,671,449,219 gallons. On the middle branch, two: L, 262·75 acres, to hold 2,828,218,733 gallons, and G, 452·19 acres, to contain 4,861,035,-156 gallons. On the east branch three: H, containing 384·67 acres, to contain 2,490,062,500 gallons; I, 449 acres, to contain 4,205,820,654 gallons; and J, 191·38 acres, to contain 2,314,074,703 gallons. On the Titicus, which unites with the Croton at Purdy's Station on the Harlem Railroad, one, M, which floods 492·75 acres, to store 4,392,131,445 gallons. On Cross river, an affluent of the Croton, at Katonah, N, covering 197 acres, for storing 1,676,049,171 gallons; and O, on Beaver's Dam Brook, which crosses the Harlem below Mount Kisco, consisting of 239·47 acres, and to store 2,182,337,109 gallons. Their joint capacity exceeds sixty-one billions of gallons, and they cover over six thousand five hundred acres of land.

In 1867, Mr. Craven, finding that it had become necessary to guard against the want of water in a season of drought, procured authority to construct one of the fifteen reservoirs, which he had located; and after commencing the one marked G, and abandoning it, because of the danger of flooding the celebrated Tilley Foster iron mine, finally decided on building the one at Boyd's corners designated as E.

By reason of the failure of the original contractors, the dam at E, now raised (except at the north end) over 40 feet of the 64 which is required, is being worked by their securities under such disadvantages that it will not be finished much before 1871, but it is possible to use it in the summer of 1870 for storage up to the hight which may then be reached. It will be seen, however, as this reservoir is capable of holding 3,369,-206,857 gallons, it will, when finished, supply 60,000,000 gallons per day for about fifty-five days, supposing that the evaporation and loss on its way to the main dam shall be equaled by the ordinary flow of the stream.

Inasmuch, however, as the Croton is supposed to furnish more than half that quantity in the season of the greatest drought, it is clear that the city will, even during dry seasons, be supplied with as much water as the aqueduct is competent to deliver.

The great drought which has prevailed for most of the summer, along nearly the whole Atlantic coast, was broken so far as this region is concerned, by the rain which fell on the last Saturday and Sunday of September; but as the ground was dry beyond any recent experience, the dam at Croton was raised only a few feet. The rain of Saturday evening and Sunday and Monday, the 2d, 3d, and 4th of October, had, however, a visible effect in swelling the Croton to the proportions of a freshet, yet although more rain is wanted, all fears of a scarcity of water may now be dismissed. Under any circumstances the minimum flow will furnish thirty gallons per day to each inhabitant, which is more than will be required for household purposes.

On Monday, the 4th inst., the water in the main dam had risen by 10 o'clock, A. M., so that it commenced to run over, and at 2 P. M. the volume pouring over was a foot in depth. Inasmuch, however, as the city is now using nearly the whole supply, the reservoir in the city will scarcely be filled before some time in November.

Nothing has contributed more to the convenience of the city than its supply of water at an elevation which, among other benefits, makes it the power or carrier for removing the refuse from houses. The growth of New York in manufacturing industry, has been so much promoted by using the surplus, that the time is not distant when other storage reservoirs and a larger or additional aqueduct will be required. From the particulars we have given, it will be seen that whenever the city chooses to avail itself of this bounteous provision, not only our increased domestic wants, whatever their extent, will be easily satisfied, but there will be a surplus to be devoted to manufacturing purposes.

The lowest elevation of any of these reservoirs is the one laid out on the Beaver Dam brook, which is 250 feet above tide water. The others vary between this and 600 feet. The formation of the valleys of Putnam and Westchester is highly favorable to these structures, and it is probable that no city of great extent is more liberally provided. Each location is inclosed with high hills, which, after allowing a sufficiently wide expanse, suddenly contract so that a short dam will complete the reservoir. The Croton was wisely chosen for this purpose, and so far from being "played out," it will eventually supply the largest population known to modern times.

The Commissioners who manage the Croton are not armed with any other authority over the contract now being executed except to declare it void, and then to relet the work. If proper vigor were used by those who act for the contractors, the work could be finished by next summer, but it would be a losing job. The contract called for its completion before this, and it is probable that sympathy for the securities, and the want of agreement which is shown between the city government and Board—which latter has the confidence of the community—prevent effective steps to secure the prompt completion of the work. The expenditure originally authorized is limited to a sum which does not permit the additional expense which haste would require. It is scarcely probable that a drought next summer will follow the one of this year, but if it occur the loss to the city will be visited upon those who are responsible for the delay.

CIRCULAR MOTION AND RECTILINEAR MOTION.

We find in an exchange an article endeavoring to draw amusement from the writings of Vitruvius, upon the principles of mechanics. One of the extracts made from this ancient author, who lived a short time previous to the birth of Christ, is the following: "I have briefly explained," he says, "the principles of machines of draft, in which, as the powers and nature of the motion are different, so they generate two effects, one direct, the other circular, but it must be confessed that neither rectilinear nor circular motion can without the other be of much assistance in raising weights."

Now, so far from seeing anything very amusing in this statement, the more we consider it the more we feel surprise at the comprehensiveness of the proposition. We see in it a generalization, the truth of which is exemplified in every machine. So large a proportion of the motions of the parts of machinery may be included in the classes rectilinear and circular, that the very few exceptions wherein the curvilinear motions are other than these, are scarcely worth consideration; and wherever they are employed it is always at a sacrifice of economy in power, the former motions being the least expensive of movements. Where, as in the case of the crank and pitman, a rectilinear motion and circular motion are coupled, there may be a loss in the application of the power to useful work, always consequent upon the increase of the number of moving parts in a machine; but when a crank drives a pitman, or winds up a rope on an axle, the losses suffered in these arrangements of working parts, are consequent upon practical difficulties. In theory there should be no loss. We know that these losses are referable to friction, inertia of parts, rigidity, etc., and therefore in theoretical formula for computing the powers of such arrangements, we do not take into account these losses. In the practical application of theory, allowances are made for such losses, but fewer such allowances are requisite when circular motion is employed than when any other is used to perform work. Motions in right lines, in circles, or arcs of circles, have proved in an experience of twenty centuries, to be, as Vitruvius said they were, the motions to be principally relied upon in mechanics.

Of these, circular motion is by far the most extensive in its application, and it is often an element where it is scarcely suspected.

The power of the inclined plane is generally referred to the plane itself, and mathematical demonstrations are based upon its proportions and inclination, but in the case of a round body rolled up the surface of an incline, the power may be calculated directly from the dimensions of the circle and the angle of ascent. In this case the element of rotary motion is generally overlooked, although it most certainly is an important element in lessening friction, which, when bodies are simply slid up an incline is an enormous source of waste; and, as we have said, it may be made the basis of computation for mechanical power.

It also is an element in the use of all hand percussive tools, as the hammer, ax, etc. The lever, too, also involves circular motion. It is evident that Vitruvius saw the full importance of these motions when he penned the paragraph alluded to; and as to confining the proposition to the raising of weights, it is not improbable that he comprehended the fact that a constant force is required to raise a given weight to a given hight in a given time, and appreciated the utility of making the force required to thus raise a given weight the standard for the measurement of power applied to any kind of work.

In modern times we use the foot-pound as a unit of work and thus have applied a hint which might easily have been drawn by a reflective mind from the passage quoted.

We may justly pride ourselves on modern progress in science; but the old philosophers undoubtedly saw and comprehended more than is sometimes credited to them.

THE EXHIBITION OF THE AMERICAN INSTITUTE.

An interesting branch of American manufacture, is that of SPOOL COTTON THREAD. This is exhibited in all the processes of the manufacture from the raw cotton to the finished thread by Greene & Daniels, of Providence, R. I. The first process is the carding, which is done in the ordinary way of carding cotton. It is then drawn in the usual manner, and then taken to a lap machine, consisting, essentially, of the old-time railway head, with drawing rolls attached. This machine is very compact, and, we are told, is the best machine for the purpose now in use. It is strictly an American machine. The cotton next goes through a process called combing, on a machine called a combing machine, the only machine of foreign construction employed in the work. This contains eight thousand needles, the action of which upon the cotton gives it a peculiar silky, light, and gauzy appearance, and the operation of combing may be considered as the finishing operation in preparing the cotton for thread; all the subsequent operations tending directly to the formation of the thread itself. The cotton, after combing, is drawn three times, and then spun into roving not larger than wrapping twine. It is now spun into yarn of wonderful fineness and uniform thickness, on a ring spinning frame. It next passes to a doubler, and is laid up in two or three-ply, as desired. From this machine it passes to a twister, which speedily reduces it to a fine and beautiful cord. These cords are then twisted on another frame to make a three or six-cord thread, as required. It is next reeled into skeins, then bleached, when it is ready for spooling. The spooling machine is a small but pretty machine, on which the winding is done with great celerity. The thread is now ready for market, except packing, etc. The finished thread shown is of excellent quality, and its applicability to sewing-machine work is demonstrated by its use on a sewing machine in the same inclosure with the machinery for manufacturing the thread. This display excites much interest in the visitors to the fair, and is a fine feature of the exhibition.

Adjacent to this inclosure stands a

CIRCULAR LOOM

for weaving twilled shade line, used for hanging pictures, window shades, etc. This loom weaves a texture which covers a strong central linen cord. The outer texture is of wool, silk, or cotton, or mixtures of these materials. The peculiarity of this loom is, that the shuttle stands still and the warp travels. It cannot be well described without diagrams, but it is a very ingenious, compact, and beautiful machine. It is exhibited by Palmer & Kendall, of New York.

S. R. Parkhurst, of Newark, N. J., exhibits a

BURRING MACHINE,

with patent steel ring feed rollers adapted to clear all grades and qualities of wool, even the most difficult Mestizo. He also exhibits a newly constructed double-cylinder

WOOL AND COTTON PICKER,

which, it is claimed, will pick, dust, bur, oil, and mix the wool ready for the cards at a single operation. He also exhibits a Double-cylinder Cotton Gin, improved by the addition of double cylinders and connected with a steel brush, and an endless slotted apron to convey the cotton in the seed to the ginning cylinders, thereupon securing the seeds and conveying them away from the ginning parts of the machine. It is claimed that this gin will separate the seed from 700 lbs. of cotton per hour, without injury to the staple. A

METALLIC WASTE CARD,

for working or reducing yarn, thread waste, and soft flannels to wool is shown by Chas. G. Sargent, of Graniteville, Mass.

These machines are, in principle, carding machines, clothe with strong, sharp-pointed steel teeth, so adjusted as to work on the twist of yarn or thread waste—combing or teazeling out gradually, the twist holding the fiber of wool together, and forming it into a thread. This gradual removing of the twist by the combing or carding process, leaves the fibers of wood composing the thread waste long and strong, with nearly the original length of staple. This gentleman also exhibits an improved machine for cleaning fibrous materials, essentially the same patented by him in 1861.

Chapin & Downes, of Providence, R. I., exhibit a

DOUBLE-CYLINDER LONGITUDINAL GIG,

which, among other advantages that have caused its extensive adoption, is arranged to work on broad or narrow goods, gigging two narrow pieces in the same time, and with as much facility as one broad piece.

C. L. Goddard, of New York, exhibits a patent Steel Ring Burring Machine, attached to a wool-carding machine. A peculiar feature of this machine is the solid packing rings, which are whole, like the steel rings, and make the cylinder permanent and solid until worn out. The same gentleman exhibits a

MESTIZO WOOL-BURRING MACHINE,

which combs open the wool by a comparatively slow and harmless process, and removes the dust, Mestizo, and all other burs, or other extraneous matters, at the same time, oiling the wool.

H. W. Butterworth, of Philadelphia, Pa., exhibits a warp dryer, which, however, has not operated at any time we have been at the Fair as yet. It looks, however, like a good machine.

The Empire Heddle Works, of Stockport, N. Y., exhibit one of their patent heddle frames, which might, from the adroitness of its movements, be almost fancied to be alive. It forms the eye in a new manner, making the twist next the eye so tight that the finest warp of woolen, cotton, or silk can not enter. It gives any requisite shape or size to the eye, and sharp angles, at the ends, are avoided. Both the machine and the heddles it makes, elicit much favorable comment.

These are, we believe, all the machines on exhibition connected with textile manufacture, and our readers will doubtless agree with us, that the display is very meager. It certainly does not properly exhibit the progress made in the manufacture of such machinery in the United States.

There is a fine display of

MACHINISTS' TOOLS

in the machinery department, though it cannot be called a very extensive one. It, however, pretty fairly represents the present status of the manufacture in the country.

The machinery of this kind is placed in inclosures allotted to the various manufactures. Three prominent manufacturers are represented, and we will notice the displays of each separately.

Hewes & Phillips, of Newark, N. J., exhibit a Planer which will do work 2½ feet in width or hight, having nothing novel except the belt-shipping lever, by which lead is given to either one or the other of the belts at will. A saving in wear of belts is claimed for this arrangement, and ease in taking apart and putting together. The belt shippers are supplied with gibs which can be replaced when worn. This firm also exhibit a 12-inch upright boring press, evidently a good tool. The pattern is new. The head can be raised and lowered independently of the feed, which is automatic. It has a peculiar arrangement of back gear, the head is balanced, and there are other good features. They have, also, on exhibition, a 6-inch slotter, a very compact and powerful machine, and a 20-inch lathe, 12 feet long. All these machines are handsomely finished and their designs are good. A peculiarity of the machines made by this firm, is eccentric gearing on all the tools where a quick return is desired, by which they secure a quicker return than any other similar machines exhibited. They have, also, in their inclosure, an 84-inch gear cutter, which, though presenting, perhaps, no novel features, is worthy of remark for its general excellence.

Wm. Sellers & Co., of Philadelphia, Pa., exhibit a 16-inch lathe, 13 feet in length, with a very novel and interesting feature. The feed gear for ordinary turning is composed of friction wheels, so arranged that, by a lever, which the workman operates with the left hand (the right hand remaining free to operate the other parts of the lathe), the feed may be slackened or accelerated at will, without any alteration in the speed of the lathe. This feature will give increased facilities in certain kinds of work, and the device is generally admired by the many experienced mechanics who witness its operation. This lathe has also a system of back gear by which a perfectly positive motion is attainable when desired. Sellers & Co., also show a powerful 48-inch slotter, with compound table, a shaping machine, for small work, and a bolt cutter, all of which are well known to the mechanical world, and need no special comment from us, except that they fully sustain the enviable reputation of this firm. They also exhibit several sizes of the celebrated Giffard injector, with a model showing the internal construction of this paradoxical instrument. Also, a 25-inch planer, of a very simple construction, and, in every respect, praiseworthy.

The shafting which drives these machines is supplied with oil from Wickersham's American Oil Feeders, manufactured and exhibited by J. B. Wickersham, 143 Front st., Philadelphia, Pa., which have not only received the indorsement of Sellers & Co., but many other prominent mechanical engineers throughout the country.

Wood, Light & Co., of New York, exhibit a bolt cutter which has some novel and valuable features. This machine is so constructed that the dies close accurately to a certain point, so as to form, in effect, a single solid die. When the cutting is done, these dies open automatically, and the bolt is shot out. It cuts threads of any length, always true to the body of the bolt, and all the bolts made by the same dies will be exactly alike. All the movements of the machine are automatic, the attendant's duty being merely to keep the machine in order and supply the blanks as wanted. The same firm exhibit a shafting lathe which attracts much attention and elicits much favorable comment. This lathe employs three cutting tools, and finishes a shaft at a single operation. A longitudinal trough is made in the bed of the lathe, and in which a solution of soda is placed, this fluid being pumped up and poured constantly upon the shaft at the point of cutting. This lathe, and the bolt cutting machine exhibited by this firm, and the lathe exhibited by Wm. Sellers & Co., combine more novel features than anything else among the machinists' tools displayed.

Outside of these inclosures are scattered about a variety of machines and implements, some of which we shall notice in the present article. There are on exhibition a considerable variety of

DROP PRESSES, BLANKING PRESSES, PUNCHES, DROP HAMMERS, ETC.

Charles Merrill & Sons, of New York, exhibit an Air-spring Forge Hammer, and a Drop Hammer. The air-spring hammer runs with little noise, and, by a peculiar arrangement of the cylinder and piston, the hammer is driven by air springs, which saves the machine from jar, other than the blow on the anvil or work.

The cylinder and hammer moving in vertical slides, each blow is square, exactly in the same place, and some kinds of die work can be forged as exact as under a drop, with greater rapidity. It is under the perfect control of the operator, and can strike light or heavy, slow or fast, as desired.

The drop hammer is so constructed that the operator can raise and drop the weight from any hight in the slides, can stop the weight after it begins to fall, or can let it settle down slowly.

Parker Brothers, of West Meriden, Conn., exhibit one of their highly finished and excellent power presses, which are favorably known to the manufacturing public as the Fowler Presses—an excellent tool, as we know from experience.

Mays & Bliss, of Brooklyn, N.Y., exhibit a beautiful Double-action Power Press, very strong and compact, of easy adjustment, with the feed rollers so constructed as to carry off all scrap metal. It is claimed that this machine will cut and bur 60,000 blanks in ten hours.

The Farrell Foundery and Machine Co., of Waterbury and Ansonia, Conn., also exhibit a Double-acting Press, of very compact form, which cuts and draws sheet metals into cup-shape at one operation. This is an excellent machine and deserves special notice.

Post and Goddard, of New York, exhibit an improved Emery Grinder. This machine was described and illustrated on page 324, last volume, of the SCIENTIFIC AMERICAN, to which the reader is referred. It may be bolted to a bench, the frame stand consisting of a single casting, containing bronze boxes for the spindle. It has rests, which can be readily set on the side or face of the wheels, and removed when not wanted, the whole forming a neat and convenient arrangement. This firm also exhibit various sizes of their Tanite Emery Wheels in connection with the above machine.

The New York Tap and Die Co. exhibit a fine collection of taps and dies, and the American Standard Tool Co. show a case of beautiful Twist Drills, arranged on a revolving platform. These drills are so well and favorably known that they need no praise from us. Any mechanic, who examines them, will pronounce them excellent.

Nathan & Dreyfus, of New York, exhibit their patent Self-Oilers and Engine Cups, composed of a transparent glass cup, mounted in Britannia and brass, provided with a hollow tube, inside of which is placed a loose-acting solid wire, which acts as a feeder and regulator. The wire rests constantly upon the journal, thereby acting with the bearing in its motion. The wire is so regulated inside the tube as to feed according to the demand only. There is no flow of oil whatever while the machinery is not in motion.

Charles Parker, of New York, exhibits an extensive line of his patent Parallel Vises with recent improvements, among which we notice an adjustable collar, which causes the jaws to open or shut, upon the slightest movement of the handle. There is thus no lost motion; and again, if the shoulder on the screw should wear, the collar can be so adjusted in a few moments that it will operate as readily as when new. Another improvement, is an adjustable spring so arranged as to hold the handle of the vise in any position or angle at which the hand leaves it, thus avoiding the pinching of fingers, which is of frequent occurrence, when the ordinary handle is in use; and, again, if the workman wishes to hold any article, however slightly, he can do so, when, with the ordinary vise, the weight of the handle would either grasp the article too hard or release it entirely.

There is, perhaps, no finer display in this department than the exhibition of

SAWS,

by R. Hoe & Co., of New York, and the American Saw Co., also of New York. It would be impossible for us to enumerate here all the varieties of saws displayed. They are of all sizes, and of all shapes known to the saw trade, finished and mounted in superb style. Our readers are already aware of the distinguishing features of the saws made in each of these establishments as they have long been extensive advertisers in these columns. Their wares have earned a very high reputation. These firms, undoubtedly, lead the saw trade in this country. Fine taste has been shown in the arrangement of their collections at the Exhibition, and they are greatly admired by all visiters to the department. The punching of the saw plates shown by the American Saw Co., is performed, we are told, by Ivens & Brooks' combined punch and shears, a model of which was shown us. It is to be regretted, that this fine tool was not shown in operation at the Fair, as it is certain that it would have made a most favorable impression.

We take this occasion to say a word upon the

ELECTRIC ORGAN

exhibited by Hall, Labagh & Co., of New York. The strains of this instrument attracted our attention as we were about to leave the building after taking the notes we have condensed into the present article. This organ was described on page 347, last volume of the SCIENTIFIC AMERICAN. It is the invention of H. L. Roosevelt, of this city. The inventor has furnished us with the following particulars in regard to it: "The keyboard is detached from the organ at a distance of about twenty-five feet, though it might as well be removed to the distance of twenty-five miles, excepting for the necessity of the organist hearing his own performance, since we know from from recent scientific investigations that the electric current will travel a mile almost instantaneously. The only connection between the key-board and the body of the organ is a bundle or rope of flexible, insulated copper wires, which may be carried in any direction without injury, and there is no pull or strain on these wires, as they are merely the passive means of conducting the electric current.

"The source of the electric current is an ordinary 'single fluid' battery, placed in any convenient position, composed of a series of jars containing a mixture of sulphuric acid and water, and in each jar is suspended a plate of carbon, in company with two plates of zinc, connected in the usual way by copper wires. From one end of this series of jars, a copper wire proceeds to the keyboard; and, if we take the case of a single key, for example, when it is pressed down by the finger of the player, we shall find this wire so connected that it forms an unbroken circuit and proceeds from the keyboard onward to the body of the organ, where it is coiled around a soft piece of iron shaped like a horseshoe, and thence returns from the organ to the other end of the battery. When a wire is connected with both poles or ends of a battery the current passes and the piece of soft iron becomes a powerful magnet; but the moment the current is broken, by disconnecting the copper wire, there is an instant loss of power. When the key of the organ is not touched the wire is not connected and the current passes; but on pressing down the key a metallic contact is formed, the electricity darts along the circuit and the electro-magnet, becoming at once excited, pulls down the pallet or opens the valve in the wind chest, admitting air to the organ pipes, and, with lightning speed causes them to speak. The couplers are applied and the stops drawn upon the same principle."

We also noticed, in passing, some specimens of artificial stone, manufactured and exhibited by the New York Stone Works, Bandman & Hollman, 75 William st., New York. This stone is a conglomerate sandstone, artificially produced, and is molded into large blocks for hydraulic structures, and also into floor tiles and ornamental architectural work of all kinds. The exhibitors claim, that this stone is superior in strength to any natural sandstone found in the United States, and that it will not scale like the brown sandstone now largely in use for ornamental building. It can be given any color or shape desired, and is twenty-five to seventy-five per cent cheaper than natural stone, cut into the requisite form. It can also be molded into statuesque forms.

AMERICAN MANUFACTURE OF MACHINE TWIST.—An error crept into our report on the Silk Department in our issue of October 9. It was there stated that the machine twist made annually in the United States amounted to a quarter of a million dollars. It should have been a quarter of a million *pounds*, the value of which would be fully three millions of dollars.

INTERESTING PATENT DECISION—WHEN DOES AN ENGLISH PATENT TAKE DATE?

The Commissioner of Patents has just given a decision in a case involving the question as to the date to be borne by patents which have been patented in foreign countries. The case on which the decision is given is the application of James Cochrane for the correction of the date of letters patent granted to him March 31, 1857, for an improved fluid meter. Cochrane obtained letters patent in England and also in the United States. The English letters patent were dated November 19, 1855, when the provisional specification was filed. They were sealed May 19, 1856. A caveat was filed in the U. S. Patent Office November 7, 1855, but application for the letters patent was not made until Nov. 5, 1856. The patent was granted March 31, 1857, but was limited to "fourteen years from the 19th day of November, 1855." The applicant now claims that the American patent should bear date from the day it was issued, and asks the correction of an assumed clerical error. The Commissioner says:

The motion presents several interesting questions.

1st. Can the mistake if it exists be corrected as a clerical error?

2d. Was there an error in limiting the American patent to fourteen years from November 19, 1855?

3d. If there was an error what is the proper limitation of the term of the letters patent?

After examining the first question and quoting quite a number of authorities, he arrives at the conclusion that it could never have been the intention of the Legislature to restrict the correction of errors to those enumerated. Accordingly it has been the practice of the office to correct all errors in parties' names, titles, dates, and all omissions or insertions of words made by the fault of the office upon a surrender of the patent without fee, but to require the patentee when seeking the correction of his own mistakes to pay the fee and conform to the provisions made for cases of reissue.

The answer to the second question involves the inquiry as to the true date of the English patent, within the meaning of our laws. The act says "that no person shall be debarred from receiving any invention or discovery, etc., by reason of the same having been patented in a foreign country more than six months prior to his application; provided, that in all cases, every such patent shall be limited to the term of fourteen years from the date or publication of such foreign letters patent."

The words "date or publication" should the Commissioner hold to be construed conjunctively, the phrase in effect meaning date *and* publication, and if there be a difference between the two, the latter time should be held as the true date. After a review of the practice in the English patent law, the Commissioner says: "As the invention in its perfected, completed form is not published until the enrollment of the final specification, as in fact much of the invention may be made between the time of the filing of the provisional and completed descriptions, it would seem that the date and publication which is to determine the limit of a patent in this country, should be the date of the filing of the complete specification."

The answer to the third question as to the limitation of the term of Cochrane's patent. Under the act of 1836 the inventor who took out a patent in a foreign country more than six months prior to his application in this country forfeited his right to an American patent. But if within six months, it took date from its issue here and ran the full term of fourteen years. The 6th section of the act of 1839 had no reference to those who made application within the six months. If made within the time, it bore the date of issue and ran fourteen years from that date. This view of the case is supported by citations from various decisions. It follows, therefore, that in the present case, Cochrane's application having been filed within less than six months from the time when his invention was "patented" in England, his patent is not affected by the provisions of the act of 1839, and must be corrected so as to run fourteen years from March 31, 1857, the date of issue.

OSBORN'S NEW TREATISE ON THE METALLURGY OF IRON AND STEEL.

A brief notice of this valuable and extensive treatise appeared in our last issue under the head of New Publications. It was our intention at that time to give it a review commensurate with its importance, but we find that to do this adequately would absorb more of our space than can be spared for the purpose. We shall therefore content ourselves with an outline of the character and origin of the work, and some extracts from its pages, one of which will appear in connection with this notice and some others in future issues. The author tells us in his preface that before he began the present work it was thought that a simple re-editing of Overman's Treatise upon Iron, would be sufficient; but that "upon a thorough examination it was found impossible to make that work meet the wants of those who would justly expect a recognition of the many important inventions and discoveries since its last edition was published, and who would not wish to read of anything as a theory which had become a fact, or of procedures which had passed away before the advance of metallurgic science. The author has therefore written a work entirely different in manner and matter."

The work is divided into four parts, the first of which treats of the theoretic metallurgy of iron. Under this head we are presented with a chapter on "the general principles of the chemistry of iron, another on the ores of iron, one on the special properties of iron and its compounds, a chapter on the theory of fluxes, and lastly an exhaustive chapter on fuel, in which the principal kinds of fuel used in the iron manufacture and in steam production are discussed, with remarks on wood, peat, coking of coals, manufacture of charcoal, and analysis of coals."

In Part Second, the practical metallurgy of iron is taken up and exhaustively treated in twelve chapters, in which all the approved processes are fully explained with detailed descriptions of the various furnaces, hot blast ovens, blast machines, etc., now employed in the smelting of iron ores.

Part Third treats of the manufacture of malleable iron, recent improvements in the construction of puddling furnaces, present modes of refining, forging, rolling, reheating furnaces, shearing, piling, etc.; and Part Four is an essay on steel, in which the various kinds of steel and the numerous processes now employed in the steel manufacture are duly discussed, according to their importance.

We find that in this work a common error of authors upon such subjects, has been avoided, and much of the merit of the work consists in the fact that no detail is supposed to be known by the reader, and nothing is jumped, or left to inference. The method adopted is a good one. The author sets out by a sufficiently elaborate discussion of the substances which have to be dealt with in the manufacture of iron and steel, and from the chemical knowledge thus obtained, the reader is led naturally and easily into the practical details of smelting, puddling, and refining iron, and the subsequent operations by which malleable iron is produced.

We have selected the following extract as a fair example of the clear style in which the author writes, and as also giving a good idea of the important part which oxygen plays in the metallurgy of iron.

"OXYGEN.—The air we breathe contains a large amount of oxygen, which plays an important part in the affairs of iron manufacture. It contains a large portion of nitrogen, with which, as metallurgists, we have but little to do, even supposing that steel contains a small amount—into which supposition we may hereafter inquire. It contains a very small portion of carbonic acid gas, a compound of carbon and oxygen, the former of which two elements, also, plays an influential part, determining by its amount, as carbon in iron, whether that iron be cast iron or steel, and, by its absence from iron, that the metal in question is neither cast iron nor steel, but malleable iron.

"Another fact: the atmosphere always contains more or less vapor of water. This water is composed of a large proportion of oxygen, and also a proportion, equal to twice the volume of this last-mentioned element, of another element and gas, hydrogen. The latter element is soon to become better known to the metallurgical world, but it is the oxygen of the vapor of water to which our attention is now called particularly. Here are *four elements*, important in the following order: oxygen, which is the supporter of all combustion, whether as flame or burning coal, and, like that which it supports, a splendid servant, but a labor-exacting master, ever waiting and watching, in its elementary loneliness, to unite with that for which it has affinity, either to help or perplex. Its union with iron forms that which we call the "rust" of iron, in which we see this affinity accomplished, for it has recalled the metal back to its primal state, namely, that of an ore, from which ore, or rust, it was made to become a metal only by the stronger affinity of the same element oxygen for carbon, whereby the act of rusting the carbon was followed by heat enough to expel oxygen from the iron rust in the ore, and leave the metal pure. That rust of carbon is the carbonic acid gas of the chemist. However rapidly in the one case, or slowly in the other, this affinity of oxygen may be exhibited, it is an affinity always in entire subjection to a stronger law of proportion, which it never violates, whether in the long-continued processes of nature, or the more intense and rapid fires and reduction of the furnace. That stronger law is seen in this: oxygen unites with iron in the proportion of only one atom of oxygen to one of iron; or, where a stronger cause exists, and larger affinity is exhibited, it is (never otherwise than as) one and the half of one atom of oxygen to one atom of iron (Ferric Acid excepted). Now, for the sake of brevity, the one-to-one proportion is called the one-oxide, or protoxide, and the other the one-and-a-half oxide; or, using the convenient Latin term, sesquioxide.

"Thus we have only two rusts, or oxides of iron, the protoxide and the sesquioxide. The latter is the highest affinity oxygen ever exhibits for *iron*, whatever higher affinities it may exhibit for other substances or elements. This oxide, therefore, may also be called the "high oxide," or, again resorting to the convenient Latin syllable "per," the peroxide of iron; so that the sesquioxide of iron, in this particular case of iron, is the peroxide, as there is no greater affinity of oxygen for iron known.

"In the case of carbon, however, we know of an affinity of one atom of oxygen to one of carbon; and again two atoms of oxygen to one of carbon. The former is always known as the oxide of carbon, or *carbonic oxide*, and the latter, inasmuch as the gas partakes of such acid properties that it will readily redden litmus paper (the chemist's test for acids) is called carbonic acid, or carbonic acid gas. Carbon is consumable, and oxygen, as we have said, supports combustion; all the conditions, therefore, of flame or fire, exist in carbonic oxide, and it is not remarkable that it is inflammable, and that the combustion should be attended by great heat. But an anomaly does present itself in the case of the other oxide of carbon, wherein the oxygen exists as the *peroxide*, or two-oxide state. We can and need only state this anomaly, namely, that where two parts of oxygen with one of carbon exist, combustion no longer exhibits itself, nor will the gas of this composition allow any combustion to take place wherever its presence exists to any great degree. When, however, from any stronger attraction or affinity, one atom of oxygen is drawn off from the two which go to form carbonic acid gas, and the resultant gas becomes possessed of only half as much oxygen as it previously possessed, the gas immediately becomes inflammable, and burns with great heat. Singular as it may seem, the addition of two atoms of the flame-supporting element, oxygen, to one of the combustible element, carbon, produces a gas which ceases to burn, nor can any combustion take place where its presence is abundant."

STEAM POWER ON CANALS.

In the annual report of the Hon. Van R. Richmond, State Engineer and Surveyor, noticed in our last, we find the following on the use of steam on our canals:

"Attempts have hitherto been made to substitute steam for horse power upon the canal. These have all thus far failed, probably from the fact, that the machinery used was not properly proportioned to the work which it was designed to perform, and that too high a rate of speed was sought to be obtained. The law connecting the resistances offered to bodies moving in water with the power required to overcome such resistances, may be stated as follows:

"The resistance varies as the *square* of the speed and the power exerted varies as the *cube* of the speed; hence, if two horses were sufficient to tow a boat at a speed of two miles an hour, the number required to tow the same at a speed of four miles per hour would be $(2 - \frac{4}{2}\frac{3}{3} = \frac{2 \times 64}{8})$ 16 horses. It appears, therefore, in order to double the speed, the propelling power must be increased eight times. The obvious effect of the double speed would be to reduce the time of transit one half; this, however, would be secured only at an expenditure for propulsion eight times as great as that due to a speed of two miles per hour.

"The foregoing determinations and comparisons are based upon the assumption that two horses will tow a loaded boat at a speed of two miles per hour upon the canal; as shown by M. D'Anbuisson's formula, 44 per cent more power is required to maintain the same speed in an indefinite fluid. For example, as shown in a former calculation from D'Anbuisson's formula, the traction or resistance encountered upon the Erie canal with the large-class of boats, carrying 210 tuns, at a speed of two miles an hour, is 428 pounds, requiring about three horses; then the resistance, at a speed of four miles an hour, would be $(\frac{428 \times 4^2}{2^2})$—3,424 pounds, requiring over 23 horses.

"If steam power should be provided sufficient to obtain an average speed a little in excess of that realized from present horse power, then it might undoubtedly be successfully and economically employed upon our canals.

"A successful application of the principle of low speeds seems to have been made by Mr. Edward Backus, of Rochester. If the result of the several trials made, are correctly stated by the inventor of this novel mode of steam propulsion, then the cost of transportation may be reduced about 32 per cent, as obtained from the following calculation, based upon the same general method employed for determining the cost of horse power. It is stated in the circular of results, by the inventor, that the extra cost of machinery and placing same in the boats is $2,500, and the consumption of fuel from 1,500 to 1,660 pounds of coal in twenty-four hours. Taking the same average for the boats hitherto used, and allowing 20 per cent for the aggregate detentions for the season (the same as now realized), and the following shows the cost of transportation:

Cost of boat and furniture	$5,000
Cost of machinery	2,500
Interest on same	5,250
Repairs of boat and interest on same	3,061
Expense of crew (same on boat with horse power) $185 per month	16,556
Expense of fuel (1,660 lbs. coal per day for 2,268 days) at $7 per tun	13,174
Total expense for ten years	$45,541
Total expense for one day	$19 64
Forty miles averaged per day for the season, per mile	49·1 cents
156 tuns average cargoes for the season, per tun per mile	3·14 mills

showing a saving of 32 per cent over horse power.

"The consumption of fuel, as reported, seems greatly in excess of that required, and can, undoubtedly, be reduced one half when the system shall have been perfected. Should this saving be realized, the cost per tun per mile will then be $2\frac{36}{100}$ mills, a saving of about 50 per cent.

"The following extract from a letter written by Gen. Quimby, U. S. A., who witnessed two trials of this boat, will convey an idea of the character of this new mode of propulsion:

"In this boat the motive power, steam, causes a wheel located near the center of the boat to roll on the bottom of the canal, and thus drive the boat in the same manner that the locomotive is propelled by its driving wheels. The wheel, placed at one end of a lever frame, readily adjusts itself to the varying depths of the water, and its weight, together with the cog-like projections distributed over its circumference, prevents slipping and consequent loss of traction. It has been found that in the whole extent of the Erie canal there are not to exceed twenty miles in which the depth of the water is too great for the wheel to work well. For very deep water, a screw propeller wheel is used and the motive power is changed from the ground wheel to it with the utmost ease and expedition."

Dredging in the Gulf Stream.

Our readers are, perhaps, aware that a scientific examination of the ocean bottom in the Gulf Stream has been in progress under the direction of Professor Agassiz, assisted by M. de Pourtalès. The *Atlantic Monthly* for October has an interesting article upon this subject, from which we collate some particulars of the method employed and the object of this examination.

"Dredging in great depths is a slow and rather tedious process, requiring not only patience but very accurate observation. M. F. de Pourtalès, of the Coast Survey, has been engaged on board the *Bibb* for the last three years in making dredgings in the Gulf of Mexico. These dredgings have included every variety of depth, from the shore outward to soundings of six, seven, and eight hundred fathoms, eight hundred and sixty fathoms being the deepest. They have brought to light the most astonishing variety of tiny beings—especially crowded on rocky bottoms, but not altogether wanting in the deepest mud deposits. A report of the results obtained in his first two years' dredgings has been partially published by M. de Pourtalès in the Bulletin of the Museum of Comparative Zoölogy at Cambridge. They form a most valuable contribution to our knowledge of the animals existing in the deep sea.

"The dredge is a strong net about a yard and a half in length, surrounded by an outer bag of sail-cloth. Both are open at the bottom, but laced above around an oblong frame of iron. This frame has two arms, with a ring at the end of each. One of these arms is securely fastened to the line by which the dredge is let down; but the other, instead of being attached to the line, is simply tied by a weaker cord to the first. This is in order that, in case the dredge should be caught on the bottom, as often happens, one of the arms may give way, allowing it thus to change its position slightly and be more easily freed. It is an important precaution; for sometimes the dredge is caught so fast that it requires not only the force of the small engine to which the reel, holding seventeen hundred fathoms of line, is attached, but the additional strength of all hands on board, to disengage it. When the dredge is lowered—being of course weighted, so as to sink rapidly—a cord is tied around the bottom of the net, while the sail-cloth is left open; thus allowing the free escape of water from the former, while the sail-cloth protects it from injury. When the dredge is landed on deck, a tub or bucket is placed under it, into which all its contents fall the moment the cord around the bottom of the net is untied. Sometimes a large tub is filled at one dredging with all sorts of living specimens—shells, corals, shrimps, barnacles, sea-urchins, star-fishes, sponges, polyps, and sea-weeds, with all their natural brilliancy of tints."

A water glass is also used which "is nothing more than a square wooden tube, with a glass plate in the lower end. Sinking this under the water and looking through it, all the undulations of the surface, which distort objects below, are lost, and nothing obstructs the vision.

"Seen through this simple apparatus, the sea-bottom, or rather the summit of the reef above which we were floating, was like the most exquisite aquarium, the contents of which were ever shifting.""

LONDON Bridge having become too narrow to accommodate the traffic over it, it is now proposed to widen it by throwing the foot-walks into the carriage-road, forming new footways upon cantilevers and brackets on either side of the road. This will increase the width of the carriage-way from thirty-five to fifty-three feet.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,465.—MANUFACTURE OF BOOTS AND SHOES, AND IN MACHINERY OR APPARATUS EMPLOYED THEREIN.—N. A. Baldwin, Milford, Conn. August 29, 1869.

2,640.—SPINNING MULES.—Samuel Oddy, Manchester, England, Robert Nuttall, Bury, England, and John B. Smith, Wappinger Falls, N. Y. Sept. 8, 1869.

2,694.—FIRE EXTINGUISHER.—G. F. Pinkham, Cambridge, Mass. Sept 11, 1869.

2,745.—SPINDLES AND FLYERS OF SPINNING FRAMES.—J. Goulding, Worcester, Mass. September 21, 1869.

NEW PUBLICA IONS.

AN ESSAY UPON FORCE IN NATURE AND ITS EFFECTS UPON MATTER. Cincinnati: Robert Clarke & Co., Publishers.

The theory of Newton that every particle of matter attracts all other particles of matter in right lines joining their centers, and in an inverse ratio to the squares of their distances by virtue of an inherent force called gravity, accounted for the motions of the planets so satisfactorily that it has been almost universally adopted by subsequent physicists as a natural law. Nevertheless there have not been wanting those who have doubted the correctness of this theory. Among these Faraday has been perhaps the most conspicuous. Without doubting the fact that what we call gravity varies as the squares of the distances, he claimed that the supposition that *a single force* could so vary was in conflict with the highest law in physical science capable of comprehension by the human mind, namely, the conservation of force.

The pamphlet before us is a very modest and calm statement of a doubt in regard to the truth of this celebrated and generally accepted theory, and though metaphysical, as all discussion upon an abstract notion of force must be, calls in mathematics to aid in the elucidation of a new theory which is, that "that all planetary movements are caused by the effect of force on matter—not inherent in matter; and further, that the one primal force on which planetary movement depends, modified by special effects upon substances differing in kind, in arrangement, and in position, is that which, under the modified conditions, is called by the various names of force, as of attraction and repulsion, cold and heat, electricity, magnetism, weight," etc. The latter portions of the essay, in which it is attempted to sustain the theory, are, as the author claims, merely suggestive; the first part being devoted to the attempt to demonstrate mathematically that the theory of Newton is untenable.

We are disposed to be lenient with the errors of an author who expresses his views so temperately and candidly as this, and though it would not be difficult to show some defects that, in our opinion, vitiate the whole argument, we do not think the topic of sufficient value to enter upon its discussion. Indeed the author himself asserts that he claims no scientific value for the discussion or the idea which led to it. We must therefore place this book among those works of which the world has seen too many; works seemingly written to no purpose but to indulge the love for speculation which has been a characteristic of certain minds in all ages.

THE GOLD FIELDS AND MINERAL DISTRICTS OF VICTORIA With Notes on the Modes of Occurrence of Gold and other Metals and Minerals. By R. Brough Smyth, F.G.S., Secretary for Mines for the Colony of Victoria. Melbourne: Printed and published by John Ferres, Government Printer. H. T. Dwight, 232 Bourke street, East. London: Trubner & Co., Paternoster Row.

This is a compilation in large quarto form, of an immense mass of information, historical, statistical, and technical, relating to the mineral resources of the Colony of Victoria in Australia. The perusal of the volume will, without doubt, excite surprise even in the minds of many Englishmen accustomed to regard Australia as a sort of *El Dorado*, yet having only a vague and very imperfect idea of the immense resources of that continent. Even many Anglo-Australians have only a partial knowledge of the country they inhabit, a country destined, perhaps, at some future period, to play as prominent a part in the history of the world as Great Britain itself. It would be futile to attempt a review of this work in any space we can at present allot to it. Suffice it to say, that we deem it one of the most important works of its class ever published. As a work of reference it will prove of great value, as it is thoroughly indexed, and also contains a glossary of mining terms, with plates illustrating scenery, also apparatus, implements, etc., used in the Australian mines. The entire work is, moreover, illustrated in a very artistic manner. The reader will find in another column an extract from this work, with an illustration of the "Welcome Stranger Nugget," found near Donolly in Australia, the largest mass of pure gold ever found native in the history of gold mining.

THE PROGRESS AND CONDITION OF SEVERAL DEPARTMENTS OF INDUSTRIAL CHEMISTRY. By J. Lawrence Smith, U. S. Commissioner to the Paris Universal Exposition, 1867.

This is one of the series of able and instructive reports which have been prepared and published on the great French Exposition. We have met with no similar document of greater interest and value than this, and we find in its perusal that we shall be able to select many extracts of interest which we shall in due time lay before our readers, premising that some of the deductions of the author in regard to the effect of legislation upon similar industries in the United States do not receive our sanction. An extract from this report, entitled "Applications and Progress of the Manufacture of Sulphuric Acid," will be found in another column, and is the first of several extracts we shall make upon this, and other important branches of manufacture.

USEFUL INFORMATION FOR RAILROAD MEN. Compiled for the Ramapo Wheel and Foundery Company by W. G. Hamilton, Engineer. Second Edition. Revised and Enlarged. New York: D. Van Nostrand, Publisher, 23 Murray street, and 27 Warren street.

This is a hand, or rather a pocket book of information in a condensed form, mainly compiled from the standard works of Clark, Colburn, Bourne, Haswell, Hurst, Molesworth, Nystrom, Percy, Scribner, Templeton, Ure, Price, and Williams, and is filled with useful and practical formulæ, rules, statistics, recipes, tables, etc., etc., thoroughly indexed, and provided with a rubber clasp. One of those books of reference most useful to practical men, and published in admirable style.

RAILWAY ECONOMY. Use of Counter-Pressure Steam in the Locomotive Engine as a Brake. By M. Le Chatelier, *Ingenieur en Chief Des Mines.* Translated from the Authors' Manuscript. By Lewis D. B. Gordon, F.R.S.E., Honorary Member of the Institution of Engineers in Scotland. Philadelphia: J. B. Lippincott & Co.

There is nothing new in the general idea of steam counter-pressure brakes. As practiced previous to the investigations and inventions of M. Le Chatelier, there were, however, insuperable objections to the employment of the system. These objections are fully set forth in the little work before us, as well as the progress of the experiments by which such an important modification of the system has been made, that, at the present date, upward of two thousand engines are running in France and Spain with this improvement attached, and it is also being introduced on the German railways. We have now in process of preparation an engraving of this improvement, and will give, in a future number, all necessary explanatory details in regard to it.

WE are in receipt of the first number of a neatly-printed quarto sheet called THE POLYTECHNIC, a semi-monthly of twelve pages, Montague L. Marks, editor and proprietor, 208 and 210 River street, Troy, N. Y. The prospectus informs us that the design is to establish this paper permanently as a high-class college scientific publication, to be increased both as to quantity and quality of its contents according to the amount of patronage it may receive. The connection of this paper with the Rensselaer Polytechnic Institute gives it command of many resources, both from the talent always to be found in that excellent school and from the alumini, among whom are many of our best engineers and scientific men. The first number is spirited and its contents are interesting. We wish our new cotemporary the success it merits. Subscription price $4 per annum.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

A valuable discovery of bismuth ore has been made near Balhannah, South Australia.

An alloy for jewelers' use, said to be very ductile and malleable and to possess a fine color, is composed of 750 parts of gold, 166 parts of silver, and 84 parts of copper.

During last year the quantity of silkworms' eggs exported from Japan amounted to 2,195,651 cards. Of this number 800,000 have been sent to France, Spain, Turkey, Persia, and other countries, and the remainder to Italy.

Dr. Poselger has determined by positive experiments that the death of trees growing along streets and promenades is not due, as has been often asserted, to the effects of the leakage in gas mains; but that it is owing chiefly to the neglect of so keeping the soil that air may freely permeate to the roots.

Abundaut seams of coal of good quality have been discovered on the eastern shores of the Caspian Sea. Humboldt was of opinion that coal would be found there at no great depth, since the entire district abounds in naphtha. The steamships of that sea have hiterto employed wood as fuel, which had to be conveyed, at great cost, from the Ural mountains.

A number of submarine sweet water springs are known to exist in the Adriatic, along the coast of Istria and Dalmatia. As the maritime districts of these provinces suffer from want of a sufficient supply of water, and as it is possible by means of the Norton pump to save much that is now lost, the Austrian Minister of Agriculture has published a book on the means of finding and utilizing submarine fresh water springs on the Austrian coasts.

The Pacific railroads are now carrying emigrants to California for $70 from Philadelphia or $42 from Omaha. The number of emigrants since the 1st of September has averaged 100 per day. They are carried on the express freight train, and make the trip in less than ten days. A large increase of business is expected on this train next year.

Sir David Brewster found, says the *Engineer*, that the fundamental principle of the stereoscope was known to Euclid, who compiled the well known *Elements* about B. C. 280; that it was distinctly described by Galen, 1,500 years ago; and that Baptista Porta, in 1599, gave such a complete separate picture seen by each eye, and of the combined picture placed between them, in which we recognize not only the principle but the construction of the stereoscope.

M. Armand contributes a paper to the *Comptes Rendus*, wherein he states that the deleterious effects of tobacco might be counteracted, if not entirely annihilated, by moistening the tobacco, while undergoing the various preparations and fermentations previous to its delivery to the consumer, with a strong infusion or other preparation of water-cresses. He has discovered that this vegetable contains principles which, while the peculiar aroma of tobacco will remain unaffected, will destroy the bad effects of nicotine.

The most remarkable railroad in Germany and Europe is the new Black Forest road, which will be completed within four years. Between Hornberg and St. George, situated 2,870 feet above the level of the sea, and but four miles distant from Hornberg, the railroad ascends nearly 2,000 feet, and passes through 27,000 feet of tunnels. Eleven thousand feet of the latter have been completed during the last two years. The truly Cyclopean work on the road is progressing rapidly, and attracting thousands of visitors, who flock together from all parts of Southern Germany and Switzerland.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

HARROW.—P. S. Graves and P. B. Parcell, Ashmore, Ill.—This invention relates to a new and useful improvement in harrows, and consists in arranging the teeth in the harrow frame so that they may be simultaneously thrown backward or forward on either side.

APPARATUS FOR RAISING WATER.—Jas. W. Prendergast, New York city.—This invention relates to a new and useful method of raising water by atmospheric pressure.

SOLDERING MACHINE.—John G. Borden, Brewster Station, N. Y.—This invention relates to new and useful improvements in a machine for soldering tin cans and other articles of tin ware.

STEERING APPARATUS.—George H. Davis, Stony Brook, N. Y.—This invention relates to a new and useful improvement in apparatus for steering vessels on the water, and consists in constructing and arranging a chain pulley in such a manner that a chain may be effectively used in combination with a traversing wheel.

CAR COUPLING.—William Cottrell, Bordentown, N. J.—This invention relates to new and useful improvements in couplings for uniting railroad cars together; and it consists in a device for holding the coupling link in a horizontal position when the cars are being coupled, and in the method of inserting the coupling pin.

RAILROAD SUPPLY APPARATUS.—David Harrison, Fayette, Miss.—This invention has for its object to furnish a simple, convenient, and effective means for supplying a moving railroad train with water, fuel, etc., while under full headway.

FENCE.—Smith Riley, Kenton, Ohio.—This invention consists of sections made of longitudinal bars with beveled ends and vertical pickets, the said beveled ends of the sections being joined so as to assume a zig-zag form, and held together by connecting links extending from the picket with the end of one section to the corresponding picket of the next section.

TILE MACHINE.—George Jackson, Albany, N. Y.—This invention relates to certain improvements in tile machines, of that class in which the clay is by a sliding piston forced through apertures in the end of a box, so that it comes out in a continuous stream of the requisite cross section, to be cut into pieces of the desired length by a series of wires attached to a swinging frame.

SICKLE-BAR COUPLING FOR MOWERS AND REAPERS.—Rufus C. Wood, Le Roy, Kansas.—This invention has for its object to furnish an improved coupling for connecting the pitman and sickle bar of a reaper or mower to diminish the wear of the coupling pin and eye, and prevent the "end shake" of the sickle bar, and which shall at the same time be simple in construction and easily attached.

CLOTH-THINNING MACHINE.—J. W. Burch, Fayette, Miss.—This invention comprises an arrangement of devices for operating either a rotary cutter of three or any other preferred number of curved blades projecting from a disk, revolving transversely of the row, or a vibratory cutter working back and forth above the row, the whole mounted on a suitable frame and wheels, and deriving motion from the axle of the said wheels by suitabe gearing.

PRESS.—John Berkley, Washington, Texas.—This invention relates t improvements in presses for cotton, hay, and similar substances designed to provide a portable press of simple and cheap construction, mounted on wheels, for moving it from place to place, and arranged for adjusting the case in a vertical position for filling, and in a horizontal position for pressing, the follower being also arranged to work in a horizontal position.

CHURN DASHER.—Gustav Radbruch, Hoboken, N. J.—This invention relates to a new churn, of that class known as atmospheric churns, and consists of a new dasher, so constructed that it will at once agitate the cream and supply the necessary air by simple means.

RUFFLING ATTACHMENT TO SEWING MACHINES.—Louis H. Gunnerman Pittsburgh, Pa.—This invention relates to a new apparatus for ruffling or wrinkling fabric, and for attaching the same to straight fabric; and the invention consists in the arrangement and combination of two plates, by which the two fabrics will be properly gaged and separated before they are sewed together.

CHAIR.—Allen Lapham, Paterson, N. J.—This invention has for its object to improve the construction of chairs, so as to make them stronger, more durable, and less liable to become loose and shaky than when constructed in the ordinary manner.

GANG PLOWS.—H. N. Dayton, Pacheco, Cal.—This invention has for its object to improve the construction of gang plows, in such a way that the gang plow may be raised while running to cut a light furrow, or to lift it entirely from the ground at the will of the operator, and which shall be simple in construction and readily applied and operated.

KEROSENE LAMP BURNERS.—Edward L. Gilman, Somerville, Mass.—This invention has for its object to improve the construction of kerosene lamp burners, so that the gas arising from the oil or fluid mingled with air may be conducted to the flame to increase the light.

PORTABLE FIRE ESCAPE.—Hugh C. Carrigan, New York city.—This invention has for its object to furnish an improved portable fire escape, designed to be kept by those occupying upper apartments, in their rooms; and which shall be so constructed and arranged, that it will enable the occupants of the rooms to lower their property and themselves with speed and convenience to the ground, and which, when not in use, will present the appearance of being nothing but an ordinary chair and may be used as such.

WATER REGULATOR, ALARM, AND INDICATOR FOR STEAM BOILERS.—Leopold Steigert, Cincinnati, Ohio.—This invention consists of the arrangement of a float in a vessel, attached to the side of the boiler in a manner to oscillate a shaft carrying indicators and actuating a whistle valve, and a plug in the supply pipe whereby the whistle may be caused to blow at the proper time, and the water is allowed to flow to the pump where required, or shut off when not needed.

HAY LOADER.—J. C. Leonard, S. B. Holcomb, and W. B. Wight, Clinton, Mo.—This invention consists in a rake and elevating apparatus, mounted on two wheel to be hitched to the rear end of the wagon and arranged to gather the hay in front of the fixed curved teeth of the rake, from which it is taken by the elevator and delivered to the wagon in a peculiar manner.

WATER REGULATOR AND ALARM.—James William Ebert and Eli C. McCloy, Zanesville, Ohio.—This invention comprises an arrangement of valves in the feed water supply pipe for the pump, connected with a float and bung inside the boiler, so as to open and close the passage, as required; also, in connection with the said valves, another set of valves in the steam pipe leading to the whistle, which, when the water supply fails will give the alarm.

VELOCIPEDE.—Theodore Searing, New York city.—This invention consists, first, in a peculiar arrangement of runner and brake attachment for the wheels, and second, in an attachment to the propelling cranks of a pair of vibrators, to which are attached spiked segmental bars by pivot joints, under an arrangement whereby the spikes will be caused to engage with the ground when moved in the direction for propelling, but will slip over it without engaging when moving in the opposite direction.

FLYING MACHINE.—W. F. Quinby, Wilmington, Del.—This invention relates to improvements in flying apparatus intended to provide an arrangement of temporary sails, resembling in some respects the wings of birds in their construction and operation, which may be readily connected to the body of a person by means of a cuirass fitted to the body and made of metallic strips, formed and adapted to assist the operator to support the wings and at the same time to shield him from the shocks and jars due to the operation of the wings.

GOVERNOR FOR STEAM AND OTHER ENGINES.—W. J. Kesselmeyer, C. A. Kesselmeyer, Manchester, England, and E. H. Nacke, Als-Shoenfeld, Saxony.—This invention has for its object to render centrifugal governors more perfect in regulating the speed of the engine, so that the speed will be immediately corrected, as soon as it shall vary. The invention consists in the application to the movable valve rod of a vessel containing liquid matter, and in connecting the same with a stationary vessel in such a manner that, when by the contraction of the governor balls, the movable vessel is lowered, the liquid will flow into it from the reservoir, causing it to sink and to open the valve without loss of time.

WATER VELOCIPEDE.—F. A. Spofford and M. G. Raffington, Columbus, Ohio.—This invention relates to a new mechanism for propelling water craft by muscular power and by the aid of levers, ratchet wheels, etc., applied to paddle wheels.

CHOCOLATE PASTE.—L. F. Leger, New York city.—The object of this invention is to so prepare chocolate that it can be preserved in a semi-liquid state, to be readily dissolved when required.

IRON DOUBLE SHOVEL PLOW.—C. I. Voigt, West Salem, Ill.—This invention has for its object to furnish an improved double shovel iron plow or cultivator, which shall be simple in construction, easily adjusted, effective in operation, and easily operated.

MANUFACTURING AND REFINING SUGAR.—Louis J. F. Margueritte, Paris, France.—This invention consists in manufacturing and refining sugar by the following mode of operation: The sugar mixed with molasses is first brought in contact with a certain quantity of wood spirit in a mixer, where the whole is stirred for a very short time. The mixture consisting of sugar and liquid is then passed to a filter similar to those containing animal charcoal, when the black liquor of the molasses is run off, which is afterward replaced by pure wood spirit. A washing effected in this manner by displacement furnishes a perfectly white sugar.

HAY RAKER AND LOADER.—N. Farlow and J. A. Ham, Sullivan, Ill.—This invention relates to improvements in apparatus for raking hay and elevating it to a pitching platform, all suspended from a pair of wheels to be hitched to and drawn by the wagon to be loaded, or, when used for gathering grain for binding, to be drawn by a horse; the invention consisting in certain arrangements of the parts.

HAY DERRICK.—Winfield Denton, Iowa City, Iowa.—This invention relates to a new and useful improvement in derricks for loading hay.

CAR COUPLING.—Michael Connelly, Baltimore, Md.—The object of this invention is to provide for public use a simple and effective automatic coupling for railroad cars.

MACHINE FOR SAWING KINDLING WOOD.—W. A. Allen, Baltimore, Md.—This invention relates to that class of sawing machines in which several circular saws are employed, in connection with endless chains and knees, for carrying the logs.

CIDER PRESS.—John J. Shaffer and Emanuel Stoner, Westminster, Md.—This invention relates to a press, in which the follower slides up and down upon vertical rods, passing through it, one near each of its ends.

FARM GATE.—Daniel Shockey, Waynesborough, Pa.—The object of this invention is to provide for public use a neat, light, simple, and strong gate, for use upon farms, etc., and which can be conveniently opened or closed from either side.

FIRE GRATE.—Asa Snyder, Richmond, Va.—This invention consists of a basket grate and concave perforated radiator, placed in such relation to the chimney and jambs as to leave an air space between the grate and the chimney and jambs, said air-space being, in fact, a continuation downward of the smoke flue of the chimney, and being seperated from such smoke flue by a damper placed between the radiator and the chimney for the purpose of creating a rapid draft through the air-space, and carrying off the debris dislodged by raking the fire.

"FIXING" OR REPAIRING PUDLING FURNACES.—Morgan Z. Evans, Ormsby Postoffice, Pa.—This invention relates to puddling and boiling furnaces, and applies in the process called by furnacemen "fixing," which is performed as occasion may require, in the way of repairs.

REAPING AND MOWING MACHINES.—T. H. Taylor, Jeffersonville, Ill.—This invention relates to improvements in reaping and mowing machines designed to provide an improved arrangement for operating the cutter bars; also, an improved arrangement of the cutter and cutter supporting bars.

KNIFE GUARD.—E. A. Goodes, Philadelphia, Pa.—The invention consists of a wire-guard attachment, so shaped and arranged relatively to the knife blade, that it may be readily clamped to the blade by thumb nuts, screwing on to the ends of the wire and against the back edge of the blade, with the gaging part adjusted along the edge, at one side, parallel with it, and the required distance for the thickness of the paring from it.

HORSE-POWER.—Diffendall & Hughes, Westminster, Md.—The object of this invention is to provide a simple and compact arrangement of multiplying wheels in a portable horse-power, for producing a rapid motion for the tumbling shaft, from the first mover, with the least possible amount of lateral pressure on the driving shaft.

LIFE, SURF, AND OTHER BOATS.—Henry Thompson, Mobile, Ala.—The object of this invention is to provide new and useful improvements in small boats, to render them safe and efficient as life, surf, or pleasure boats. Also, to provide improvements in propelling apparatus, calculated to apply the same to better advantage than in the common way. Also, to provide an an arrangement of the paddlewheels and wheel guards, to facilitate the transportation of the said boats on land. Also, to provide an arrangement of pumping devices, which may be used either for pumping water from the hold, or for drawing water over the side, for playing upon fires, or for other purposes.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

A. H. B., of Pa.—A body floating in a fluid medium, and sustaining by its buoyancy just as much weight as it is capable of supporting, would descend through that medium by the addition of just sufficient weight to overcome the friction of the fluid against its sides. It will then certainly take *as much* (practically more) weight to draw it down through that fluid as it can raise by its buoyancy. In the answer to the correspondent about the balloon, the endeavor was to make this point clear, and to show that a balloon in rising could exert no more force (practically not so much) than would be required to pull it down again.

W. A. H., of Tenn.—The plan of closing a well air tight at its mouth and inserting a pipe to reach below the surface of the contained water, and raising the water by forcing air into the well will work in some cases, but it is neither new, patentable, nor practicable. Because the top of a wheel rolling along a level surface moves faster ahead relatively to any point on that surface than the bottom, it does not follow that its circumferential motion is greater at the top than at the bottom. What we mean by circumferential motion, is the motion of all points in the circumference around the axis of the wheel.

J. A., of Ill.—The photographer has the best of it. The contraction of the pupil of the eye does not diminish the apparent size of external objects. The reason of the apparently larger size of the sun and moon when near the horizon is probably that they are then in immediate contrast with terrestrial objects, by which their size is estimated, while in the zenith no such standard of comparison can be simultaneously viewed with them.

B. J. J., of Va.—We would not recommend the arrangement of piping for a lumber drying-house you propose. "A Practical Treatise on Heat," published by Henry Carey Baird, of Philadelphia, will instruct you properly on this subject. There ought to be good ventilation in any room used for drying purposes. Your last question cannot be answered in the form you put it.

J. B. W., of Pa.—Your suggestions for ventilating mines by forcing air down through a main pipe by steam power, and delivering it through branch pipes, contain nothing new. This is, however, a good plan, and it, or its equivalent, has been tried successfully in English coal mines. We agree with you that either this or some other equally effective system ought to be generally adopted in working coal mines.

J. W. P., of Me.—The best material for a step to a turbine wheel is probably lignum vitæ. That your steps burn out indicates that the wheel is not balanced properly to take off its weight from the step. If it is not practicable to balance it in this way your only remedy will be to increase the size of the bearing in proportion to the weight of the wheel.

G. M. S., of Miss.—The power of an engine having a twenty-inch stroke would be to one having a thirty-inch stroke, everything else being equal and the steam being worked non-expansively, as one to two. This, of course, supposes everything so arranged that the mean effective pressure in the cylinders should be the same throughout their respective strokes.

F. C. B., of Ohio.—To scale sheet steel, use a wooden trough lined with sheet lead. Use crude sulphuric acid, one part of acid to ten of water, by measure, or rather more dilute, let the sheets remain only a very short time in the bath, take them out and wash them in hot lime water, and then rub them with clean dry saw dust or chaff.

W. Z., of La.—The appearance of gold, copper, or brass, is given to tin plate by the application of suitable lackers. You can purchase these lackers at dealers in varnishes, etc.

F. D. H., of N. Y.—You can dissolve rubber in naphtha to a thick solution and with it stop small holes in rubber. Apply it soft and allow it to harden thoroughly.

G. G. B., of N. H.—The mineral specimen seems a schist containing iron. It appears to be of no value, but analysis might give a different result.

J. D. P., of N. Y.—The broad gage railways are failures only because they are, for various reasons, so expensive in their operation. We can not enter at this time into a detailed account of these causes. They are good for the passengers but hard on the companies who own them.

M. G., of Minn.—Your sketch is very imperfect, but from what we can understand of it, it shows no patentable improvement. It would, therefore, be scarcely worth while to enter into the computation necessary to determine what strain such a structure would sustain.

S. E. W., of N. Y.—Friction would be reduced in using friction rollers under your shaft in proportion to the diminished surfaces of the journals. The size must depend upon the circumstances of the case. Make the rollers as large as you can conveniently.

C. T. G., of Pa.—It would be impossible to give you the knowledge you require in the form of a recipe. A small volume called "The Complete Practical Brewer," published by Henry Carey Baird, of Philadelphia, gives the precise information you require.

J. M. H., of Wis.—We know of no steam apparatus which will meet your requirements and which you can purchase ready made You might, it seems to us, easily devise one for yourself. Set your wits t work.

R. S. B., of Ky.—The minerals you send appear to contain iron and perhaps copper, with sulphur and arsenic. We cannot determine whether other metals of value are present without making an assay.

M. S. M., of Mo.—The stones you send are agate and chalcedony. They have little value except when worked and polished. They are rendered valuable according to the labor bestowed upon them.

E. H. S., of N. H.—You will find an article fully treating your question about long and short screw drivers in the SCIENTIFIC AMERICAN, Vol. XVIII, No. 25, page 393, June 20, 1868.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING OCT. 5, 1869.

Reported Officially for the Scientific American

*SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years ... $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from ... $1 *upward, but usually at the price above-named.*

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them ... $1·25

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York.

95,405.—COMPOSITION FOR MAKING TYPES FOR PRINTING WALL PAPER, OILCLOTH, AND OTHER FABRICS.—R. A. Adams, New York city.
95,406.—SAWING MACHINE.—W. A. Allen, Baltimore, Md.
95,407.—MEDICAL COMPOUND OR CORDIAL.—Joseph Ambrose, Nashville, Tenn.
95,408.—HAY LOADER.—Isaac Anderson, Poland, Ohio.
95,409.—BINDING GUIDE FOR SEWING MACHINE.—E. F. Angell, Chicago, Ill.
95,410.—HAMES FASTENER.—H. W. Austin and E. C. Perry, Portage township; Edwin C. Perry, assignor to G. T. Nash, Kalamazoo Mich.
95,411.—COTTON PRESS.—Augustine Baldwin, New York city. Antedated Sept. 22, 1869.
95,412.—APPARATUS FOR CARBURETING AIR AND GAS.—Arthur Barbarin, New Orleans, La.
95,413.—DEVICE FOR STEAMING ROVINGS.—Solomon Barber, South Coventry, Conn.
95,414.—BAND CUTTER.—W. C. Barr and E. J. Hunkins, Macon City, Mo.; said Hunkins assignor to said Barr for his right. Antedated Sept. 22, 1869.
95,415.—WASHING MACHINE.—B. B. Beers and Nathan Couch, New Fairfield, Conn.
95,416.—HAY AND COTTON PRESS.—John Berkeley, Washington, Texas.
95 417.—SHAFT COUPLING FOR CARRIAGES.—Albert Betteley, Boston, Mass.
95,418.—MACHINE FOR SOLDERING TIN CANS.—J. G. Borden, Brewster Station, N. Y.
95,419.—PURIFYING IRON AND STEEL, OR OTHER METAL.—Edward Brady, Philadelphia, Pa.
95,420.—RIM PRESS AND TIRE HEATER.—J. H. Britton, Painesville, Ohio.
95,421.—TABLE SLIDE.—Aaron Brower (assignor to himself and C. S. Hall), Rochester, N. Y. Antedated Sept. 18, 1869.
95,422.—COTTON-THINNING MACHINE.—I. W. Burch, Fayette Miss.
95,423.—THRASHING MACHINE.—Duncan Campbell, Indian Town, Ill.
95,424.—SAFETY PIN FOR SECURING CLOTHING.—Frederick Catlin, New York city.
95,425.—DYERS' VAT.—H. Champenois, New York city.
95,426.—ATTACHMENT FOR WINDOW SASH CORDS.—S. N. Chapin, New Britain, Conn.
95,427.—STUMP EXTRACTOR.—Daniel S. Chapman, Conneaut, Ohio.
95,428.—REFRIGERATOR.—A. J. Chase (assignor to B. F. Horn), Boston, Mass.
95,429.—COOKING STOVE.—B. F. Clement (assignor to C. H. Buck and W. S. Wright), St. Louis, Mo.
95,430.—HAMES FASTENER.—J. Clendening, Rockford, Ill.
95,431.—RAILWAY CAR COUPLING.—Michael Connelly (assignor to himself and H. W. Rogers), Baltimore, Md.
95,432.—HERNIA TRUSS.—D. J. Cooper, New Orleans, La.
95,433.—TRUSS AND SUPPORTER.—D. J. Cooper, New Orleans, La.
95,434.—RAILWAY CAR COUPLING.—Wm. Cottrell (assignor to himself and F. G. Wiese), Bordentown, N. J.
95,435.—LATHING MACHINE.—George N. Creamer, Trenton, N. J.
95,436.—BEEHIVE.—L. H. Critchfield, Shreeve, Ohio.
95,437.—SPRING FOR GANG PLOWS.—H. N. Dalton, Pacheco, Cal.
95,438.—WRENCH.—A. B. Davis, Pleasantville, Pa.
95,439.—HAY DERRICK.—Winfield Denton, Iowa City, Iowa.
95,440.—HORSE POWER.—Joseph Diffendal and S. Hughes, Westminster, Md.
95,441.—METHOD OF FORMING MOLDINGS.—Joseph Dill and E. Rice, Grand Rapids, Mich.
95,442.—BAND FOR BOOMS AND GAFFS.—David Dryburgh, Philadelphia, Pa. Antedated Sept. 20, 1869.
95,443.—RAILROAD SPIKE.—P. J. Dwyer, Elizabethport, N. J.
95,444.—BOILER FEEDER ALARM DEVICE.—J. W. Ebert and E. C. McCloy, Zanesville, Ohio.
95,445.—APPARATUS FOR EVAPORATING AND DECOMPOSING LIQUIDS.—Albert Eckstein (assignor to "Zdenks Ritter Von Wessely"), Vienna, Austria.
95,446.—TURN TABLE.—L. W. Emmart and E. D. Griffith, Washington, D. C.
95,447.—BALING PRESS.—C. J. Emmett, New York city.
95,448.—HOISTING MACHINE.—Wm. Eppelsheimer (assignor to himself and E. A. Trapp), San Francisco, Cal.
95,449.—SNOW PLOW.—C. L. Ericzon, Salt Lake, Utah Territory.
95,450.—FIXING PUDDLING AND BOILING FURNACES.—M. Z Evans, Ormsby, Pa. Antedated Oct. 1, 1869.
95,451.—HAY RAKER AND LOADER.—Newton Farlow and J. A. Ham, Sullivan, Ill.
95,452.—DEVICE FOR SUPPORTING THE SHAFTS OF VEHICLES.—Rubin Fink and Reuben Daveler, Lancaster, Pa.
95,453.—WHEELED CULTIVATOR AND PLOW.—Sam'l Fisher, Hightstown, N. J.
95,454.—SAUSAGE STUFFER.—Charles Forschner, New York city.
95,455.—TOY TOP.—Henry Foulkes, Utica, N. Y.
95,456.—BEARING FOR SPINDLES IN SPINNING MACHINES.—J. B. Fuller, Norwich, Conn. Antedated Sept. 16, 1869.
95,457.—ATTACHING HANDLES TO CUTLERY.—J. W. Gardner (assignor to "Lamson and Goodnow Manufacturing Co."), Shelburne Falls, Mass.
95,458.—HARROW.—D. L. Garver, Hart township, Mich.
95,459.—MANUFACTURE OF COAL GAS.—Wm. Gibson, Cambridge, Mass.
95,460.—LAMP BURNER.—E. L. Gilman (assignor to himself and F. Houghton), Somerville, Mass.
95,461.—HOT-AIR FURNACE.—B. Gommenginger and C. W. Trotter, Rochester, N. Y.
95,462.—MACHINE FOR DRAWING FLAX, ETC.—John Good, Brooklyn, E. D., N. Y.
95,463.—KNIFE GUARD.—E. A. Goodes (assignor to the Philadelphia Patent and Novelty Co.), Philadelphia, Pa.
95,464.—WASH BOILER.—S. A. Goodwin, Buffalo, N. Y.
95,465.—PROCESS OF PREPARING ALIZARINE.—Chas. Graeb, Frankfort-on-the-Main, and Charles Liebermann, Berlin, Prussia.
95,466.—CARRIAGE SEAT.—S. P. Graham, Columbus, Ohio.
95,467.—HARROW.—P. S. Graves and P. B. Parcell, Ashmore Ill.

95,4 8.—Cleaning Brush for Ordnance.—John Tyndale Greenfield, Dover, England.
95,469.—Ruffling Attachment for Sewing Machines.—Louis H. Gunnerman (assignor to himself and William G. Hoover), Pittsburgh, Pa.
95,470.—Shoe Knife.—M. E. Hall, Spring, Pa.
95,471.—Railway.—David Harrison, Fayette, Miss.
95,472.—Apparatus for Separating Gold from Sand.—D. F. Hawkes. Timbuctoo, Cal.
95,473.—Process of Seasoning Wood.—T. W. Heinemann, New York city.
95,474.—Process and Apparatus for Preserving Wood.—T. W. Heinemann, New York city.
95,475.—Press for Making Coffin tops.—A. W. Hendrick, Batavia, Ill.
95,476.—Valve Device for Steam and other Enginery.—E. H. Hewins, Boston, Mass.
95,477.—Milk and Provision Safe.—William Hinman, Elkhart, Ind.
95,478.—Cigar Machine.—J. C. Hintz, Cincinnati, Ohio.
95,479.—Tile Machine.—George Jackson, Albany, N. Y.
95,480.—Machine for Cutting Tapers.—Clark Jillson, Worcester, Mass.
95,481.—Governor for Steam and other Enginery.—W. J. Kesselmeyer and C. A. Kesselmeyer, Manchester, England, and E. H. Sacke, Ais-Schoenfeld, Saxony.
95,482.—Whip Holder.—A. W. Johnson, New York city.
95,483.—Boring Tool.—W. J. Johnson, Newton, and George Tainter, Watertown, Mass.
95,484.—Manufacture of White Oxide of Zinc.—Richard Jones, Mount Holly, N. J.
95,485.—Hulling Machine.—C. H. Keniston, Somerville, and J. H. Sawyer (assignors to J. T. Prince), Boston, Mass.
95,48 .—Steam Engine.—Alden Kilby, Boston, Mass.
95,487.—Plow.—Henry Killam, Mendon, Mich.
95,488.—Carriage-Axle Connection.—J. W. Kingsbury, New Bedford, Mass.
95,489.—Doll.—Martin Kintzback, Philadelphia, Pa.
95,4 0.—Sawing Machine.—R. M. Lafferty (assignor to himself and J. E. & J. P. Prutzman), Three Rivers, Mich.
95,4 1.—Chair.—Allen Lapham, Paterson, N. J.
95,492.—Chocolate Paste.—L. F. Leger, New York city.
95,493.—Hay Raker and Loader.—J. C. Leonard, S. B. Holcomb and W. B. Wright, Clinton, Mo.
95,494.—Mar ne Paint.—W. H. Lewis, assignor to himself and J. B. Folger, Boston, Mass.
95,495.—Combined Try-Square, Calliper, etc.—W. J. Linton, Detroit, Mich. Antedated Sept. 20, 1869.
95,496.—Manufacture and Refining of Sugar.—Louis J. F. Margueritte, Paris, France. Patented in France, October 16, 1867.
95,497.—Car Spring.—J. R. Mathews, New London, Conn.
95,498.—Locomotive Head-Light.—H. S. Maxim and James Radley, New York city.
95,499.—Sewing Machine.—T. L. Malone, Mount Gilead, Ohio.
95,500.—Manufacturing German Hand-Cheese.—F. C. Mende and T. F. Mende, Philadelphia, Pa.
95,501.—Cooking Stove.—B. H. Menke, Cincinnati, Ohio.
95,502.—Suspended.
95,503.—Water Gage.—George Murray, Jr., Cambridgeport, Mass.
95,504.—Device for Holding Together the Different Parts of Bureaus and other Articles of Furniture.—J. O. L. Murray and D. A. Mullane, New Orleans, La.
95,505.—Cultivator.—A. S. Perrigo, Sandwich, Ill.
95,506.—Combined Latch and Lock.—N. Petre, New York city.
95,507.—Combined Latch and Lock.—N. Petre, New York city.
95,508.—Latch.—N. Petre, New York city.
95,509.—Lock.—N. Petre, New York city.
95,510.—Hot-Air Register.—H. M. Phinney, Cambridge, Mass.
95,511.—Window Blind.—Anthony Pirz and Manuel Pirz, East New York, N. Y.
95,512.—Air-Pressure Water Reservoir.—J. W. Prendergast, New York city.
95,513.—Flying Machine.—W. F. Quinby, Wilmington, Del.
95,514.—Churn Dasher.—Gustav Radbruch, Hoboken, N. J.
95,515.—Velocipede.—John Reinhart, (assignor to Andrew Christian), New York city.
95,61 .—Machine for Making and Wrapping Webbing Boot Straps.—J. W. Richardson, South Braintree, Mass.
95,517.—Composition for Covering Steam Boilers, etc.—John Riley and C. W. Bissell, Troy, N. Y., assignors to C. W. Bissell, Terrance Riley, and Mary C. Frazer.
95,518.—Fence.—Smith Riley, Kenton, Ohio.
95,519.—Staging for Roofs.—W. B. Ross, Keene, N. H.
95,520.—Cultivator.—S. A. Sabin, Pecatonica, Ill.
95,521.—Sleigh-Attachment for Velocipedes.—Theodore Searing, New York city.
95,522.—Harvester.—Allen Sherwood, Auburn, N. Y.
95,523.—Manure Drag.—A. H. Shock and H. R. Shirk, Lancaster, Pa.
95,524.—Farm Gate.—Daniel Shockey, Waynesborough, Pa.
95,525.—Mode of Attaching Trimming to Articles of Dress.—John Sims, Liverpool Road, England, assignor to Wm. Sparks Thompson.
95,526.—Harvester.—Wm. P. Slack, Lewisburg, Pa.
95,527.—Manufacture of Soap for Medicinal and for other Purposes.—Lebbeus W. Smith, Boston, Mass. Antedated September 18, 1869.
95,528.—Pipe Coupling.—Thomas Smith, Baltimore, Md.
95,529.—Fireplace.—Asa Snyder, Richmond, Va.
95,530.—Cr dle.—Augustus Spiegel, Indianapolis, Ind.
95,531.—Water Velocipede.—Fisher A. Spofford and Matthew G. Raffington, Columbus, Ohio.
95,532.—Steam Generator.—Samuel Stanton, Newburg, N. Y.
95,533.—Boiler Water Regulator and Alarm.—Leopold Steigert, Cincinnati, Ohio.
95,534.—Manufacture of Pigments for Paints.—Robert S. Stenton, New York city.
95,535.—Seed Drill.—S. Stow, East Enterprise, Ind.
95,536.—Organ and Melodeon.—Simeon Taylor, Worcester, Mass.
95,537.—Harvester.—T. H. Taylor, Jeffersonville, Ill.
95,538.—Life Boat.—Henry Thompson, Mobile, Ala.
95,539.—Gang Plow.—J. N. Thompson and Wm. Kenady, Belpassi, assignors to D. W. Frary, Portland, Oregon.
95,540.—Automatic Passenger Register.—H. H. Trenor, New York city.
95,541.—Double Shovel Plow.—Charles Immanuel Voigt, West Salem Ill.
95,542.—Bath-tub Eduction Tube.—William. H. Walton, Philadelphia, Pa.
95,543.—Steam Engine Governor.—William Wickersham, Boston, Mass.
95,544.—Chair, Cradle, Cot, etc.—John T. Wightman, Charleston, S. C.
95,545.—Water Elevator.—J. W. Wheeler, Cleveland, Ohio.
95,546.—Railway Car Coupling.—J. C. Wilson, Appleton, Wis.
95,547.—Watch.—Charles V. Woerd, Waltham, Mass.
95,548.—Pitman-connection for Harvesters.—Rufus C. Wood, Le Roy, Kansas.
95,549.—Horse Power.—Daniel Woodbury, Rochester, N. Y.
95,550.—Furna e Door Frame.—D vid H. Young, Manchester, N. H.
95,551.—Stove Drum.—Wm. Allchin, Newburg, N. Y.
95,552.—Washing Machine and Table.—Daniel Arndt, Toledo, Ohio.
95,553.—Spring for Bed Bottoms.—Lyman M. Bates, Jackson, Mich.
95,554.—Manufacture of Sheet Iron.—Silas Barker, Hartford, Conn.
95,555.—Railway-rail Chair.—Robert C. Blackall, Albany, N. Y.
95,556.—Grain Dryer.—Wm. Blakey, Baltimore, Md.
95,557.—Grinding Mill.—Righter W. Bowman, Orangeville, Pa.
95,558.—Cider Press.—Asa Brooks, Tolland, Conn.
95,559.—Wagon Tongue Holder.—Orlando F. Bryant, Carver Minn.
95,560.—Churn.—Francis Burdick, South East, N. Y., and Lodowick Burdick, Lee aven, Pa.
95,561.—Combined Straw-cutter and Feed Box.—Jesse Burgess, Richmond, Ind.
95,562.—Refrigerator.—Morgan Burton, Darlington, Pa.
95,563.—Cotton Press.—C. A. Caldwell, Concord, N. C.
95,564.—Spring-bed Bottom.—Charles L. Chadeayne, Yonkers, N. Y.
95,565.—Washing Machine.—E. Hall Covel, New York city.
95,566.—Post Auger.—Z. S. Cracraft, Lacon, Ill.
95,567.—Washing Machine.—John Crampton and Wm. H. Pangborn, Plainfield, N. J.
95,568.—Manufactu e of Iron and Steel.—Norman Cutter, Cincinnati, Ohio, and Elliot Savage, West Meriden, Conn.
95,569.—Rock Drill.—Charlton H. Davis, San Francisco, Cal.
95,570.—Car Coupling.—Calvin R. Densmore and Jacob A. Vrooman, Oil City, Pa.
95,571.—Sewing Machine for Boots and Shoes.—Auguste Destouy) assignor to Charles Goodyear, Jr.), New York city.
95,572.—Table Caster.—Henry A. Dirkes, New York city.
95,573.—Washing Machine.—Charles F. Dodge, New York city
95,574.—Process of Distilling Spirits.—Joshua Ellingwood, Owensborough, Ky.
95,575.—Lamp-shade Supporter.—Charles W. Emerson (assignor to himself and John C. Abbott), Hartford, Conn.
95,576.—Fabric for Roofing and for other Purposes.—Benjamin F. Field, Beloit, Wis., and Robert D. O. Smith, Washington, D. C., assignors to Benjamin F. Field.
95,577.—Manufacture of Anvils, and the Top and Bottom Parts of Hammers, etc.—David Foster, Sheffield, England. Patented in England, June 4, 1868.
95,578.—Apparatus for Transmitting Power.—Arthur L. Freeman, South Boston, Mass.
95,579.—Platform for Railway Car.—Joseph Gilmer, Monticello, Fla.
95,580.—Machine for Drawing and Spinning Wool, etc., from the Carding Machine.—John Goulding, Worcester, Mass.
95,581.—Sewing Machine.—Joshua Gray, New York city.
95,582.—Machine for Sawing Lath.—Wm. P. Hale, Ionia, Mich.
95,583.—Process of Treating Wood, to Preserve, Season, and Give it a Better Surface.—Ira Hayford and Joseph F. Paul, Boston, Mass.
95,584.—Machine for Steaming and Shrinking Cloth.—Wm. Hebdon, New York city.
95,585.—Machine for Bending Fifth-wheels.—Geo. W. Heckart, New Lisbon, Ohio.
95,586.—Mechanical Movement.—William M. Henderson, Philadelphia, Pa.
95,587.—Suspended.
95,588.—Spring Scale.—Simon Ingersoll, Brooklyn, N. Y.
95,589.—Stair Rod.—Hans Iversen and Daniel Ack r, New York city.
95,590.—Wagon Seat.—Melvin Jincks, Wallace, N. Y.
95,591.—Steam Engine Slide Valve.—Hans Knudsen, North Windsor, Wis.
95,592.—Sash Holder.—J. S. Kuder and Willoughby Seiple, Tiffin, Ohio.
95,593.—Water Wheel.—Dennis Lane, Montpelier, Vt.
95,594.—Hen's Nest.—D. P. Leach, Franklin, Ind.
95,595.—Low-water Indicator.—L. L. Lee, Milwaukee, Wis.
95,596.—Fence.—William Mallary, Bucyrus, Ohio.
95,597.—Water Closet for Railroad Cars.—W. E. Marsh, Jr., Plainfield, N. J.
95,598.—Moldings of Wood.—W. J. Miller and J. W. Campbell, New York city.
95,599.—Coffeepot.—Elie Moneuse and Louis Duparquet, New York city.
95,600.—Washing Machine.—Chas. Muhl, Bloomington, Ill.
95,601.—Boiler Furnace.—G. H. Nott, Boston, Mass.
95,602.—Saw Teeth.—W. B. Noyes (assignor to himself and C. S. Baker), Manchester, N. H.
95,603.—Screw Feeding Apparatus.—E. S. Pierce, Hartford, Conn.
95,604.—Construction of Ordnance.—J. B. Read, Tuscaloosa, Ala. Antedated Sep. 27, 1869.
95,605.—Sirup for Flavoring Beverages, etc.—Victor Billett, Hoboken, N. J.
95,606.—Calendering Machine.—H. E. Rogers, South Manchester Conn.
95,607.—Grain Drill.—J. R. Rude, S. B. Rude, and G. W. Rude, Liberty, Ind.
95,608.—Cider Press.—John Schaffer and Emanuel Stoner, W stminster, Md.
95,609.—Snag Boat.—E. M. Shield, Cincinnati, Ohio.
95,610.—Compound for Curing Toothache.—W. P. Sigsby, Delta, Ohio.
95,611.—Hay Elevator.—Anthony Smith, Shellsburg, Pa.
95,612.—Refrigerator, Sideboard, and Room Cooler.—D. E. Somes, Washington, D. C.
95,613.—Air Pump.—D. E. Somes, Washington, D. C.
95,614.—Apparatus for Transmitting Power by Means of a Fluid Passed Through a Pipe or Tube.—Robert Spear, New Haven, Conn.
95,615.—Sleeves of Overcoats, etc.—Joseph Steinhauser, Lancaster, Pa.
95,616.—Grain Dryer.—S. M. Stevens, Elwood, Ill.
95,617.—Process of Forming Letters, Characters, and Ornaments on Glass.—C. M. Strauss, Memphis, Tenn.
95,618.—Dish Washer.—James A. Strong, North Wolcott, Vt.
95,619.—Grain Drill.—W. H. Trimmer, Round Hill, Pa.
95,120.—Hotel Annunciator.—Lucius J. Vansands, Chicago, Ill.
95,621.—Pipe Connection.—Augustus Weyermann, Saint Gall, Switzerland.
95,622.—Spring for Beds, Berths, Car Seats, etc.—N. S. Whipple, Detroit, Mich.
95,623.—Boiler for Cooking Stoves.—Henry R. Robbins, Baltimore, Md., assignor to himself and J. J. Moran. Antedated Sept. 2 , 1869.
95,624.—Mode of Applying Inks of Different Characters so as to Print Safety, Revenue, and other Stamps.—William Thorpe, St. Louis, Mo.
95,625.—Hoop Skirt.—K. McRae, New York city.
95,626.—Ink for Printing Revenue, Postage, and other Stamps, so as to Secure Greater Safety and Prevent Frauds.—Thos. Antisell, Washington, D. C.

REISSUES.

64,484.—Bucket Ear.—Dated May 7, 1867; reissue 3,658.—Henry Callahan, John Reese, and R. S. Hoglen, Dayton, Ohio, assignees, by mesne assignments, of Henry Callahan.
35,141.—Cooking Stove.—Dated May 6, 1862; reissue 3,659.—E. J. Cridge, Troy, N. Y.
57,743.—Metal Frame for Pianos.—Dated Sept. 4, 1866; reissue 3,660.—Martin Martins, New York city.
86,305.—Metallic Lathing.—Dated Jan. 26, 1869; reissue 3,661.—I. V. Holmes, New York city.
45,272.—Wash Boiler.—Dated Nov. 29, 1864; reissue 3,662.—John Reist, Philadelphia, Pa.
91,388.—Attachment of Main Springs to Watch Barrels, etc.—Dated June 15, 1869; antedated Dec. 15, 1868; reissue 3,663.—Arthur Wadsworth, Newark, N. J., for himself and Robert Schell, New York city, assignee of Arthur Wadsworth.
78,705.—Spring Seat.—Dated June 9, 1868; reissue 3,664.—J. L. Whipple, Detroit, Mich.
48,366.—Tremolo Attachment.—Dated June 27, 1865; reissue 3,444, dated May 18, 1869; reissue 3,665.—Alonzo Hitchcock, George G. Saxe, and James H. Robertson, New York city, assigneers of Riley W. Carpenter.

DESIGNS.

3,687.—Buckle.—Alma Bedford, Coldwater, Mich.
3,688.—Center Piece.—Henry Berger, New York city.
3,689.—Drawer Pull.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn.
3,690 and 3,691.—Latch Handle.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn. Two Patents.
3,692.—Match Safe.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn.
3,693.—Shuttle Hook.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn.
3,694 and 3,695.—Sash Lift.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn. Two Patents.
3,696.—Door Knob.—Stephen Eich, East Toledo, Ohio.
3,697.—Muff.—J. K. Cappelhoff, New York city.
3,698 to 3,703.—Carpet Pattern.—E. J. Ney, Dracut, Mass., assignor to Lowell Manufacturing Co. Six Patents.
3,704.—Bell.—F. G. Niedringhaus, St. Louis, Mo.
3,705.—Tea Service.—Wm. Parkin (assignor to Reed & Barton), Taunton, Mass.
3,706.—Knitted Cap.—Wm. Schwab, New York city.
3,707.—Trade Mark.—George C. Thilenius, Cape Girardeau, Mo.

EXTENSIONS.

Boring Machine.—Arcalous Wyckoff and E. R. Morrison, o Elmira, N. Y.—Letters Patent No. 13,606, dated Sept. 25, 1855; reissue No 404, dated Oct. 14, 1856.
Interlocking Grate Bars.—S. Van Syckle, of Titusville, Pa.—Letters Patent No. 13,669, dated Oct. 9, 1855.

PATENT OFFICE DECISION RESPECTING DESIGNS---APPLICATION OF FRANKLIN FIELD FOR A PATENT FOR A DESIGN FOR PAPER COLLARS.

ON APPEAL TO THE EXAMINERS-IN-CHIEF—S. H. HODGES FOR THE BOARD.

It is true, as has been remarked in this case, that the differences between the design presented, and the one referred to by the Examiner in charge, are very slight. The lines in the respective drawings are nearly the same, and were nearly in the same direction. It must be remembered, nevertheless, that almost imperceptible variations in the lines of drawings often change the whole aspect of the images represented, and may cost intense study, and the exercise of the highest genius. The emotions indicated by the painting of a face may be entirely changed by modifications which would not be noticed by a stranger to the art. The novelty of a design is not to be determined, therefore, by the extent to which the lines are parallel to those of another, but the effect must also be taken into consideration.

The design which was referred to as being an anticipation of the one before us was intended to represent a collar with a hem. The purpose of the applicant is to represent a collar with a tape attached to the border, and his drawing is modified accordingly. The change, though slight in itself, produces the desired effect. This constitutes a substantial difference between the two, and precludes the one from being regarded as an anticipation of the other.

The decision of the primary Examiner is reversed.

Advertisements.

RATES OF ADVERTISING.

Back Page .... $1·00 *a line.*
Inside Page .... 75 *cents a line.*
Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

WOODWORTH Planer & Matcher, $350 & $600. For sale by S. C. HILLS, 12 Platt st., N. Y.

FOR CUTS & PRICES of Wood-working Machinery, address STEPTOE, McFARLAN & CO., Cincinnati, Ohio.

H. BOARDMAN, Lancaster, Pa.—Superior Patent Cork-cutting Machinery, Hard-laid Twine, Cord, and Rope Machinery, with Pat. Stop & Condenser.

$1140. How I made it in 6 months. Secret & sample mailed free. A. J. Fullam, N. Y.

ALL THAT 'S REQUIRED of Sash Fasteners, WALKER'S Patent will do. Never get out of order. $2 per doz. Buy of WALKER & CO., Whitlock Exposition, 35 Park Place, N.Y., or Hardware Merchants.

A WATCH FREE—GIVEN GRATIS TO every live man who will act as agent in a new, light, and honorable business, paing $30 a day. No gift enterprise No humbug. No money wanted in advance. Address R. MONROE KENNEDY & CO., Pittsburgh, Pa.

ATKINS' PAT. ELASTIC STAIRS—Applied to all ordinary stairs without detriment. Agents wanted in every town and city. A small royalty on all stairs introduced. Send stamp for circular. ATKINS ELASTIC STAIR CO., Danbury, Conn.

HAIR, WOOL, AND COTTON DUCK FELT, for sale by the Square foot, or boilers covered by Contract. RUSSIAN FELT, of every description, a SPECIALTY, by HENRY J. DAVISON, 77 Liberty st., N. Y.

FOR SALE—
Lease, or Exchange—One Eight-tun Rolling Mill at Memphis, Tenn., new and in good order, or will take a partner to run same on joint account. Apply to DONOHO, JOY & CO., Southern Real Estate Brokers, Memphis, Tenn.

PORTABLE ENGINES—Manufactured by WALTER WRIGHT, Danvers Center, Mass., with a variable cut-off, worked by the governor. For economy of fuel, simplicity of construction, regularity of speed, and non-liability to derangement, they are equal to any in the market. Patent Rights for sale.

MATERIALS for FIRE-PROOF CEMENTS and Paints, Silicate of Soda, Chloride of Calcium, Asbestos, Talc, Soapstone, Black Lead, Manganese; also, Steel and Glass Makers, Potters, and Chemists' Materials, Crude Minerals, Drugs, and Chemicals, for sale by L. & J. W. FEUCHTWANGER, Chemists & Drug Imp's, 55 Cedar st., New York.

JERSEY CITY LOCOMOTIVE WORKS.
MACHINERY SALE.
Great Reduction in Prices. Descriptive Catalogue and Price List furnished on application to Company's Agent, WILLIAM S. AUCHINCLOSS, Office, Steuben and Warren sts., Jersey City.

MOXLEY'S FARM GATE.
The only practical Farm Gate, obviating Strain upon the posts. There is no expense for Hinges or Castings; it is effective, simple, cheap, easily operated, secure against hogs and other animals, can be readily made by any farmer, and combines, with other advantages, that of working well over snow. State and County Rights for sale cheap. Farm Rights, with full directions and drawings, sent to any address for $1·50. Address JOHN T. MOXLEY, Owasso, Mich.

GOOD READING
AND NO IMPURE ADVERTISEMENT IN THE
New York Observer,
$3 50 PER ANNUM.
SAMPLE COPIES FREE.
SIDNEY E. MORSE, JR., & CO.,
37 PARK ROW, NEW YORK.

LORAINE'S
Patent Adjustable
HANGER.
SEND FOR CIRCULAR TO
22d ST. AND WASHINGTON AVE., PHILADELPHIA.

EVERY ONE INTERESTED IN
AGRICULTURAL IMPLEMENTS
Seeds or Fertilizers,
Should see our new Catalogue Circular.
Send a stamp for it to R. H. ALLEN & CO.] Postoffice Box 376, New York City.

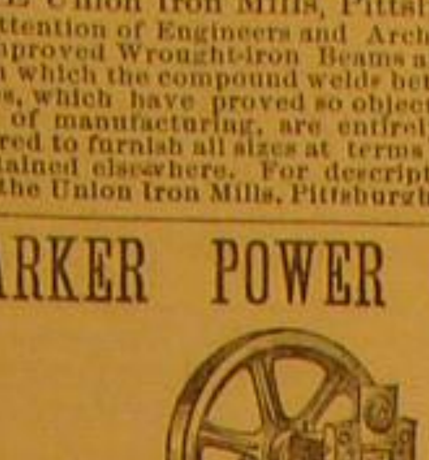
AGRICULTURAL IMPLEMENTS

BAIRD'S BOOKS
For Practical Men.
LIST NO. 10.

Stokes' Cabinetmakers' and Upholsterers' Companion. With Illustrations. 12mo. $1 25
Strength & other Properties of Metals for Cannon. By Officers of the Ordnance Department U. S. Army. 25 large steel plates. 4to. $10
Tables showing the Weight of Round, Square, and Flat Bar Iron, Steel, etc., by measurement... 63c.
Taylor's Statistics of Coal. Illustrated by Maps and Wood Engravings. 8vo. $6
Templeton's Practical Examinator on Steam and the Steam Engine. 12mo. $1 25
Thomas' Modern Practice of Photography. 8vo. .... 75c.
Thomson's Freight Charges Calculator.. $1 25
The Turner's Companion. Illustrated. 12mo. $1 50

☞ The above or any of my Books sent by mail, free of postage, at the publication prices. My new revised and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS, 78 pp. 8vo, now ready, complete to Sept. 1, 1869, will be sent, free of postage, to any one who will favor me with his address.
HENRY CAREY BAIRD, Industrial Publisher, 406 Walnut st., Philadelphia, Pa.

WROUGHT IRON
Beams and Girders.
THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address the Union Iron Mills, Pittsburgh, Pa. 21 tf

PARKER POWER PRESSES.

Are what are universally known as the
"FOWLER PRESS,'
improved, and *are without a rival* as regards strength and durability, combined with delicacy of adjustment of the Punch. NOTICE is hereby given that the
STILES POWER PRESS
Is a direct INFRINGEMENT OF OUR PATENT dated April 17, 1855, and reissued Aug. 24, 1869, and ALL PARTIES are hereby CAUTIONED against BUYING OR USING said presses WITHOUT OUR PERMISSION.
PARKER BROTHERS, West Meriden, Conn.
New York office with CHAS. PARKER, 27 Beekman st.

STEAM PIPE FOR HEATING FACTORIES. MANUFACTURED BY PARKER BRO'S WEST MERIDEN, CONN.

THE BEST PUNCHING PRESSES ARE made by the Inventor and Patentee of the famous Eccentric Adjustment. Infringements upon said Patent will be severely dealt with. N. C. STILES, Middletown, Conn.

HINKLEY KNITTING MACHINE
FOR Family use—simple, cheap, reliable. Knits everything. AGENTS WANTED. Circular and sample stocking FREE. Address HINKLEY KNITTING MACHINE CO., Bath, Me.

WOODWORTH PLANERS a SPECIALTY —From new patterns of the most approved style and workmanship. Wood-working Machinery generally. Nos 24 and 26 Central, corner Union street, Worcester, Mass. Warerooms, 42 Cortlandt street, New York. WITHERBY, RUGG & RICHARDSON.

BURGESS NON-CONDUCTING BOILER CEMENT (Snyder's Patent) for sale or applied to Boilers, Pipes, Generators, Fire Boxes, Heaters, etc. etc. Saves 25 per cent in Fuel, and will stand any degree of heat. Send for circular. JOHN F. RIDER, 47 Dey st., New York.

CAMDEN
Tool and Tube Works.
Camden, N. J. Manufacturers of Wrought Iron Tube, Brass Work and Fittings, and all the most improved TOOLS for Screwing, Cutting, and Fitting Pipe. Screwing Machines for Pipe, of five different sizes. Pipe Tongs, Common and Adjustable; Pipe Cutters, Pipe Vises, Taps, Reamers, Drills, Screwing Stocks, and Solid Dies. Peace's Patent Screwing Stocks, with dies. No. 1 Screws ¼, ⅜, ½, ¾ Pipe. Price complete, $10. No. 2 Screws, 1, 1¼, 1½, 2 Pipe, $20. No. 3 both screws and cuts off, 2½, 3, 3½, 4, $65.

F. W. BACON,— Consulting Engineer, 84 John st., New York.—Especial attention given to Erecting Machinery, Shafting, and Belting. The Indicator applied to Steam Engines. Instruments furnished and Instruction given.

To Electro-Platers.
BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with books of instruction, manufactured and sold by THOMAS HALL, Manufacturing Electrician, 19 Bromfield st., Boston, Mass. Illustrated catalogue sent free on application.

STOCKS, DIES, AND SCREW PLATES Horton's and other Chucks. JOHN ASHCROFT, 50 John st., New York. 16 tf

L. W. Pond's New Tools.
NEW AND IMPROVED PATTERNS— Lathes, Planers, Drills, Milling Machines, Boring Mills, Gear and Bolt Cutters Punches and Shears for iron. Dealer in
IRON & WOOD WORKING MACHINERY
Works at Worcester, Mass. Office, 98 Liberty st., N. Y. S. N. HARTWELL, General Agent.

CAST STEEL Name Punches, Letters, and Figures—all sizes and styles, and for all purposes, made by ROBERT ROGERS, Letter Cutter, 26 Spruce st., S. E. cor. William st., New York.

CATALOGUES SENT FREE.
MATHEMATICAL INSTRUMENTS, 112 pages.
OPTICAL INSTRUMENTS, 72 pages.
MAGIC LANTERNS and STEREOPTICONS, 100pp.
PHILOSOPHICAL INSTRUMENTS, 84 pages.
JAMES W. QUEEN & CO., 924 Chestnut st., Philadelphia, Pa

$2,000 A YEAR AND EXPENSES
To agents to sell the celebrated WILSON SEWING MACHINES. The best machine in the world. STITCH ALIKE ON BOTH SIDES. First machine on trial. For further particulars address THE WILSON SEWING MACHINE CO., Cleveland Ohio, Boston, Mass., or St. Louis, Mo.

R. BALL & CO., Worcester, Mass., Manufacturers of Woodworth's, Daniel's, and Dimension Planers; Molding, Matching, Tenoning, Mortising, Shaping, and Boring Machines; Scroll Saws, Re-Sawing, Hand Boring, Wood Turning Lathes and a variety of other Machines for Working Wood. Also, the best Patent Door, Hub, and Rail Car Mortising Machines in the world. ☞ Send for our Illustrated Catalogue. RICHARD BALL. E. P. HALSTED.

IRON STEAMERS, HULLS, & LIGHTERS. Estimates & Specifications furnished on application. HENRY J. DAVISON, 77 Liberty st., New York, Agent for Pusey, Jones & Co. 21 tf

SCHWEITZER PATENT BOLT CO., Greenpoint, L. I. Office 120 Chambers st., New York. Machine Bolts, Forged Nuts, Washers, Lag Screws, etc., cheap. Bolts made by this Company are superior in strength and finish to any in market.

AGENTS!
Read This!
WE WILL PAY AGENTS A SALARY of $30 per week and expenses, or allow a large commission, to sell our new and wonderful inventions. Address M. WAGNER & CO., Marshall, Mich.

WANTED—AGENTS—$75 to $200 per month, everywhere, male and female, to introduce the GENUINE IMPROVED COMMONSENSE FAMILY SEWING MACHINE. This Machine will stitch, hem, fell, tuck, quilt, cord, bind, braid, and embroider in a most superior manner. Price only $18. Fully warranted for five years. We will pay $1000 for any machine that will sew a stronger, more beautiful, or more elastic seam than ours. It makes the "Elastic Lock Stitch." Every second stitch can be cut and still the cloth cannot be pulled apart without tearing it. We pay Agents from $75 to $200 per month and expenses, or a commission from which twice that amount can be made. Address SECOMB & CO., Pittsburgh, Pa., Boston, Mass., or St. Louis, Mo.
CAUTION.—Do not be imposed upon by other parties palming off worthless cast-iron machines, under the same name, or otherwise. Ours is the only genuine and really practical cheap machine manufactured.

ASHCROFT'S LOW-WATER DETECTOR will insure your Boiler against explosion. JOHN ASHCROFT, 50 John st., New York. 16 tf

WANTED—AGENTS—To sell the AMERICAN KNITTING MACHINE. Price $25. The simplest, cheapest, and best Knitting Machine ever invented. Will knit 20,000 stitches per minute. Liberal inducements to Agents. Address AMERICAN KNITTING MACHINE CO., Boston, Mass., or St. Louis, Mo.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st., New York. 17 tf

POWER LOOMS.
Improved Drop Box. Spooling, Winding, Beaming, Dyeing, and Sizing Machines Self-Acting, Wool-Scouring Machines, Hydra Extractors Also, Shafting, Pulleys, and Self-Oiling Adjustable Hangers, manuf'd by THOS. WOOD, 2106 Wood st., Philad'a, Pa

WOODBURY'S PATENT
Planing and Matching
and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery. S. A. WOODS, Send for Circulars. {91 Liberty street, N. Y.; 67 Sudbury street, Boston.

BOILER FELTING SAVES TWENTY-five per cent of Fuel. JOHN ASHCROFT, 50 John st. New York. 16 tf


THE
Whitlock Exposition,
Nos. 35 and 37 Park Place, NEW YORK.
This consists of a
Perpetual Fair
of New Inventions and Manufactured Articles of every description. For terms, etc., see THE WHITLOCK EXPOSITION RECORDER (specimen copy sent free), a Semi-Monthly journal, $1 per annum. Agents wanted.

PLATINUM. H. M. RAYNOR, 57 Bond st., N. Y.

ROBERT McCALVEY, Manufacturer of HOISTING MACHINES AND DUMB WAITERS. 602 Cherry st., Philadelphia, Pa.

STEAM AND WATER GAGES, STEAM Whistles, Gage Cocks, and Engineers' Supplies. JOHN ASHCROFT, 50 John St., New York. 16 tf

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK, P. O. Box 1,057, Boston, Mass.
N. B.—This detector is covered by two U. S. patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

TWISS, HAYES & CO., Man'f'rs of Engine Lathes, Planers, & Shapers, Shafting, Pulleys, Gearing. Contractors for all kinds of machinery, New Haven, Ct.

LATHE CHUCKS—HORTON'S PATENT —from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks, Conn.

WROUGHT-Iron Pipe for Steam, Gas, and Water; Brass Globe Valves and Stop Cocks, Iron Fittings, etc. JOHN ASHCROFT, 50 John St., N. Y.

CINCINNATI BRASS WORKS.
ENGINEERS' AND STEAM FITTERS' BRASS WORK.
BEST QUALITY AT VERY LOW PRICES.
F. LUNKENHEIMER, Prop'r, Cincinnati, Ohio.

VINEGAR.—How Made from Cider, Wine, Molasses, or Sorghum in 10 hours, without using drugs. For circulars, address F. I. SAGE, Vinegar Maker, Cromwell Conn.

HENRY WARD
BEECHER'S
SERMONS IN
PLYMOUTH PULPIT,
Are being read by people of every class and denomination all over this country and Europe. They are full of vital, beautiful religious thought and feeling. *Plymouth Pulpit* is published weekly, and contains Mr. Beecher's Sermons and Prayers, in form suitable for preservation & binding. For sale by all newsdealers. Price 10c. Yearly subscriptions received by the publishers, $3, giving two handsome vols. of over 400 pp. each. Half-yearly $1·75. A new and superb Steel Portrait of Mr. Beecher presented to all yearly subscribers. Extraordinary offer! PLYMOUTH PULPIT ($3), and THE CHURCH UNION ($2·50), an unsectarian, Independent, Christian Journal—16 pp., cut and stitched, clearly printed, ably edited, sent to 1 address for 52 weeks for $4. Special inducements to canvassers and those getting up clubs. Specimen copies, postage free, for 5c. J. B. FORD & CO., Pubs., 39 Park Row, New York

PATENT IMPROVED BAND-SAW MAchines manufactured and sold by FIRST & PRYIBIL, 452, 454, and 456 10th Avenue, between 35th and 36th sts., N. Y. city. We also offer hand Saw Blades, imported and domestic, of the best qualities at reduced prices. Send for Circular and Price List.

HOMINY AND SAMP MILLS— The only Self-Feeding, Discharging, and Separating Mill in use. For Mills and Territory, address J. DONALDSON, Rockford, Ill.

SHINGLE AND HEADING MACHINE— Law's Patent. The simplest and best in use. Shingle Heading and Stave Jointers, Stave Cutters, Equalizers Heading Turners, Planers, etc. Address TREVOR & CO., Lockport, N. Y.

FOR SALE.
ABOUT EIGHT HUNDRED (800) feet of wire rope, made by John A. Roebling, of Newton, N. J., described in his circular as 19 wires, No. 16, 2 65-100 inches in circumference. It has been used but very little. Inquire of S. B. JANES, Treas., 16 Park Place, New York

Bolts. Nuts.
HINGES, PICKS, Etc.
Prov. Tool Co., Providence, R. I. 29 Beekman st., N. Y.

THE CHURCHMAN.
The Best and LARGEST Weekly Newspaper, WITH THE LARGEST circulation in the Protestant Episcopal Church. Sent FREE for one month for examination, and till Jan. 1, 1870, to new subscribers for that year. $3 a year, in advance. M. H. MALLORY & CO., Hartford, Conn.

FOUNDERY WORK.—The Mineral Vale Iron Co. are prepared to make all kinds of FOUNDERY CASTINGS, heavy and light, at their Works, Mineral Vale, Pa., by the piece or by weight. Work solicited. Address S. B. JANES, Treasurer, 16 Park Place, New York.

MODELS, PATTERNS, EXPERIMENTAL and other machinery, Models for the Patent Office built to order by HOLSKE MACHINE CO., Nos. 528, 530 and 532 Water st., near Jefferson. Refer to SCIENTIFIC AMERICAN office. 4 tf

WOOLEN FACTORY and Flouring Mill For sale. Also, first-class Stock or Grain Farm. Address D. W. ORENDORFF, Hopedale, Ill.

SALESMEN—Wanted, a few reliable, energetic salesmen, to sell by sample standard goods. Address H. H. RICHARDS & CO., 413 Chestnut st., Philadelphia, Pa.

VALUABLE PATENTS FOR SALE.—The The Patent right for the six New England States for Kenyon's Patent Corn Picker and Husker, Letters Pat. therefor (No. 68,085) having been issued to Silas R. Kenyon and Milton C. Jeffers, Aug. 27, 1867. Also, the Patent Right, for the whole United States, for Dorman's Patent Self-Lubricating Axle and Journal for Carriages, under Letters Patent No. 57,100, issued to Lathrop Dorman, Aug. 14, 1866. The above are worthy the attention of all wishing an interest in valuable patents. Also, for sale, 300 Greene's Pat. Rifles. Apply to HENRY G. DENNY, Administrator of the Estate of James C. Merrill, 37 Court Square, Boston, Mass.

GREAT IMPROVEMENT IN CRUSHING and Grinding. To Miners, Ironmasters, Manufacturing Chemists, Superphosphate Makers, Bone Grinders, Dyewood Workers, etc., etc.—E. P. BAUGH'S Patent Sectional Crushing and Grinding Mills, for reducing to powder rocks, ores, slag, bones, logwoods, all kinds of mineral guano, and other tough and hard substances. For illustrated circular address BAUGH & SONS, 20 S. Delaware ave., Philadelphia.

PATENT RIGHTS SOLD ON COMMISSION, and Valuable Inventions introduced by the most experienced Patent Salesmen in the Union. Can refer to over one hundred Inventors for whom we have acted. E. E. ROBERTS & CO., Consulting Engineers, 15 Wall st., New York.

WOOD-WORKING MACHINERY.—THE subscriber is the New York Agent for all the Manufacturers, and sells at their prices. 3 tf c S. C. HILLS, 12 Platt street.

AMERICAN TINNED SHEET IRON.
Coating uniformly over the entire sheet, by an entirely new and patented process. All sizes and gages on hand and made to order. H. W. BUTTERWORTH & SON, 25 eow tf 29 and 31 Haydock st., Philadelphia, Pa.

BLACK DIAMOND FILE WORKS.
TRADE MARK.

G. & H. BARNETT, 41 and 43 Richmond st., Philadelphia, Pa

Molding Machinery.
THE MOST VALUABLE MACHINE FOR Planing Irregular and Straight Work in all branches of Wood-Working is the Combination Molding and Planing Machine Co.'s "Variety Molding and Planing Machine." Our improved guards make it safe to operate our combination collars save one hundred per cent; and for planing, molding, and cutting irregular forms, our Machine is unsurpassed. The right to make and vend these Machines is owned solely by us, and we will defend Purchasers in case litigation is forced upon them by any parties pretending to own Patents on any part of our Variety Machine. COMBINATION MOLDING AND PLANING MACHINE CO., 424 East 23d st., or Postoffice Box 3230 New York City. Silas M. Hamilton, Baltimore Samuel Leggett, New York. 19 tf eow

Gear's Variety Moulding Machine,
WARRANTED THE BEST IN THE WORLD FOR Moulding and Cutting Irregular Forms, with Patent Improvements for Combination Cutters, and Patent Guard to protect operator and material. Secured by six Patents. Deeds of Right to use furnished with every Machine sold, to protect parties in using them. Before purchasing Combination Moulding and Planing Machine Co.'s or Grosvenor's Mongrel Infringing Machines (which they and their agents in behalf of the Singer Sewing Machine, and the Central Pacific R. R. Co. and others to whom they had sold Machines to be used out of the State of New York, have been made to pay us for using) or Ball's or Fay's infringing Machines, which users have had to pay us for right to use. Address for particulars and Machines, Sole Owners and Lawful Manufacturers for all the United States, except New York, A. S. & J. GEAR & CO., New Haven, Conn., or 91 Liberty Street, New York.

$25 A DAY.—33 new articles for Agents Samples sent FREE. H. B. SHAW, Alfred, Me

GREAT ATLANTIC AND PACIFIC
TEA COMPANY,
NO. 8 CHURCH STREET,
P. O. BOX 5506, NEW YORK
An organization of capitalists for the purpose of importing Teas and distributing them to Merchants throughout the country at Importer's prices. Established 1859 Send for Price List.

MERRICK & SONS,
Southwark Foundery,
430 Washington Ave., Philadelphia, Pa.,
MANUFACTURE NASMYTH & DAVY STEAM HAMMERS,
CORNISH PUMPING, BLAST, HORIZONTAL, VERTICAL, AND OSCILLATING ENGINES.
Gas Machinery of all descriptions.
Sugar Refineries fitted up complete, with all modern apparatus.
New York office 62 Broadway.

Advertisements.

Advertisements will be admitted on this page at the rate of $1.00 per line. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

Ball, Black & Co.,
565 and 567 BROADWAY
MANUFACTURERS OF
ENGLISH STERLING
Silver Ware.

THE FACILITIES OF BALL, BLACK & CO. FOR MANUFACTURING, ENABLE THEM TO OFFER A LARGER VARIETY OF PATTERNS, AND AT LOWER PRICES THAN ANY OTHER HOUSE IN THE TRADE.
16 ostt

W. W. VANDERBILT, Consulting Engineer & Contractor. Cor. Av. D & E.12th st., N.Y.

A VALUABLE PAT. RIGHT for sale or exchange for other property. For particulars inquire of J. I. BARINGER, Germantown, Col. Co., N. Y.

American **OIL FEEDERS.**
CHEAPEST & BEST SYSTEM.
FOR JOURNALS OF MACHINERY, etc. Perfectly reliable. ¾ per cent saved. One doz. sample feeders, without oil cups, sent by mail for $1. Or Circulars sent free.
J. B. WICKERSHAM,
143 South Front st., Philadelphia.

UNIVERSAL CLOTHES WRINGER

THE only Wringer which has the Pat. Stop, to prevent the cogs from entirely separating. The only Wringer with Rowell's improved double gear with alternate teeth in the same cog, which cannot be thrown out of gear.
"It really merits all the good that can be said of it."—Moore's Rural New Yorker.
"The Universal 'the best'."—Am. Agriculturist.
"Having used the Universal Wringer in our own household, we can FULLY INDORSE IT."—Ed. Sci. American.
Sold by dealers generally. No exclusive rights given.
R. C. BROWNING, General Agent,
32 Cortlandt st., New York.

FRENCH BAND SAW MACHINES, SAWS, Taper Files, etc., Machines for Scroll, Re-sawing, and Log; Mougin & Co.'s Band Saw Blades, all Sizes, on hand and made to order.
All Styles of Band Saw Machines in operation at Mahogany Mill, 10th st., E. R.
GEORGE GUEUTAL.
Sole Agent for the U. S., 39 West 4th st., N. Y.

SEVEN TOOLS IN ONE.—Try Square, Calipers, Wire Gage, Dividers, Rule, Level, and Plum. Heavy Brass. Sent by Mail. Price $1.
J. MILL & CO., Skaneateles, Onondaga Co., N. Y.

OFFICE LOWER APPOMATTOX CO.,
PETERSBURG, VA., Sept. 25, 1869.
BUILDERS OF DREDGE BOATS WILL Please send Plans and Prices of a Dredge to dredge in SAND to a depth of from 4 to 16 feet, 150 cubic yards per hour, and discharge the same SIDEWAYS, from 175 to 275 feet by cars on a pontoon railroad, or by shoots, or any durable fixture. State price of dredge separate and time of delivery.
H. D. BIRD,
Engineer and Superintendent.

PRATT'S ASTRAL OIL
FOR FAMILY USE—NO CHANGE OF LAMPS required—A perfectly Safe Illuminating Oil—Strictly Pure—No Mixture, No Chemicals—Will not Explode—Fire-test 145 degrees (being 35 degrees higher than is required by U. S. Government—Unequalled for Brilliancy and Economy—Packed in the celebrated *Guardian Pat. Cans*. Ask for Pratt's "Astral," the safest and best Illuminating Oil. *Try it.* Agents wanted in every town. At wholesale and retail by the Proprietors.
OIL HOUSE OF CHAS. PRATT,
(Established in 1770.)
Manufacturers, Packers, and Dealers in strictly First-Class Oils,
Box 3050. 108 FULTON ST., NEW YORK.
Send for circulars, with testimonials and price lists.

J. F. WERNER, Model Maker & Machinist, 62 Center st., New York. Working Models, Experimental Machinery, Gear Cutting, & Stud & Rivet Turning.

KIDDER'S PASTILES—A Sure Relief for Asthma. STOWELL & CO., Charlestown, Mass.

COTTON AND WOOL
SHODDY PICKERS
Of the most approved English pattern, built by RICHARD KITSON.......................Lowell, Mass.

BOGARDUS' Eccentric Mills for Grinding Bones, Sugar, Clays, Salts, Guanos, Pot Shells, Ores, Feed, Drugs, Spices, Tobacco, Coffee, Paints, Printers' Inks, etc. JAS. BOGARDUS, cor. White & Elm sts., N.Y.

SENT FREE!
M. O'KEEFE, SON & CO.'S
SEED CATALOGUE
AND GUIDE TO THE
FLOWER AND VEGETABLE
GARDEN, FOR 1870.
Published in January. Every lover of flowers wishing this new and valuable work, free of charge, should address immediately M. O'KEEFE, SON & CO., Ellwanger & Barry's Block, Rochester, N. Y.

Why Waltham Watches
ARE THE BEST AND CHEAPEST.

Because, being made of the Best Materials, and every part being finished in the most perfect manner, they will run with great precision, and will not stop or run irregular, as is the case with other Watches.

We desire to increase the sale of these reliable timepieces, and have reduced the prices much lower than formerly.

Silver Hunting Watches,	$18
Gold Hunting Watches, (18-carat cases)	$80
Gold Hunting Watches, (Ladies' size),	$70

Every Watch Warranted by Special Certificate.

We send single Watches to any place by express, with the bill to collect on delivery, and we give the purchaser the privilege of opening the package and examining the Watch before paying, and if, after it is taken and paid for, it should not prove satisfactory, we will exchange it or

Refund the Money.

We have sent thousands of these Watches by express, and to every section of the country, and, by our improved method of packing, they will go safely to any distance. Persons living in the distant States and Territories can save from 50 to 100 per cent by buying from us.

Do not order a Watch till you have sent for our Descriptive Price List. It explains the different kinds, gives weight and quality of the cases, with prices of each.

When you write for a price list, please state that you saw this in the SCIENTIFIC AMERICAN. Address, in full,

HOWARD & CO.,
Jewelers and Silversmiths,
NO. 619 BROADWAY, NEW YORK.

Gerner Boiler.
SAVES 40 PER CENT IN FUEL.
SIMPLE, SAFE, & DURABLE.
SEE SCIENTIFIC AMERICAN OCT. 2.
Please Send for Circulars.
Postoffice Box 5195. KASSON & CO., 119 Broadway, N. Y.

PATTERN LETTERS TO PUT ON PATTERNS FOR CASTINGS &c. KNIGHT BROS. SENECA FALLS N.Y.

Oak Tanned Belting
Manufactured by C. W. Arny, 301 Cherry st., Philadelphia.

SCHLENKER'S PATENT
BOLT CUTTER
NEW INVENTION. ADDRESS,
HOWARD IRON WORKS, BUFFALO, N.Y.

DEAD STROKE POWER HAMMERS, Made under Shaw & Justice Patents, greatly Improved Model. Licenses granted to build on favorable terms.
PHILIP S. JUSTICE,
42 Cliff st., New York, and 14 N. 5th st., Philadelphia.

Reynolds'
Turbine Water Wheels.
No Complex, Duplex, or Triplex complications. All such are costly, perishable, easily clogged, inaccessible. Mill Gearing, Shafting, and Pulleys. Send for Illustrated Pamphlet.
GEORGE TALLCOT,
96 Liberty st., New York.

THE GENUINE
Coes Screw Wrenches,
WITH A. G. COES' PATENT LOCK FERRULE,
Manufactured by
A. G. COES & CO.,
Successors to L. & A. G. Coes,
Worcester, Mass.
ESTABLISHED IN 1839.

SEND FOR CIRCULARS
TRADE MARK.
EARTH-CLOSET CO., HARTFORD, CONN.
EARTH-CLOSETS
SALESROOMS
NEW-YORK, 597 BROADWAY.
PHILADELPHIA, 513 MARKET ST.
BOSTON, 19 DOANE ST.

ROOT'S
WROUGHT IRON SECTIONAL
Safety Boiler.

THE Position of this Boiler as absolutely safe from disastrous explosion, economical in fuel, and as a thoroughly reliable, durable, practical, and efficient Steam Generator, is fully established, as evinced by the sale of about One Hundred and Fifty Boilers, the sale, to many purchasers, of a second one after trial of the first, and by the experience of those who have used it. Its safety is self-evident, it not being built of any dangerous materials, as large wrought iron plates, containing unseen defects, nor cast iron, which cracks and gives way instantly, but being composed of the best Wrought Iron Boiler Tubes, tested to 500 lbs. pressure, water and steam inside of them, and having no large sheet iron shell to explode. Its economy of fuel, and many other advantages, resulting from its sectional form, as lightness, low freight, facility of enlargement, etc., are equally evident upon examination. Its use secures the economy of high pressure without danger. In view of the thousands of victims maimed or murdered by all the common forms of boilers, no humane man can afford to incur the risk of using a boiler in which such fearful results are POSSIBLE. They ARE POSSIBLE, and somewhat PROBABLE in all SHELL BOILERS, the danger being inherent in the large diameter, and ready to develop itself, at any moment, in an explosion. Root's Safety Boiler offers absolute immunity from such results. Send for Illustrated Pamphlet. Address
ROOT STEAM ENGINE CO.,
Second ave., cor. 28th st., New York.
A Boiler of 120-H. P. at American Institute Fair until Oct. 30, 1869.

WE PUT GENUINE
HOWARD WATCHES
AND SELL NO OTHER—Into the hands of all respectable dealers throughout the country of our own manufacture.
All Genuine Howard Watches are marked "E. Howard & Co., Boston," both on the plate and dial, and none without such marks are genuine, whoever may sell them. If you cannot find the real Howard Watches at the dealers, send to E. Howard & Co., 114 Tremont st., Boston, Mass., and you will be at once attended to. We have no connection with Howard & Co., 619 Broadway, New York, as is frequently supposed. E. HOWARD & CO., 114 Tremont st., Boston, Mass.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of Superior Quality, on hand and finishing. For sale Low. For Description and Price, address NEW HAVEN MANUFACTURING CO., New Haven, Conn. 5 tf os

FREE.—Our New Catalogue of Improved STENCIL DIES. More than $200 A MONTH is being made with them S. M. SPENCER & CO., Brattleboro Vt.

NESTER'S COMBINED CARPENTER'S Tool saves one fourth the labor at Weather Boarding. Inquire of the Trade. Send stamp for circular to 27 Park Row, New York.

THE
Tanite Emery Wheel.
Does not Glaze, Gum, Heat, or Smell. Address THE TANITE CO.,
Stroudsburg, Monroe Co., Pa.

"MOUNT SAVAGE",
FIRE BRICK,
U. S. GOVERNMENT STANDARD, Manufactured exclusively by the CONSOLIDATION COAL CO., of Maryland, for Blasting, Puddling, Smelting, and Glass Furnaces, and all other purposes requiring the BEST QUALITY. Diagrams of Shapes, and Prices will be furnished by the undersigned. Also,
George's Creek Cumberland Coal
By the Cargo, from the Company's famous OCEAN MINES.
C. H. DALTON, President,
4 Pemberton Square, Boston.
JAS. S. MACKIE, Vice Pres't, 71 Broadway, New York.
JAS. A. MILLHOLLAND, 2d Vice Pres't,
Mount Savage, Md.

THE NOVELTY IRON WORKS—Foot E. 12th st., and 77 and 83 Liberty st., New York Manufacture the most approved Stationary Steam Engine, with Variable Cut-off, now in use.

WOODWARD'S NATIONAL ARCHITECT.
A practical work, just published, containing 1000 Designs, Plans, and Details to Working Scale of Country, Suburban, and Village Houses, with Specifications and estimate of cost. Quarto. PRICE **Twelve Dollars,** postpaid.

WOODWARD'S COUNTRY HOMES. 150 Designs, $1 50, postpaid.
GEO. E. WOODWARD, Architect
191 Broadway,
New York.
Send stamp for catalogue of all new books on Architecture.

Gunpowder Pile Driver
THOMAS SHAW'S PATENT.
The Company are prepared to sell rights, furnish machines, or contract for Driving Piles quicker and better than by any other machine. FIFTY BLOWS PER MINUTE, AND NO CRUSHING OR SHATTERING. See Scientific American of Aug. 14.
GUNPOWDER PILE DRIVER CO.,
505 Minor st., Philadelphia.

London.......................48 Cannon street.
H. KOHNSTAMM,
Manufacturer of
ULTRAMARINE,
And Importer of English, French, and German Colors, Paints, and Artists' Materials, Bronzes, and Metals. No. 3 Tryon Row, New York, opposite City Hall.

Root's Wrought Iron Sectional
Safety Boiler.
OVER 100 SOLD—TESTED TO 300 lbs., no large sheet-iron shell to explode. Economical and Durable. All sizes on hand. Also, Steam Engines, Steam Pumps, etc. Send for Pamphlets and Price Lists.
JOHN B. ROOT,
95 and 97 Liberty st., New York.

SILICATE OF SODA, IN ITS VARIOUS forms, manufactured as a specialty, by Philadelphia Quartz Co., 783 South 2d st., Philadelphia, Pa. 25 13

WIRE ROPE.
Manufactured by
JOHN A. ROEBLING'S SONS,
Trenton N. J.
FOR Inclined Planes, Standing Ship Rigging Bridges, Ferries, Stays or Guys on Derricks & Cranes Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes.

STEAM ENGINES & BOILERS

FROM 4 to 500-H. P., including celebrated Corliss Patent Variable Cut-off Engines, Slide Valve Stationary Engines, Portable Engines, etc. Also, Circular Mulay, & Gang Saw Mills Sugar Cane Mills, Shafting, Pulleys, etc. Wheat and Corn Mills, Circular Saws, Belting, etc. Send for Circular and Price List.
WOOD & MANN
STEAM ENGINE CO.,
Utica, N. Y.

THE WOODWARD STEAM-PUMP MANUFACTURING COMPANY, Manufacturers of the Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Also, Dealers in Wrought-iron Pipe, Boiler Tubes, etc. Hotels, Churches, Factories, & Public Buildings, Heated by Steam, Low Pressure. Woodward Building, 76 and 78 Center st., cor. of Worth st. (formerly of 77 Beekman st.), N.Y. All parties are hereby cautioned against infringing the Pat. Right of the above Pump. G. M. WOODWARD, Pres't.

PUMPING
And Blast Engines,
MADE under Shaw & Justice Patents, are very much the MOST EFFICIENT and ECONOMICAL IN WORKING, and by far the CHEAPEST PUMPING ENGINE yet made, with no lubricating parts, and entirely automatic. They pump mud or sand freely, and work perfectly well under water. Pumps capable of delivering from 10 to 10,000 gals. per minute supplied to order. Licenses to build granted on very favorable terms. See Scientific American, July 17th. Apply to
PHILIP S. JUSTICE, 14 N. 5th st., Philadelphia.

Philadelphia Advertisements.

☞ T V. Carpenter, Advertising Agent. Address hereafter, Box 773, New York city.

The Harrison Boiler.
THIS IS THE ONLY REALLY SAFE BOILER in the market, and can now be furnished at a *GREATLY REDUCED COST*. Boilers of any size ready for delivery. For circulars, plans, etc., apply to
HARRISON BOILER WORKS,
Philadelphia, Pa.; J. B. Hyde, Agent, 119 Broadway, New York; or, to JOHN A. COLEMAN, Agent, 36 Kilby st. Boston, Mass. 19 tf os

Drawing Instruments
OF Every Description, for Schools, Colleges, Civil Engineers, etc., of Brass, German Silver, and Swiss, Drawing Materials, Chesterman's Steel and Metallic Tapes, Transits, Levels, etc., etc. A priced and Illustrated Catalogue sent free on application.
WM. Y. McALLISTER,
728 Chestnut st., Philadelphia.

SAWS. EVERY DESCRIPTION Guaranteed under a forfeiture of $1000, to cut the most lumber with the least expense
Henry Disston & Son,
PHILADELPHIA. Special attention paid to our new style Circular, Belt, Cross-cut, Mill, and Hack Saws. Orders received from England, Ireland, and the Continent.

Drawing Materials.
WHATMAN'S PAPERS.—White and Yellow Roll Drawing Paper, 40 and 54 inches wide Tracing Muslin, Tracing Paper. Muslin-backed Drawing Paper, 40 and 54 inches wide. Winsor & Newton's Colors India Ink. Faber's Drawing Pencils, etc., etc. Priced Catalogues sent free. JAS. W. QUEEN & CO.,
924 Chestnut st. Philadelphia.

INCREASE TWIST DRILLS, FLUTED HAND REAMERS, exact to Whitworth's Gage, and Beach's Patent Self-centering Chuck, manufactured by Morse Twist Drill and Machine Co., New Bedford, Mass.

E. TURNER, Civil, Railway, and Mechanical Engineer. Address, care of W. JACKSON 504 Walnut st., Philadelphia, Pa.

Factory, Trenton, N. J.. ..Office, No. 2 Jacob st., N. Y
☞ Branch Office for Pacific Coast, No. 606 Front st San Francisco, Cal.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co., Leeds, Mass.

HAVE YOU A TUBULAR BOILER?—I am now prepared to repair leaky Boiler Tubes, in whatever condition they may be in, and to warrant all repairs satisfactory or demand no pay. Men and tools ready at all times. Do not plug or remove the tubes Send for circular.
JOHN F. RIDER,
47 Dey st., New York.

THE
Architectural Review,
AND
American Builder's Journal.
By SAMUEL SLOAN, Architect.
Volume 1, bound in extra Cloth, now ready. Price $7 50
☞ This Review is Royal Octavo, and published Monthly. Each part containing sixty-four pages of letter press, together with eight full-size page illustrations—the latter mainly in wood, but occasionally in lithography or chromo-lithography. The terms are FIFTY CENTS PER MONTHLY PART, or SIX DOLLARS PER ANNUM, payable invariably in advance. Specimen numbers furnished on receipt of the subscription price. All orders should be addressed to the Publishers,
Claxton, Remsen & Haffelfinger,
819 and 821 Market st., Philadelphia, Pa.

Excelsior Lubricator
For Cylinders of Engines. The most durable and best oil cup, manufactured by B. E. LEHMAN, Lehigh Valley Brass Works, Bethlehem, Pa. Send for desc've circular.

Pevey's Cupola,
WARRANTED to Melt, with one tun of Coal, 2000 lbs. of Iron MORE than any other Cupola now in use. ABIEL PEVEY, Patentee and Proprietor, Lowell, Mass. Van Tuyl & Co., No. 273 Cherry st., New York, Agents.

MAYS & BLISS,
MANUFACTURERS of PATENT SCREW and Lever Presses, Power Presses, Double-acting Presses, Cutting and Stamping Dies,
Machinery for Petroleum Cans.
Tinner's Tools made to Order. Plymouth st., near Catharine Ferry, Brooklyn, N. Y.

Bridesburg Manf'g Co.,
OFFICE No. 65 NORTH FRONT STREET,
PHILADELPHIA, PA.,
Manufacture all kinds of Cotton and Woolen Machinery including their new
SELF-ACTING MULES AND LOOMS,
Of the most approved style. Plans drawn and estimates furnished for factories of any size. Shafting and mill gearing made to order.

MASON'S PAT'T FRICTION CLUTCHES are Manufactured by Volney W. Mason & Co., Providence, R. I. Agents, R. BROOKS & CO., 123 Ave. D, New York; TAPLIN, RICE & CO., Akron, Ohio 16 tfeow

PORTABLE STEAM ENGINES, COMBINing the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than 700 being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J. C. HOADLEY & CO. Lawrence, Mass

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXI.—No. 18. [NEW SERIES.] NEW YORK, OCTOBER 30, 1869. $3 per Annum [IN ADVANCE.]

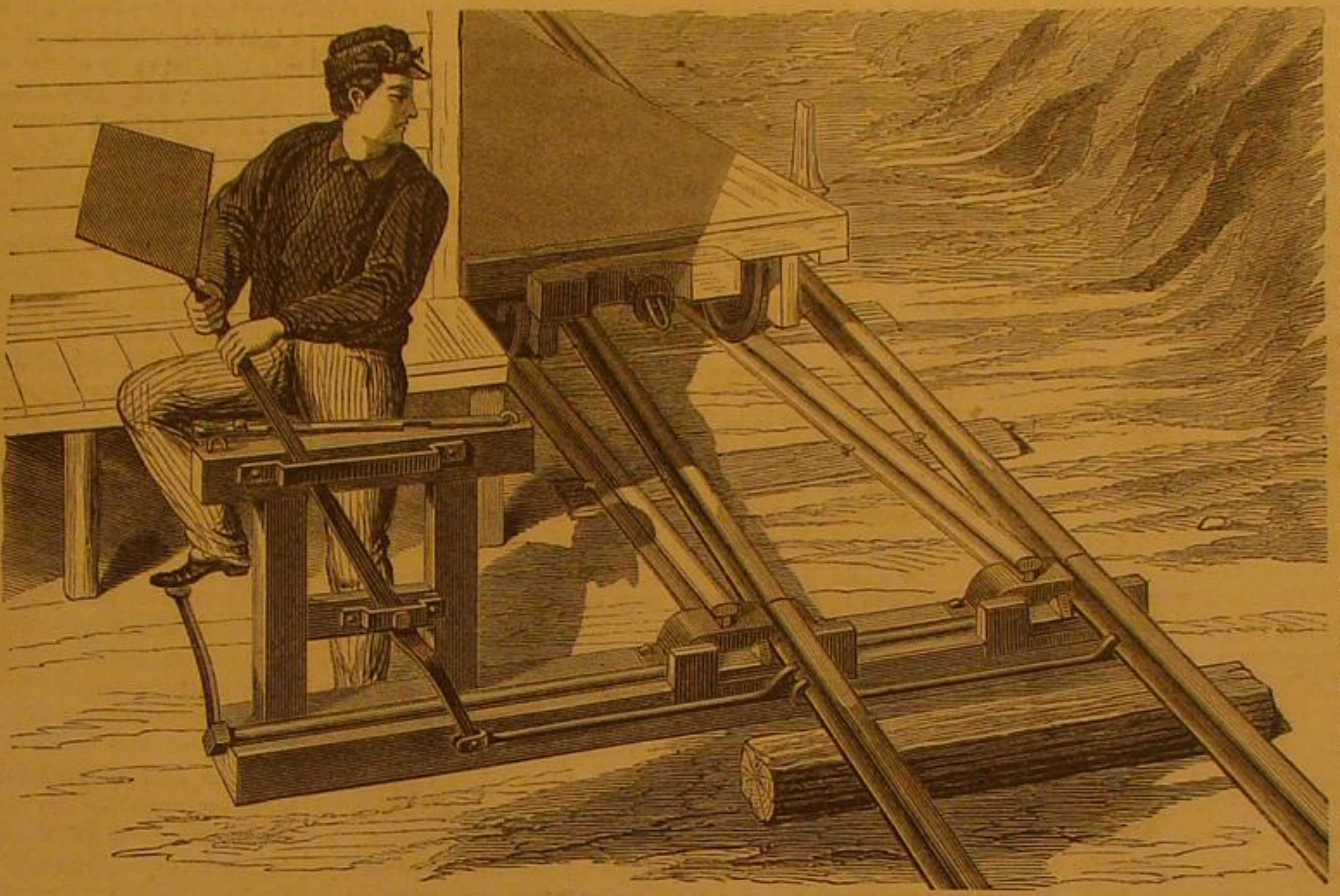
Improvement in Railroad Switches.

The essentials to a good switch are simplicity, durability, and security. All other considerations must be sacrificed to insure perfect safety. It is true that no form can be adopted that will render switch tenders careful, but there may be much question whether many of the misplacements of switches are not due to the flying over of switches, after they have been correctly placed by the tenders. As switches are now constructed, the tenders get the blame in all cases, right or wrong.

Our engravings exhibit the construction of a new kind of switch, differing in some features from anything else of the kind now in use. Everything about it is substantial, and when placed, nothing short of a man at the levers can change it.

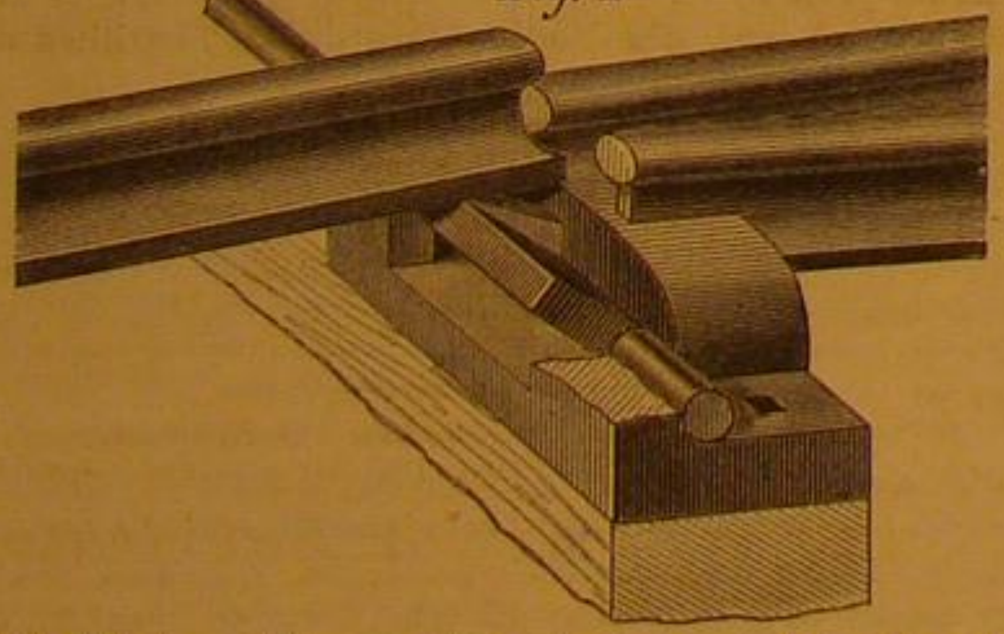
The movable rails receive their lateral motion through a lever of the ordinary kind, which may be held in place when not in use, by a hasp and lock, as heretofore.

The distinguishing feature of the switch is a rock shaft, shown in detail in Fig. 2, with angular projections underlying, and vertical angular projections rising up on either side of each of the movable rails. The rock shaft is operated by a lever upon which the switch tender places his foot, as shown in the larger engraving. When this lever is depressed, the angular projection upon which the rail rests is elevated as shown in Fig. 2. The rail is elevated with it, and released from the vertical angular projections which rise up at the side of the rail in the first position of the foot lever and rock shaft as shown in Fig. 1. The lateral movement being then made by the hand lever, the foot is removed, when the weight of the rail depresses the angular projection underlying the rail, and the latter drops down between the vertical angular projections above described, after which no lateral movement of the rail can take place until the foot lever is again depressed.



DOUGLASS' PATENT RAILROAD SWITCH.

Fig. 2



The flat form of the angular projection underlying the rail makes a perfect and solid foundation, and the side wear on the head of the rails is no more than in any other joint of the track.

We are informed this switch is now in use on the Delaware, Lackawanna, and Western Railroad, and is on trial upon several other important roads.

Patented through the Scientific American Patent Agency, Oct. 24, 1865, by George Douglass, who may be addressed for further information at Bridgeport, Conn., P. O. Box, 118.

THE FRENCH ATLANTIC TELEGRAPH.

From Chambers' Journal.

It is now nearly three years since it was our agreeable task to lay before our readers a description of the laying of the Atlantic Cable of 1866, and the recovery and completion of the lost cable of 1865. Since that time a great many telegraph cables have been laid; but none have been of so much importance, or possessed so many features of interest, as that just successfully completed between France and the United States. In the first place, it is interesting as being longer by about fifteen hundred miles, and laid in deeper water by five hundred fathoms, than any direct submarine line yet in existence; then its track lies through a part of the Atlantic which until very recently had been unexplored, and the nature of the bottom comparatively unknown; and thirdly, we look upon it with interest, because it shows that the importance of submarine telegraphic communication is commending itself to other countries besides our own. Hitherto, nearly all the more important submarine lines have been the direct offspring, and have remained in possession of English companies; but the present cable, although manufactured and laid by an English firm, is the result entirely of French enterprise, and to a large extent owes its existence to French capital.

The vital part of the longer section of the cable—or technically the "core"—is a copper conductor of seven wires twisted together, insulated by four concentric coatings of gutta-percha, separated from each other by an equal number of coatings of the material known as "Chatterton's compound"—exactly after the pattern of the cores in the last Atlantic cables—the only difference between them being in the weight of the conductor, which in the present case is four hundred pounds per mile, instead of three hundred pounds. This increase is to compensate for the additional length of the cable. Experiments have shown that the speed of signaling through submarine cables varies *inversely* according to their length, and *directly* as the weight of the conductor; so that, by adding to the weight in due proportion to the increased length, the speed obtained is the same as through a shorter cable.

The core is surrounded with a serving of yarn, called the "wet serving," allowing of the ready access of the water to the core. Until comparatively recently, this serving was saturated with tar, but experience showed that, should a slight defect occur in the gutta-percha, the tar from the serving being in itself an insulator would sufficiently stop it up to prevent its being discovered by the electrical tests, until perhaps it was too late to remedy it. The present wet serving, however, containing no insulating fluid, permits of the instant detection of a fault.

Around the serving are twisted spirally ten homogeneous iron wires galvanized, each of them embedded in five strands of Manila hemp. The cable thus completed is of a diameter of about one and a quarter inches, weighing about thirty-six hundredweight to the nautical mile, and capable of bearing a strain of seven tuns.

The core of the shorter section—St Pierre to Boston— is of the same description as that of the Brest to St Pierre section; but owing to its much shorter length, the weights of the copper conductor and insulator are only one hundred and seven pounds and one hundred and fifty pounds per mile respectively. This core is also covered with a wet serving, and then surrounded with about a dozen iron wires galvanized—the outside covering consisting of a silicated material, known as "Clark's compound;" the whole forming a cable of about one inch in diameter, weighing about two and three quarter tuns to the mile.

The Brest to St Pierre section was manufactured at the Telegraph Construction Company's Works at Greenwich, and transmitted piece by piece in old hulks to the *Great Eastern* steamship, lying off Sheerness. This section is of three kinds, namely: 1. The heavy shore-ends for protection against ships' anchors, tides, etc., weighing 360 hundredweight per mile. 2. The "intermediate," of a size between the shore-end and the deep-sea portion, 127 hundredweight per mile. 3. The deep-sea portion already described.

The whole of the above, 2788 knots in length, with the exception of 15½ miles of shore-end, and twenty miles of intermediate, was taken to the *Great Eastern*. We calculate that if the various component parts of it were laid end to end, they would make a chain of over 192,000 miles in extent, or nearly eight times the circumference of the globe. The whole of the work, including the manufacture of the two sections, and the fitting out of the *Great Eastern*, occupied little more than eight months.

For the accommodation of the cable on board the *Great Eastern*, three gigantic tanks were constructed, situated in the center, stern, and fore part of the ship, and known as the main, after, and fore tanks, respectively. Their diameters were as follows: Fore, 51 feet 6 inches diameter, by 20 feet 6 inches deep; main, 75 feet diameter, by 16 feet 6 inches deep; after, 58 feet diameter, by 20 feet 6 inches deep; with a total capacity of 169,760 cubic feet—being 27,750 feet greater than the capacity of the tanks in 1866. These immense structures were fixed to the sides of the ship, and supported by about 30,000 cubic feet of timber. The weight contained in them was about 5520 tuns, distributed as follows: Fore, 1270 tuns; main, 2580 tuns; aft, 1670 tuns; total, 5520 tuns.

The cable paying-out apparatus, consisting of an elaborate series of break-wheels and stoppers, with the measuring-machine, and the "dynamometer," a machine for constantly recording the strain on the cable, contained all the improvements that science and experience have suggested. The dynamometer especially claims our notice, as being, to our mind, one of the most ingenious and useful contrivances connected with the apparatus. It is placed between the stern of the ship and the paying-out breaks, and consists of a vertical frame-work of iron, in the center of which is fitted a grooved wheel, for the cable to pass under as it runs out over the stern of the ship. The wheel is made to slide up and down the frame as the strain on the cable varies, or, in other words, as the cable becomes tighter between the stern and the breaks. At the side of the machine is a scale, with the calculated strains in hundredweights marked upon it; and a hand fixed to the sliding-wheel traverses this scale, and indicates at any moment the strain on the cable. From the indicated strain, of course, the depth of water may be judged, and the breaks arranged accordingly; but the dynamometer is of most service in cases of hauling back the cable.

The ship was also fitted with a powerful set of picking-up machines and tackle, together with buoys, buoy-ropes, mushroom anchors, and everything requisite for picking up the cable in case of a breakage, as in 1865.

We must not forget to mention that the ship was also fitted with a complete set of "Wier's Pneumatic Signals," such as we believe are in use on several of the Cunard steamers. The uses to which this excellent apparatus is put are as numerous as they are effectual. The apparatus is rather complicated in its details, but simple enough in the principle on which it works. By pressing down a lever on a series of chambers of compressed air, the air from the latter is forced along a very small leaden pipe, producing instantaneously at the distant end some mechanical effect—either ringing a bell, or moving a hand, or lifting up a small flap, under which is written the signal meant to be observed. On the *Great Eastern* there were—1. An apparatus at both ends of the ship for communicating various messages to both screw and paddle engines; 2. An apparatus at each of the three cable tanks for signaling to screw and paddle to stop and reverse, in case of a hitch or foul-flake in the tank; 3. An apparatus connected, by means of cams, with the shafts of the screw and paddle engines, registering the revolutions of the same on a clock placed in the engineer's office; and 4. A communication was placed between the bows and the steering-wheel, to be used in case picking up should become necessary. Connected with some of the apparatus was also a tell-tale, which by an automatic action would indicate whether the order sent had been obeyed or not.

We have given so lengthy a description of this pneumatic apparatus, because we believe it to be one of the most useful inventions in the signaling department yet made. If properly fixed, it is almost impossible for it to get out of order.

With reference to the ship itself: so much has been said about the *Great Eastern*, that we do not wish to trespass upon our readers' patience with any long discourse upon the subject; but still the ship remains one of the wonders of the world, and we cannot pass on without some slight reference to its astonishing size and capabilities.

The increased size of the cable tanks has taken away considerably from the convenience and appearance of the cabin and saloon accommodation, but still the cabins more resemble rooms in a hotel than what we usually understand by ships' berths; and the saloons, especially the grand saloon, are still far beyond our ideas as to the size of any rooms to be found on board a ship. In fact, the ship more resembles a floating town than anything else we can think of. On what other ship can one find full-sized premises for butchers, bakers, plumbers, carpenters, blacksmiths, and fitters, with saw-mills, roperies, farm-yards, sheep-pens, pig sties, and store-rooms big enough to contain stores for a small army? It cannot be doubted that for anything else besides cable-laying, the *Great Eastern* is *too* big. The expenses of keeping her in trim, and her daily expenses while at sea, are such that no ordinary number of passengers would, at the usual fares, make her pay. But for cable-laying, she is the ship *par excellence;* and we doubt very much whether either of the present Atlantic cables would have been laid but for her size and general adaptability to the purpose. In the first place, no other ship could have taken the entire cable on board, thus obviating all the risks attendant upon changing from one ship to another in mid-ocean, as was done with so much danger with the first cable, in 1858. In the second place, her behavior at sea fits her better than any other ship in existence for cable-laying. She rolls to perfection when she has a heavy "swell" to encounter, but all her movements are of so regular and easy a character, that, in even heavy gales, the operation of cable-laying can proceed without any interruption whatever.

THE MANUFACTURE OF SULPHURIC ACID.

From the Report of J. Lawrence Smith, United States Commissioner to Paris Exposition.

Sulphur from Coal Gas.—In the manufacture of gas from coal, sulphide of hydrogen is one of the products from which the gas must be purified; and, for several years, what is known as the oxide of iron process has been adopted in large towns. This process consists in passing the gas through layers of peroxide of iron, mixed with some inert material to give it the necessary mechanical subdivision. The peroxide of iron is reduced to protoxide of iron, and the sulphur is precipitated in the mass, remaining uncombined. Exposure to air reconverts the protoxide into peroxide of iron without altering the sulphur contained in it; and this revived peroxide is used a second, third, and fourth time, in fact until the accumulated sulphur interferes with its rapid action, when it is replaced by fresh material. After repeated use this oxide of iron often contains as much as 40 per cent of sulphur. Some sulphuric acid factories employ this residue thus charged with free sulphur, and manufacture sulphuric acid from it after certain cyanides are extracted from it by other factories. The amount of sulphur that could be thus furnished annually is very great, estimating the sulphur in coal as one per cent, when its average is actually much greater. In London and its suburbs alone the gas produced annually would furnish 15,000 tuns, equal to 30,000 tuns of sulphuric acid. M. Lawes, near London, uses 2,180 tuns of this residue, each tun furnishing one and a quarter tuns of sulphuric acid.

Sulphur from California.—To the northeast of Borax Lake, in California, and about one mile from it on the borders of Clear Lake, is a large deposit of sulphur, where solfatric action is still apparent. The amount of sulphur which has been deposited in this place is very large, covering an area of several acres, and extending to a depth not yet ascertained. From six to eight tuns of this sulphur are refined daily, and are used in the manufacture of sulphuric acid, gunpowder, etc. A small quantity of cinnabar is associated with this sulphur. There is another large deposit two miles from this locality, at Chalk Mountain, and still another at Sulphur Springs further east; but neither of them contains cinnabar. These and other localities of sulphur in California were represented in the collection sent from California by the Commissioner.

Pyrites.—The manufacture of sulphuric acid from pyrites is probably the most important improvement made in manufacturing chemistry since the production of carbonate of soda from sulphate of soda, by Leblanc; and although it has been in operation for many years, it is instructive to review it in connection, together with the development of industrial chemistry in the past few years; for hardly fifteen or twenty years have elapsed since all sulphuric acid was manufactured from Sicilian sulphur, with but one or two insignificant exceptions, while now there is not more than one tenth of this acid made directly from sulphur.

While the use of iron pyrites in the manufacture of sulphuric acid dates back prior to 1830, it was not until 1838 that the short-sighted policy of the King of Naples, granting the monopoly of Sicilian sulphur to Messrs. Taix & Co., of Marseilles, that its use was fairly established, for the price of sulphur rose in England from $25 to $70 a tun, and in twelve months from that time, in England alone, not less than fifteen patents were granted for the manufacture of sulphuric acid from pyrites. And although the monopoly was soon withdrawn, by the persuasion of English vessels of war and the diplomacy of other governments, the pyrites had secured a firm footing in supplanting sulphur in the manufacture of sulphuric acid; and since then its use has rapidly increased; giving a wholesome lesson to governments to exercise great caution in granting monopolies and in legislating so as not to thwart industries based upon a science that draws colors rivaling the tints of the rainbow from coal, and that is not to be confined in the manner and method of its creations so long as the elements in one shape or another are at its command.

Since the first production of sulphuric acid from pyrites the establishment at Fahlun, in Sweden, has employed this process altogether, pyrites being very abundant in that locality. This example was followed by Perret, of Chessy, France, where the pyrites contains from three to four per cent of copper, which metal can only be extracted by desulphurizing the ore. From the mines of this locality 70,000 tuns of pyrites are burnt and exported annually, and the various lead chambers here for making sulphuric acid have a capacity of about 1,600,000 cubic feet. This process is carried on in all parts of France, whether the pyrites contains copper or not, and Sicilian sulphur is only employed for special purposes in France and England.

In the middle of France the pyrites of d'Alais is principally employed, it being very abundant. In the North of France the Belgian pyrites is used. In England the Irish pyrites is sometimes employed, although containing not more than 30 per cent of sulphur; but most of the manufacturers use the pyrites coming from Huelva, in Portugal, containing 45 to 50 per cent of sulphur, where the deposits of pyrites are remarkable for their great extent, extending into Andalusia, in Spain.

One of the mines that is worked in the province of Alemtejo, in Portugal, has a deposit of massive pyrites nearly a half mile long by two hundred and fifty feet across the widest part, and contains from two and a half to four per cent of copper.

Pyrites is frequently arsenical, and as the sulphuric acid produced from it contains arsenious acid, it is unfit for many purposes, especially where it is employed in the manufacture of products of domestic economy, such as acetic, citric, and tartaric acids, and also in some of the industrial arts, and in cleansing the surface of metals for alloying them with tin or other metal. In these cases acid made from sulphur is to be used, or the pyrites acid is to be purified by means of sulphide of barium or by sulphide of hydrogen, when the acid thus treated is equal in purity to any other.

It is not to be supposed, however, that sulphur is henceforth to be excluded from the manufacture of sulphuric acid; on the contrary, it is more than probable that many factories will return to its use, as the sulphur in Sicily is almost exhaustless, and if ever the country becomes opened to the world by good and numerous roads, the price of sulphur must diminish; and the diminution required is very small to bring it again into more common use among the acid manufacturers of the world. The factories in Belgium, in the North of France, and some in other parts of that country, those in Germany, and a number in England, will find it profitable in almost any state of the case to continue the use of pyrites.

(To be continued.)

THE NIAGARA ELEVATOR AT BUFFALO.

A great deal of engineering skill has been displayed in the erection of the giant elevators now in operation in various parts of the country, and our readers will probably be interested in some items respecting the Niagara elevator at Buffalo, which we cull from a letter of one of the correspondents of the New York *Tribune*.

"This, although the largest, is only one of 25 others which line the river upon both sides for a mile from the harbor's mouth. Buffalo has often been called "the world's granary;" a view of these elevators at work proves it. But a few years ago all the grain was handled in the bushel measure; many will be glad to learn how it is handled now. I propose to give as minute a description of one of the great elevators by which this is accomplished as my memory will enable me. The produce of the great West is so enormous that it requires enormous steam power to handle the millions of bushels of grain which are passing through this port.

"After several destructive fires, which consumed vast amounts of grain, a party of gentlemen determined to build an elevator that should be fire proof; the Niagara was the result. It is almost wholly composed of stone, brick, and iron, inside and out. The tall structure upon all elevators known as the "tower" is extremely liable to take fire, on account of the accumulation of dust, which is dry and highly inflammable. This tower has eight iron floors, reached by an iron, spiral stairway. The side walls are without openings. The foundations are stone and brick; the superstructure iron. The main building is 125 by 180 feet, the walls resting upon piles driven to the solid rock. The bins, which contain an enormous weight when full, rest upon independent foundations. There are 132 solid cut stone piers, each upon nine piles. Upon each pier are three solid oak timbers, braced together, which support the floor of the bins 20 feet above the pavement. This gives room for spouting the grain from any one of the 144 bins, upon endless-belt grain-carriers, to the bottom of elevators, which raise it to the top of the building, whence it flows by its own gravity into boats or cars or other bins. Grain keeps best in wood, so the bins are made of planks six to ten inches wide, laid up like a block-house, flat-wise. The center bins are 73 feet deep, and those under the lowest part of the roof, 52 feet. An iron ladder is built into one corner of each to enable a man to examine the grain or sweep out the dust when empty, or for any other purpose. The valves for discharging the grain are plainly marked by registered numbers, and are opened or shut in the lower story, information being conveyed by speaking tubes throughout the building to those in charge of the various departments. The boiler and engine which set in motion the ponderous machinery are in a separate, fire-proof building, away from any danger from sparks. Some of the grain is shamefully dirty—a disgrace to the growers. Sometimes the owners of such grain contract to have it run through the cleaner, with which every perfect elevator is furnished. In this one the dirt is driven by a powerful blast through a sheet iron pipe, two feet in diameter, and discharged into the river. Tuns of a good manurial substance and some grain are thus wasted, though many weed seeds are got rid of. There should be a law requiring all grain passed through a public elevator to be passed through the cleaner, if not already clean, before being offered for sale.

"Now let us suppose that a vessel full of grain has arrived. The steamer upon which I am now sailing up Lake Erie, the Dean Richmond, is capable of carrying 38,000 bushels of wheat. Imagine, if you can, the labor of transferring such a cargo, by the old process, with pails, tubs, half bushel measures, bags, hands, shoulders, carts, and horses. Now, as soon as the hatches are off a signal is given to the engineer, and directly the machinery of the tower begins to rumble, and a ponderous iron case rises, until high enough to swing its foot out over the hatchway. Another signal, and down it drops into the pile of grain. This is the "leg," and contains a belt of iron buckets which scoop up the grain and carry it into the first story of the tower. There it is poured into the hopper of a weighing machine, gaged exactly for 100 bushels. The moment the scale turns a man in charge stops the supply and opens a valve at the bottom, which lets out the grain while he is making his score; it should be self-registering—perhaps it is. Then he closes the lower valve, and opens the upper, repeating the operation so often that 7,000 bushels an hour are thus weighed. As fast as it falls from the scale hopper it is taken up by another elevating belt, and emptied into a receiver at the top of the tower, whence it runs to any part of the building. If it has to be cleaned it is reweighed and loss charged, as well as a small charge for cleaning. The quantity, quality, and owner's name of the wheat in each bin is registered, the elevator proprietors being responsible for the contents. The grain is sold by sample, but can be readily inspected and quantity ascertained by visiting the bins. If the grain heats it is immediately transferred to other bins, the operation giving it a thorough airing. As the floor of the bins is 20 feet above the ground, it will readily be seen how easily canal boats or cars can be loaded, while the unloading and elevating go on simultaneously.

"Suppose a cargo of wet grain arrives at this elevator. The same machinery is applied to its discharge, but instead of being stowed in the bins or shifted about to dry it in the air, it is sent into a spout which conducts it into another building owned by the same company, and built for a model malt house, with all the modern improvements. Here upon drying kilns, each 50 feet square, 15,000 bushels of wet grain can be dried daily. At the time of my visit the kilns were all in full blast with a cargo of oats from a sunken canal boat, and I wondered whether his damaged grain, when dry, would be put upon the market as sound. On being 'kiln dried,' will the oats be ground for human food? Or, having their vitality thus destroyed, if sold cheap, will they be, like other trash, mixed with 'Norway oats' and sold as pure improved seed? This malt house is 212 feet long and 54 feet wide, of solid blue limestone, with slate roof, iron gutters, and fire-proof floors, where the barley is sprouted, after having been steeped, 500 bushels at a charge. The kilns are heated by anthracite fires in the basement, and the flues are conducted up to and form the bottom of the kilns, which are of perforated iron, so that all the air or gas of the furnace may pass out through the grain. The finished malt or dried grain can be delivered directly from the store rooms of the malt house to the cars which run between the building and the elevator."

The Woolwich Dockyard Abandoned.

This celebrated dockyard, nine miles southeast of London, which has been in operation as government works for over three hundred years, has been closed, and will either be sold or leased to private shipbuilders. This dockyard, at the lowest estimate is worth $5,000,000, and if leased at 2½ per cent on this valuation, would yield a rent of $125,000.

The town of Woolwich has a population of over 40,000 souls, and owes its prosperity to the government establishments. In addition to the dockyard, which is one mile in length, separating the town from the Thames, it is the site of the largest arsenal in Great Britain, which covers more than 100 acres, and contains 24,000 pieces of ordnance and a vast amount of warlike material. Woolwich is also the headquarters of the Royal Horse and Foot Artillery and Corps of Sappers and Miners, for the accommodation of which extensive barracks have been built and parade grounds prepared. It is also the seat of a Government Military Academy for engineering and artillery.

In consequence of the increasing shallowness of the Thames, the Woolwich dockyard has been used for the construction of steamers and the lighter class of vessels, and for the above reason the establishment is now closed. When in full operation, the dockyards employed two thousand workmen, and great apprehensions of distress and inconvenience were entertained in case this large number of men should be discharged at once. However, the force was gradually reduced, and when the works were finally closed, only two hundred men were at work. The removal has caused many dwelling houses in the town to become empty, and the business of the tradesmen has been seriously affected.

The first ship built at Woolwich was the *Henri Grace de Dieu*, named after Henry VIII. Subsequently, in 1637, the *Soverign of the Seas*, carrying 167 guns, and the largest ship of war then known, was built at this yard, and in 1751 the *Royal George*, which foundered at her anchorage at Spithead.

SOME EXPERIMENTS WITH THE GREAT INDUCTION COIL AT THE ROYAL POLYTECHNIC.

BY JOHN HENRY PEPPER, F.C.S., ASSOC. INST. C. E.

THE LARGE INDUCTION COIL.

We extract from the *Chemical News* the following abstract of a paper communicated to the Royal Society, by J. P. Gassiot, F.R.S.:

"The length of the coil from end to end is 9 feet 10 inches, and the diameter 2 feet; the whole is cased in ebonite; it stands on two strong pillars covered with ebonite, the feet of the pillars being of a diameter of 22 inches. The ebonite tubes, etc., are the largest ever constructed by the Silver Town Works.

"The total weight of the great coil is 15 cwts., that of the ebonite alone being 477 lbs.

"The primary wire is made of copper of the highest conductivity and weighs 145 lbs.; the diameter of this wire is 0·0925 of an inch, and the length 3 770 yards. The number of revolutions of the primary wire round the core of soft iron is 6,000, its arrangement being 3, 6, and 12 strands.

"The total resistance of the primary is 2·201400 British Association units, and the resistance of the primary conductors are respectively—for three strands, 0·733800 British Association units; six, 0.366945 B.A.U.; twelve, 0·1834725 B.A.U.

"The primary core consists of extremely soft straight iron wires 5 feet in length, and each wire is 0·0625 of an inch in diameter. The diameter of the combined wires is 4 inches, and the weight of the core is 123 lbs.

"The secondary wire is 150 miles in length; it is covered with silk throughout, and the average diameter is 0·015 of an inch.

"The total weight of this wire is 606 lbs., and the resistance is 33·560 B.A. units. The length of the secondary coil is 55 inches, and the insulation throughout is calculated to be 95 per cent beyond that required. The secondary wire is insulated from the primary by means of an ebonite tube of ½ an inch in thickness and 8 feet in length.

"The length of the secondary coil is 54 inches, the diameter is 19 inches, and without the internal ebonite tube containing the primary wire and iron core it is a cylinder 19 inches in diameter and 6 inches thick.

"The condenser, made in the usual manner with sheets of varnished paper and tinfoil, is arranged in six parts, each containg 125 superficial feet, or 750 square feet of tinfoil in the whole.

"A large and substantially made contact breaker, detached from the great coil and worked by an independent electro magnet, was constructed, and worked very well with a comparatively moderate power of 10 or 20 large Bunsen's cells, when, however, the battery was increased to 30 or 40 cells, it became unmanageable.

"A Foucault break, with the platinum amalgam and alcohol above it, was now tried, and answered very much better than the ordinary contact breaker; there was no longer any burning or destruction of the contact points, although the great power of the instrument appeared to cause continued decomposition in the water of the alcohol placed above the platinum amalgam; and every now and then the spirit was violently ejected, probably by explosion of the mixed gases taking place in the amalgam, in which they collected in bubbles; the alcohol took fire constantly and had to be extinguished. A large and very strong glass vessel (in fact, an inverted glass cell belonging to a bichromate battery) was bored through, and the neck fitted into a cap with cement, a thick wire covered with platinum being inserted in the bottom; the platinum amalgam was poured on this, and over it a pint or more of alcohol; the contract wire was also very thick and pointed with a thick stud of platinum, and, being attached to a spring, contact was easily made and broken. Explosions did not occur, flashes of light could be seen between the amalgam and the alcohol, and the hight of the column of the latter prevented the forcible ejection of the spirit, which no longer took fire. The break was used for eight hours in a continuous series of experiments.

"The Bunsen's battery used in the experiments was made with the largest porous cells that could be obtained, and each cell contained about one pint of nitric acid

"Some experiments were tried with the battery arranged for intensity, and used with the complete condenser of 750 square feet of tinfoil and 1,500 square feet of paper. At first five cells were used, and these gave a spark 12 inches in length. The number of cells were gradually increased until 50 were in operation, when a spark from 28 to 29 inches in length was obtained.

"In order to ascertain whether any variation in the size of the condenser would affect the length of the spark, a number of experiments were tried; and it was found that when half the condenser was used the spark increased in length up to 20 cells, but not after.

"Experiments were now tried to ascertain whether any increase in the length of the spark could be obtained by arranging the battery and the primary coil for quantity, but no material advantage was obtained by this arrangement; even where three groups of cells were connected a decrease in the length of the spark is observed when compared with the 45 or 50 cells arranged for intensity, the dfference being as 20 to 28

"The spark obtained from the large coil is thick and flame-like in its appearance, and therefore it will be alluded to as the 'flaming spark.'

"When the discharging point and circular plate are brought within 6 or 7 inches of each other, the flaming nature of the spark becomes still more apparent.

"Two light yellow flames curving upwards appear to connect the opposite poles. If a blast of air from a powerful bellows is directed against a flaming spark, the flaming portion can be blown away and increased in area, and thin wiry sparks are now seen darting through it, sometimes in one continuous stream, at another time divided into three or more sparks, all following the direction in which the flame is blown.

"The flaming spark is very hot, and if passed through asbestos (supported on an insulating pillar), quickly causes the latter to become red hot.

"When powdered charcoal is shaken from a pepper box into the flaming spark in a vertical line and in considerable quantities, the greater part of the light is obscured, and the whole form of the flaming spark presents the appearance of a black cloud with a line of brightly ignited particles fringing the bottom parts. If the charcoal is dusted through in small quantities, each particle becomes ignited, like blowing charcoal into a hydrogen flame

"When the flaming spark is directed on to a glass plate upon which a little solution of lithium chloride is placed, the latter colors the flame upwards to the hight of 3 or 4 inches in the most beautiful manner; and if the point of the discharge is tipped with paper, or sponge moistened with a little solution of sodium chloride, the two colors (the yellow from the salt, and the crimson from the lithium) meet each other, a neutral point being found about half way, and thus illustrating apparently the dual character of electricity, and that + passes to — electrical, and *vice versa*.

"The flaming spark can be obtained in perfectly dry air.

"While passing through common air, if blown against a sheet of damp litmus paper, the latter is rapidly changed red. In order to ascertain whether the acid product was nitric acid, the flaming spark (9 or 10 inches in length) was passed through a tube connected by a cork and bent tube with a bottle containing distilled water, from which another tube passed to the air pump; on drawing the air slowly over the spark, and passing the former into the bottle, nitric acid was obtained in large quantities, so much so that it could be detected by the smell and taste as well as by the ordinary tests. The popular notion that nitric acid is always produced during a thunder storm would therefore appear to be correct. To determine the effect of a cooling surface on the flaming spark, a hole 1½ inches in diameter was bored through a thick block of Wenham Lake ice, and the spark passed through the air in the tube of ice; no change took place, and the spark was still a flaming one.

"When the spark was received on the ice, it lost its flaming character, and became thin and wiry, spreading out in all directions.

"If the discharging wires were tipped with ice, the spark was always flaming when any thickness of air intervened between them. Even over the ice, if the spark passed a fraction of an inch above the surface, it was always a flaming one, but changed to the thin spark when the point of the discharging wire was thrust into the ice.

"If one of the discharging wires of the great coil is brought to the center of a large swing looking-glass and the other wire connected with the amalgam at the back, the sparks are thin and wiry, arborescent, and very bright; the crackling noise of these discharges being quite different from that of the heavy thud or blow delivered by the flaming spark.

"When the discharging wire is brought close to the flame of the looking-glass, or if a sufficient thickness of air intervenes, the spark again becomes flaming; or, as sometimes occurs, if the discharging wire is placed about 5 inches from the frame, the spark is partly flaming and partly wiry, *i. e.*, when it impinges on the glass.

"The spectrum is a continuous one with the sodium line.

"When the blast of air is used, and the wiry sparks made apparent, then the nitrogen line appears.

"The flaming spark has been ascribed by some experienced observers to the incandescence of the dust in the air, and especially sodium chloride

"To ascertain whether the 'flaming spark' could be obtained with a small number of cells, the large Bunsen's battery was reduced to three cells, and it was found that no appreciable spark could be produced when the whole primary wire was used with less than five cells.

"By reducing the length of the primary wire, and using the four divisions separately, with five cells the spark was wiry, and varied from 4½ to 6½ inches; with 10 cells it was wiry, and varied from 8½ to 9¾; in the latter the spark was slightly flaming. With fifteen cells the spark was slightly flaming, and varied from 10 inches to 11¾ inches. With twenty cells a flaming spark varying from 11½ inches to 12½ inches was obtained.

"When the two wires from the secondary coil are placed in water, no spark is perceptible, even when the wire was brought very close together, until they touch.

"If the negative wire is passed through a cork, on which a glass tube (a lamp glass) is fixed containing a depth of 5 inches of water, and the positive wire is brought within half an inch of the surface of the water in the tube, it becomes red hot, and if drawn further away from the surface the upper part of the tube is filled with a peculiar glow or light abounding in Stokes' rays.

"The experiments with the vacuum tube, and especially Gassiot's cascade, are, as might be expected, very beautiful. When a coal gas vacuum tube of considerable diameter, and conveying the full discharge from the secondary coil, is supported over a powerful electro-magnet axially, the discharge is condensed and heat is produced.

"If placed equatorially, the heat increases greatly, and when the discharge is condensed and impinges upon the sides of the glass tube, it becomes too hot to touch, and if the experiment was continued too long the tube would crack.

"The enormous quantity of electricity of high tension which the coil evolves, when connected with a battery of forty cells, is shown by the rapidity with which it will charge a Leyden battery.

"Under favorable circumstances, three contacts with the mercurial break will charge 40 square feet of glass.

"On one occasion a series of twelve large Leyden jars arranged in cascade were discharged; the noise was great; and each time the spark (which was very condensed and brilliant) struck the metallic disk, the latter emitted a ringing sound, as if it had received a sharp blow from a small hammer.

"The discharges were made from a point to a metallic disk; and when the former was positive the dense spark measured from 18½ to 18¾ inches, and fell to 2½ inches when the metallic plate was positive and the point negative.

"Variations of the Lyden-jar experiments were tried by connecting the coil worked by a quantity battery of 25 + 25 cells with six Leyden jars arranged in cascade, and the spark obtained measured 8½ inches.

"The same six jars connected with the coil, when the fifty cells were arranged continuously for intensity, gave a spark of 12 inches of very great density and brilliancy.

Earthquake-Proof Buildings.

The recurrence of earthquake shocks in California has led to a discussion of the methods of building houses in such a manner as to be virtually earthquake-proof. A San Francisco architect, Mr. Saeltzer, has read a paper on this subject before the California Institute of Architecture, in which he contends that flexible materials only should be used in building. His theory is as follows:

"By distributing the whole weight of the building on piers of stone, brick, or iron, or on wooden piles—in fact, isolating the foundation in such a manner that these piers or piles form part of the foundation — and by connecting them with iron beams screw-bolted together, the building is then well anchored at the proper place; in fact, this style of foundation will form a girding all round the building longitudinally and transversely.

"This mode of construction will insure, first of all, the least contact with the earth; secondly, concentration of the whole mass of the building on single points only with strong anchorage; thirdly, more elasticity of the foundation, and consequently more elasticity in the whole mass of the building; fourthly, a combination of heterogeneous materials in one mass—an amalgamation—one of the most important points to be gained; fifthly, this style of building is the cheapest of all, and in most cases applies to our wants and climate, and to the desired architectural arrangements, and is applicable to any material."

* * * "The advantage of the concentration of the whole mass on piers will at once be visible. A pier has more elasticity than a solid wall, and if placed isolated, in the proportion of about eight times the hight to its base, this pier would, by a slight movement of the earth, lose its point of gravity; but by connecting a number of piers horizontally, traversely, and longitudinally, and by resting the weight of the whole building upon them, they become restrained in their natural action till the whole mass of the building begins to move.

"That piers will facilitate the rapidity or velocity of the movement of the whole mass, nobody will deny; inasmuch as they stand isolated, are comparatively weaker than a solid wall, and have solely to depend on themselves, in their own strength and nature, without any assistance from a connecting wall. It is hardly necessary to mention that the piers should, of course, be in proportion to the weight they have to support, and should be placed at proper distances for security."

* * * "To many it may seem strange that the towers of San Francisco stood so well during the late earthquakes, with hardly any apparent damage, and that also in European cities the towers have also been less injured; a fact which proves, in a most striking manner, that the flexibility or elasticity of a mass is a necessity for safety. A tower is a pier of high proportion, and forms a high pendulum, and naturally swings with more rapidity than a longer mass, and hence there is less danger. The tower of the Doin of Erfurt, at present a fortified city in Prussia, contains the largest bell in the world except the celebrated bell in Moscow. This bell requires twenty-four men to set it in motion, and when in motion has always caused an oscillation of the tower varying from four to five feet from the perpendicular line. For centuries this bell has been used, and the tower remains as perfect as ever. This tower is built of cut stone, with the finest details of Gothic architecture. I merely give this example to show the flexibility even of stone, provided the proportions are right.

"All our hotels stood well, also a large number of stores; in fact all buildings supported on piers or columns. All the bodies of churches also stood well, especially where buttresses were introduced. Each buttress forms a pier, and has, consequently more elasticity, and always will stand well, provided the proportions are artistically carried out. Very low churches, built more in the proportions of a stable, are unsafe; in fact, all buildings one story high and of considerable extent are liable to danger, more so than two or three-story buildings, no matter of what materials soever."

Floating Telegraph Station and Lightship.

We gave on page 36, Vol. XVII., a description with illustrations of floating batteries, buoys, and lifeboats, invented by Capt. John Moody, late Managing Director of the Goole Steam-Shipping Company.

We now present to the consideration of our readers an improvement on the form of the lightship, an engraving of which was given in the article referred to.

The great difficulty to be overcome in the perfection of this invention was to obtain a suitable vessel capable of being moored in any sea however tumultuous, and to obviate the continuous rolling motion of the lightships hitherto used, the great essential in a floating telegraph station being buoyancy with stability and constant steadiness, which a sharp vessel cannot give.

The vessel is constructed with four equal rays or projections proceeding from a central circular deck protected by iron bulwarks, sloping outward at the top. Proper openings are made through the deck to the interior of the vessel for companions and skylights, as well as good large scupper holes round the bulwarks to take off all water from the deck, so that even if it were possible for this part of the vessel to fill with water it would all run out through the scuppers; nor would there be any danger of foundering, owing to the great buoyancy of the vessel, her clearing valves, and her division into numerous water-tight compartments and other internal contrivances.

The vessel is also constructed to deflect the waves as they strike, instead of allowing them to break upon deck, as in the ordinary form of vessel.

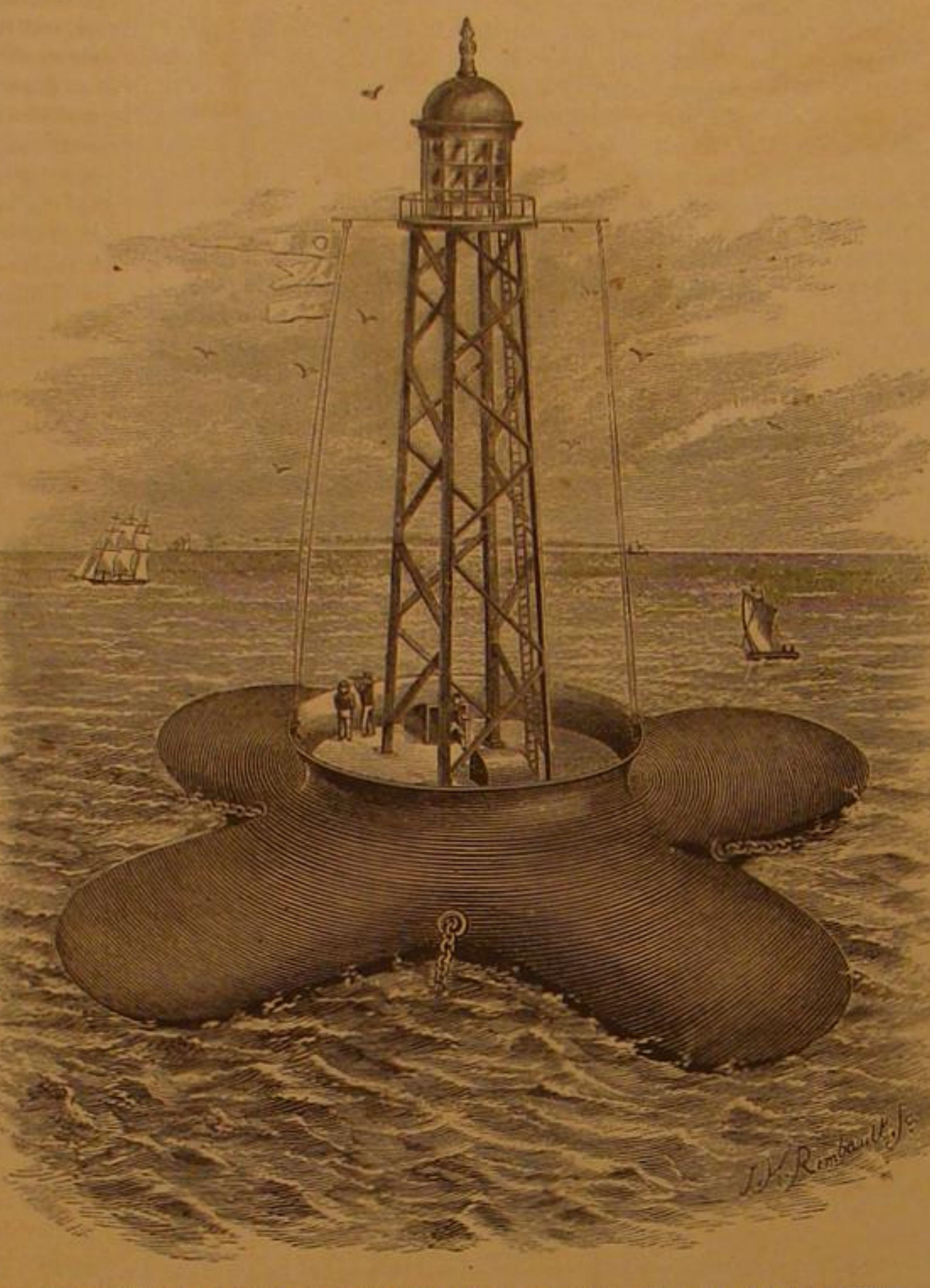
It is proposed by the inventor to use these vessels as intermediate telegraph stations where long submarine cables are laid. For example, he would, in establishing an Atlantic cable, carry it in comparatively short lengths, placing one of these vessels somewhere in mid-channel with a cable from Land's End. The next vessel would be placed off the Western Islands, or Hebrides, and the third off the American coast, from which a cable would be carried direct to New York.

By this means the cable would be divided into shorter lengths without increasing its aggregate length, and it is claimed the following advantages would be secured:

1. The diameter and weight of the cable would be considerably lessened, thereby diminishing its cost.

2. These shorter lengths could be carried out and laid by a smaller steamer than that employed in laying the present cables, thus very considerably reducing the cost of laying them.

3. These shorter cables, should they break, could be repaired or replaced with new lengths in a much shorter time, with much less labor, and at a greatly diminished risk and cost than in the case of a cable stretching from shore to shore.



FLOATING ELECTRIC TELEGRAPH STATION AND LIGHTSHIP.

Capt. Moody claims that even supposing that the cable laid in lengths was only intended to be used at its shore ends for through messages, such a plan would possess the advantages enumerated; but he claims numerous other advantages for this system.

Among these later advantages are the following:

Ships could call, and masters could communicate with their owners, whether in England, France, or the Continent, on that side the cable, or in America on this side. Masters on a trading voyage, and a long time out, would thus be enabled to send home letters and papers giving full information of the results of their voyages; for these mid-ocean stations could be made available for post-offices as well as telegraph stations. Arrangements could be made with the mail steamers to call for letters and anything else that might be left at the stations.

By means of these stations, money and bills could be transmitted from masters to owners.

Large quantities of all kinds of stores and provisions could also be kept there for sale to passing ships, and to relieve shipwrecked people who might be picked up, or who in open boats had succeeded in gaining the station.

News of wrecks or disasters at sea could be sent through the cable, and assistance might be obtained for many a ship which otherwise would be lost. Lifeboats should be kept at these stations (built upon the same principle as the telegraph ships, somewhat modified—that is, with four rays or arms, which would render them free from liability to upset), for the purpose of saving life, rendering salvage services, and as a means of communication with passing ships; so that all these floating stations would thus become not only places of business, but places of refuge in the very midst of the ocean. These stations could be boarded in all weather, for from their peculiar form they could always be approached on the lee side, where the sea would be much broken, and perfect safety in boarding secured.

In fact these stations might be made the centers of communication between all nations by a simple system of cross cables; as, for example, in a cable between Europe and America, the first or mid-channel station might have short cross cables to England and France, the next station, placed off the Western Islands, could have a short cable carried to the principal island in the group, putting it in communication with America, England, France, and the whole Continent of Europe; and what could be done in that case in that ocean, could be done in all other cases, and in all other oceans and seas, until the whole world became connected together.

"FAST" METHODS OF TELEGRAPHY.

We herewith give, as promised, an extract from the Report of the President of the Western Union Telegraph Company, on the subject of "fast" telegraphy. It has a certain historical value and is of interest in other points of view. It is quite evident that this company, if the report of the President may be considered as a fair representation of the opinions of the Directors, do not have much faith in new improvements. This view we do not indorse. We hope to live to see the time when ten words shall be transmitted in the time now occupied in sending one. The opinions expressed as to the impracticability of doing telegraphic work faster than it is now done we deem to be without any solid foundation. But so long as telegraphic business is limited by high tariffs, and the capacity of the present system is ample to do the work required, the value of a system of fast telegraphy will not be appreciated by telegraph owners. We advise our readers, therefore, to remember that there is another side to this question, to which we perhaps will at some future time again recur.

Mr. Orton in his report says: For many years past, efforts have been made to perfect a system of rapid telegraphing, which should be able to transmit several times as many dispatches per hour over a telegraph wire as can be done by the Morse instrument. The theory upon which all the experimenters in this direction have proceeded is that electricity has a definite velocity like light, and that all that is necessary to produce the most rapid writing at any distance is an instrument to record the signals produced by an automatic process, similar in principle to Professor Morse's original type and port rule transmitter.

In 1844 Mr. Bain, of Edinburgh, devised a plan of perforating the dispatches for transmission through a strip of paper, in the characters of the Morse alphabet. The prepared paper was then passed between a metallic comb and roller, which were in connection with the line wire, the circuit being completed when the teeth of the comb passed through the holes in the paper. At the receiving station he used chemically prepared paper, upon which the messages were recorded in colored dots and lines. The apparatus, although very attractive in theory, has never been of any practical value, as the time occupied in preparing the messages for transmission is many times greater than that required for sending by the Morse system, and an equal, if not greater length of time is consumed in copying them, while the Morse operator, who reads by sound, copies his messages as fast as they are sent. Subsequently, Mr. Humaston and others invented instruments for more rapidly perforating the paper, which it was thought by some would bring the "fast system" into general use, but these anticipations have never been realized. Mr. Humaston's apparatus, although very ingenious in design, is of so complicated a character as easily to get out of order, while its capacity for producing the Morse characters, when worked by an expert operator, is only about one third as great as that of the ordinary hand key. Added to these difficulties are the still more serious ones that messages cannot be sent by this system at a faster rate of speed than by the ordinary Morse apparatus, except over comparatively short distances; that it cannot be used upon a wire strung upon poles with other wires; nor will it work during a magnetic storm, except by the employment of a double line. Taking all of its merits and demerits into account, it is so greatly inferior to the Morse, and other systems in use, that it cannot be profitably employed either in connection or in competition with them. When the fast method was invented the relative proportion of telegraphic facilities to the requirements of the public was very small; but during the score of years which have intervened the rate of increase of the lines has exceeded that of the business, so that at the present time there are not only enough wires to transmit all that is offered, but they are equal to the performance of a much larger service, provided the messages could submit to a delay as great as that required to prepare them for transmission by the punching process. Therefore, the introduction of the complicated automatic system, even if it were practicable, is unnecessary.

The bulk of the business is received at our offices for transmission between the hours of eleven A. M. and two P. M., and all must receive immediate dispatch—both law and custom requiring that every message shall be forwarded in the order of its receipt. This peculiarity of the service necessitates the erection of many more wires than would be necessary if the work could be spread over the whole day. In Belgium speed rates are established to compensate for the loss by the reduced tariff, and a telegram requiring immediate transit is charged three times the ordinary rate. This innovation is embodied in the so-called postal telegraph system sought to be introduced in this country. Were this plan inaugurated here, business men, to whom time is money, would be obliged to pay an extra price to secure that promptness and certainty of transmission without which the telegraph is of little value for all important transactions.

The value of the telegraph does not consist in the amount of time which can be saved by it over the mail or other means of communication, but in its practical annihilation of time. A telegraphic dispatch, for example, might occupy two days in going from New York to London, and yet reach there eight days in advance of the mail, but this would not be a proper performance of the functions of the telegraph. Instant and constant communication is what is required, and hence the introduction of any apparatus which interposes an unnecessary delay in the preparation of dispatches, either for transmission or delivery, is a change for the worse. This is a disadvantage which the so-called "fast systems" labor under, and which will forever preclude their use.

The automatic system, however, is especially unfitted for the transmission of press reports, as this process enables but one station to receive at the same time, while the Morse wires can be connected throughout the country, and the news sent to every office with a single manipulation. The preparation for transmission of so great an amount of matter by the punching process as we daily transmit for the press, would entail an expense for labor and machinery far greater than the entire receipts of this company for regular press reports.

The double transmitter—an apparatus for working both ways over one wire at the same time—has also long occupied a prominent place among speculative telegraphers, and has recently been extensively advertised by the promoters of various competing lines. During the past twenty years there have been several inventions for accomplishing this result, the first being that of Dr. Gintl, of Germany; but while it is possible, under certain exceptional circumstances, to transmit messages both ways at the same time, over one wire, the conditions under which this result is obtained are such as to render the general use of the system impossible. If there were, however, any practical value in this apparatus, its use—like that of the Morse telegraph—is freely open to all.

The following is given as the composition of a good bath for electro-plating metals with platinum: In a solution of chloride of platinum sprinkle finely powdered carbonate of soda until bubbles of carbonic acid gas cease to appear, add to this solution equal quantities of glucose and sea salt, until the coating of platinum loses all blackness and becomes of the natural color of the metal. The advantage of this bath is that it may be concentrated to any degree, and thus maintained for a long time. The articles to be plated are placed in a pierced zinc receptacle, and the bath heated to about 140°; after a few moments the articles are withdrawn, washed, and dried in sawdust.

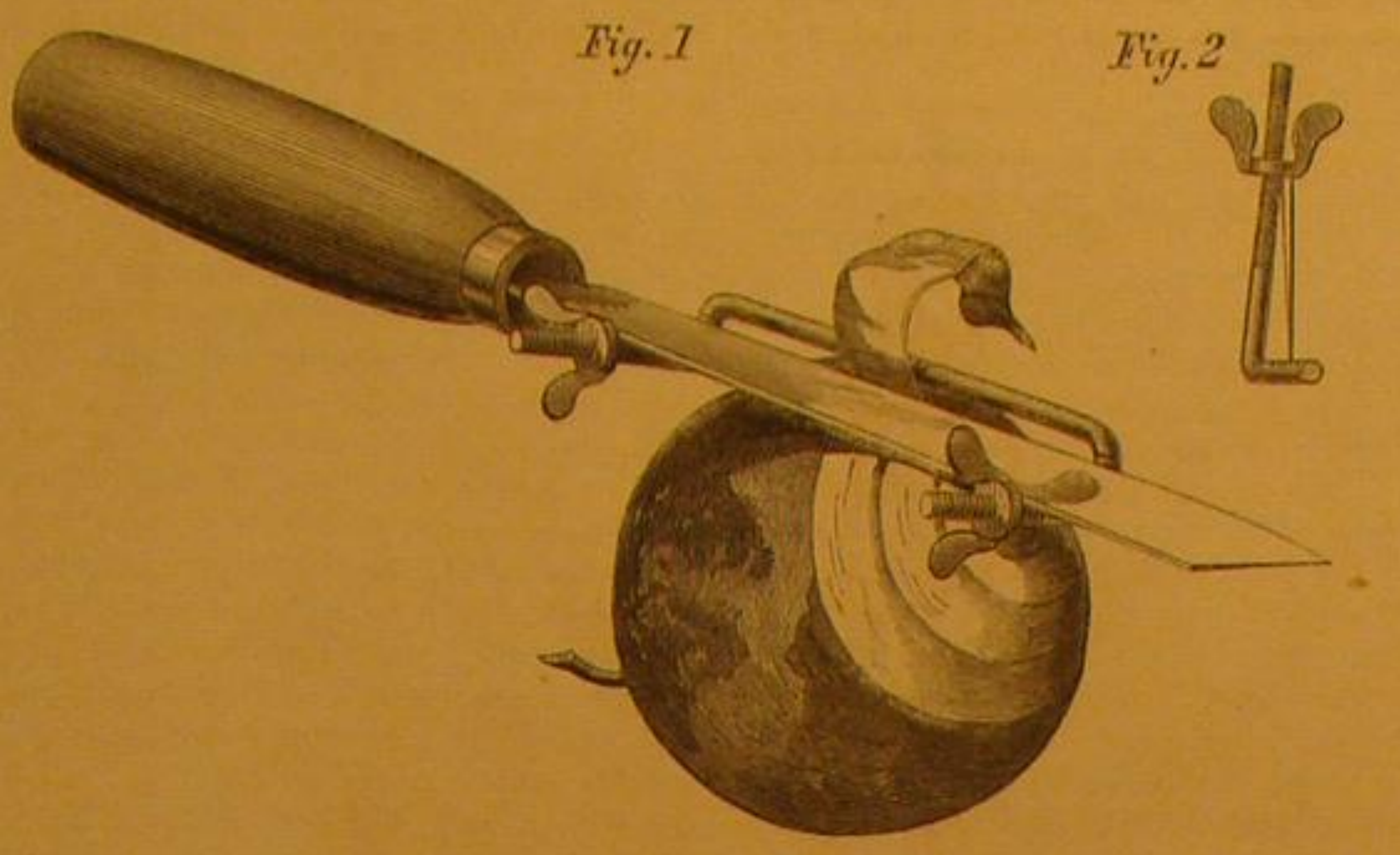
A copy of the Declaration of Independence in Chinese and on silk is on exhibition in California. The silk on which it is written, measures about five feet in length and twenty inches in width.

Improved Knife Guard.

This neat little device has for its object the provision of a simple attachment to knives used for peeling fruits and vegetables, so as to gage the thickness of the paring; and it may also be advantageously used in slicing, perfect uniformity of thickness in the slicing being very desirable in properly drying apples and other fruits.

Fig. 1 shows a knife, with the guard attached; and the detail section in Fig. 2 shows the simple method of attaching it to the knife blade.

The guard consists of a wire, bent twice, at right angles, so as to leave a portion lying parallel to the edge of the blade The edge of the blade engages in nicks on the elbows thus formed, these nicks being cut at uniform intervals at both ends of the guard, so that the latter may be adjusted to any required thickness.



GOODES' KNIFE GUARD.

After these bent portions of the wire pass across the edge of the blade, they are turned up again at right angles, and a thread is cut upon the extremities, upon which small thumb nuts are placed. The edge of the knife blade being placed in the desired nicks, above described, the thumb nuts are turned down to engage with the back of the blade, thus firmly fastening the guard.

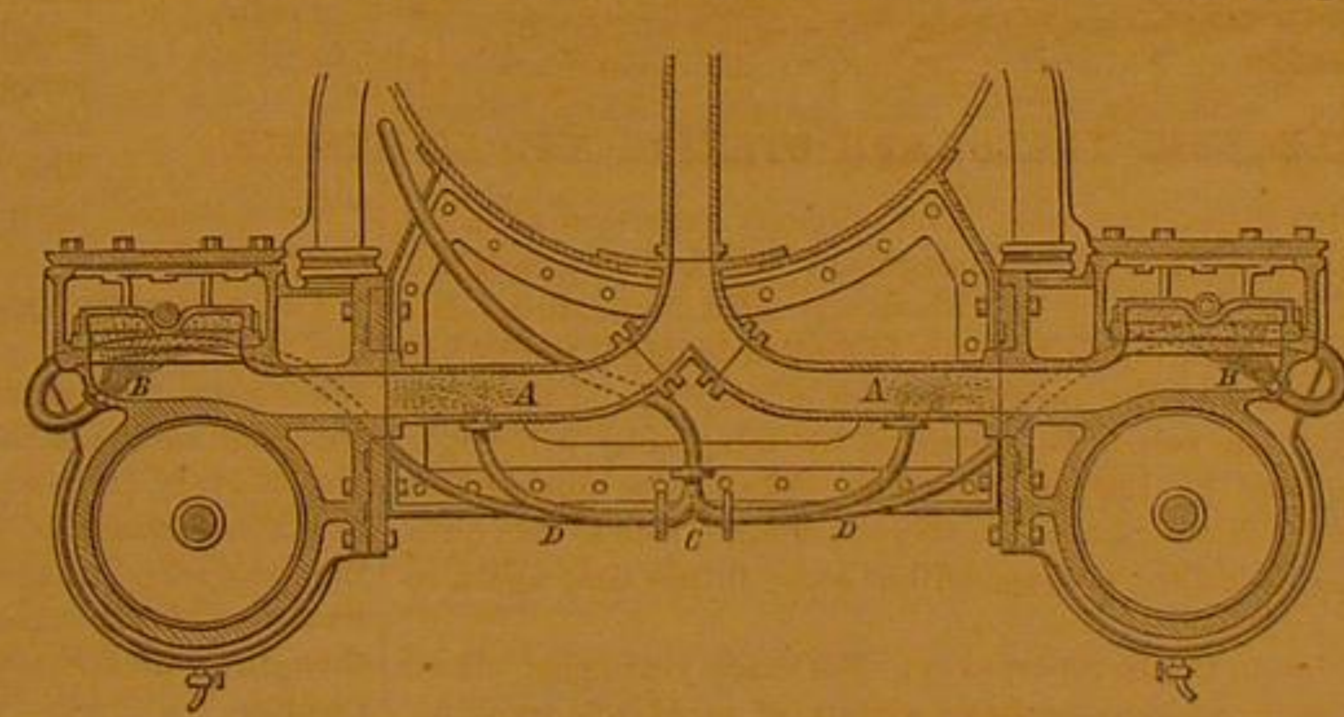
Simple as this invention is, it is one of that character which is, on the whole, most remunerative. Its advantages are obvious to the merest tyro in invention, and its expense must be a mere trifle.

Patented, through the Scientific American Patent Agency, Oct. 5, 1869, by E. A. Goodes. For further information address the Philadelphia Patent and Novelty Co., 717 Spring Garden st., Philadelphia, Pa.

THE USE OF COUNTER-PRESSURE STEAM IN THE LOCOMOTIVE ENGINE AS A BRAKE.

The work of M. L. Le Chatelier, noticed in our last, entitled "Railway Economy," and in which the above subject is discussed, is probably the most important work on railway engineering recently published. The improvement in the application of counter-pressure steam which gave rise to the work, we consider the greatest advance made in railway engineering since Stephenson demonstrated that a train could be drawn on smooth rails by smooth surfaced wheels.

We shall give an illustration and an account of this improvement, extracted from the treatise above alluded to, which will serve to impart a general idea of its nature; but there are many nice scientific points connected with its operation, which the reader will seek from the work itself, and which will amply repay the research.



The author gives the history of the improvement as follows:

About the middle of 1865, when I first thought of organizing a system of experiments for removing the difficulties of reversing the steam, I began by trying whether it would be possible to work the engine for any considerable time by means of the compressed-air apparatus of M. de Bergue. I soon convinced myself that the heating of the cylinders went on so rapidly that this system was inapplicable for any length of run. It was then that I drew up a complete programme of experiments, the sum and substance of which was to establish a communication between the boiler and the lower end of the exhaust pipe, in order to supply there a jet of steam or of water, and to force into the boiler the elastic fluids—steam or gases discharged from the cylinders by the return stroke of the piston. I pointed out three combinations to be experimented on in succession, according to the greater or less difficulty found in completly cooling the cylinders.

1st. Injection of steam mixed with air.

2d. Injection of steam in sufficient excess to prevent the entrance of air.

3d. Injection of water, instead of steam.

At first I supposed that the steam would carry along with it a sufficient quantity of water to absorb the heat produced, and that it would be condensed before reaching the cylinders. This idea was incorrect. During the working with steam reversed, the water ceases to be in a state of violent ebullition, and is only carried over in small quantities; and, besides, when the steam expands in issuing from the boiler, it dries, and the small quantity of water brought with it is almost entirely converted into steam.

The first experiment with a mixture of steam and gases drawn into the cylinders did not give favorable results. With the injection of an excess of steam—a system which I characterized as an *inverted steam engine*—more satisfactory results were obtained, and it was found possible to work with a moderate admission of steam with light loads on moderate gradients, without burning the packings, and without injuring the rubbing surfaces. We have in France the example of a railway on which 200 engines have only a cock for the injection of steam, and the substitution of this for the gases drawn from the smoke-box has proved sufficient to render the counter-pressure steam applicable for stopping and shunting in stations, and for moderating the speed in the descent of goods trains on gradients of 1 in 260. Indeed, the injection of steam alone has been effectually applied to light trains on a short incline of 1 in 22.

But experience soon showed that the only general and complete solution of the question is found in the injection of water. To complete the absorption of the heat produced by the compression in the cylinders, to force back the steam into the boiler, and to render the reversal of the steam an absolutely innocuous operation, water is the only appliance.

The engineers in Spain, to whom I intrusted the experiments, never quite understood the effects which the injection of water should produce. The application of it was therefore made with timidity and with doubt.

They imagined that it must be reduced to the minimum quantity. As a consequence, the results obtained in this, the first application, were never complete, despite successive increments of the quantity of water added to the steam. It was in France that engineers first recognized the necessity of giving a great preponderance to water over steam, and thus succeeded in rendering the new system applicable under every circumstance of the locomotive service.

For many months the official reports sent from Spain announced that the results obtained, from a mixture of steam and water, were quite satisfactory, but this was afterwards proved not to be the case. For two years and a half after my first programme was drawn up, this idea, that the solution of the problem consisted in injecting a mixture of steam and water in the exhaust pipe, prevailed. By successive trials—by rendering the steam and water cocks altogether independent of each other under the hand of the driver, the suitable proportion of water to steam in the various circumstances of admisson, speed, distribution, and dimensions of cylinders, was arrived at. It is by correcting this erroneous notion, which attributes to steam a necessary part in the action, that in France alone the system has been applied to 1,800 engines in work, or being fitted with the necessary apparatus. The practical result has been complete, because of the independence of the injecting cocks, which has allowed of the proportion of water being carried to the necessary limit in each case.

At the end of the year 1868, being free from my usual occupations, I determined on a consecutive study of the question, and on the verification of the results which had been obtained independently of my control. I soon perceived that my original notion—on which I had often by correspondence insisted—was correct in every respect; that the true solution consisted absolutely in the injection of water—that this solution satisfied every condition of the problem, and is probably the only one entirely applicable in cases of full admission and great speed. Steam, in fact, plays only a secondary part, prejudicial when above certain proportions, and, when used, to be applied with great caution, and only within certain limits.

When we speak of injecting water issuing from the boiler into the cylinders of a locomotive engine, it must be borne in mind that it is not water in the state in which it would flow from a fountain; it is at a high temperature when it issues from the boiler, and rushes into space at atmospheric pressure. It enters at once into ebullition, and becomes steam at 100° C., in quantity corresponding to the heat employed.

The new system of reversing steam has been, until recently, limited to the use of a mixture of steam and water. The engineers to whom I had intrusted the task of making the first trials, followed my instructions with some apprehension, endeavoring as much as possible to avoid the injection of water into the cylinders. The result has been that, even now, in Spain, where these first trials were made, the use of counter-pressure steam has not had the success which it has had elsewhere. In France, the part played by the water was better understood; it has been abundantly injected and the results have been most satisfactory; but up to the moment when I had an opportunity of personally experimenting, in order to verify the correctness of my first conceptions, steam was universally considered as a necessary agent, and was used in a greater or less proportion. It was supposed that its function was to fill the cylinders during the period of aspiration, and that it served as the vehicle for the water which was shut in with it, behind the piston, at the moment the period of cushioning and forcing back commenced. It was supposed that the water led from the boiler was applied directly to the absorption of heat.

I have shown that the water is converted into steam from the moment that it enters the cylinder, even during the period of aspiration, and the conclusion is that not only is it not required to take steam directly from the boiler, but that the addition of steam to the water, beyond a certain limit, might become prejudicial.

In every case the substitution of steam for, or the addition of steam to water, results in a discharge of a less moist steam from the cylinders into the boiler, and it is the same with the steam in the exhaust-pipe used for aspiration. The rubbing surfaces are therefore drier, and the friction greater. The more the proportion of steam is increased, the more these effects become sensible. At last the steam actually diverts the water indispensable for the absorption of the heat although large quantities of steam escape by the funnel, and, although no gases from the smoke-box get into the cylinders.

The intervention of steam during the working with inverse admission, unless required for some particular purpose, which I shall point out presently, is always more or less prejudicial. The rule, in fact, should be, to add the least possible quantity of steam to the water. The wet steam, on the water issuing from the boiler, gives this minimum proportion.

The apparatus to be fitted to the locomotive to admit of working counter-pressure steam as a brake, is as simple as the principle itself. It consists of a tube of an inch to an inch and a quarter in diameter—one inch diameter is very convenient—which communicates between the boiler and the exhaust pipe, and a distributing cock by which the driver regulates the supply. If, as I advise, although it is not indispensable, it is desired to have the power of injecting water and steam alternately or simultaneously, a second cock is placed, with a short tube as a branch from the first, at a short distance from its origin. The one tube enters the boiler below the lowest level of the water, the other above the highest, so that steam only shall pass through the latter.

When the engines have external cylinders, the exhaust-pipe divides into two branches. The injection tube must therefore have also two branches; one going to the under side of each branch of the exhaust pipe. The bifurcation should be perfectly symmetrical, so that the water held in suspension in the steam may not take the line of steepest descent, and that the distribution to each cylinder may be equal.

The engraving shows how the injection tube is joined to the exhaust pipes at two distinct places; but various other arrangements may be adopted.

The pipes, D, leading from the boiler to the exhaust, discharge into the exhaust at the point A, or B, the engraving representing at one view two different arrangements in this respect, showing two distinct ways in which the wet vapor may reach the cylinders. The branch piece C, should be of brass, and should be joined on to a *straight* length as long as possible. The drops of water in suspension in the steam tend to continue to move in a straight line, by virtue of their inertia and of their quantity of motion. If the bifurcation be not symmetrical, the distribution is unequal. Again, it is essential that beyond the point of bifurcation the two branches of the tube should have the same length, the same form, and the same section. Thus it will be found convenient to carry the tube under the center of the boiler; or, if room can be found for it, along the back of the boiler, in order to place the bifurcation at equal distances from the two cylinders. Want of symmetry might, of course, be compensated by difference of section in the tubes; but it is better to use a greater length of main tube in order to reach a point which allows of a perfectly symmetrical arrangement.

The injection of water might be used with the ordinary lever arrangement of reversing gear, where the consequences of a sudden spontaneous return of the handle would be unimportant. But the application is only quite satisfactory when the screw motion is used, as adopted by M. Marié, after Mr. Kitson's model. This apparatus, as a complement to the counter-pressure steam, has rendered most important service. Without it there must have been a long struggle against the natural repugnance of the engineers to reversing the steam. With it, the continual changes of the degree of admission, in order to maintain a uniform speed on lines with many changes of gradient, or for stopping trains at the right point in stations are made without fatigue or anxiety to the engineer. There are no longer sudden jumps from one notch to another; the regulator remains open, and consequently all the manipulations are more quickly effected, even when the steam has to be rapidly reversed. It is to this happy combination that the rapidity is to be ascribed with which the Paris, Lyons, and Mediterranean Company have already adopted (May 1869) the counter-pressure-steam apparatus for not less than 1,400 engines.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

The California Fairs---How San Francisco Looks to a New Yorker.

MESSRS. EDITORS:—Referring again to the Mechanic's Institute Fair, I would remark that although it is almost wholly an exhibition of the productions of this side of the Rocky Mountains, there are not a few articles, mechanical as well as merchantable, brought hither from the busy towns of the most eastern easterly States. So large an assortment of washing machines, for instance, could never be gathered in any part of the world without the help of New England. And so of brick machines, though prominent among these for apparent efficiency, is the "Climax," born, I think, of these west-coast minds.

Two articles there are which pre-eminently represent California as we have known and read of it any time these twenty years past—one an ore crusher, with its half dozen heavy pounders almost constantly busy in reducing golden stones to powder; and the other an immense wine cask, capable of containing something more than four thousand gallons of California's choicest juices. If one of those crusher-pounders were but playing its ponderous tune in that big barrel, I should be obliged to recall scenes of early youth when the family linen was duly pounded into cleanliness.

A very ingenious contrivance in the application of steam to pumping—so much of which is required west of the mountains—is Martin's oscillating engine and pump. Both consist of two cylinders cast in one piece, the two piston heads connected by rods on the outside, the steam and water being admitted and discharged through the oscillating shaft at the center of the casting.

In the same line of improvement, but not like the first, adapted to use for power purposes, is the Wilcox Steam Water Lifter. In this the steam itself acts directly on the water by means only of an intervening plunger, the steam being admitted at one end and the water at the other end of the same cylinder.

One of the peculiarities of Californian life, or rather one of the evidences that Californians are fully "posted up" in the movements of the day, may be seen in the stands set apart for institutions connected with what are popularly called "Women's Rights." Among these is a Women's Printing Establishment, where orders are taken, and the work executed and delivered without aid or intervention by the lords of creation. Connected with this are women artists and women engravers, and the establishment really covers all the demands made upon it, by the labor of the fairer sex. Indeed the artist and wood-engraving department is, as I know, carried into some fine mansions here, and supersedes the useless fancy stitching and embroidery once the only way of killing time among their inmates.

But it is full time that I left the Fair building and remarked upon the appearance and construction of the city. To how great an extent San Francisco depends upon the neighboring forests can scarcely be realized save by ocular demonstration. Suppose, if you can, that every brick and stone of whatever variety were removed from the great city of New York! What would remain? Possibly a few buildings of iron and wood; but would not the city be gone, and its very site an unmarked wilderness?

And just so much, and nothing more, would remain of the city of San Francisco if once the wood were removed. Beginning on the ground the street pavements would disappear—not principally Nicolson either, but plain common planks two or three inches thick. After them would go the sidewalks and curbing—then the fancy fencing to door yards, some of which vies with our best iron railings in beauty of design and finish—then the porches, and steps which appear to the passer by as the equal in solidity, as in ornament, of those grand entrance ways on Fifth avenue. And, lastly, the apparently solid blocks of sandstone and granite so deftly wrought, imposing in more senses than one—the very body and walls of the house—would melt to nothingness. A few slender brick chimneys and a few heaps of crumbled plaster might be said to remain sole evidences that a great city once existed.

Next to the construction of the houses the manner of improving the ground is worthy of remark. "'Frisco," as Californians love to call it, is located on the sides and at the foot of sand hills. Below, the streets are level and regular, but on the side hill, necessity rules, and the front door of the house is often thirty, if not forty feet above the street. On the street line appears a common stone wall ten to twenty feet high. The wall is rough and ungainly—unpromising to the last degree—and the rude doorway pierced through it, has all the appearance of leading to the kitchen. Entering, we rise by successive flights of stairs, and emerge upon a delightful parterre of flowers and shrubs. The house stands sufficiently back, and so entirely by itself as to possess nearly all the attractions of a villa in the country, while its windows command the whole city on the plain below, with the blue waters of the bay beyond and the distant mountains. B.

San Francisco, Sept 30, 1869.

Machine for Picking Cotton.

MESSRS. EDITORS:—In your number of July 24th, B. W. Woodward asks for a cotton picker, but repudiates the tin tube and chain picker style. I would like with your permission, to offer a few suggestions as to what is necessary in order that mechanical appliances may be made to do the work of cotton picking.

In the present condition of cotton culture it is necessary that anything that does the gathering shall have an intelligent controlling power to direct, in order to reach the individual bolls without damaging the plant; this cannot be imparted to machinery; therefore it becomes necessary that the cotton plant itself shall be so improved or modified that the whole of its produce shall be ripened at one time (much more difficult problems have already been solved by horticulturists) and if but one plant out of the many cultivated can be found answering to this requirement it will take but few years to seed this whole continent, then, and not till then, can we expect mechanical ingenuity to assist in the gathering of the crop. A. D. C.

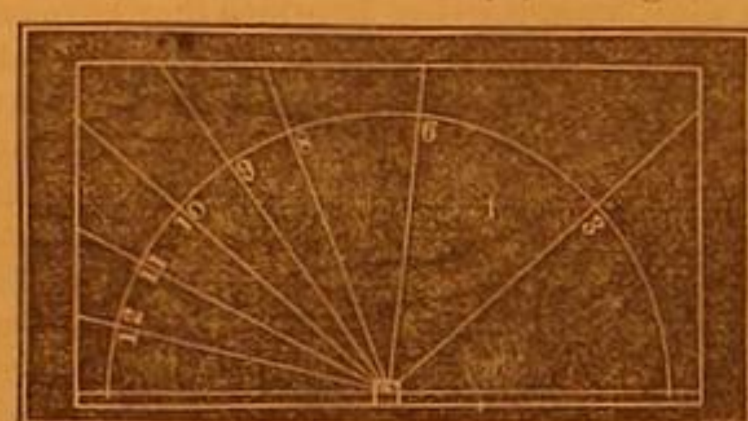
New Madrid, Mo.

Setting Work on the Face-Plate of a Lathe and Spacing Circles.

MESSRS. EDITORS:—I beg to offer some practical suggestions on the above subject, where great accuracy is required, which may prove of service to some of your readers.

Let the work be set out, and first lightly prick-punched; then clamp to place lightly as near as possible, but never set the "dead center" against the work, for that will not bring it true—now with a "scratch-awl" or a sharp-pointed center, with the point resting in the prick mark, and the other end held against or on the "dead center," revolve the work. If the point marked for the center of the hole is out of truth, the "scratch-awl," or whatever rests in the point, will vibrate. Put into the lathe rest a tool, without fastening it, and push it up to the scratch as the work is revolved, and the extent of the vibration can be seen. The work can be driven as thus indicated. When there is no vibration of the scratch or center, the work is perfectly set, and may be securely fastened. I regard this as the only perfect way to set work, and yet good workmen (?) take some other way.

In your reply to a correspondent who seemed to have something for readily spacing a circle, a few weeks ago, I was reminded of a plan I used successfully years ago.



I took a well-seasoned board something wider than the half of any circle I expected to space, and more than twice as long, so as to get the half circle upon it, and drove a bit of hardened steel that was pricked for the center into the center of the circle. I then drew with a sharp knife a line through this point the whole length of the board. This was the diameter, or my starting point, line. I then spaced this half circle with dividers into twelve or any other number of spaces, beginning always at the left, so as to have the spaces right for a whole circle, then with the sharp knife I drew lines from the center through the points spaced on the circle, and numbered them with ink from twelve round to three. I then varnished the board. To use it now, take the dividers, open half the diameter of the circle you wish to space, and with one foot on the steel center touch the first line on the board (chalked so as to mark through the chalk and not deface the board) and then the line numbered for the spaces you wish; the distance between the lines thus marked was the right distance for that circle in spacing it. The board was subject to atmospheric changes, of course, and so was not perfectly reliable, but sufficiently accurate for a good deal of work in a machine shop when templets could not well be used. WM. L. BULLOCK.

Fitchburg, Mass.

Correlation of Forces---A Meteorological Fact.

MESSRS. EDITORS:—In connection with the theory of "Correlation of Forces," some curious ideas are presented.

In producing electricity by friction, for instance, it is evident that two surfaces should be rubbed together that will produce the most friction with the least heat. Whether the old amalgam rubber and glass are the best for this purpose is doubtful. I would suggest that the well-known "biting" quality of turpentine or benzole might be used to advantage.

Again: If two polished and plane surfaces of totally inelastic material are placed together, these might be *forced* together with a pressure of any number of thousands of tuns by the bending of a hair, for, as there could be no motion, or heat, or electricity produced, the force applied might theoretically be multiplied or correlated into pressure simply to any extent. Many other curious notions grow out of the application of this beautiful theory, the principles of which ought to be understood by every inventor especially.

But I have a fact to communicate in relation to meteorology.

The early summer here, latitude 42°, was very wet. About the 1st of September commenced dry south winds, which have blown, with occasional intermission, all the month.

The first week I predicted an extraordinary rise in the river, for I reasoned thus, both theory and previous observation being my guide:

These winds take up a vast amount of moisture which must be precipitated on the higher and colder slopes of the Lake Superior dividing ridge, and of course come back to us in the river.

The result has been such a great and persistent rise as was never before known from the same cause. The Mississippi is within a few feet of the highest spring floods, and immense damage has been done in sweeping hay from the bottoms, never before reached at this season. CHAS. BOYNTON.

Lyons, Iowa.

How to Clean Broom Corn Seed.

MESSRS. EDITORS:—In your issue of September 11th, Benjamin Roach, of Natchez, asks for a seed cleaner for broom corn. A very good and simple one can be made by taking an old grain fanning mill, and in place of the arms, substitute a drum, 12 inches in diameter; on the outside of this drum, nail strips all around, first driving through the strips 16 penny nails, after the manner of a thrashing cylinder; take the broom corn by handfuls, and hold it to receive the action of these teeth while revolving; two men can clean while one turns. A. D. C.

New Madrid, Mo.

Fires from Steam Pipes.

MESSRS. EDITORS:—In regard to fires from steam pipes, I would say that I have been engaged in repairing locomotives some years past, and it is well known that the jacketing of the boiler is matched pine with sheet-iron outside; yet I have never seen any that looked burned. I have noticed some that looked like wood affected by dry-rot, and some of these boilers were worked with a head of steam of 110 lbs. I know also of a 24-horse power engine which has been running eighteen years, the cylinder of which is jacketed with pine, veneered with rosewood, the wood of which is all sound. The same engine is run with from sixty to eighty pounds of steam, with only four feet of pipe from the boiler to the cylinder. C. B. HOYT.

Oriskany Falls, N. Y.

To Keep Pure Air in a Sick Room.

MESSRS EDITORS:—The following simple arrangement will remedy the evil of foul gas, generated by burning a kerosene lamp all night in a nursery or sick room.

Take a raisin or any other suitable sized box, that will contain the lamp when set up on end. Place the lamp in the box, outside the window, with the open side facing the room. When there are blinds the box can be attached to each by leaving them a little open and fastening with a cord; or the lamp box can be nailed to the window casing in a permanent manner. The lamp burns quite as well outside, and a decided improvement of the air in the room is experienced. Try it. "CONVALESCENT."

Filing Saws.

MESSRS. EDITORS:—In your article on "How to file and set a saw," page 252, current volume, you say—"the teeth in cross-cut saws ought to cut both ways," so they should; and I think they should cut *much* more in the downward stroke than in the upward, because in the latter we naturally have little more than the weight of the saw to bear on the wood, while in the former we work the saw inward and downward at the same time, with an extra force from the upper arm and shoulder.

In filing, I pitch the teeth front a little, and give the front edge of the tooth a sharper bevel. It makes a great difference. E. R. RICE.

Clinton, Mass.

[For the Scientific American.]

HOW MAHOGANY IS OBTAINED.

Few persons having their dwellings comfortably fitted out with some old, solid, and yet elegant mahogany furniture, have the remotest idea with how much labor and hardship the cutting of the mahogany tree is connected. To prove the correctness of Mr. Squier's remark in his "Travels through Central America," that "of all the out-door works, the cutting of the mahogany is the most laborious and the roughest," we will give a brief sketch of how the work is done, having been associated with that kind of business for several years.

The countries where most of the mahogany trees grow are principally St. Domingo and the Central American States. British Honduras, Guatemala, and Honduras furnish a superior quality, as also the largest logs. The latter are mostly shipped to England, while the smaller logs, say from three to six feet in diameter, are shipped to the United States under the name of "Yankeewood."

The cutting of the mahogany trees is conducted as follows: The tract of land selected for the works must be so situated that it is easily accessible through rivers, creeks, or canals, which run into a sheltering bay or harbor, where the vessels can lie and receive the wood. The lands are leased from the government for a certain number of years for which lease the manager has to pay annually a certain sum of money—some two hundred dollars or more, according to the land he occupies and to the circumstances under which he makes the bargain. For every log which he ships he pays from five to ten dollars—the different States varying in their taxes.

The number of workmen necessary to carry on the business on a large scale is about one hundred, who belong to different nations—Caribs, Sambos, Indians, and Spanish Americans. They are engaged for ten months, as no work is done during December and January, on account of the heavy rains. The men receive from ten to twelve dollars per month, payable half in goods and half in cash, besides their weekly rations, consisting of seven quarts of flour and four pounds of salt pork. Whoever has once witnessed the scene of paying out the rations will never forget it. It is always a scene of tumult and general dissatisfaction which often ends in a revolt. The cause is that the workmen always pretend that the flour was not properly measured or the meat not properly weighed. This giving out of rations is always and everywhere the work of Sunday mornings, and it is therefore so much more painful to a man who remembers the peaceful Sunday mornings of a northern home. Each nation has, of course, a distinct language, and as all speak at once in the most vociferous manner, the scene often resembles a second Babel. The workmen are divided into "gangs," according to their nationalities, and the work which they are required to accomplish. The heaviest work is done by the Caribs and Sambos; the Spaniards have the charge of the cattle, while the Indians are used as carriers, hunters, etc. All the laborers are under the inspection of a captain or overseer, under whose command are two or more foremen or second captains. As soon as the men are thus organized the work begins.

First of all roads have to be made, in all directions, leading towards the water's edge. At four o'clock in the morning a shell is blown by order of the foremen as a signal that it is time to get up. The men then prepare their hasty, frugal breakfast, consisting of a piece of boiled pork and a dumpling made of flour and water and boiled with the meat. At a second signal they have to appear before the captain's hut armed with their hatchets, etc. When the names of those present have been called out, and the missing ones noted down, the captain marches them off, and sets them at work. This is no small job, as the work in these countries is only done by tasks and not by the hour. The captains have, therefore, to measure and mark each separate task, and in the evening it is their business to see if the tasks are all properly finished. In making truck paths and other roads, twenty-five to thirty feet are called a task. The work consists of clearing away trees and bushes. As it often happens that one has, in his distance, many large trees to cut down, while the next one has nothing more than bushes, of course a great deal of grumbling and dissatisfaction is manifested, but they have to manage that between themselves and help each other. Very often they finish their task by ten o'clock, and they have thus the rest of the day for themselves to cultivate their gardens or corn patches around their huts, or to go hunting, as many of the laborers have wives and children with them, and the usual rations would not be sufficient for the wants of a family. The different nationalities keep apart from each other, and the little colony is divided into settlements. The animosities existing between the different inhabitants greatly augment the trials of the manager.

While some of the workmen are thus preparing the roads several explorers are sent out in different directions through the almost impenetrable wilderness, to hunt up and mark such mahogany trees as they think are good and sound. Many of the larger ones prove to be hollow, which, of course, is loss to the owner if time is expended in cutting them. The hunter is paid from twenty-five to fifty cents for each tree which he marks. He has no compass or means to show him his position in this vast forest, his only guide is the sun, and often he is obliged to climb on a tree in order to see it.

The cutting of the trees is an interesting and almost a dangerous process. As the roots of the mahogany tree project sometimes more than ten feet above the ground, a sort of scaffold has to be erected at the hight where the trunk of the tree commences. This scaffold is simply made of creepers, about half an inch in thickness, fastened around the nearest trees. The cutting is done with the ax in the hands of the Caribs, and it is a most exciting sight to look upon these men as they stand barefooted on a single limb and swing their axes with all possible ease. If one of them loses his equilibrium, which seldom happens as they consider it a dishonor, it always causes a great deal of merriment among his fellow workmen. The actual felling of the trees depends very much on the wind and weather. If the wind is contrary to where the trees are intended to fall, they have to wait for another chance; neither ought the trees to be cut while the moon is increasing, as the wood would not be so valuable for future use. There are not more than four months in the year when the actual cutting can be carried on, and it is therefore necessary that everything should be prepared and in good working order when the right time arrives.

The trucking and sleighing of the trees down to the river or creek forms another important operation. Every tree is rolled into the water amid the loud cheering of the laborers. Fourteen cattle are usually yoked to a truck, but if the tree is one of the largest, twenty-eight cattle are used. Generally three, but sometimes only two trips are made in a day, each trip with a different set of cattle. It is almost impossible to give the reader an idea of the difficulties and tediousness of the trucking; it can only be partly imagined what an immense trouble it is to make fourteen or twenty-eight half-wild oxen work together or to guide them. As soon as the rains have set in, the sleighing commences; mud here taking the place of the snow of northern climates. The loss of cattle is always very great, caused by the carelessness of those who have the charge of them, or by many other unavoidable circumstances. Many straggle off into the woods, where they are often attacked and killed by tigers, always to be found hovering around the cattle-yards; while others get into the swamps, in search of water, from whence they are unable to extricate themselves, and as there is no possibility of helping them out they are left to die. Half of the oxen are always on the sick list, disabled by over-work, or some other casualty. In this condition they are driven to a place where they find their own food, while those that are in working order are kept in a yard and fed with the leaves of the bread-nut tree, which the Indians have to cut down for them. As soon as the rivers and creeks are swollen by the heavy rains, the rafting begins. If the owner loses the opportunity of floating down his wood during the high water, he will have to wait till the next year for another chance. This work requires a great deal of attention and calculation; if the rafts are not properly "boomed," it often happens that the wood is floated off and washed into the sea, where it rarely can be fished up again.

As soon as the rafts approach the bay or harbor they are moored, and the trees are drawn out of the water on some level piece of land, where they are squared, measured, and cut in logs of suitable length for shipment.

We have only given the roughest outlines of how the work is carried on; but we have said but little of the many trials which the manager, who is in most cases a foreigner, has to undergo. If he is a man of education and cultivation, his sufferings are endless, and yet it is absolutely necessary that he should be on the spot, to keep order and superintend the business himself. Though his hut may be somewhat better than those of his men, yet he can have but little comfort; he is, like all the rest, whether indoors or outdoors, besieged by hosts of scorpions, tarantulas, frogs, snakes, rats, and numberless other animals which make his hut their habitation. The climate, the surrounding swamps, and the rank vegetation, are the causes of fevers which attack him. These are, however, only bodily sufferings, to which human nature can get more or less accustomed, but the mental trials are still greater. Every extra stroke of work must be paid by a drink; and should the owner neglect to have a supply of rum on hand, the most serious consequences might follow. If he is not fortunate enough to secure a reliable captain he is constantly cheated, but is powerless to prevent it, as he can only be at one place at a time. The owners and the captains are always prepared for an attack from the workmen, and never go out without guns or pistols. We have seen mahogany captains covered with as many wounds and scars as a veteran soldier. Another great trouble to the manager are the "runaways." He is more or less in subordination to his men. The laws of the mahogany works are such that he is obliged to pay his men two or three months in advance. With this advance money they go off to some neighboring works and engage again under some other name. This changing of names is quite a peculiarity among the cutters; with every new master they adopt a new name. If the former master is lucky enough to find out where the runaways have gone he can only claim them when the time for which they have engaged with their second master has expired. Then he can only force them to work out their advance pay, but this does not indemnify him for his loss, for often the few working months are passed and his allotment of trees have not been brought out.

These troubles are almost daily occurrences in all the mahogany works, and are considered a necessary evil. The government is obliged, by the annual tax paid by the owner, to afford him all possible protection and aid in the recapture of the runaways, or to punish any disobedience, etc.; but it is always much better for the superintendent to avoid, if possible, recourse to the public authorities, as it causes him extra expense and loss of time, losses nowhere so much felt as in this business.

We have thus far only described the dark side of the life in the mahogany works, let us look, therefore, upon a more agreeable picture. Passing through the different settlements during an evening, we shall find, in spite of the warmth of the clime, large fires blazing everywhere, to keep away all animals that usually sneak around at night, and drive off the swarms of insects that fill the air. Men, women, and children are grouped around these fires, giving the scene a gipsy-like appearance.

Let us pass through the Carib settlement; it is particularly lively here. They always have some kind of a genius among them, who takes charge of the evening's entertainments. We see him balancing himself on the trunk of a fallen tree or on an empty flour barrel, and he is delivering a speech amid many gesticulations. We understand little of their jabber; the words "father" and "mother" are often repeated, and are ever received with loud acclamations from the attentive and appreciative audience.

Parental love is a marked feature in the character of this people, and the most of the haranguing which they greatly affect is based on this subject. Upon the whole they are exceedingly boisterous in speech and action. The stranger is often induced to believe that they are quarreling or ready for a fight, when a sudden outburst of laughter will convince him of his mistake.

As we proceed a little further in our evening ramble, we meet an entirely different scene. We are among the Spanish speaking people; they are much more quiet. We stop to listen to the monotonous melody of some Spanish ditty, sung in a falsetto voice by a native, and accompanied by the guitar. There is not much music in their songs, but they are melancholy, and therefore touch the heart.

As we turn again towards our own gloomy hut, the desire and hope of a prosperous season in our mahogany business is greater than ever, as it will afford us the happiness of returning to our former home and associations.

GREAT FIRE AMONG THE SHIPPING AT BORDEAUX.—The particulars of the great fire in the shipping at Bordeaux, in France, on the 28th of September, have reached us, and show the very great danger of permitting petroleum vessels to moor alongside or even in proximity to other vessels. This fire originated in the sudden explosion of a lighter laden with petroleum. The lighter was lying at anchor in the harbor, near Lormont. The petroleum casks, wafted by the tide, communicated the fire with frightful rapidity to the vessels moored to the quay. The conflagration lasted the whole night, and between twenty and thirty large vessels were destroyed. The amount of the loss is as yet impossible to estimate with anything like certainty, but seventeen vessels were totally destroyed, and many others injured.

How to Build a Corduroy Road.

The border settlements of our country have frequently to resort to the construction of corduroy roads, these roads remaining for years in some cases before a better road can be constructed. The proper construction of such a road is therefore a matter of no small importance to these settlements. Properly laid down, a corduroy road is not so bad a thing as the improperly constructed ones, which have, at some period in the experience of most Americans, tried their patience to the utmost, would lead them to believe.

On the contrary, we have ridden over a road of this kind which was a very comfortable road, and in nowise destructive to team, vehicle, or temper.

Mr. T. F. Nicholl, a civil engineer and contributor to a spirited paper published in Chicago, called *The Land Owner*, gives the following rules for laying such a road, which, if followed, we know from experience, will make a very good road, until the surface becomes uneven through decay of the timber.

"In marsh, or bog lands," says Mr. Nicholl, "where the bog is not deep, and where timber can be obtained, the road-bed may be formed at the least expense by what is known as corduroy, which should be constructed as follows: first lay all small poles or brush transversely and across the road; next take long trees—the smallest ends being at least of 10 inches diameter—and lay them longitudinally along on these poles and brush, in two rows, 8 feet apart from center to center, making the ends at the junction of each piece lap each other, at least 3 feet, breaking joint on either side, and placing under these ends large logs, of sufficient length to extend across the road, and 2 feet on each side of these stringers. Cover these stringers with transverse logs, 12 feet long from scarf to scarf, and at least 10 inches in diameter at the smallest end, fitted close together, on the straight portions; the logs alternated with a large and small end; and on the outer side of curves all the large ends, which will assist in the curvature of the road, and the gravity of the vehicles. Next adze off the center ridges of these logs to a face of about 5 inches for a width of 9 feet in the center of the roadway, and cover this 9 feet with gravel to fill in between the logs and give a smooth surface. The best timber for this purpose is cedar, tamarack, etc., usually found in these localities. Two stringers are preferable to three, as in case of sinkage of either of the outside stringers, the cross-pieces would ride and rock on the center stringer, and, consequently, the whole road-bed become displaced.

"A very desirable plan is to lay on the top of the road thus formed, poles of 5 or 6 inches diameter, spiked down on each side of the track, every 10 feet, with oak pins, to prevent, in frosty weather, the lateral sliding of wagons."

Purifying and Bleaching Oils.

An invention has been patented in England, which consists in the purification, bleaching, and saturation of animal and vegetable oils, also of gums and resins, as well as of such liquids as oil of turpentine, spirits of turpentine, and methylated spirits, by means of ozone, whereby much time is saved and greater purity obtained than by the methods at present in use. The substance to be acted upon, if liquid, as in the case of oils and spirits in their usual state, as well as the gums and resins in the melted state, is placed in a suitable vessel, and streams of ozonized atmospheric air or ozonized oxygen are forced through the substance. It is advisable to keep the liquid in motion, so as to bring its particles in contact with the ozonized air or ozonized oxygen, and thus expedite the process of ozonization, or the liquid substance may flow through a vessel possessing a large superficial area, and into which ozonized air or ozonized oxygen is passed. The great extent of surface permits the ozonized air to act readily upon the liquid and ozonize it. Or animal or vegetable charcoal in fine powder is saturated with ozonized air or ozonized oxygen, and the oils are exposed to the action of the ozonized charcoal. In the case of the gums or resins in their usual solid or unmelted state, the inventor exposes them in fine powder to the action of ozonized air or ozonized oxygen. By the continued action of ozonized air upon oil or spirits of turpentine, the latter becomes so saturated with ozone as to become a vehicle for the conveyance of ozone to other substances. By ozonized air or ozonized oxygen is meant atmospheric air or oxygen ozonized by any artificial means.

The Albertype.

A recent number of the London *Photographic News* contains a fine example of this new style of photographic pictures. The process is as follows: A plate of glass is covered with a solution of albumen, gelatine, and bichromate of potash, dried and exposed to light until hardened. It is then again covered with a solution of gelatine and bichromate of potash, and when dry exposed under the negative, and the film is then found to possess qualities analogous to a drawing made with fatty ink upon lithograph stone. All those portions of the film that were acted upon by the light will refuse water and take printing ink, while those portions which were protected from light by the negative will take water and refuse ink. The ink and water will be absorbed by the film just in accordance with the gradations of light and shade in the negative. To produce a picture, wet the surface of the film, then apply ink, lay on paper and pass through a press; the operation being substantially the same as lithography. The processs is said to be rapid, and excellent pictures of all sizes may be printed in admirable style.

To think properly, one must think independently, candidly, and consecutively; only in this way can a train of reasoning be conducted successfully.

Improvement in Turbine Water Wheels.

The class of water wheels known as turbines has been steadily growing in favor ever since the true principles of their operation have been thoroughly understood. Their general adaptation to all heads, their power of running under as well as above water, their compactness, and their power of utilizing the mechanical power of falling water, have given them the first rank among water wheels. There have been, however, some drawbacks which it is the object of the improvement under consideration to remove, as well as, at the same time, to increase the utilization of power in such wheels.

The nature of the improvement will appear from the following explanation referring to the accompanying engravings; Fig. 1 being a top view, and Fig. 2 a vertical section of a turbine wheel, thus improved. In both figures, A represents portions of the wood-work surrounding and supporting the working parts of the wheel. B is the shaft supported by a step, C, as shown in Fig. 2.

The internal or chute-chamber, D, Figs. 1 and 2, is supported from the top by an outward flange or rim, E, which rests upon the top of a cast-iron breast, F, but is not bolted to it. The breast, F, is supported by the wooden framework, A.

The chute-chamber, D, not being bolted or otherwise attached to the breast, F, may revolve, should a stone or other obstruction engage between the outer lip of any of the chutes, G, and the inner lip of a bucket of the wheel, whereupon the wheel speedily comes to a stand-still, and the obstacle which might, on many forms of turbines, have caused serious breakage, only causes, with this wheel, a temporary stoppage. This vertical rotation of the chute-chamber also allows the chutes to be so placed in relation to the buckets of the wheel proper as to secure the maximum effect of the water.

The chutes are shown at G, Figs. 1 and 2. The gate H, is of hoop form, and is shown closed in Fig. 2. It is opened by simply raising it by a system of vertical rods, and may be placed under the control of a governor to secure a uniform motion of the wheel.

The revolving part, or the wheel proper, is shown at I, Figs. 1 and 2, and the curved buckets of the wheel are seen at J, in both figures.

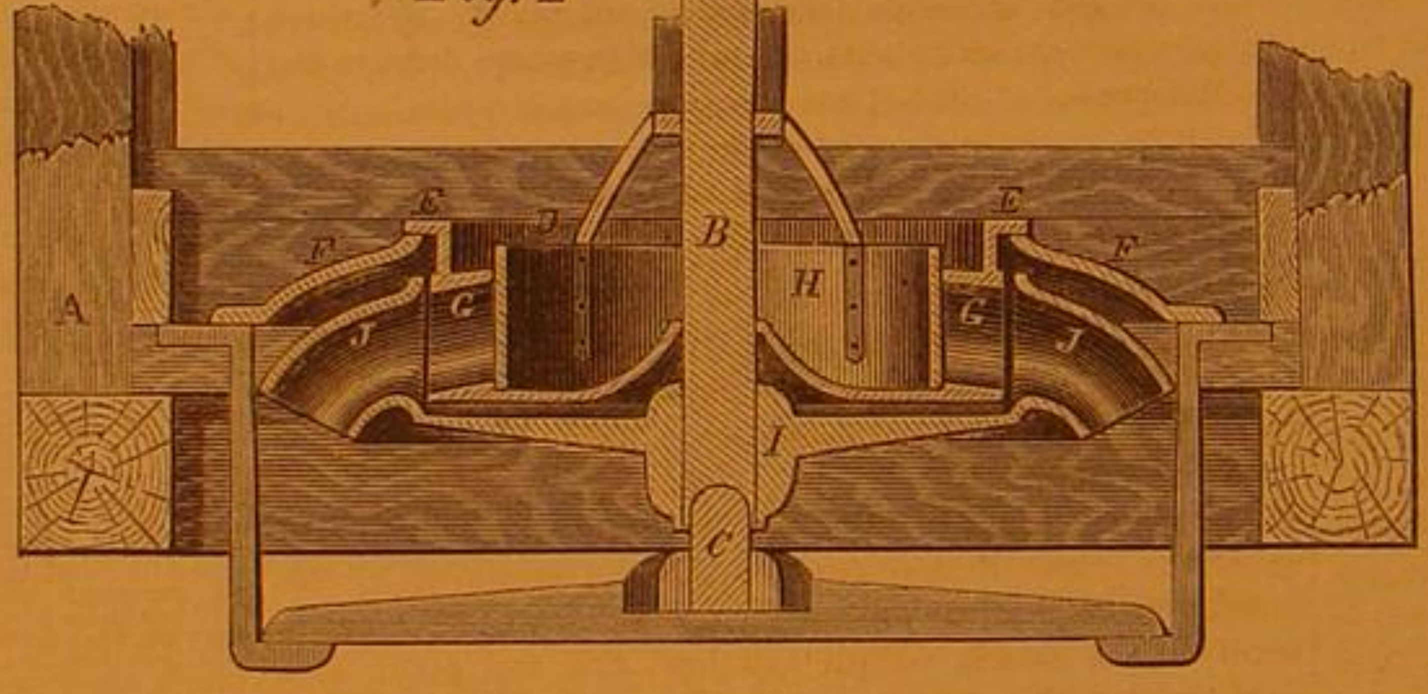
Thus it will be seen that a very simple wheel has been secured, having but few parts, and so arranged that obstructions cannot break it.

With regard to its power of utilizing the mechanical effect of water, we can only form a personal judgment from its construction, which seems based upon correct principles. The inventor claims that it will utilize more of this effect than any other wheel in use, and he has shown us very flattering testimonials, from parties now using the wheel, corroborative of his personal testimony. These testimonials indicate that the performance of the wheel is not excelled, if equaled, by any other wheel.

Patented, August 4, 1868, by Isaac S. Roland, whom address, for rights or other particulars, Reading, Pa.

Fig. 1

Fig. 2



ROLAND'S TURBINE WATER WHEEL.

Improved Method of Constructing Railways.

The Report of the State Engineer of New York on railroads contains the following statement: "The desirableness, if not the necessity, of increasing the durability of our railway tracks, even to meet present demands, is the truth of all others that our railway managers do not require to be told." And again: "There is a growing conviction among engineers that the longitudinal system will become standard. It offers from 2 to 3 times as much bearing for the rail as the cross sleeper system. The whole strength of the longitudinal is added to the strength of the rail, considered as a beam to carry the load. The strength of the cross sleeper in this direction is wholly wasted. The longitudinal is almost certain to prevent the displacement of a broken rail."

These quotations show the importance of any judicious attempt at devising a perfect longitudinal system. Such an attempt is the subject of the present article, and the nature of the improvement is fully shown in the accompanying engraving.

In this engraving, A is a Bessemer steel rail, resting upon two side rails of iron, B, the forms of which are fully shown in their sections. These side rails fit upon the inner edges of two collateral wooden supports (oak scantlings), C, in the manner shown, and the whole combination thus formed rests upon a longitudinal sleeper, H.

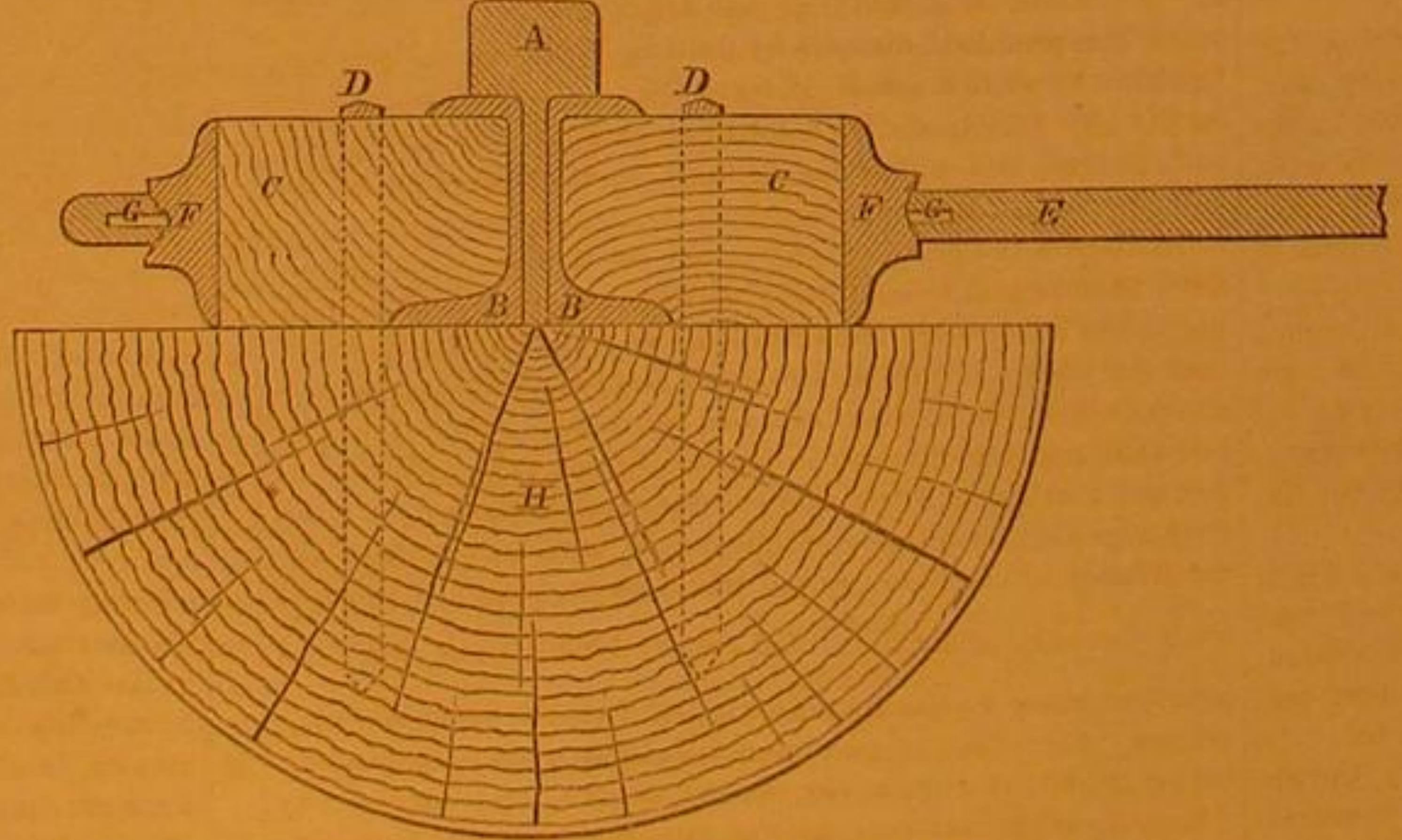
At proper intervals tie rods, E, bind the opposite sides of the track, being firmly held by lining or wedge keys at G. These wedge keys bearing upon the graduated cast-iron washers, F, also serve to clasp and bind together all the parts resting on the sleeper, H. These parts thus bound together are secured to the sleeper, H, by wooden pins or treenails, D.

The advantages of this system have been already partially set forth in the introductory extracts above, but we will, in addition, give the advantages claimed by the inventor—a gentleman who has had twelve years' experience in the construction and maintenance of railway tracks. It is claimed that a railway thus constructed possesses greater strength and gives a better support to the rails. The extended and continuous bearing of the rail prevents its mashing into the wood. By means of the tie-bars, spring keys, and graduated washers, the track is easily kept in gage.

No accident can happen through a broken rail. No part of the track is liable to shake loose, as no fishplates, bolts, nuts, spikes, chairs, or wedges are used. Cross sleepers are entirely superseded. A large reduction of expense in the maintenance of way is attained, and there will be less decay of sleepers, as less surface of wood is presented to the ground. There are no elbow joints in curves, as only one fifth of the rail is at any point non-continuous. The iron rails, if made of good material, will last so long that only their first cost need be practically considered, and the steel rail may wear off as low as the flange of the wheels will permit, and be still as safe to run upon as when first laid. The rails and sleepers being combined in one continuous beam will greatly counteract the heaving of the track by frost in winter as no short undulations can be formed on the line.

Thus a track in every respect superior to the ordinary road is attained; safer, smoother, more elastic, containing fewer pieces per mile, and every joint combining to assist the others in their respective functions; and the reduction of the expense of repairs, both of the way and the rolling stock, will pay ample interest on the additional cost.

Patented through Scientific American Patent Agency, September 14, 1869, by Charles G. Wilson, of Brooklyn, N. Y., who may be addressed for further information.



CHAS. G. WILSON'S PERMANENT WAY.

Why Do Railway Carriages Oscillate?

There is so prevalent an idea that the unpleasant, and, to the nervous, injurious oscillation of railway coaches is due to the axles being too wide for the line, that the following explanation, given in the *Times*, by Mr. Charles Fox, is of much importance, both to the public and the "companies":

"The oscillation of railway trains, more especially at high velocities, producing what is ordinarily called 'gage concussion,' is a very serious source of wear to the permanent way and rolling stock of railways, and, as a consequence, of great expense, to say nothing of the discomfort it occasions to passengers, and is, in my opinion, caused, in very great measure, by the use of wheels, the tires of which are portions of cones instead of cylinders.

"It is well known to engineers that the tires of railway wheels are generally coned to an inclination of one in twenty. It is considered that these were first introduced by Mr. Geo. Stephenson, in the expectation of facilitating the passage of vehicles round curves by their adapting themselves, through their various diameters, to the different lengths of the two rails on which they were running. This, however, is not the case in practice, as any one will find upon carefully investigating the matter, inasmuch as, in a vehicle passing round a curve, the flange of the off fore wheel will be found close up to the outer rail, while that of the aft near wheel will be found running with its flange close up to the inner one, so that no benefit whatever accrues from the use of the cone, even in going round curves.

"The question of passing with steadiness over straight lines seems to have been altogether overlooked in the introduction of coned wheels, for it will be obvious that with the inch 'play' allowed between the tires and the rails, unless one-half of such play be constantly preserved on each side of the way, two wheels, staked upon the same axle, will be running upon different diameters, and, consequently, a struggle arises which cannot fail to result in oscillation, inasmuch as the moment one of the flanges touches a rail, that wheel, becoming larger than the opposite one, turns it off from the rail, only to make the opposite one perform, in its turn, the same operation, when serious oscillation is the result.

"As I have already stated, no advantage is found to arise in the use of conical wheels in passing round curves, and as much evil results therefrom, on straight lines, I have constructed upward of 250 miles of railway abroad, in the rolling stock of which I have departed from the usual form of wheel, and have used only cylindrical ones, and have, as I expected, been gratified with the satisfactory reports I have received of the steadiness of trains supplied with them.

"Now that main-line companies are running their express trains at such high velocities, this oscillation is becoming a very serious matter, not only as a question of safety, but also one of great discomfort to the passengers, to say nothing of the enormous cost occasioned by this destructive action. I would, therefore, venture to recommend, that should any one desire to test the correctness of the principles here stated, he should select a carriage known to be most subject to oscillation, and place under it four cylindrical instead of conical wheels, and let this carriage run in an express train, care being taken to avoid the oscillation of the two adjoining carriages with conical wheels being communicated to it, which would be effected by the introduction of two coupling links, say ten feet long, instead of the shorter ones in general use, and he will at once perceive the advantage of using cylindrical wheels.

"I have a form of tire which I find to answer the purpose very well, a section of which I should be happy to send to any one who may think it worth while to ask for it."

A COLLECTION of twenty-five pins, very well made, has just been placed in the Louvre, Paris. They were found in the subterranean vaults of Thebes, and were made more than three thousand years ago, showing that the modern invention is only a reïnvention.

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK

O. D. MUNN, S. H. WALES, A. E. BEACH.

☞ "The American News Company," Agents,121 Nassau street,New York.

☞ "The New York News Company," 8 Spruce street.

☞ Messrs. Sampson, Low, Son & Marston, Crown Building, 188 Fleet st.; Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.

VOL. XXI., No. 18...[NEW SERIES.]...*Twenty-fourth Year.*

NEW YORK, SATURDAY, OCTOBER 30, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

ORGANIC AND INORGANIC SUBSTANCES.

There was a time when certain proximate principles, as the chemists called those substances,found in organized bodies,and which enter into the composition of vegetable and animal tissue, and occupy an intermediate position between the bodies recognized as elements, and fully organized living tissues; there was a time, we repeat, when these complex substances were supposed to owe their origin to something more than ordinary chemical affinity. As usual,in the history of science, when something has been obscure, an occult force was supposed to account for the mystery attending the composition of these substances. The force thus called in was styled "Vital Force," merely a name for an unknown cause or causes.

Chemistry has also been divided into two distinct departments, simply because of the supposed differences between the deportment and composition of organized bodies and inorganic bodies. We say supposed differences. There are striking differences between a living organism and a dead mass of matter; but we are not now speaking of that mystery of mysteries, life; we are not even speaking of living things; only of the substances which enter into and make up the separate parts of living things; parts which, by themselves, do not live, cannot live, but which, together, make up that "unity in multeity," which we call a living thing.

If we cut out a brain or a heart from a living animal, these organs (although manifesting, perhaps, in a more striking degree than any others, the subtile principle of life, so long as they remain attached to the rest of the living organism,) cease to live; become as dead as a sod,or a bough lopped from a tree, nay, die even quicker than the bough; for it is a most singular law of life, that the lower in the scale of animated being an organism exists, the greater is the power of living vested in individual organs.

The heart and the brain, thus isolated, die. Seizing the time before decomposition (which also implies, in every case, *recomposition* "into something new and strange,") sets in, we may subject the substances contained in either, to the most rigid examination without detecting the slightest difference between it and other dead matter, of the same kind, found in minerals or gases.

We are,therefore, forced to the conclusion that no difference exists, in the essential nature of these substances. Just here we encounter a difficulty. The heart or the brain may be fed to other animals,digested and assimilated into new organisms, may even become a part of other hearts and brains in the living animals which devour them.

But if we take the substances of which the heart and brain are composed and resolve them into their elements, and feed them to other animals, we find they are not all assimilated. The phosphorus in the brain may even act as a violent poison, and produce death in the animals to which it is fed.

But were we to stop here, and make, prematurely, the absurd generalization, that no inorganic matters *can be assimilated*, we should have committed a grave error. What is meant by assimilation? It is the conversion of substances taken as food into the substances contained in the body. In other words, *decomposition and recomposition*. This decomposition and recomposition is strictly a chemical process; demonstrated to be so by the artificial production of many organic constituents outside of either plants or animals in the laboratory of the chemist. As a chemical process, it is subject to the same laws as other chemical processes.

One of these laws is, that the occurrence of chemical reactions depends, in part, upon the manner and forms in which substances are presented to each other. For instance: Nitrogen and oxygen, under favoring circumstances, unite to form a series of important acids. Yet they remain intimately mixed in the atmosphere for ages uncombined.

Free sulphuric acid attacks, rapidly, a wooden vessel, and reduces it to charcoal. If, then, we wished to combine a substance with sulphuric acid, in a wooden vessel, without injury to the vessel itself, we should be obliged to present the sulphuric acid to the base in some form in which it would not injure the vessel. Suppose that potash were the substance to be combined with sulphuric acid. Potash, in a free state, also, attacks and disintegrates wood, we should have, therefore, to use the same caution with the potash. We may, however, put into a wooden vessel sulphate of iron, in solution, or bicarbonate of potash without injuring the wood; and if we mix these solutions, the sulphuric acid of the sulphate of iron will unite with the potash in the bicarbonate of potash, and the combination we sought will be effected.

Could we now suppose an animal with a wooden stomach, it is evident that sulphuric acid, by itself, or potash, by itself, would be a corrosive poison to that animal, but that sulphate of iron or bicarbonate of potash would not be. The digestive apparatus of plants is made up of woody tissue, and either of the two former substances, in a free concentrated state, is a poison to plants, yet one of them, potash, is an essential element of nutriment in the growth of plants.

Phosphorus is an essential element to animal growth. We have stated, that, presented in a free state, it is a poison, yet, in a combined state,it is an important constituent of the most valuable articles of food. When we analyze these articles, we find that there is no difference in the phosphorus salts contained in them, from the same salts made directly in the laboratory.

When taken into the stomach in the same state of dilution or mixture with other materials, the natural salts are no more readily assimilated than the artificial, if, indeed, it be proper to make any distinction of natural and artificial in these salts, where both are formed in strict obedience to the same natural laws.

Who, then, can point out the real distinction between organic and inorganic matter. One of the ablest chemists of the age, Dumas, has recently declared, in a public lecture, that there is no such distinction.

It may be granted that there is a structural peculiarity in an organic substance not to be found in crude mineral substances, but the ingredients are all to be found in the mineral kingdom. How this structural form is produced is the problem with which modern biologists are now grappling, and present indications are, that the cause will finally be referred to one general formative tendency in all matter, by which not only animals and plants, but crystals assume definite and specific forms.

THE VELOCIPEDES OUT AGAIN.

The first serious attack of the velocipede epidemic in this country set in during the closing weeks of winter. It raged with great violence during the spring; but the hot weather, which seems to favor other epidemics, threw cold water on this, and by the middle of July a velocipede was rarely seen in our streets.

Just as we began to turn our two-wheeled steeds out to grass, the British Empire awoke to find the fever upon it. No quarantine regulations or sanitary precautions had sufficed to ward off the attack. High and low, rich and poor, were seized with such a rage for velocipede exercise, that even the gravest engineering periodicals and papers felt themselves obliged to say something on the subject. *Engineering* and the *Engineer* held off as long as possible, but were obliged to give in finally to the popular *furore*. *Engineering*, at the outset, made some remarks upon the extent of the popular demand for velocipedes, but dropped the subject almost immediately. Another mechanical journal copied in full our editorial on the "Mechanics of Walking," and forgot to credit it. A London book compiler also appropriated it. The *Engineer* compromised matters by getting Professor J. Macquorn Rankine to write a series of recondite mathematical articles on the gay velocipede, with formulæ long enough for a velocipede course, and numerous enough to accommodate all the velocipedes in England.

To discuss the topic in any other style than this, would have been beneath the dignity of this journal, which is nothing if not scientific. Nevertheless, we are willing to admit that the keen analysis of Professor Rankine has evolved subtile points of philosophy from the bones and marrow of our pet, that make us more in love with it than ever. While our feet are moving in lively and exhilarating motion, our mind may now also be actively employed in meditating upon the "deflection of the base track," which is expressed by the neat little formula: $PM=\frac{mPv^2}{g.cm}$ but out of which issue forth an army of sines, co-sines, tangents, and logarithms. We may reduce "the effect of (*our*) unskillfulness upon oscillations," into a triple equation of the second degree, and correct our "horizontal oscillations" by the application of the formula: $\frac{gy}{v^2p}$ which Professor Rankine has so kindly bestowed upon mankind, and which once stored up in the head of a velocipede rider will forever effectually prevent a loss of balance in his body, whatever may be the effect upon his brain.

Could we have had Professor Rankine's formulæ to guide us at the outset of our velocipede experience, how many bumps and bruises we might have spared ourselves. How easy it would have been when we found ourselves sprawling and with painful effort extricated ourselves, vainly endeavoring to exhibit no sign of discomfiture, to have avoided such humiliating defeat by such an adjustment of our co-sines, as would have prevented our flying off in a tangent to the "arc of progression." Truly, as Solomon averred, "wisdom is profitable to direct."

But while the velocipede has been doing so much in England, it has been recuperating itself for a fresh run in America and we already see many of these machines in active operation on smooth pavements not yet opened to travel for larger vehicles. The velocipede is not dead, but will, this cool and delightful autumn weather, once more resume its sway, though to what extent it may conquer is yet to be recorded in history.

THE EXHIBITION OF THE AMERICAN INSTITUTE.

Our last visit to the Fair of the American Institute took us first among the pumps, of which there is a considerable variety displayed. We find no marked advance in this department of engineering since the exhibition of 1867, but we will briefly mention the most important of the pumps exhibited.

The Woodward Steam Pump Manufacturing Co., of New York, exhibit one large single cylinder, and one large double cylinder steam pump with several small ones of their manufacture, the construction of which is too well known to our readers to render details necessary here. They also display a novel steam pump called the "Little Giant." The pistons, both of steam cylinders and of pump cylinders, remain stationary while the cylinders travel. It is a double-acting pump—all the cylinders are vertical—and it occupies very little space. Its valves are cylindrical, and consequently balanced, and it is said to work very economically.

Knowles & Sibley, of New York, exhibit some beautiful pumps, the workmanship of which is of a superior kind. The main steam valve of these pumps is carried over the center by means of an auxiliary valve of peculiar construction, the action of which is extremely delicate, rendering these pumps as suitable for boiler feeders, where a very slow motion is required, as for work requiring their fullest capacity. It will be unnecessary to dwell upon the special merits of these pumps as they are well known to all American engineers.

The steam pumps shown by Geo. F. Blake & Co., of Boston, is also a good one, exhibiting many points of merit, and excellently made. The steam valve is balanced, and it will start at any part of the stroke.

The Emery Rotary Machine Co. exhibit Novarro's rotary pumps, the principle of which is the thrusting out and in of flat buckets by the alternate action of a fixed eccentric ring surrounding the shaft of the motor wheel and the case; the wheel and fixed eccentric being concentric with each other but eccentric to the case. This pump is also a motor-wheel or a water-meter, by making it a propelled wheel instead of a propeller.

J. H. A. Gericke, of Jersey City, N. J., exhibits his turbinate force pump, which is essentially a centrifugal pump.

T. F. Rowland, of Greenpoint, Brooklyn, N. Y., also shows a powerful centrifugal pump, which is very simple in construction, and is so little liable to obstruction, that it may even be used for dredging.

Philip S. Justice, of New York and Philadelphia, exhibits one of the pumping engines described and illustrated on page 33, current volume of the SCIENTIFIC AMERICAN, which is one of the novelties among this class of devices, and attracts much observation. It is making a favorable impression.

Berhen's rotary engine and pump, exhibited by H. C. Dart & Co., of New York, is for many purposes doubtless as good a rotary pump as any present at the Fair, and it attracts much favorable comment. One of them is in operation as a boiler feeder, a kind of work which it does in a superior manner.

The Niagara Steam-pump Works, of Brooklyn, N. Y., exhibit the well-known Niagara pump and engine, the arrangement of valves in which is admirable. The valves may be reached, all obstructions—if any chance to be present—removed, the valves replaced, and the pump set to running in a very short space of time. All that is necessary to get at the valves is the removal of a single nut. This pump has acquired a deservedly good reputation.

Wm. D. Andrews & Bro., of New York, exhibit their central-discharge centrifugal pump, and their patent improved anti-friction pump. Important improvements have been added to the latter recently. The piston is balanced by a series of holes in the piston itself, by which the pressure may be equalized on both sides of it, and the induction wing used formerly on these pumps is dispensed with. This pump is of great capacity and its operation excites much attention.

From pumps to

BLOWERS,

which may be regarded as a species of air pumps, the transition is natural. There are only a few of these on exhibition. There are two kinds of fan blowers, each of which are great improvements over the original fan blower of Ericsson & Bathwaite, constructed in 1829.

The most important of these is the multiplying pressure fan blower, invented and exhibited by P. Clark, of Rahway, N. J. All methods employed to attain increased pressure without increase of speed, except this, have proved unsuccessful to a greater or less degree. This blower is made up of a series of fan wheels all attached to a common shaft, and running at the same speed, but in different compartments, communicating only by an annular space surrounding the shaft, of sufficient capacity to permit the flow of air from the first compartment to the second, and so on. The rotary motion of the air acquired in each compartment is checked by a fixed turbinate arrangement of curved buckets, which change the direction of the current and conduct it through the annular space above alluded to, when the next fan in order takes it and gives it additional pressure, and so on to the end of the series. Water gages attached to each compartment show that the pressure is uniformly increased in each compartment. It is thus the required pressure may be obtained without excessive speed. This blower, as being one of the few novelties of the machinery department, attracts much attention from mechanical visitors to the Fair.

The pressure blower exhibited by B. F. Sturtevant, of Boston, Mass., is also a good blower, running without great noise and performing good work. This blower has been before the public so long, and is so favorably known that we need not dwell upon its details.

A machine of an entirely different class is Root's patent force-blast rotary blower, exhibited by S. S. Townsend, of New York, the construction of which can hardly be explained without diagrams. It gets up a strong blast with slow speed, the air being impelled by absolute pressure. The weight of the moving parts is light, they being composed chiefly of wood, and very little power is absorbed in friction. There are no valves, and the parts of the machine are very few in number. The same principle is applied to hand blowers, of which there is one on exhibition—a very convenient and effective substitute for the old-time blacksmith's bellows for forges.

Besides the pumps mentioned, exhibited by Wm. D. Andrews & Bro., of New York, that firm also exhibit their patent

OSCILLATING ENGINES,

by which their pumps are operated. They also show one of their friction grooved hoisting machines, with oscillating cylinder and direct connection of the piston rod and crank. Motion is, in this machine, communicated to a wheel and axle by grooved friction pulleys. It therefore runs without noise, and the speed is perfectly controlled.

A novelty in

STEAM GENERATORS,

not on exhibition at our previous visit, is exhibited by Thomas Mitchell, of Albany, N. Y. It is a cylinder of wrought iron with welded joints, into which water is thrown by a feed pump; the same pump operating through a worm gear to slowly rotate the cylinder in the furnace where it is suspended upon two journals, one at either end of the furnace. The design is to only throw water into the revolving generator, as wanted, to make steam. The steam is generated under very high pressure. The water is injected through a core pipe in one of the journals which extends longitudinally through the axis of the cylinder, and is perforated at intervals throughout its length. The water is thus subdivided into small jets, which the heat of the cylinder converts into steam instantaneously.

In one corner of the floor devoted to the exhibition of machinery stands two beautiful machines displayed by S. R. Krom, of New York, one of which is an ore crusher and the other a dry ore concentrator; both these machines exhibit a degree of mechanical and inventive skill highly creditable to their inventor. The crusher munches up large lumps of the hardest ores, with as much ease as a boy could crack a hazel nut, while the concentrator separates the ores from the gangue with great rapidity and certainty. The prominent feature of this machine is the use of intermittent puffs of air, which renders available whatever difference there may be in the specific gravity of the ore and its gangue. The construction of the machine is based upon sound scientific principles, and will well repay inspection. In the

DEPARTMENT OF INTERCOMMUNICATION.

there is very little worthy of mention. There is, however, a model of a turn-table exhibited by James B. Kelly, of Kendallville, Ind., which turns on car wheels of the ordinary constructions, rolling between concentric tracks on the under side of the table and corresponding tracks upon which the wheels rest. The wheels are kept at their proper distances by radial shafts upon which they play almost without friction, as these shafts bear no part of the load. The model works with remarkable ease, and we judge the principle might be advantageously applied to drawbridges, locomotive turn-tables, etc.

A novelty in this department are the

PAPER BOATS,

exhibited by A. Waters, of Troy, N. Y. They are beautifully finished and astonishingly light. The largest one exhibited, capable of carrying 170 lbs., only weighs 32½ lbs. These boats attract much attention.

We take this occasion to notice a

STEAM FIRE ENGINE

exhibited by Cole Brothers, of Pawtucket, R. I. It is finished in a high style of art, and has some peculiarities of construction worthy of note. The piston rod is forged solid, by which cramping of the link block is obviated. The pump is always charged from the outlet by means of the siphon form of the suction pipe. These engines are guaranteed to draw water twenty-nine feet. They are compact and built to combine strength with lightness, so far as this is practicable.

Near this fire engine stands an

ELECTRO-MAGNETIC ENGINE,

in which there is no new principle displayed, but the application of which to the driving of sewing machines attracts a great deal of attention. The motion is uniform and sufficiently strong for the purpose, and we were told that the expense of maintaining the battery was only ten cents per day.

In passing from the building we notice one of the best things we have seen at this Fair, namely, Poulson's patent lazy-tongs

SHUTTER BLIND AND AWNING,

made entirely of metal, and worked from the inside by a crank. When open they are entirely out of sight, and when closed they are burglar and fire proof. They can be adjusted to admit light and air and exclude the sun. The awnings are supported by brackets from the wall, and are adjusted in the same manner as the blinds. They are simple in construction, not liable to get out of order, not materially more expensive than the ordinary awnings and fixtures, and in our opinion far superior to any thing of the kind hitherto used.

NEW FACTS ABOUT THE FORMATION OF DEPOSITS IN STEAM BOILERS.

It is generally considered that water containing carbonate of lime is less injurious for feeding steam boilers than such with sulphate of lime in solution, inasmuch as the latter shows more tendency to form a hard and adhering incrustation. Albeit deposits of this character have been analyzed that present a considerable percentage of carbonate of lime, their number is few in proportion to those in which the greater part of lime is known to exist as a sulphate. The addition of carbonate of soda to selenitic waters, as those of the latter class are termed, has at least proved to be an effective means, inasmuch as it causes the formation of a muddy deposit, which, upon analysis, proves generally to be a carbonate. Be this as it may, it is important for us to know, that waters with but carbonate of lime in solution may lead to injurious consequences under circumstances that were unknown heretofore. Reports in our foreign cotemporaries inform us that cases of this kind have occurred in Switzerland, since the firing of boilers with coal in that country has become more universal. Old as well as new Cornwell and Fairbairn boilers were seen to become red hot, while the water gage indicated several inches of water above the fire space. They got out of shape in such a way that they had to be removed and replaced by new ones.

Satisfactory information upon the subject is due to Prof. Bolley, in Zurich, who in various instances was called upon as an expert. The first case occurred in the Canton of Zurich. The feeding water was hard, but otherwise pure; it contained but traces of organic matter and no sulphates. The mineral ingredients left behind, upon evaporation were found to consist of 81·84 per cent of carbonate of lime. It had settled as a white gray powder and in considerable quantities. If thrown upon water it remained floating upon it; it did not get moist, and remained dry even when in contact with boiling water for some time. When exhausted with ether, a small amount of fatty matter separated, and this gave the clue to the disturbance mentioned.

This pulverulent deposit covered the boiler plate to the hight of several inches, so that the water could not come in contact with it. The fatty matter was sufficient to surround the particles of the carbonate of lime with a thin layer, in this way causing them to float upon water if this was not subjected to pressure.

Whence did this fatty matter originate? At the very beginning it had been supposed that it came from the waste water of a neighboring bleaching establishment that flowed in the river a short distance above the spot where the feeding water was taken. Indeed, on examination, it was found that the bleaching liquid contained a small amount of fat, but whence this was derived could not be ascertained.

Another case of this kind occurred in the Canton of Thurgovia. The deposit in question exhibited the same characteristics as described above. Upon being subjected to distillation in a retort with a small surplus of sulphuric acid, a very distinct odor of butyric acid could be perceived. One half a pound of the material in question was then boiled with distilled water and under addition of a little soda. In this way an alkaline solution was obtained with the fatty substance in solution. On filtering it and adding some muriatic acid butyric acid could also be perceived. At the same time small fat globules were recognized that did not disappear on diluting with water; on taking them up with ether, and evaporating, an odorless oily substance was left behind. When Bolley had recognized butyric acid, the opinion was entertained by him that it originated from the water, as this acid is often met with in water arising from peat moors. But when he had detected fat, of which butyric acid is a constituent part, this opinion was abandoned, and now it was ascertained that the condensing water served to feed the boiler. The fat was probably derived from the lubricating oil.

When some soda was added to the feeding water no dry deposit was observed, and this was also the case when the condensing water was not employed for feeding. At any rate it is important to know that a small amount of fat in water that contains earthy carbonates, but no sulphates, may produce a dry instead of a muddy deposit. However, it is quite strange that this was not observed before, as the inside of boilers is sometimes rubbed over with fat, which is supposed to protect them from incrustations. With regard to the fuel, it is self-evident that it can not have any influence upon the formation of deposits. However the plates will become sooner red hot when coal instead of wood is used.

It may yet be remarked that recent investigations have revealed the fact that butyric acid is of a more common occurrence in the soil and in water than hitherto supposed. Pierre detected this acid in soil that had not been fertilized for four years; it was also met with in the pond of a farm. On examination it was discovered that it had originated from putrescent sugar beets in which it often appears. Besides, it is known that straw and the food of cattle yield sugary elements that are more or less convertible into this acid.

Several cases of similar powdery deposits have recently come to our knowledge in this country; and we have received several specimens corresponding almost exactly to those described as having occurred in the boilers in Switzerland, and probably resulting from the same causes.

THE PRESERVATION OF IRON.

The great enemy of iron when used in architectural or engineering work is oxygen. We would not be understood to ignore other causes, the tendency of which is to hasten the destruction of bridges, etc., such as expansion, the production of a crystalline state of the metal by vibrations, etc., but these causes apply only to special cases, while in all cases, unless something interferes, oxygen slowly but surely gnaws away at every bit of iron exposed to its action.

A great many methods have been employed to prevent the rusting of iron, by which is meant its chemical union with the oxygen of air, water, or other medium in which it may be placed. In the case of saline waters, the reactions are more complicated, but the final result is the same, namely, the oxidation and disintegration of the metal. Unprotected iron rusts away much faster in such waters than in common air; but exposed to the action of the ordinary substances, to be found in all places where structures of iron are located, the ultimate destruction of such structures is merely a question of time.

But while the vibratory motion of iron tends to render it brittle, and change its physical character from a fibrous to a crystalline material, such motion acts, in some yet unexplained manner, to combat the affinity of oxygen for iron. Hence the old proverb that "the used key is always bright," has more foundation than the polishing effect of wear.

In machinery it is common to paint or otherwise protect the stationary parts, while the moving parts have been found not to require much protection, when properly shielded from damp. In many cases castings will stand in a shop just as they have been taken from the sand, without rusting, being protected by a thin film of silica from the melting of the sand during the process of pouring, but as soon as exposed to the action of water this protection fails, and they rapidly become coated with rust.

The processes most generally applied to shield iron from the action of oxygen, have for their object the isolation of the metal from this gas.

The coating of iron with metals is one of the most important of the means employed for this purpose; tin and zinc being the metals most frequently used. But these metals will not permanently protect iron in all situations, and they cannot in many instances be applied.

Another class of substances are paints, tar, linseed oil, etc., which form coatings upon the surface of iron and thus isolate it from oxygen. None of these can, however, be relied upon as a permanent protection; and they have to be from time to time renewed, upon parts where the metallic surface has become exposed. It has been regarded by some as quite doubtful whether any cheap and practicable method for the prevention of iron rust, that will permanently secure this object can be devised, yet it would seem, with all the great resources of modern chemistry, this problem should be capable of solution.

As yet iron cannot compete with stone in structures designed to endure the effect of time, without repeated attention to keeping its surface covered with some protective covering; and until it is enabled to do this by some improvement in methods of protection, its use for engineering and architectural purposes can never entirely supersede that of stone, if, indeed, it can ever compete fully with stone in other respects. What is wanted is something equally applicable to large or small pieces of iron, and which will answer to ward off the attacks not only of the common atmospheric oxygen, but will also remain unaffected by acids or salt waters. Who will give this to the world?

THE WATERING OF THE STREETS OF NEW YORK WITH SEA WATER.

At intervals, for a period of two years, we have called public attention to the method of watering streets with saline solutions, now practiced in parts of London, in Liverpool, and other cities of England, with the most satisfactory results. Our efforts to force the advantages secured by this method upon public attention, have been seconded, so far as we are aware, by no other paper in this country. We have, however, this season been helped by a strong natural ally—the drought.

The scarcity of Croton water, which, but for the timely October storms, would have placed the city in danger, has aroused the authorities to the fact that "something must be done."

It is now proposed by the engineer of the Metropolitan Board of Health, to water the streets of New York with sea water, the water to be raised by pumping.

While there are certainly no insuperable engineering difficulties to be surmounted in carrying out this project, the expense it will entail upon the city will prove a serious obstacle to its adoption; and after all, though approximating perhaps in effect to the method above alluded to and which we have recommended, we do not believe it could ever be so economical or effectual.

We have not room to give this week, an abstract of the important report in which the plan under consideration is recommended to the board.

Would it not be wise for the Board of Health to try the English plan in some section of our most dusty thoroughfares—an experiment which could be made thoroughly at an expense of less than two thousand dollars for an entire season—before deciding to favor the report of their engineer?

The entire concurrence of the English press in the economy, comfort, and sanitary effect of their method, warrants a trial of it in American cities, and the sound scientific principles upon which it is based should also claim for it attention from the able men who compose the Metropolitan Board of Health.

PROGRESS OF AMERICAN WOOLEN MANUFACTURES.

The proceedings of the Fair of the American Institute were diversified on the evening of Oct. 5th, by an able address, delivered by Erastus B. Bigelow, President of the National Association of Wool Manufacturers.

We regret that pressure upon our columns forbids our giving more than an abstract of the address.

After some introductory remarks, the speaker went on to say that this exhibition of American woolens is the first instance of any attempt in our country to bring before the public eye, in one great collection, the characteristic products of a single industry. We can, I trust, honestly say that it is prompted by a higher motive than that of ambitious display. In no other way can the progress, the extent, and the value of such an industry be so effectually shown. No statements or statistics can be so impressive and convincing as the visible evidence which is furnished by an exhibition like that now before you. It is the next best thing to actually visiting the manufactories from which these fabrics come. Could you pass through the great establishments so honorably represented here, and look on their busy wheels and cards and spindles and looms—their myriads of thrifty, happy working men and women, the huge masses of raw material which they work up, and the countless car-loads of finished fabrics which daily leave the mills, you would need no argument to assure you that the woolen industry of the country is second to no other, whether individually or nationally considered.

The annual value of our woolen manufactures, and of those manufactures in which wool is a component part, is not less than $175,000,000. Of these goods more than four fifths are made from American wools. The coarse carpet-wools, which are not grown here at all, the worsted combing-wools, and the fine clothing-wools, which are grown by us only in limited quantities, go to make up the rest.

In relation to the articles now brought out under the direction of the National Association, it is only proper to state that none of them were made specially for this occasion, or appear as candidates for prize awards. They are the usual products of the mills, such as are got up for the general market, and they are here not for individual gain or glorification, but rather to show the quality and variety of our wool fabrics, and the extent to which they supply, or can supply, the wants of the American people. The fine quality and the beautiful finish of many articles in this collection cannot fail to arrest attention. Yet the real significance of the display is to be seen, not so much in this as in the wide range and diversified character of the fabrics, in their soundness, and their fitness for the uses intended, and in the low prices at which they can be furnished. For instance, in no market of the world can better cassimeres be found than some of those which are here exhibited. These meet the demands of one class in the community, while the wants of another and far more numerous class are met by cloths equally excellent, because equally adapted to the use for which they are designed. I have selected a particular case, but this remark has a general application.

This display of woolen fabrics is instructive, as showing the great advance which a comparatively short period has effected in the diversification of our wool manufactures. Ten years ago, our manufacturers had attempted scarcely any thing beyond common goods of the coarser kinds. Now they produce almost every variety of wool fabric in general use. Among those which are now successfully made here, but which are comparatively new as American productions, I may mention lastings, bunting, worsted reps, and serges for furniture covering, worsted furniture damask, Italian cloths, worsted popling, mohair lustre, cashmeres, merinos, Astrachans, chinchilla cloakings, Scotch cassimeres, embroidered table-covers, Axminster carpets.

The annual consumption of woolen goods in the United States may be put in round numbers at $240,000,000. In 1868, for instance, we imported woolen goods as follows:

Cloths and cassimeres	$6,956,449
Shawls	1,559,999
Blankets	28,196
Carpets	2,766,391
Dress goods	15,196,233
Manufactures not specified	5,902,591
	$32,409,759

The above figures, it must be remembered, represent the foreign valuation as expressed in gold. In comparing the value of woolen goods imported with the estimated value of our home productions, we must add to that valuation the customs duties, the premium on gold, and the profits of the importer. With these all on, the value of sales in first hands is fully double the amount of foreign valuation. If now to $175,000,000, the estimate of our domestic product, we add $64,819,518 for the sales of imported woolens in first hands, the result is $239,819,518. Thus it appears that our own manufactures amount in value to nearly three quarters of the whole.

Notwithstanding the unquestionable and the generally acknowledged excellence of our wool manufactures—a fact which this exhibition fully demonstrates—those manufactures still suffer, more or less, in the market, from prejudices and prepossessions alike ill-founded. A preference for fabrics of foreign origin has very naturally come down from the time, not very distant, when our domestic products were generally inferior. Of those who now habitually insist upon buying the foreign article, some are honestly ignorant. They are not aware of any improvement in American manufactures. With others, it is the merest aping of a senseless fashion. But the delusion could not be long kept up, were it not for the interest of the dealer to sustain it. It is easy for him to make a larger profit on the imported article, from the fact that its probable cost is not so generally known. In many instances the temptation is so strong that truth, honesty, and patriotism make their appeal in vain. Not only are American productions systematically disparaged, but, in a multitude of instances, these very productions are labeled as French, English, or German. The extent to which this imposition is carried is known only to those who are let into the secret. There are, probably, very few of us who have not thus been taken in. And, what I am inclined to regret as the most melancholy thing of all, is the unquestioned fact that some of the manufacturers themselves have consented to the deed. I suppose the process by which such a bargain is consummated to be somewhat as follows; A manufacturer, after much toil and outlay, is prepared to introduce a fabric not before made here. He finds the market, however, fully supplied with the foreign article. Those who hold it give him no encouragement, for they know that the introduction of the domestic product must lessen their chance for high profits. Between him and the consumer (who must be reached somehow, or his enterprise fails) stands a class of men whose interest it is to sell foreign rather than domestic goods. The result is a compromise. Says the dealer to him, "I like your goods, but I cannot sell them as American. Give them a foreign brand, confine the product of your mill to me, and I will take all that you produce." The poor manufacturer, seeing no alternative, closes the unhallowed bargain.

It will be strange if this exposition of our wool manufactures does nothing toward correcting these mistaken ideas in regard to the inferiority of American fabrics which are entertained by so many. It shows the great and respectable body of American manufacturers that there are those among them who have no need to sail under borrowed colors, and who, under any circumstances, would scorn the thought. It is a silent but eloquent rebuke to those dealers in such fabrics who, to promote their own selfish aims, are wont to decry and deride everything that is home-made. And, finally, it appeals to the great class of consumers, and bids them be candid when they buy, even if they cannot be patriotic.

It has been through a long series of difficulties and discouragements that our wool manufactures have attained to their present advanced condition. Not the least of these impediments has been a vacillating tariff. In this respect the policy of our government has been sometimes friendly, sometimes decidedly hostile. The tariff of 1846, which imposed upon wool a higher rate of duty than some of its manufactures paid, proved especially adverse. Under its baneful operation the growing of wool remained almost stationary, and many of the largest manufacturing companies became bankrupt.

Mr. Bigelow closed his address with an able review of the subject of free trade, showing the fallacies of the doctrine in the present condition of the world, and comparing its advocates to the advocates of a universal peace, something very desirable, and to be looked for with hope, but at the present day utterly out of the question.

OBITUARY---CHARLES B. HUTCHINSON.

The Auburn, N. Y., *Advertiser* publishes a long and glowing eulogy upon the life and character of Charles B. Hutchinson, who died in that city, on the 9th of October, at the age of 50 years.

Mr. Hutchinson possessed a marked genius, and was constantly occupying his mind upon some new and useful improvement. The records will show that he had secured about twenty patents; and we are pleased also to record the fact that he was successful, and had accumulated a handsome reward for his ingenuity and business capacity.

Our acquaintance with Mr. Hutchinson began nearly twenty years ago, and we can bear testimony to his high and manly qualities of head and heart.

Curious Stereoscope Effects.

In the stereoscopic views one image of the view is superposed on the other and produces the effect of relief. If we tint one of the views with a transparent color, such as cobalt blue and the other with carmine or lake, we have the combination of these colors in the stereoscope, viz., a purple tint; and so with regard to the colors to produce various shades of green, brown, etc. The colors thus employed produce remarkable effects by their transparency; and to see a view first with one eye in one set of tints, and then with the other in a different set of tints, and then with both eyes to see a third and differently colored picture, is an optical effect as instructive as it is amusing. We, in fact, combine the colors in the eyes instead of the color-cups.

A GERMAN photographer has invented a method of making seals and stamps with the portraits of his customers. A thin layer of gelatine, sensitized with bichromate of potash, is exposed to the action of light under a photograph positive, by which the parts acted on are rendered insoluble in water. The gelatine film is immersed in water, and the parts not acted on by the light swell up, and we obtain a picture in relief of which a plaster cast can be taken. A galvanic plastic copy being taken of the cast, we have a metallic facsimile of the photograph, which can be employed as a seal. This process suggests a method of obtaining perfect likenesses of persons in metallic checks for the use of the printer, and also an admirable way of illustrating scientific books.

THE latest advices with regard to the progress of the Suez Canal are to the effect that the Bitter Lakes had been brought up to the level of the Mediterranean, and that M. Lesseps, the engineer, had gone through the whole length of the canal in a steamer. The completion, however, of the rest of the works in time for the proposed opening on the 17th of November is still considered in some degree uncertain.

Coloring of small Metallic Objects.

M. Puscher, a German chemist, gives the following receipts for the application of sulphur to the purposes referred to. 1. A solution is made in the following manner: Dissolve 4 oz. of the hyposulphite of soda in a pint and a half of water, and then add a solution of 1 oz of acetate of lead in the same quantity of water. Articles to be colored are placed in the mixture which is then gradually heated to boiling point. The effect of this solution is to give iron the effect of blue steel; zinc becomes bronze, and copper or brass becomes, successively, yellowish red, scarlet, deep blue, light blue, bluish white, and, finally, white, with a tinge of rose. This solution has no effect on lead or tin. 2. By replacing the acetate of lead in the solution by sulphate of copper, brass becomes first of a fine rosy tint, then green, and, finally, of a iridescent brown color. Zinc does not color in this solution; it throws down a precipitate of brown sulphuret of copper, but if boiled in a solution containing both lead and copper, it becomes covered with a black adherent crust, which may be improved by a thin coating of wax. If the lead solution be thickened with a little gum tragacanth, and patterns be traced with it on brass, which is afterwards heated to 212 degrees, and then plunged in solution No. 1, a good marked effect is produced.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,518.—COFFIN.—J. D. Nietscke, Somerset, Ohio. August 24, 1869.

2,633.—PIANOFORTE.—T. King, West Farm, N. Y. September 7, 1869.

2,635.—PREVENTING THE RADIATION OF HEAT FROM STEAM BOILERS.—C. M. O'Hara, New York city. September 7, 1869.

2,639.—KNITTING MACHINE.—C. A. Shaw, Biddeford, Me., and J. Hinkley Norwalk, Ohio. September 8, 1869.

2,578.—MEANS FOR EXTINGUISHING FIRES AND WATERING STREETS.—T Bigelow, Brooklyn, N. Y. September 13, 1869.

2,693.—COMBINED BUCKLE AND BUTTON-HOLE.—L. A. Kettle, Philadelphia, Pa. September 15, 1869.

2,691.—MEANS FOR BURNING SOLID FUEL.—L. A. Kettle, Philadelphia, Pa. September 15, 1869.

2,697.—MACHINERY FOR THE MANUFACTURE OF FELT AND OTHER CLOTHS.—J. T. Sanford, New York city. September 15, 1869.

2,698.—STEAM AND CALORIC ENGINE.—Alex. Hendry, Victoria, British Columbia. September 15, 1869.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

HARVESTER.—R. M. Williams, Rockville, Md.—This invention consists in attaching the finger bars and platforms to the framework of the machine in such a manner that said finger bars and platforms may rotate about a common center in a horizontal plane.

HORSE-POWER.—Geo. W. Moyers, Gordonsville, Va.—This invention consists in arranging the line shaft under the power wheel in such manner that the former may be vertically adjusted with reference to the latter, without removing the power wheel, or in any manner interfering with it.

COTTON AND HAY PRESS.—Wm. C. Banks, Como Depot, Miss.—This invention relates to an improved arrangement for operating the movable supporting block, and an improvement in the construction and application of the metallic plates attached to said movable beam against which the rotating screw nut bears.

COTTON CHOPPER AND SCRAPER.—H. B. Cage, Madison Station, Miss.—The object of this invention is to provide for public use a simple and cheap cotton chopper and scraper, so constructed that the chopper shaft can be conveniently removed and the instrument then used either as a scraper or ordinary plow.

FIRE-PROOF PAINT.—Emil Kunzendorf, New York city.—This invention tion relates to a new composition, which, when applied to wood or other combustible matter, will render the same comparatively fire-proof. The invention is applicable to all buildings, and all combustible matter, as a roof paint, and wherever fire-proof qualities are required.

SUPPORTING BARS FOR VEHICLES.—James B. Brewster, Flushing, N. Y.—This invention has for its object so to strengthen all kinds of supporting bars for wheeled vehicles and sleighs—that is to say, axle beds, bolsters, fellies, and sleigh runners, that the same will not be liable to split or break. nor to yield in the direction in which the greatest strain is applied.

MACHINE FOR PLANING AND MOLDING.—Frank Douglas, Norwich Town, Conn.—The object of this invention is to provide for public use a machine for planing and molding, in which the several parts are more perfectly and readily adjustable than heretofore,so that it can be operated with increased convenience, while, at the same time, it is adapted to a greater variety of work.

COMBINED PIPE TONGS AND WRENCH.—V. K. McElheny, Pittsburgh, Pa.—This invention consists in combining with a main stem, having a fixed jaw at one extremity and a handle at the other, a movable jaw, held by a band upon one side of said stem, and a lever, with a sliding fulcrum, for operating said movable jaw, upon the opposite side of said stem.

FOLDING CHAIRS.—E. W. Vaill, Worcester, Mass.—This invention consists in attaching rigid arms, pivoted at both ends, directly to the rigid seat of a folding chair, when such seat has slots in its sides for the reception of pins in the upper ends of the short legs, so as to allow the latter and the rigid seat to be folded back compactly against the back posts of the chair.

BINDING ATTACHMENT FOR REAPING MACHINES.—J. H. Mudgett, Camanche, Iowa.—The object of this invention is to provide a simple and efficient binding attachment for reaping machines, which will secure the grain from the reaper and present it, in bunches or gavels, to the attendant, and place the binding cord in a convenient position, to enable him to tie it quickly and discharge the sheaves, so bound, into a carrying rack, where they are retained until a sufficient number accumulates to form a shock, when they may all be discharged together by the pulling of a trip catch.

HYDRANT AND STOP-COCK RODS.—Henry Rausch, Brooklyn, N. Y.—This nvention has for its object to furnish an improved hydrant and stop-cock rod, which shall be so constructed and arranged as not to be liable to be detached when removing the key, and at the same time stronger and not so liable to be eaten away by rust and broken as when constructed in the ordinary manner.

HAMES FASTENER—A. J. Tompkins and J. M. Wegand, Clarksville, Iowa.—This invention has for its object to furnish a simple, convenient, and reliable adjustable hames fastener, designed especially for fastening the lower ends of the hames, but which may be used with equal facility for fastening the upper ends of said hames.

COMBINED SEED SOWER AND CULTIVATOR.—John W. Doud, Ward's Corners, Iowa.—This invention has for its object to combine with the improved cultivator, patented by the same inventor January 7, 1868, and numbered 73,173, a broadcast seed-sowing attachment, which shall be simple in construction, and so constructed and arranged as to do its work accurately and well.

BASE-BURNING STOVE.—Robert Batting, Albany, N. Y.—This invention has for its object to furnish an improved base-burning stove, or heater, which shall be so constructed and arranged as to furnish a greater amount of heat from the same or a less quantity of fuel than is possible with stoves constructed in the ordinary manner.

WHEELBARROW.—Peter Noling, Woodside, Wis.—This invention has for ts object to furnish an improved barrow, which shall be so constructed and arranged that a much greater amount of work may be done in the same time, and with greater ease than when an ordinary barrow is used, and which shall, at the same time, be simple in construction and effective n operation.

CAR COUPLING.—James A. Morrison, Brady's Bend, Pa.—This invention has for its object to furnish an improved car coupling, strong and simple in construction, effective in operation, conveniently operated, and not liable to break or get out of order.

HAY TEDDER.—J. K. Collins, Hartford, Vt.—This invention has for its object to furnish a simple and convenient machine for tedding hay, which shall be so constructed and arranged as to operate the tedding forks with a movement similar to the movement of the fork when the hay is being tedded by hand.

WATER WHEEL.—V. M. Baker, Preston, Minn.—This invention has for its object to improve the construction of horizontal water wheels so as to make them more efficient in operation, enabling them to utilize a larger proportion of the water, and bring them more fully under the control of the operator.

PROCESS FOR MANUFACTURING WOOL INTO ALL KINDS OF COLORS AND GOODS WITHOUT THE USE OF OIL OR GREASE IN CARDING AND SPINNING.—J. Saxton and B. Saxton, Sumner, Ill.—This invention has for its object to furnish an improved process, by the use of which wool may be manufactured into yarn and cloth without the use of oil or grease, so that the work may all the time be clean and the cloth ready for market when taken from the loom.

PEAT MACHINE.—John S. Kelly, New York city.—This invention has for its object to furnish a simple, convenient, and effective machine for scraping, condensing, and partially drying peat upon the bed and without removing it therefrom, thereby enabling the peat to be prepared for market at trifling expense.

VELOCIPEDE.—McClintock Young, Frederick, Md.—This invention relates to a new manner of constructing the frame, or reach, the steering frame, the saddle, and the brake of a velocipede, for the purpose of producing a light instrument fully as strong and reliable as the heavy machines now in use.

BRIDLE BIT.—C. M. Huckins, Johnsbury, Vt.—This invention relates o a new bridle bit for horses, which shall be so constructed that it may be used as a straight rigid bit or as a power bit, when driving or riding an unruly or hard-mouthed horse, and which shall be so constructed as to give he rider or driver full control over the horse.

DENTISTS' GRINDING WHEEL.—John K. Merrick, Odell, Ill.—This invention relates to improvements in grinding wheels, for dentists' use, for grinding and polishing teeth. It consists in the construction of such wheels of glass, and in a peculiar form calculated to promote the efficiency thereof.

CONSTRUCTION OF CARS.—M. C. Lawless, Montana, Iowa.—This invention relates to improvements in the attachment of the timbers of cars which support the drawheads to the permanent stringing, the object of which is to afford a ready means of detaching them for repairs.

ROOF SCAFFOLD BRACKET.—S. Clough, Monmouth, Maine.—This invention relates to a new and useful improvement in brackets for scaffolds on roofs.

LUBRICATOR.—Carl August Baumgart, Allegheny City, Pa.—This invention relates to a new and useful improvement in lubricators, or "oilers," whereby they are rendered more sure in their operation and more useful than they have hitherto been.

COMPOUND FOR ROADWAYS, PAVEMENTS, ETC.—Russell Fisk, New York city.—This invention relates to new and useful improvements in compounds, to be used in connection, by admixture, with sand, gravel, broken stone, cinders, and other like matters, for the construction of sidewalks, pavements, till, brick, and artificial stone.

WATER TWEER.—Edward Davidson, Boston, Mass.—This invention relates to improvements in water tweers, designed to provide a simple, cheap, and efficient arrangement; also, an adaptation of the same for connection directly to the water tank, or for detachment and use separated and moved away from it, as is sometimes required by the nature of the work in hand.

MEDICATED CIGARS.—Louis Walther, New York city.—This nvention relates to improvements in cigars, and it consists in imparting an improved flavor to them, and in expelling the nicotine by steeping the tobacco leaves previous to being formed into cigars, in a liquor formed of vegetable substances.

HAY OR COTTON PRESS.—James A. McGillivrae and C. O. Wheeler, Matteson, Ill.—This invention consists of an arrangement in a case, adapted in shape and size for occupying that position on a wagon of an ordinary wagon box, of a sliding plunger operated by racks and pinions, receiving and discharging passages and doors and door fastenings. Also, of adjustable ends and walls for the chamber, in which the finished bale is inclosed.

RAKING, LOADING, AND ELEVATING APPARATUS.—Charles P. Hale, Calhoun, Ky.—This invention relates to improvements in raking, or gathering, loading, and elevating apparatus for hay, straw, sand, and other substances to be gathered from the ground for loading, transporting, and elevating to a stack, building, or other place. It consists in an improved arrangement on a truck of a rake, or gathering instrument, which also delivers the substance gathered into a rack, and a receiving and delivering or elevating rack with connecting and tripping gear for a hoisting apparatus.

CASTING HOLLOW ARTICLES.—J. Brunner, New York city.—This invention consists in forming the hollow castings by the employment of chill molds, made in two parts, with large openings from the exterior to the molds at one side, and smaller air-escaping passages from the opposite sides, which molds are plunged into the molten metal from which the castings are to be made, with the said large openings downward and the smaller ones upward, so that the metal will flow in freely to the molds and become chilled against the surface of the molds and solidified sufficiently to form the exterior shell of the article required. The flask or mold is then raised vertically out of the molten metal to allow the central part not solidified to flow out, leaving the castings hollow. They are then removed from the molds in the usual way.

VISE AND DRILL.—Otis Dean, Richmond, Va.—This invention relates to improvements in the construction of the vise and drill, recently patented by the inventor, in which improved device the fixed jaw is made use of as the stock of the drill spindle, the movable jaw as the table and support of the articles to be drilled, and the vise serves as the feed screw. The present invention comprises an improved arrangement of the vertical adjusting spindle of the support for the jaws, and the adaptation of the feeding or vise screw for operation, either by the ordinary vise lever or by the crank used for turning the drive spindle; also, certain improvements in the connection of the vise screw and the drill spindle with the fixed jaw.

MACHINE FOR WIRING BLIND RODS.—John Holzberger, Newark, N. J.—This invention relates to a new machine for forcing wire staples into the rods of window blinds, and also into the slats of the same. The invention consists in the arrangement of double-detaining plates, which serve to separate the several staples as the same slide down on an inclined plate.

STIRRUP.—C. R. Van Osdel, Chicago, Ill.—This invention has for its object to construct a stirrup, which will form a support for the whole foot, which can be adjusted for any length of foot, and which will swing around to release the foot in case the rider is thrown.

HORSE HAY FORK.—David P. Stewart, Spruce Creek, Pa.—This invention consists in the arrangement, upon a straight pointed stock, to which the elevating rope is attached, of a set of jointed hooks capable of closing with the point of the stock to be forced into the hay, and then opening to hold the hay, and a set of gathering and holding hooks, connected together by slides parallel with the stock and operated simultaneously by setting and tripping levers.

CAR COUPLING.—A. H. Clark, Otisville, Mich.—The object of this invention is to provide a safe and durable coupling for railroad cars, one which shall couple automatically and be sure in its operation.

REAPING AND MOWING MACHINES.—E. M. Birdsall, Penn Yan, N. Y.—This invention relates to a new and useful improvement in fastening the knives or cutters to the cutter bars of reaping and mowing machines.

CRIBS AND CRADLES.—L. A. Chichester, Poughkeepsie, N. Y.—This invention relates to an improvement in cribs and cradles for children and dolls, whereby they are made cheaper, handsomer, and more durable, than when made in the ordinary manner.

FRICTION MATCHES.—W. H. Rogers, New York city.—This invention relates to a new and useful improvement in friction matches, and it consists in coating the match below the igniting end with an inflammable composition.

HOISTING APPARATUS.—W. M. Howland and G. L. Howland, Topsham, Me.—This invention relates to improvements in apparatus for hoisting heavy weights, pulling stumps, and the like, by hand power, and consists in the application to one of the legs of a tripod, which is detachably connected, to the other two by a hook, having a double shank which is separated for attachment to the said leg, so as to provide a space between the end of the leg and the hook for the same, of a pair of ratchet wheels on a chain, winding shaft, a pair of pawls, connecting rods, operating lever, and a device for throwing the pawls out of action with the catch wheels, under an arrangement whereby the stones or other weights may be raised or lowered, by the distance of one or more notches of the ratchet wheels at each movement of the lever.

COMBINED TABLE AND CRADLE.—E. A. Goodes, Philadelphia, Pa.—This invention consists of a circular or other formed table top, the under half of one side of which is detachable, a set of semi-elliptical legs, and a circular brace connected to the legs at the center, made in two parts and brought together, all so arranged as to be readily adjusted to the conditions of either a table or cradle.

FASTENING BOLT NUTS.—W. C. Mason, Beaver Falls, Pa.—The object of this invention is to provide means of preventing the turning off of saw nuts from their bolts.

COMPENSATING OR EQUILIBRIUM SPRING.—Charles Shea, Newark, N. J.—The object of this invention is to provide means for avoiding the jar and inconvenience on carriages and railroad cars, and for economizing springs on the same. The invention consists chiefly in providing compensating springs in connection with the ordinary springs of carriages, cars, locomotives, etc., the said compensating springs being so arranged that they act in an opposite direction to the main springs.

DRAFT BARS FOR VEHICLES.—J. B. Brewster, Flushing, N. Y.—The object of this invention is to so strengthen the draft bars, that is to say, the whiffletrees, evener bars, pole yokes, poles, and shafts, of all wheeled vehicles and sleighs, that the same will be greatly strengthened in the direction in which the greatest strain is applied.

MACHINE FOR MAKING COP TUBES.—Henry and James Douglas, Glasgow, Scotland.—This invention relates to new and useful improvements in machinery for making cop tubes, whereby it is designed to provide more efficient machines than those now in use. The invention consists in a new and improved arrangement of forming rollers, a forming mandrel, and a finishing brush.

BAKING AND DRYING STOVE.—F. S. Reefy and S. M. Zent, Roanoke, Ind.—This invention relates to improvements in baking and drying stoves, whereby it is designed to provide an attachment to a cast iron stove which may be used for drying fruit or baking, with great facility, and which will utilize the heat as much as possible.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

P. M. M., of N. Y., writes for an explanation of a singular case of collapse occurring in a low-wines still. The cause of this collapse must have been the removal of internal pressure by condensation, the external pressure of the atmosphere then acting to crush in the crown of the still. How this could have occurred with the worm open and the stream of high wines passing through being only a small fraction of its capacity, while the ordinary operation of distillation was in progress, seems unaccountable. It is probable some condition has been overlooked by our correspondent.

S. R. of Vt.—We have often used both a rotating slide valve and oscillating cylindrical valve in hydraulic machines, and either will work well for a time. The cylindrical valve is however better replaced by a tapering one like those used in ordinary water cocks, as that will enable you to take up all wear on the valve and seat. This wear soon makes a cylindrical valve leak where much work is required. The rotating slide valve, however, will keep tight a long while with fair treatment.

D. V., of Va.—A machine is only a means of transmitting and applying force to work. It of itself does nothing. When moved by the application of force, it does not even transmit the whole of that force but absorbs a portion of it. How, then, can you by placing a machine between force and work, expect to apply more force to work with, than without the intervening machine. A second look at your computation will show you your error.

C. E., of Mich.—What is called puddled steel is made by stopping the process of puddling iron at the precise time when sufficient carbon remains in it to form steel. When the puddling is carried beyond this point, more of the carbon is combined with oxygen, and passing off in the form of carbonic acid, leaves the reduced metal in a state called malleable iron, the principal difference between which and steel is the less amount of carbon it contains.

D. M. T., of N. Y.—Two bodies moving in contact with each other, and at a common velocity, can neither of them take motion from the other. There are, however, some very nice points connected with this subject which we cannot discuss here; but you may safely conclude that when one body is imparting motion to another body, the latter must be moving with less velocity in some direction than the former.

D. K. M., of Pa.—You can prevent in a great degree the rusting of an iron vessel in which water is boiled by greasing the interior and allowing it to, as the housekeepers say, "burn on." Wipe it out with a greasy rag and then let it heat till it smokes freely. Repeat this several times and you will not be troubled again soon.

R. M., of Ill.—To compute the length of an arc of any number of degrees, radius being given, multiply the radius by 710 divided by 113. Multiply this product by the number of degrees in the arc, and divide by 360, and you will have the length of the arc in the denomination by which the length of the radius is expressed.

L. T. D., of Md.—Where a force pump is employed to force water to a great hight, it is the best practice, in our opinion, to use more than one check valve, as the valves only add to the power required to work the pump by their weight, while the wear will be distributed provided the valves are properly adjusted.

M. M. G., of N. Y.—You can coat malleable iron castings permanently with copper by the use of the electro-plating process, which you will find fully described in the "Practical Metal Workers' Assistant," published by Henry Carey Baird, of Philadelphia. That work also gives the other information you desire.

C. J. H., of Pa.—To kill knots before painting apply a paste of wet lime to them. When the paste dries apply a hot iron to the knot which will melt out the pitch, and the lime will absorb it. The spots may be rubbed down smooth and then paint applied.

L. C. D., of Wis.—The details of the art of encaustic painting, as practiced by the ancients, are not now known. According to Pliny, it is probable that the vehicle of the colors was melted wax, but attempts at imitating this method in modern times have been unsuccessful.

D. S., of N. J.—Glue is not soluble in oil, as you might easily have determined by an experiment. It may therefore be used to coat over the insides of oil casks, and will in great measure prevent loss from leakage.

C. B. H., of N. Y.—Agates, carnelians, and other hard stones, are sawed with small metal plates armed with diamond dust. You can get such work done by Michael Fox & Co., No. 1 Maiden Lane, New York.

E. C. H., of R. I.—Your device is as old as Vitruvius, who describes it exactly. Bell-shaped reflectors of sound were used in the Corinthian theaters, and were introduced into Rome after the taking of Corinth.

T. P., of N. C.—The aluminum bronze is the strongest alloy yet discovered. Its composition is ninety parts of copper to ten of aluminum.

C. L. M., of Ca.—What have been called Egyptian pebbles are a species of agate or jasper.

G. W. B., of Wis.—The stone you send appears to be agate.

APPLICATIONS FOR EXTENSION OF PATENTS.

SHIRT COLLARS.—Polly Hunt and George W. Hunt, of New York city, administrator of the estate of Walter Hunt, deceased, has petitioned for an extension of the above patent. Day of hearing, December 13, 1869.

HORSE HAY RAKE.—Mary G. Pratt, administratrix de bonis non, of the estate of Randal Pratt, late of the township of Marple, Pa., has petitioned for the extension of the above patent. Day of hearing, December 20, 1869.

GAS COOKING STOVE.—Hiram B. Musgrove, Cincinnati, Ohio, has petitioned for an extension of the above patent. Day of hearing, December 20 1869.

PLOW.—Benjamin F. Avery, of Louisville, Ky., has petitioned for the extension of the above patent. Day of hearing, December 20, 1869.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Send for Agents' Circular—Hinkley Knitting Machine Co., 176 Broadway.

To Inventors—Garrison's Model and Exchange Rooms for exhibition of models and sale of rights for the Northwest, No.5 Arcade Court, Chicago. The largest establishment of the kind west of New York.

Territory for sale or exchange for real estate of the O U C I X L carriage-seat fastener. Send for circular. Address H. E. Murray, Chester, Orange county, N. Y.

E. Myers, Creagerstown, Md., wants address of harvester makers.

Engine builders, planing and machinery for a sash, blind, and door factory, send price lists to P. O. Lock Box No. 3, Lavaca, Texas.

American Oil Feeders are in use on shafting and loose pulleys at American Institute Fair. Made by J. B. Wickersham, 143 South Front st., Philadelphia. Send for circular.

The Novelty Job Printing Presses, for printers, merchants, and amateurs. C. C. Thurston, Agent, Brooklyn, N. Y.

Manganese Ores suitable for glass, steel, oil boilers, at low prices. Muriatic Acid, full strength, price 1¾ cents per lb. Soda Ash. Bleaching Powder, fresh made, full test, at market prices. Michigan Chemical Company, Jackson, Mich.

Wanted—A large quantity of cast-steel castings, manufactured ough and strong, weight half-pound each. Address H. Birdsall, Son & Co., Penn Yan, N. Y.

Shafting, Hangers, and Pulleys, Craig's Oscillating Steam Ennes, on hand and to order. Gallatin & Brevoort Machine Works, 223 Front st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

The Best and Cheapest Boiler-flue Cleaner is Morse's. Send to A. H. & M. Morse, Franklin, Mass., for circular. Agents wanted.

Snow-plow patent for sale. M. A. & I. M. Cravath, Lansing, Mich.

For Norris' Self-acting Spooling Gage (measures spool silk and cotton thread), address R. H. Norris, Paterson, N. J.

Wanted—Manufacturer to introduce and fill orders for a patent cast-iron shutter worker. Address T. H. Bradley, War Department, Washington, D. C.

Every wheelright and blacksmith should have one of Dinsmore's tire shrinkers. Price $40. R. H. Allen & Co., P.O.Box 376, New York.

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

Chemicals, Drugs, Minerals, Metals, Acids, etc., for all Mechanics and Manufacturers, for sale by L. & J. W. Feuchtwanger, Chemists, and Importers of Drugs and Minerals, 55 Cedar st., New York.

Clothes Wringers of all kinds repaired or taken in part pay for the "Universal," which is warranted durable. R. C. Browning, Agent, 32 Courtlandt st., New York.

For Sale—Cotton Planter.—The entire right of the King Cotton Planter—the only successful in use. Have been worked since the war, and given universal satisfaction. The machine is simple, strong, and can be built cheaply. Will sell at a low figure. Reason for disposing of it is want of time to give it proper attention. Address S. N. Brown & Co., Dayton, O.

Hot Pressed Wrought Iron Nuts, of all sizes, manufactured and for sale at moderate prices by J. H. Sternbergh, Reading, Pa.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

Man'f'rs of grain-cleaning machinery and others can have sheet zinc perforated at 2c. per sq. ft. R. Aitchison & Co., 845 State st., Chicago.

Send for a circular on the uses of Soluble Glass, or Silicates of Soda and Potash, fire and water-proof. Manufactured by L. & J. W. Feuchtwanger, Chemists and Drug Importers, 55 Cedar st., New York.

Mill-stone dressing diamond machine, simple, effective, durable. Also, Glazier's diamonds. John Dickinson, 64 Nassau st., New York.

Leschot's Patent Diamond-pointed Steam Drills save, on the average, fifty per cent of the cost of rock drilling. Manufactured only by Severance & Holt, 16 Wall st., New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of the Parker Power Presses.

Diamond carbon, formed into wedge or other shapes for pointing and edging tools or cutters for drilling and working stone, etc. Send stamp for circular. John Dickinson, 64 Nassau st., New York.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING OCT. 12, 1869.

Reported Officially for the Scientific American

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from .... $1 *upward, but usually at the price above-named.*

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them .... $1·25

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York.

95,627.—BORING TOOL.—Alexander Allan, New York city.
95,628.—PNEUMATIC APPARATUS FOR DRAWING ALE.—Henry Andes, Wilkesbarre, Pa.
95,629.—VELOCIPEDE.—Solomon Andrews, Perth Amboy, N. J.
95,630.—WATER WHEEL.—V. M. Baker, Preston, Minn.
95,631.—HAY AND COTTON PRESS.—W. C. Banks, Como Depot, Miss.
95,633.—BATH TUB.—Arad Barrows, Philadelphia, Pa
95,632.—REEL—J. H. Barker, Washington, D. C.
95,634.—ROOFING FABRIC.—D. P. Bartlett and Alfred Adams, Chagrin Falls, Ohio.
95,635.—LUBRICATOR.—C. A. Baumgart, Allegheny City, Pa.
95,636.—BASE BURNING STOVE.—Robert Batting, Albany, N.Y.
95,637.—STEAM ENGINE.—William Baxter (assignor to W. D. Russell), Newark, N. J.
95,638.—HARVESTER-CUTTER.—E. M. Birdsall, Penn Yan, N.Y.
95,639.—GRINDSTONE FRAME.—Byron Bisbee, North Waterford, Me.
95,640.—ORE CONCENTRATOR AND AMALGAMATOR.—J. S. Bradford, New York city.
95,641.—DRAFT BAR FOR VEHICLES.—J. B. Brewster, Flushing, N. Y.
95,642.—SUPPORTING BARS FOR VEHICLES.—J. B. Brewster, Flushing, N. Y.
95,643.—RAILWAY RAIL CHAIR.—James Bridger, Newark, N. Y.
95,644.—HEAT RADIATOR.—Warren Brown, Sandusky, Ohio.
95,645.—CASTING HOLLOW ARTICLES.—J. Brunner, New York city.
95,646.—BLANK FOR AX POLLS.—William Bunton (assignor to himself and G. W. Jope), Pittsburgh, Pa.
95,647.—HAY TEDDER.—H. M. Burdick, Ilion, N. Y. Antedated May 19, 1869.
95,648.—VELOCIPEDE.—V. H. Buschman, Baltimore, Md. Antedated Sept. 29, 1869.
95,649.—STOVE PIPE THIMBLE.—C. A. Buttles, Milwaukee, Wis.
95,650.—MACHINE FOR BENDING SHEET METAL FOR CORNICES, ETC.—C. A. Buttles and Dennis Murphy, Milwaukee, Wis.
95,651.—COTTON CHOPPER AND SCRAPER.—H. B. Cage, Madison Station, Miss.
95,652.—CAR COUPLING.—A. H. Clark, Otisville, Mich.
95,653.—STEAM ENGINE.—W. H. T. Clark, San Francisco, Cal.
95,654.—ROOF BRACKET.—S. Clough, Monmouth, Me.
95,655.—CALENDAR.—G. L. Coburn, Hartford, Conn.
95,656.—HAY TEDDER.—J. K. Collins, Hartford, Vt.
95,657.—FRUIT HOUSE.—Nathan Cope, New Waterford, Ohio.
95,658.—EXCAVATOR.—James Cowden, La Prairie Centre, and Daniel Brown, Akron, Ill.
95,659.—HEMP BREAK.—E. M. Crandal, Alton, Ill.
95,660.—FIRE PLACE.—J. M. Crockett, Newbern, Va.
95,661.—WATER TWEER.—Edward Davidson, Boston, Mass.
95,662.—STEAM CHEESE-VAT.—J. A. Davis, Watertown, N. Y.
95,663.—VISE.—Otis Dean, Richmond, Va.
95,664.—COOKING STOVE.—J. De Frain (assignor to himself and William Callahan), Philadelphia, Pa.
95,665.—MANUFACTURE AND APPLICATION OF GAS FROM PETROLEUM, ETC.—T. S. Dickerson, assignor for one half his right to R. M. Whipple, Chicago, Ill.
95,666.—APPARATUS FOR EXHIBITING PHOTOGRAPHS.—Martial Dimock, Newark, N. J., assignor to S. S. Barnaby and David Millard.
95,667.—LAMP CHIMNEY.—Edward Dithridge, Pittsburgh, Pa.
95,668.—EVAPORATING SALT WATER, ETC.—W. J. Dodge, Syracuse, N. Y.
95,669.—COMBINED SEED-SOWER AND CULTIVATOR.—J. W. Doud, Ward's Corners, Iowa.
95,670.—MACHINE FOR MAKING COP-TUBES.—Henry Douglas and James Douglas, Glasgow, Scotland.
95,671.—OVEN.—J. S. Dunham and James Green, St. Louis, Mo.
95,672.—STONE DRILL.—W. C. Edenfield, Savannah, Mo. Antedated Sept. 27, 1869.
95,673.—COMPOUND FOR PAVEMENTS, ROADWAYS, ETC.—Russell Fisk, New York city,
95,674.—GRAIN SEPARATOR.—F. R. Foster, Brandon, Wis.
95,675.—HORSE CANT-HOOK.—E. W. Gale (assignor to himself and J. G. Gale), Monroeton, Pa.
95,676.—CLOD FENDER.—F. M. Gardner, Brown township, Ohio.
95,677.—RAILWAY CAR BRAKE SHOE.—S. B. Gardner, Freeport, Ill., assignor to himself and A. H. Leedy.
95,678.—COAL ASH SIFTER.—J. L. Griffin, Redding, Conn.
95,679.—SOAP.—H. L. Guldin, Robeson township, Pa.
95,680.—HAY LOADER.—C. P. Hall, Calhoun, Ky.
95,681.—CORN PLANTER.—J. J. Harpel, Lebanon, Pa.
95,682.—KEY GUARD.—B. R. Hathaway, Mormon Island, Cal.
95,683.—HAND CORN PLANTER.—E. W. Haven, Brandon, Vt.
95,684.—SKIRT.—Henry Hayward, New York city.
95,685.—BASE BURNING STOVE.—J. C. Henderson, Troy, N. Y.
95,686.—APPARATUS FOR HEATING PUDDLING FURNACES.—Samuel A. Hill and Charles F. Thumm, Oil City, assignors to themselves and Oliver P. Scaife, Pittsburgh, Pa.
95,687.—DEVICE FOR GENERATING STEAM IN STEAM GENERATORS.—Samuel A. Hill and Charles F. Thumm, Oil City, assignors to themselves and Oliver P. Scaife, Pittsburgh, Pa.
95,688.—APPARATUS FOR GENERATING STEAM IN BOILERS.—Samuel A. Hill and Charles F. Thumm, Oil City, assignors to themselves and Oliver P. Scaife, Pittsburgh, Pa.
95,689.—MACHINE FOR TARRING PAPER FOR ROOFING.—James Howard, West Manchester, Pa.
95,690.—ROAD SCRAPER.—Lymon Howe, Worcester, assignor to himself, Jonathan Luther, same place, and Moses W. Wheeler, Milbury, Mass.
95,691.—HOISTING APPARATUS.—Wm. M. Howland and Geo. L. Howland, Topsham, Me.
95,692.—STATION INDICATOR.—George R. Johnson, Wilmington, Del.
95,963.—DROP HAMMER.—Edward Kaylor, Pittsburgh, Pa.
95,964.—LATHE.—James Kievlan (assignor to himself and Wm. Wisdom), Chicago, Ill.
95,695.—LINIMENT AND MEDICAL COMPOUND.—John King, Warren county, Ohio.
95,696.—FIREPROOF PAINT.—Emil Kunzendorf, New York city.
95,697.—RAILWAY CAR.—M. C. Lawless, Montana, Iowa.
95,698.—ANCHOR.—Geo. A. Lloyd and Chas. A. Stewart, San Francisco, Cal.
95,699.—RAILWAY BRAKE.—Wm. W. Loomis, Wilkesbarre, Pa.
95,700.—MACHINE FOR WIRING HINGES.—Ellis Luther, West Troy, N. Y.
95,701.—VEHICLE PROPELLED BY HAND.—Peter Lutteke, St. Louis, Mo.
95,702.—CHIMNEY.—Benj. F. Mann, Oakland, Cal.
95,703.—APPARATUS FOR IMPARTING AGE TO WHISKY AND OTHER SPIRITS.—Wm. P. Martin, Millersburg, Ky.
95,704.—LOCK NUT.—Wm. C. Mason (assignor to himself and J. H. Nichols), Beaver Falls, Pa.
95,705.—RAILWAY-CAR AXLE BOX.—Mark McCammon, Chicago, Ill.
95,706.—COMBINED PIPE TONGS AND WRENCH.—V. K. McElheny, Pittsburgh, Pa., assignor to himself, Ernest Frank, and John B. Adt.
95,707.—HAY AND COTTON PRESS.—James A. McGillivrae and C. O. Wheeler (assignors to C. O. Wheeler), Matteson, Ill.
95,708.—LACING EYE.—Albert G. Mead (assignor to himself, Charles J. Addy, and George H. Wood, assignors to Albert G. Mead, Charles J. Addy, and Milton A. Kent), Boston, Mass. Antedated September 27, 1869.
95,709.—MODE OF PREPARING ORNAMENTAL TRANSPARENT LETTERS FOR SIGNS, ETC.—Emil F. Meyer, Brooklyn, N. Y. Antedated October 5, 1869.
95,710.—COFFEEPOT.—Elie Moneuse and Louis Duparquet, New York city.
95,711.—RAILWAY CAR COUPLING.—James A. Morrison, Brady's Bend, Pa.
95,712.—WAGON BOX.—Wm. F. Moore and Jacob A. Bowers, Channahon, Ill.
95,713.—NECKTIE RETAINER.—Porter C. Moulton, New Haven, Conn.
95,714.—GRAIN BINDER.—J. H. Mudgett, Camanche, Iowa.
95,715.—PRESERVING MEAT FOR PASTRY PURPOSES.—George H. Monroe, New York city.
95,716.—MODE OF LUBRICATING JOURNALS.—Samuel Nash (assignor to himself and John M. Duncan), Boston, Mass.
95,717.—WHEELBARROW.—Peter Noling, Woodside, Wis.
95,718.—COMBINED WHEELBARROW AND GARDEN PLOW.—John D. O'Callahan, Calhoun, Ga.
95,719.—MILK COOLER AND DEODORIZER.—Alexander Osborn, Eagleville, Ohio.
95,720.—GAS CHECK FOR ORDNANCE.—J. W. Pearson, Watertown, assignor to Alfred B. Ely, Newton, Mass.
95,721.—MACHINE FOR MAKING SHEET-METAL PANS.—Geo. S. Peck (assignor to himself and Wm. H. Morgan), Towanda, Pa.
95,722.—MILK COOLER.—Julius R. Pond, New Hartford, Conn.
95,723.—MILK HOUSE.—Julius R. Pond, New Hartford, Conn.
95,724.—HYDRANT STOPCOCK ROD.—Henry Rausch, Brooklyn N. Y.
95,725.—BAKING AND DRYING STOVE.—F. S. Reefy and S. M. Zent, Roanoke, Ind.
95,726.—REVERSIBLE AXLE FOR CARRIAGES.—J. R. Renkin (assignor to himself and M. M. Grumbling), Hillsdale, Pa.
95,727.—FIREBOX FOR STEAM GENERATORS.—Edwin L. Robbins, Owego, N. Y.
95,728.—FOOT OR BED WARMER.—L. M. Roby, Leesville, Ohio.
95,729.—MACHINE FOR MILLING THE KNIFE-EDGES OF SCALE BEAMS.—Thomas J. Rockwood, St. Johnsbury, Vt.
95,730.—FRICTION MATCH.—Wm. H. Rogers, New York city.
95,731.—SCREW PROPELLER.—S. W. Rowell, Rutland, Vt.
95,732.—METALLIC ROOFING.—Franklyn Roys, East Berlin, Conn.
95,733.—PROCESS OF PREPARING WOOL FOR MANUFACTURE.—J. Saxton and B. Saxton, Sumner, Ill.
95,734.—HOT-AIR FURNACE.—Ph. I. Schopp, Louisville, Ky.
95,735.—BOILER FOR HYDRATING THE ATMOSPHERE OF APARTMENTS.—Ph. I. Schopp, Louisville, Ky.
95,736.—COMPENSATING OR EQUILIBRIUM SPRING.—Charles Shea, Newark, N. J.
95,737.—WINDOW BLIND.—S. M. Sherman, Fort Dodge, Iowa.
95,738.—HARVESTER.—Amos Smith, Springfield, Ohio. Antedated April 12, 1869.
95,739.—PERMUTATION LOCK.—Daniel Snell, Little Falls, N. Y.
95,740.—DISTILLING APPARATUS FOR SPIRITS.—Frank Sonier, Springfield, Ill.
95,741.—MACHINE FOR MIXING SOAP, PAINT, PASTE, AND OTHER SIMILAR MATERIALS.—John Stainthorp, New York city.
95,742.—PLATE.—Newell D. Stevens (assignor to himself and O. A. Hill), Westbrook, Me.
95,743.—HORSE HAY FORK.—David P. Stewart, Spruce Creek, Pa.
95,744.—WRENCH.—Daniel C. Stillson, Charlestown, Mass.
95,745.—FORMING HORSESHOE CALKS.—Samuel Stone, North Manchester, Conn.
95,746.—METALLIC BAR.—Samuel Stone, North Manchester, Conn.
95,747.—RAILROAD GRAIN TRANSFERRER.—James W. Sykes, Chicago, Ill.
95,748.—SHAFT TUG.—Samuel Taylor, Georgetown, N. J.
95,749.—CENTRIFUGAL PUMP.—Stephen P. Thayer, Baldwinsville, N. Y.
95,750.—OVEN.—J. R. Treadwell, Brooklyn, N. Y.
95,751.—MACHINE FOR GRINDING HARVESTER CUTTERS.—John Welchhart, San Francisco, Cal.
95,752.—MANUFACTURE OF CRYSTAL GLASS.—Otto Wuth, Pittsburgh, Pa.
95,753.—VELOCIPEDE.—McClintock Young, Frederick, Md.
95,754.—SCULLING OAR.—F. T. Angers, Canastota, N. Y.
95,755.—FISHHOOK.—F. T. Angers, Canastota, N. Y.
95,756.—HEATING APPARATUS.—John Armstrong, Jr., San Francisco, Cal.
95,757.—MEANS FOR PREVENTING BACKLASH IN MACHINES DRIVEN BY GEARING.—G. H. Babcock, J. P. Manton, and Jonathan Boyd, Providence, R. I. Patented in England May 8, 1868.
95,758.—MACHINE FOR PRINTING PAPER, CLOTH, ETC.—G. S. Barton, Worcester, Mass.
95,759.—DRAFTSMEN'S SQUARE AND TRIANGLE.—A. V. Benoit, New York city.
95,760.—GRAINING MACHINE.—William H. Berger, Pittsburgh, Pa.
95,761.—CARRIAGE CLIP.—Alfred Bixby, Lansing, Mich.
95,762.—CULTIVATOR.—Jeremiah Bohan, New Hartford, Iowa.
95,763.—REVOLVING PROW FOR VESSELS.—David Bookwalter, Gardner, Ill.
95,764.—FAN.—Otto Bruck, New York city.
95,765.—REVOLVING BILLIARD TABLE.—Solomon Brunswick, St. Louis, Mo.
95,766.—PAPER FILE.—Hubert Burgess, San Francisco, Cal.
95,767.—STOP MOTION FOR DRAWING FRAME.—J. S. Casey, Voluntown, Conn.
95,768.—CRIB OR CRADLE.—L. A. Chichester, Poughkeepsie N. Y.
95,769.—MOWING MACHINE.—T. J. Clark and G. M. Clark, Higganum, Conn.
95,770.—MILKING STOOL.—S. P. Clemons, Dansville, N. Y.
95,771.—MEDICINE FOR RHEUMATISM.—Geo. Conroy (assignor to R. A. Smith), Mendocino co., Cal.
95,772.—WOOD VISE.—R. F. Cook and J. F. Post, Potsdam, N. Y.; said Cook assignor to said Post.
95,773.—WEATHER STRIP.—A. M. Corbit, Bethlehem, Iowa.
95,774.—STAVE JOINTER.—H. A. Crossley, Cleveland, Ohio.
95,775.—CARPET.—Thos. Crossley, Bridgeport, Conn.
95,776.—FELTED CARPET FABRIC.—Thomas Crossley, Bridgeport, Conn.
95,777.—MACHINE FOR PRINTING CARPETS.—Thos. Crossley, Bridgeport, Conn.
95,778.—GRINDING CURRIERS' KNIVES.—Henry Cunningham, Albany, N. Y.
95,779.—MODE OF SOFTENING LEATHER.—Henry Cunningham, Albany, N. Y.
95,780.—MACHINE FOR SPLITTING LEATHER.—Henry Cunningham, Albany, N. Y.
95,781.—MILK PAIL AND STRAINER.—D. S. Curtiss, Washington, D. C.
95,782.—PLANING MACHINE.—Frank Douglas, Norwich Town, Conn.
95,783.—COAL-ASH SIFTER AND TABLE.—P. J. Dwyer, Elizabeth Port, N. J.
95,784.—ARCHED BRIDGE.—J. B. Eads and Henry Flad, St. Louis, Mo.
95,785.—WATER LOCOMOTIVE.—G. A. Fall, Hoboken, N. J.
95,786.—PILE DRIVER.—Henry Flad (assignor to J. B. Eads), St. Louis, Mo.
95,787.—RAILWAY TRACK CLEARER.—Geo. Fowler, Claverack, N. Y.
95,788.—ROTARY HARROW.—H. A. Gaston, Stockton, Cal.
95,789.—COMBINED SEEDER AND GRAIN DRILL.—H. A. Gaston, Stockton, Cal.
95,790.—SULKY CULTIVATOR.—Oscar L. Gaylord, Plainfield, Ill.
95,791.—TABLE AND CRADLE COMBINED.—E. A. Goodes (assignor to the Philadelphia Patent and Novelty Company), Philadelphia, Pa.
95,792.—WASHBOARD.—Benjamin F. Gott, Brooklyn, E. D., N. Y.
95,793.—COMBINED TOOL.—Emile Granier, Paris, France.—Patented in France, May 9, 1868.
95,794.—SPARK ARRESTER.—Isaac H. Graves, Sacramento City, Cal.
95,795.—CAST METAL CHIMNEY CAP.—Wm. Green, Snyder township, Pa.
95,796.—ELECTRICAL FIRE-ALARM THERMOMETER.—J. H. Guest, Brooklyn, N. Y.
95,797.—POCKETBOOK.—Frederick Heiles, New York city.
95,798.—APPARATUS FOR DRYING SUGAR.—Alexander Herbst Moscow, Russia.
95,799.—DOOR SILL.—D. Hitchcock and D. S. Trout, Arcola Ill.
95,800.—MACHINE FOR WIRING BRIND RODS.—John Holzberger, Newark, N. J.
95,801.—BRIDLE BIT.—C. M. Huckins, East Topsham, Vt.
95,802.—NAIL-CUTTING MACHINE.—C. D. Hunt, Fairhaven, Mass.
95,803.—AUGER.—W. A. Ives, New Haven, Conn.
95,804.—FILE-CUTTING MACHINE.—James Jervis, Baltimore, Md.
95,805.—SHOE.—A. S. Kelly, Haverhill, Mass.
95,806.—PEAT MACHINE.—J. S. Kelly, New York city

95,807.—Mowing Machine.—William G. Kenyon, Wakefield, R. I.

95,808.—Hinge for Carriage Tops.—Henry Killam, New Haven, Conn.

95,809.—Cutter He d.—Jefferson Kindleberger and William Augustus Arnold (assignors to "The Inventors' Association,") San Francisco, Cal.

95,810.—Machine for Ten ning Blind Slats.—Jefferson Kindelberger and W. A. Arnold (assignors to "The Inventors' Association,") San Francisco, Cal.

95,811.—Bakers' Oven.—J. G. Kluge, New York city.

95,812.—Grate Bar.—L. F. Lakey and W. B. Hayte, Quincy, Ill.

95,813.—Hanger.—P. P. Lane and Edward Myers (assignors to Lane & Bodley), Cincinnati, Ohio.

95,814.—Suspended.

95,815.—Scaffold Bracket.—Noah Lovell (assignor to himself and E. W. Mixer), Adrian, Mich.

95,816.—Lock for Mail Bags.—R. O. Lowrey, Salem, N. Y.

95,817.—Mail Bag.—R. O. Lowrey, Salem, N. Y.

95,818.—Mail Bag Fastener.—R. O. Lowrey, Salem, N. Y.

95,819.—Fruit Jar.—W. W. Lyman, Meriden, Conn.

95,820.—Fence.—John Markley, Bucyrus, Ohio.

95,821.—Gate for Draw Bridges.—G. A. May, Chicago, Ill.

95,822.—Toy Hoop.—H. J. May, Brooklyn, N. Y., assignor to himself and J. S. Thornton, Jersey City, N. J.

95,823.—Dentists' Grinding and Polishing Wheel.—J. K. Merrick, Odell, Ill.

95,824.—Composition for Emery Wheels and other Abrading Implements.—E. C. Merrill and A. W. Willard, Charlestown, Vt., assignors to E. C. Merrill.

95,825.—Washing Machine.—J. S. Moore, Jr., and Chas. H. Reynolds, Brooklyn, E. D., N. Y.

95,826.—Horse Power.—G. W. Moyers, Gordonsville, Va.

95,827.—Machine for Polishing and Cleaning Coffee.—Wm. Newell, Philadelphia, Pa.

95,828.—Carriage-Body Brace.—J. H. Ormsby, Dixon, Ill.

95,829.—Feed for Grinding Mills.—Geo. Parker, Poughkeepsie, N. Y.

95,830.—Sausage Stuffer.—Thomas Parker, Shelby, Ohio.

95,831.—Cultivator.—J. C. Pearl, Mendota, Ill.

95,832.—Coach Door.—James Penfield and D. F. Woolsey, Bridgeport, Conn.

95,833.—Machine for Surfacing and Ornamenting Wood.—T. T. Ponsonby (assignor to John Anderson), Liverpool, Eng. Patented in England Sept. 5, 1865.

95,834.—Combined Pliers and Scissors.—John H. Price, Boston, Mass.

95,835.—Railway Car Coupling.—W. V. Pulliam, Kansas, City, Mo.

95,836.—Stone-Crushing Machine.—G. W. Rawson, Cambridgeport, assignor to himself and Michael Hittinger, Somerville, Mass.

95,837.—Hoisting Apparatus.—W. B. Reaney, Chester, Pa.

95,838.—Cut-Off Gear for Steam Engines.—J. B. Root, New York city. Antedated Oct. 2, 1869.

95,839.—Fishing Reel.—J. J. Ross (assignor to Sarah Ross), Buffal , N. Y.

95,840.—Device for Extinguishing Fires.—Enno Sander, St. Louis, Mo.

95,841.—Circulating Grate for Steam Generators.—James Braden, Indianapolis, Ind., administrator of the estate of James Scanlan, deceased.

95,842.—Spool and Thread Protector.—T. O. L. Schrader, New York city.

95,843.—Manufacture of Iron and Steel.—Charles W. Siemens, Westminster, England. Patented in England, September 20, 1866.

95,844.—House Connection for Sewer, Water, and Gas Pipes.—John Silsby, New York city.

95,845.—Hoop-Bending Machine.—G. E. Smith, Middleport, N. Y.

95,846.—Combined Bit and Tap.—S. A. Smith, New Haven, assignor to The Centre Brook Manufacturing Company, Centre Brook, Conn.

95,847.—Device for Securing Buttons to Fabrics.—D. McLean Somers, Brooklyn, N. Y.

95,848.—Bed and Cushion Spring.—D. E. Somes, Washington, D. C.

95,849.—Apparatus for Utilizing Heat.—B. F. Sturtevant, Jamaica Plains, Mass.

95,850.—Die for Manufacturing Lead Pipe.—B. Tatham, New York city.

95,851.—Carriage Body Brace.—Jacob Taylor, Beloit, Ohio.

95,852.—Horse Rake.—James Thompson, Bridgeport, Ill.

95,853.—Type-Setting Machine.—Joseph Thorne, New York city.

95,854.—Cotton-Bale Fastening.—Matthew Tildesley, Willenhall, England.

95,855.—Hames Fastener.—A. J. Tompkins and J. M. Wemund, Clarksville, Iowa.

95,856.—Folding Chair.—E. W. Vaill, Worcester, Mass.

95,857.—Stirrup.—C. R. Van Osdel, Chicago, Ill.

95,858.—Medicated Cigar.—Louis Walther, New York city.

95,859.—Slate Pencil Holder.—Edward G. Ward, Hoboken, N. J.

95,860.—Stone Channeling Machine.—G. J. Wardwell, Rutland, Vt., assignor to Steam Stone-Cutter Co., New York city.

95,861.—Pencil Attachment.—Edward Weissenborn, Hudson City, N. J.

95,862.—Machinery for the Manufacture of Felt.—Milton D. Whipple, Cambridge, Mass., assignor to James T. Sanford, New York city.

95,863.—Machine for the Manufacture of Felt.—Milton D. Whipple, Cambridge, Mass., assignor to J. T. Sanford, New York city.

95,864.—Harvester.—R. M. Williams, Rockville, Md.

95,865.—Lock.—S. N. Brooks, Bernardston, Mass., administrator of the estate of Linus Yale, Jr., deceased.

95,866.—Carbon Tool.—Hugh Young, Middletown, Conn., and J. L. Young, New York city.

95,867.—Car-Axle Bearing.—Louis Brauer, Washington, D. C.

REISSUES.

15,753.—Oven.—Dated Sept. 23, 1856; reissue 3,666.—Hosea Ball, New York city.

92,934.—Method of Preserving the Aromatic Principle of Hops.—Dated July 27, 1869; reissue 3,667.—E. D. Brainard, Albany, N. Y.

94,073.—Manufacture of Soap.—Dated August 24, 1869; reissue 3,668.—W. T. Bush, Union City, Tenn.

79,639. Gang Plow.—Dated July 7, 1868; reissue 3,669.—G. A. Davison, San Leandro, Cal.

90,433.—Needle Sharpener.—Dated May 25, 1869; reissue 3,670.—A. S. Dinsmore, New York city.

13,369.—Method of Operating Steam Valves.—Dated July 31, 1855; antedated March 1, 1855; extended 7 years; reissue 3,671.—O. T. Earle, Norwalk, Conn., assignor of N. W. Wheeler.

53,957.—Tire Tightener.—Dated April 17, 1866; reissue 3,672.—James Orr, Hampden township, Pa., assignee of P. Daniels.

85,847.—Stalk Cutter.—Dated Jan. 12, 1869; reissue 3,673.—R. B. Parks and J. R. Parks, Neponset, Ill.

85,713.—Composition for Artificial Stone.—Dated Jan. 5, 1869; reissue 3,674.—E. Westermayr, Chicago, Ill.

DESIGNS.

3,708.—Foot Lathe.—J. W. Baldwin, Laconia, N. H.

3,709.—Elevated Oven Range.—A. F. Barry (assignor to himself and I. G. Lane), New York city.

3,710.—Bottle.—W. A. Candee and W. C. Richards, Bristol, Conn.

3,711.—Trade Mark.—B. C. Smith, Auburn, N. Y., assignor to Hayden and Leitchworth.

3,712.—Return Bend.—G. F. Stone, Baltimore, Md.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

During the past four years the revenue derived from the rentage of docks and slips in New York amouted to $1,399,749. Of this sum $410,261 were collected during the present year.

The first known account of the air-gun is in the *Elem ens d'Artillerie* of David Rivant, the preceptor of Louis XIII. The invention is there ascribed to Martin, of Lisieux, who presented one to Henry IV., of France.

It is calculated that for every million pounds of raw silk produced in France, 250 million pounds weight of leaves are consumed, and that five million trees of the average age of thirty years are stripped to furnish them.

A geological survey of Georgia is commenced. C. W. Howard has been employed by the Superintendent of the State Railroad to make a survey of the southern slope of Lookout Mountain in search of iron, coal, and petroleum oil.

The Minnesota lumbermen are making preparations for logging next winter. Many have already sent up teams and men to prepare the camps, cut out the roads, and make such other preparations as are necessary before the crews of men arrive in the fall.

Chicago has introduced mounted letter-carriers. The experiment is begun with ten men and ten horses. A new division of the city into districts has also been made. It is expected that by these arrangements the mail delivery will be better executed than heretofore.

Chief Justice Perley, of the Supreme Judicial Court of New Hampshire, has recently ruled that where property is transported over a railroad line composed of several distinct roads, the original company, which received it, is liable for the loss or injury, should any occur, whether the damage be on its own road or any other.

Application will be made to the Parliament of Canada, at its next session, to incorporate a company for the purpose of making a tunnel under the Detroit river, to connect the Great Western Railroad with the Michigan Central, and to secure to other roads terminating either in Hudson or Detroit, the use of the same on fair terms.

General Sylvanus Thayer, of South Braintree, Mass., has given $10,000 to Dartmouth College, making a total of $60,000 given by him for the purpose of founding, in connection with the college, the Thayer School of Civil Engineering. He has also given the college $1,000 as a foundation for two prizes, for proficiency in the higher mathematics.

In making a shaft for the new Thames Tunnel, a rotten leather bag was found containing about 300 silver twopenny, fourpenny, and sixpenny pieces of the reigns of Henry III., of England, and Alexander VII., of Scotland. Just above where these coins were found a broad and well-paved road was come upon which was evidently, centuries ago, one of the main routes from Thames street to Tower Keep.

The law passed at the last session of the Massachusetts Legislature, prohibiting the running of cars of any description on the railroads of that State without a brake, went into effect on October 1, and the penalty for its infraction is $100. On the Concord Railroad in Nashua the side tracks are full of freight cars, many of them laden, which the lower roads refuse to run, as they have no breaks attached.

M. Brugère introduces a new kind of gunpowder consisting of fifty-four parts of picrate of ammonia and forty-six parts of nitrate of potassa. He also gives a mixture of twenty-five grms. of picrate of ammonia, sixty seven grms. of nitrate of baryta, and eight grms. of sulphur as an excellent substitute for Bengal light, and as suitable for signal and port lights, and, since hardly any smoke is emitted and no unpleasant smell is given off, for use in theaters.

During the last five or six months the engineers employed by the Central Underground Railroad Company have been actively engaged in making their examinations and surveys; and toward the close of the present month, or early the ensuing one, they will be prepared to present their reports. No engineering difficulty has been encountered The work will be commenced as soon as the plans under consideration can be matured in detail, and the contracts for the various kinds of material required and work to be performed can be awarded to responsible parties on satisfactory terms.

NEW PUBLICATIONS.

Henry Ward Beecher's Sermons are published weekly, in pamphlet form, by J. B. Ford & Co., No. 39 Nassau street, New York city. Price 10 cents. They are worth having and worth reading.

City Subscribers.—The Scientific American will be delivered in every part of the city at $3·50 a year. Single copies for sale at all the News Stands in this city, Brooklyn, Jersey City and Williamsburg, and by most of the News Dealers in the United States.

Subscribers—who wish to have their volumes bound, can send them to this office. The charge for binding is $1.50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

Receipts—When money is paid at the office for subscriptions, a receipt for it will be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgment of their funds.

Advertisements.

The value of the Scientific American as an advertising medium cannot be over estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2·50 per line to advertise in one of thirty thousand.

RATES OF ADVERTISING.

Back Page....................$1·00 *a line.*
Inside Page....................75 *cents a line.*
Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

Advertisements.

Advertisements will be admitted on this page at the rate of $1.00 per line. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

Ball, Black & Co.,

565 and 567 BROADWAY

MANUFACTURERS OF

ENGLISH STERLING

Silver Ware.

THE FACILITIES OF BALL, BLACK & CO. FOR MANUFACTURING, ENABLE THEM TO OFFER A LARGER VARIETY OF PATTERNS, AND AT LOWER PRICES THAN ANY OTHER HOUSE IN THE TRADE.

16 os tf

FOR SALE—THE 1-4th INTEREST IN A One-Set Woolen Factory. Address J. BARNARD, Fairbury, Ill.

ALL KINDS Of Experimental Machinery, Models, Dyes, and Fine Tools, for any specialty. Patterns, etc., made to order at HENRY & CO.'S, 125 Eldridge st., New York.

W. W. VANDERBILT, Consulting Engineer & Contractor. Cor. Av. D & E.12th st., N.Y.

A VALUABLE PAT. RIGHT for sale or exchange for other property. For particulars inquire of J. I. BARINGER, Germantown, Col. Co., N. Y.

THE MAGIC DIAMOND Cuts Glass perfectly, and is durable. We will send one by mail, prepaid, to any address, on receipt of one dollar. Dealers furnished at lowest rates. MILLER'S FALLS M'F'G Co., 87 Beekman st., New York.

FOR SALE.

3 24-shuttle Looms; 2 20-shuttle do.; 1 30-shuttle Buttonhole Loom for weaving Suspender Straps, all of Knowles' pat., have been run less than two years. Also, 2 Wooden Looms, a Spooler and Quiller, with a lot of cotton, different colors, and numbers. Will be sold cheap. Apply to A. P. CRITCHLOW, Leeds, Mass.

GETTY'S PATENT PIPE CUTTER.

No. 1 cuts from 1 inch to ⅛........Price $8
No. 2 cuts from 2 inches to ⅛........Price $10
GETTY'S PATENT PROVING PUMP AND GAGE.
Pump and Gage........Price $25
Gage alone........Price $13

Address McNAB & HARLIN, MANUFACTURERS OF BRASS GOODS AND IRON FITTINGS, 86 John st., New York.

Morrison & Harms'

OSCILLATING, ROTARY-CUTTING MULEYS are pronounced, by Practical Saw-mill Men, everywhere, to be the Cheapest, Most Simple, and Durable, and the Best Upright Saw Mill ever offered to the public. They are guaranteed to do from 30 to 50 per cent more work with the same power than any other mill in use. Send for circular to MORRISON & HARMS, No. 386 River ave., Allegheny City, Pa. A few reliable Ag'ts wanted.

HINKLEY KNITTING MACHINE

FOR Family use—simple, cheap, reliable. Knits everything. AGENTS WANTED. Circular and sample stocking FREE. Address HINKLEY KNITTING MACHINE CO., Bath, Me.

176 BROADWAY, N. Y.; 25 N. 9TH st., PHILADELPHIA; 187 STATE st., CHICAGO, ILL.; 162 West South st., CINCINNATI, O.

William A. Harris, Manufacturer of CORLISS

Steam Engines,

Cor. Park and Promenade sts., West of Passenger Station, Providence, R. I. An 80-H. P. Engine on Exhibition at the American Institute Fair, till Oct. 30.

ALL SIZES OF HAND AND POWER

PUNCHING AND SHEARING MACHINERY.

The Cheapest, Best, and Most Durable

Tenoning Machines

To be found in the Market. Price, with Copes, $175, without Copes, $125.

DOTY MANUFACTURING CO., Janesville, Wis.

FRENCH-BAND SAW MACHINES, SAWS, Taper Files, etc., Machines for Scroll, Re-sawing, and Log; Mougin & Co.'s Band Saw Blades, all Sizes, on hand and made to order. All Styles of Band Saw Machines in operation at Mahogany Mill, 10th st., E. R. GEORGE GUEUTAL, Sole Agent for the U. S., 39 West 4th st., N. Y.

J. F. WERNER, Model Maker & Machinist, 62 Center st., New York. Working Models, Experimental Machinery, Gear Cutting, & Stud & Rivet Turning.

KIDDER'S PASTILES—A Sure Relief for Asthma. STOWELL & CO., Charlestown, Mass.

COTTON AND WOOL SHODDY PICKERS

Of the most approved English pattern, built by RICHARD KITSON........Lowell, Mass.

BOGARDUS' Eccentric Mills for Grinding Bones, Sugar, Clays, Salts, Guanos, Pot Shells, Ores, Feed, Drugs, Spices, Tobacco, Coffee, Paints, Printers' Inks, etc. JAS. BOGARDUS, cor. White & Elm sts., N.Y.

VARIETY IRON WORKS, York, Pa., Grist & Saw Mill Machinery a Specialty. Burnham's Improved Turbine Wheel. Iron Railing, Architectural, Bridge, and Car Castings. Sen for circular. E. G. SMYSER.

Excelsior Lubricator

For Cylinders of Engines. The most durable and best oil cup, manufactured by B. E. LEHMAN, Lehigh Valley Brass Works, Bethlehem, Pa. Send for desc've circular.

Gerner Boiler.

SAVES 40 PER CENT IN FUEL.

SIMPLE, SAFE, & DURABLE.

SEE SCIENTIFIC AMERICAN OCT. 2.

Please Send for Circulars.

Postoffice Box 5195. KASSON & CO., 119 Broadway, N. Y.

Oak Tanned Belting

Manufactured by C. W. Arny, 301 Cherry st., Philadelphia.

SCHLENKER'S PATENT
BOLT CUTTER
NEW INVENTION. ADDRESS, HOWARD IRON WORKS, BUFFALO, N.Y.

Reynolds'

Turbine Water Wheels.

No Complex, Duplex, or Triplex complications. All such are costly, perishable, easily clogged, inaccessible. Mill Gearing, Shafting, and Pulleys. Send for Illustrated Pamphlet.

GEORGE TALLCOT, 96 Liberty st., New York.

THE GENUINE

Coes Screw Wrenches,

WITH A. G. COES' PATENT LOCK FERRULE, Manufactured by A. G. COES & CO., Successors to L. & A. G. Coes, Worcester, Mass. ESTABLISHED IN 1839.

SEND FOR CIRCULARS
TRADE MARK
EARTH-CLOSET CO. HARTFORD, CONN.
EARTH-CLOSETS
SALESROOMS: NEW-YORK, 597 BROADWAY. PHILADELPHIA, 613 MARKET ST. BOSTON, 19 DOANE ST.

ROOT'S WROUGHT IRON SECTIONAL Safety Boiler.

THE Position of this Boiler as absolutely safe from disastrous explosion, economical in fuel, and as a thoroughly reliable, durable, practical, and efficient Steam Generator, is fully established, as evinced by the sale of about One Hundred and Fifty Boilers, the sale, to many purchasers, of a second one after trial of the first, and by the experience of those who have used it. Its safety is self-evident, it not being built of any dangerous materials, as large wrought iron plates, containing unseen defects, nor cast iron, which cracks and gives way instantly, but being composed of the best Wrought Iron Boiler Tubes, tested to 500 lbs. pressure, water and steam inside of them, and having no large sheet iron shell to explode. Its economy of fuel, and many other advantages, resulting from its sectional form, as lightness, low freight, facility of enlargement, etc., are equally evident upon examination. Its use secures the economy of high pressure without danger. In view of the thousands of victims maimed or murdered by all the common forms of boilers, no humane man can afford to incur the risk of using a boiler in which such fearful results are POSSIBLE. They ARE POSSIBLE, and somewhat PROBABLE in all SHELL BOILERS, the danger being inherent in the large diameter, and ready to develop itself, at any moment, in an explosion. Root's Safety Boiler offers absolute immunity from such results. Send for Illustrated Pamphlet. Address ROOT STEAM ENGINE CO., Second ave., cor. 28th st., New York.

A Boiler of 120-H. P. at American Institute Fair until Oct. 30, 1869.

UNIVERSAL CLOTHES WRINGER

THE only Wringer which has the Pat. Stop, to prevent the cogs from entirely separating. The only Wringer with Rowell's improved double gear with alternate teeth in the same cog, which cannot be thrown out of gear.

"It really merits all the good that can be said of it."—Moore's Rural New Yorker.
"The Universal 'the best'."—Am. Agriculturist.
"Having used the Universal Wringer in our own household, we can FULLY INDORSE IT."—Ed. Sci. American.

Sold by dealers generally. No exclusive rights given. R. C. BROWNING, General Agent, 32 Cortlandt st., New York.

SENT FREE!

M. O'KEEFE, SON & CO.'S

SEED CATALOGUE AND GUIDE TO THE FLOWER AND VEGETABLE GARDEN, FOR 1870.

Published in January. Every lover of flowers wishing this new and valuable work, free of charge, should address immediately M. O'KEEFE, SON & CO., Ellwanger & Barry's Block, Rochester, N. Y.

THE

Architectural Review, AND American Builder's Journal.

By SAMUEL SLOAN, Architect.

Volume 1, bound in extra Cloth, now ready. Price $7 50

☞ This Review is Royal Octavo, and published Monthly. Each part containing sixty-four pages of letter press, together with eight full-size page illustrations—the latter mainly in wood, but occasionally in lithography or chromo-lithography. The terms are FIFTY CENTS PER MONTHLY PART, or SIX DOLLARS PER ANNUM, payable invariably in advance. Specimen numbers furnished on receipt of the subscription price. All orders should be addressed to the Publishers,

Claxton, Remsen & Haffelfinger, 819 and 821 Market st., Philadelphia, Pa.

WE PUT GENUINE

HOWARD WATCHES

AND SELL NO OTHER—Into the hands of all respectable dealers throughout the country of our own manufacture. All Genuine Howard Watches are marked "E. Howard & Co., Boston," both on the plate and dial, and none without such marks are genuine, whoever may sell them. If you cannot find the real Howard Watches at the dealers, send to E. Howard & Co., 114 Tremont st., Boston, Mass., and you will be at once attended to. We have no connection with Howard & Co., 619 Broadway, New York, as is frequently supposed. E. HOWARD & CO., 114 Tremont st., Boston, Mass.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of Superior Quality, on hand and finishing. For sale Low. For Description and Price, address NEW HAVEN MANUFACTURING CO., New Haven, Conn. 5 tf os

FREE.—Our New Catalogue of Improved STENCIL DIES. More than $200 A MONTH is being made with them. S. M. SPENCER & CO., Brattleboro Vt.

THE

Tanite Emery Wheel.

Does not Glaze, Gum, Heat, or Smell. Address THE TANITE CO., Stroudsburg, Monroe Co., Pa.

"MOUNT SAVAGE"

FIRE BRICK,

U. S. GOVERNMENT STANDARD, Manufactured exclusively by the CONSOLIDATION COAL CO., of Maryland, for Blasting, Puddling, Smelting, and Glass Furnaces, and all other purposes requiring the BEST QUALITY. Diagrams of Shapes, and Prices will be furnished by the undersigned. Also,

George's Creek Cumberland Coal

By the Cargo, from the Company's famous OCEAN MINES. C. H. DALTON, President, 4 Pemberton square, Boston. JAS. S. MACKIE, Vice Pres't, 71 Broadway, New York. JAS. A. MILLHOLLAND, 2d Vice Pres't, Mount Savage, Md.

THE NOVELTY IRON WORKS—Foot E. 12th st., and 77 and 83 Liberty st., New York Manufacture the most approved Stationary Steam Engine, with Variable Cut-off, now in use.

WOODWARD'S NATIONAL ARCHITECT.

A practical work just published, containing 1000 Designs, Plans, and Details to Working Scale of Country, Suburban, and Village Houses, with Specifications and estimate of cost. Quarto. PRICE **Twelve Dollars**, postpaid.

WOODWARD'S COUNTRY HOMES. 150 Designs, $1 50, postpaid. GEO. E. WOODWARD, Architect 191 Broadway, New York. Send stamp for catalogue of all new books on Architecture.

Gunpowder Pile Driver

THOMAS SHAW'S PATENT.

The Company are prepared to sell rights, furnish machines, or contract for Driving Piles quicker and better than by any other machine. FIFTY BLOWS PER MINUTE, AND NO CRUSHING OR SHATTERING. See Scientific American of Aug. 14. GUNPOWDER PILE DRIVER CO., 505 Minor st., Philadelphia.

London........48 Cannon street.

H. KOHNSTAMM, Manufacturer of

ULTRAMARINE,

And Importer of English, French, and German Colors, Paints, and Artists' Materials, Bronzes, and Metals. No. 3 Tryon Row, New York, opposite City Hall.

Root's Wrought Iron Sectional Safety Boiler.

OVER 100 SOLD—TESTED TO 300 lbs., no large sheet-iron shell to explode. Economical and Durable. All sizes on hand. Also, Steam Engines, Steam Pumps, etc. Send for Pamphlets and Price Lists. JOHN B. ROOT, 95 and 97 Liberty st., New York.

SILICATE OF SODA, IN ITS VARIOUS forms, manufactured as a specialty, by Philadelphia Quartz Co., 783 South 2d st., Philadelphia, Pa. 25 13

WIRE ROPE.

Manufactured by JOHN A. ROEBLING'S SONS, Trenton N. J.

FOR Inclined Planes, Standing Ship Rigging Bridges, Ferries, Stays or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes.

THE WOODWARD STEAM-PUMP MANUFACTURING COMPANY, Manufacturers of the Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Also, Dealers in Wrought-iron Pipe, Boiler Tubes, etc. Hotels, Churches, Factories, & Public Buildings, Heated by Steam, Low Pressure. Woodward Building, 76 and 78 Center st., cor. of Worth st. (formerly of 77 Beekman st.), N.Y. All parties are hereby cautioned against infringing the Pat. Right of the above Pump. G. M. WOODWARD, Pres't.

Bridesburg Manf'g Co.,

OFFICE No. 65 NORTH FRONT STREET, PHILADELPHIA, PA.

Manufacture all kinds of Cotton and Woolen Machinery including their new SELF-ACTING MULES AND LOOMS, Of the most approved style. Plans drawn and estimates furnished for factories of any size. Shafting and mill gearing made to order.

H. B. Smith's

PAT. WOOD-WORKING MACHINERY, Molding, Mortising, Tenoning, Resawing, and Planing Machines, warranted to be the best in use, and give satisfaction, or be returned within thirty days. Address H. B. SMITH, Smithville, Bur. Co. N. J.

HAVE YOU A TUBULAR BOILER?—I am now prepared to repair leaky Boiler Tubes, in whatever condition they may be in, and to warrant all repairs satisfactory or demand no pay. Men and tools ready at all times. Do not plug or remove the tubes. Send for circular. JOHN F. RIDER, 47 Dey st., New York.

Pevey's Cupola,

WARRANTED to Melt, with one ton of Coal, 2000 lbs. of Iron MORE than any other Cupola now in use. ABIEL PEVEY, Patentee and Proprietor, Lowell, Mass. Van Tuyl & Co., No. 273 Cherry st., New York, Agents.

Philadelphia Advertisements.

☞ T. V. Carpenter, Advertising Agent. Address hereafter, Box 773, New York city.

The Harrison Boiler.

THIS IS THE ONLY REALLY SAFE BOILER in the market, and can now be furnished at a *GREATLY REDUCED COST*. Boilers of any size ready for delivery. For circulars, plans, etc., apply to

HARRISON BOILER WORKS,

Philadelphia, Pa.; or, to JOHN A. COLEMAN, Agent, 36 Kilby st., Boston, Mass. 19 tf os

Drawing Instruments

OF Every Description, for Schools, Colleges, Civil Engineers, etc., of Brass, German Silver, and Swiss, Drawing Materials, Chesterman's Steel and Metallic Tapes, Transits, Levels, etc., etc. A priced and Illustrated Catalogue sent free on application. WM. Y. McALLISTER, 728 Chestnut st., Philadelphia.

SAWS. EVERY DESCRIPTION Guaranteed under a forfeiture of $1000, to cut the most lumber with the least expense

Henry Disston & Son,

PHILADELPHIA. Special attention paid to our new style Circular, Belt, Cross-cut, Mill, and Hack Saws. Orders received from England, Ireland, and the Continent.

Drawing Materials.

WHATMAN'S PAPERS.—White and Yellow Roll Drawing Paper, 40 and 54 inches wide. Tracing Muslin, Tracing Paper. Muslin-backed Drawing Paper, 40 and 54 inches wide. Winsor & Newton's Colors India Ink. Faber's Drawing Pencils, etc., etc. Priced Catalogues sent free. JAS. W. QUEEN & CO., 924 Chestnut st. Philadelphia.

INCREASE TWIST DRILLS, FLUTED HAND REAMERS, exact to Whitworth's Gage, and Beach's Patent Self-centering Chuck, manufactured by Morse Twist Drill and Machine Co., New Bedford, Mass.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co., Leeds, Mass.

Factory, Trenton, N. J.. ..Office, No. 2 Jacob st., N. Y. ☞ Branch Office for Pacific Coast, No. 606 Front st San Francisco, Cal.

LECOUNT'S PATENT HOLLOW LATHE DOGS AND CLAMPS.—A set of 8 Dogs from ⅜ to 2-in., inclusive, $8. A set of 12 from ⅜ to 4-in., $17·30. Five sizes Machinists' Clamps, from 2 to 6-in., inclusive, $11. Send for Circular. C. W. LeCOUNT. South Norwalk, Conn. 16 tf eow

MECHANICS

WILL FIND THE

Scientific American

The Best Paper for Them Now Published.

It is the most Popular Journal in the world, devoted to Invention, Mechanics, Manufactures, Art, Science, and General Industry.

THE SCIENTIFIC AMERICAN

Has been Published for nearly a quarter of a Century and has a larger circulation than all other paper of its class in this country and in Europe. Every number of illuminated with

Superb Illustrations

by our own artists, of all the best Inventions of the day and descriptions and illustrations of

LEADING MANUFACTURING ESTABLISHMENTS, MACHINES, TOOLS AND PROCESSES.

Inventors and Patentees

will find in each number an official List of Patents, together with descriptions of the more important Inventions, with decisions in Patent Cases and points of law affecting the rights and interests of Patentees.

TERMS OF SUBSCRIPTION:—$3.00 a year, $1.50 for six months. $1 for four months.

To clubs of ten and upward, the subscription is only $2.50 per annum each.

Specimen copies will be sent gratis.

MUNN & CO., Publishers. 37 Park Row, New York.

PATENTS—*INVENTORS*

Who desire to secure their rights by

LETTERS PATENT

Are referred to an advertisement on another page. **An Illustrated Pamphlet** containing the Patent Laws, and full particulars concerning the obtaining of Patents, will be mailed free on application. Also, a Pamphlet relative to

Foreign Patents and their cost furnished free.

Address **MUNN & CO. Patent Solicitors,** 37 Park Row, New York.

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXI.---No. 19. [NEW SERIES.] — NEW YORK, NOVEMBER 6, 1869. — $3 per Annum. [IN ADVANCE.]

Improved Time Register for Velocipedes, Etc.

A want has been felt in velocipede schools, livery stables, billiard rooms, pleasure grounds, etc., where articles are rented out by the hour or for any short periods of time, for some instrument that would register accurately these times and save the trouble of recording the same on a registering book; and also obviate any disagreement which might arise from real or supposed errors in the estimation of time.

The invention herewith illustrated is an instrument which supplies this want, and its construction and operation may be described as follows:—Fig. 1 being a front view with a portion of the dial plate broken away to show better important parts lying underneath it; and Fig. 2 being an enlarged detail showing one of these parts still more fully.

The device is connected with the works of an ordinary clock. Around the ordinary dial are placed smaller dials, as shown in Fig. 1, as many being used as required, divided into hour and minute spaces, and each provided with a single hand. These hands are attached to the journals of the small wheels, A, Figs. 1 and 2, and receive motion from them. These wheels revolve in brackets set radially to the center of the main dial, and attached to the frame of the clockwork. The form of these brackets is well shown at B in Fig. 2. The wheels, A, are provided with a stop which prevents them from making more than one revolution, and stops them with their hands upon the zero mark when revolved back. These wheels are also provided with small coiled springs, C, which revolve them back to the zero mark as soon as they are thrown out of gear with the clockwork.

Small pinions, D, are attached to the inner ends of levers, one of which is partially shown in perspective at E, Fig. 2, the form of the remainder, lying underneath the dial plate, being indicated by a dotted outline, with one of the pinions, D, in gear with a central driving wheel, F, Figs. 1 and 2, and also with the wheel, A.

The levers, E, are pivoted to the journals of the wheels, A, or in a line with these journals, so that in whatever direction the levers are moved the wheels, D and A, will always mesh into each other.

The large gear wheel, F, is attached to the hollow spindle which carries the hour hand of the clock. Each of the levers is acted upon by a spring, G, shown in dotted outline in Fig. 2, so that when these levers are left free the action of the springs will run the pinions, D, into gear with F, and the wheels, A, at once commence to revolve and record the time on their respective dials.

The levers, E, are thrust to one side, throwing the pinions, D, out of gear with F by keys of the proper form, H, thrust into keyholes arranged at suitable intervals around the outer portion of the clock case, when the action of the small coiled springs, C, carries the wheels, A, immediately back to the zero point. Each key is numbered to correspond with the number of the dial to which it belongs, to avoid dispute.

In using this register when a velocipede or other article is rented, the key of one of the dials is withdrawn, and presented to the person renting the article. When he returns the key it is put back in its place and the hand on its dial returns to zero, the time registered thereon being first noted by both parties.

Each dial with its gearing is independent of all the others, and as many may be used as can be arranged around the central driving wheel.

Thus a simple and accurate register is obtained. The same principle is capable of extension to hotel registers for rooms, to timing laborers on docks, and to numerous other purposes which will suggest themselves to the reader.

Application for patent pending through the Scientific American Patent Agency by A. Courvoisier whom address for further information, at Denver, Colorado.

Fig. 1

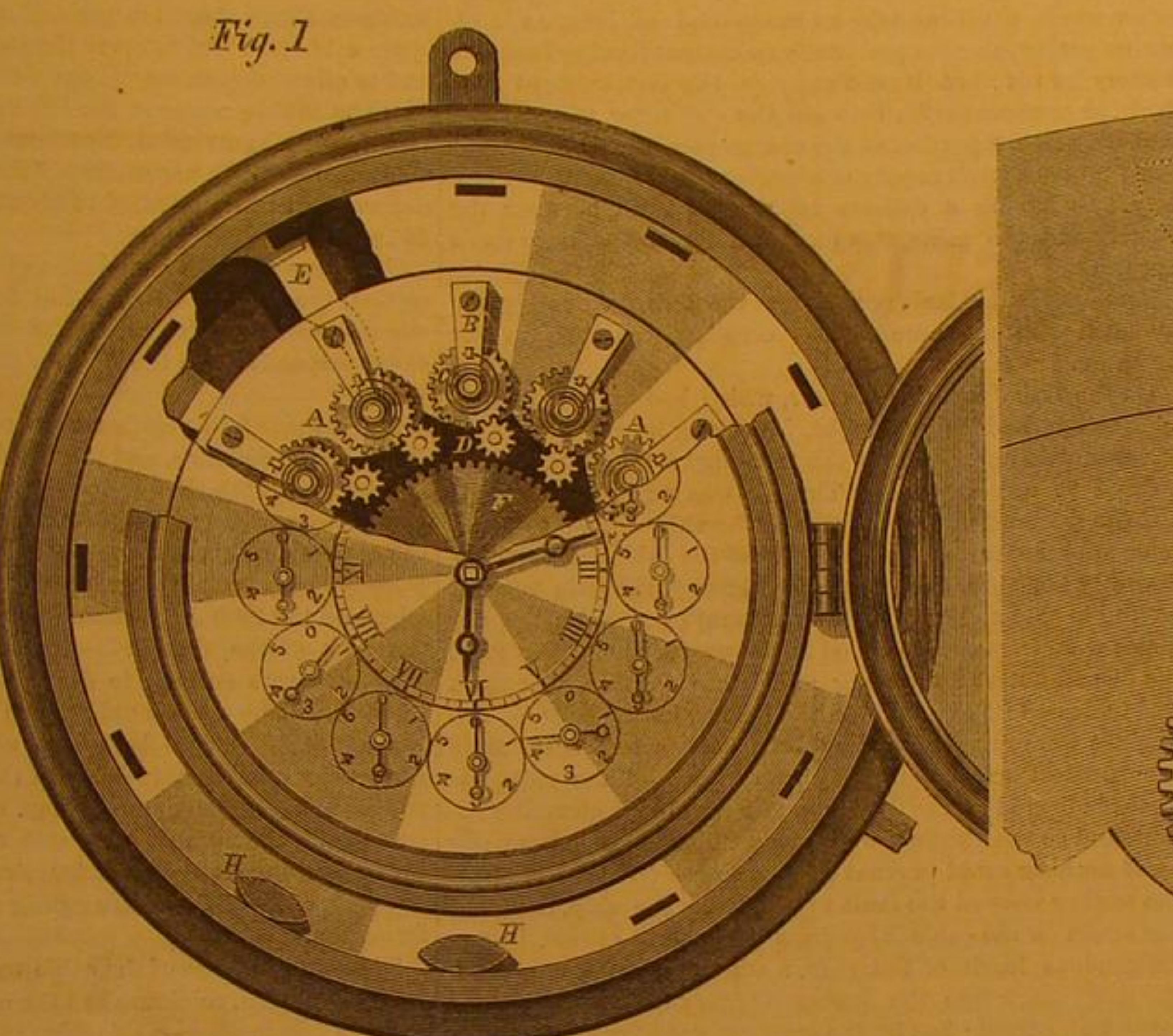
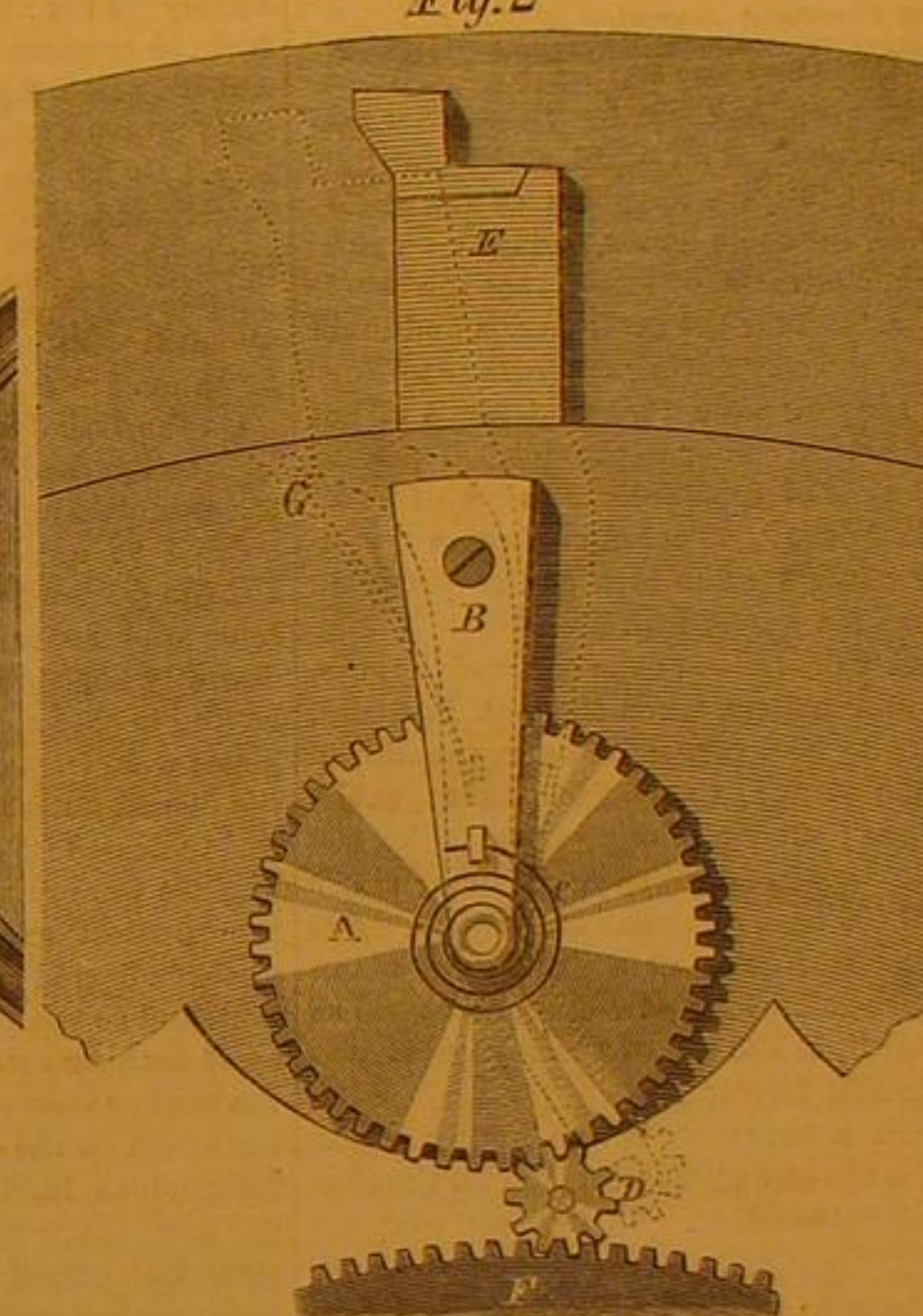


Fig. 2



COURVOISIER'S TIME REGISTER.

Improvement in Mill Bushes.

The object of the invention which we herewith illustrate, is to enable the spindles of millstones to be adjusted with perfect accuracy, and at the same time to furnish bearings of anti-friction material, which may be kept constantly and perfectly lubricated, and from which all extraneous dust or grit calculated to aggravate friction may be kept excluded.

Fig. 1 is a perspective view of this improvement, and Fig. 2 is a sectional view of the same, showing details of construction. A, Fig. 2, is the spindle, playing in segmental bearings, B. There are four of these which, together, make up the entire bearing for the spindle. They are hollow, as shown in the engraving, and faced with anti-attrition surfaces.

The outer sides of these segments are inclined, these surfaces resting against the inclined inner surfaces of the hollow binding wedges, C. Through the lower part of these wedges pass hooked bolts, D, with thumb-nuts at their lower ends, by turning which, the wedges are forced upward, and the segments, B, being prevented from rising by the top plate, E, are forced inward till their surfaces are brought in proper proximity to the spindle.

It is evident that by raising and lowering these wedges as circumstances require the spindle can be adjusted with the greatest accuracy.

Lubrication is secured by placing a store of oil in the chambers, F, of the segmental bearings, B, from which it is fed, as wanted, through the apertures, G, to the bearing surfaces of the spindle and bush.

Lastly, the exclusion of dust and grit is secured by forming a chamber, H, upon the top plate of the bush, with an annular cap which shuts down over it and incloses the spindle, in which chamber is placed packing yarn or other suitable material to intercept all extraneous materials of this character.

The top plate is bolted down to the external portion of the bush, and the whole inclosed as shown in Fig. 1.

All experienced millers are aware that the attainment of the above objects by a simple device is a very desirable achievement. By the use of this improvement the adjustment can be readily and accurately made, and the wear of the spindle would seem to be reduced to a minimum.

This improvement was patented through the Scientific American Patent Agency, Dec. 31, 1867, by C. Custer. For further information address C. K. Bullock, 1,128 Market street, Philadelphia, Pa.

Fig. 1

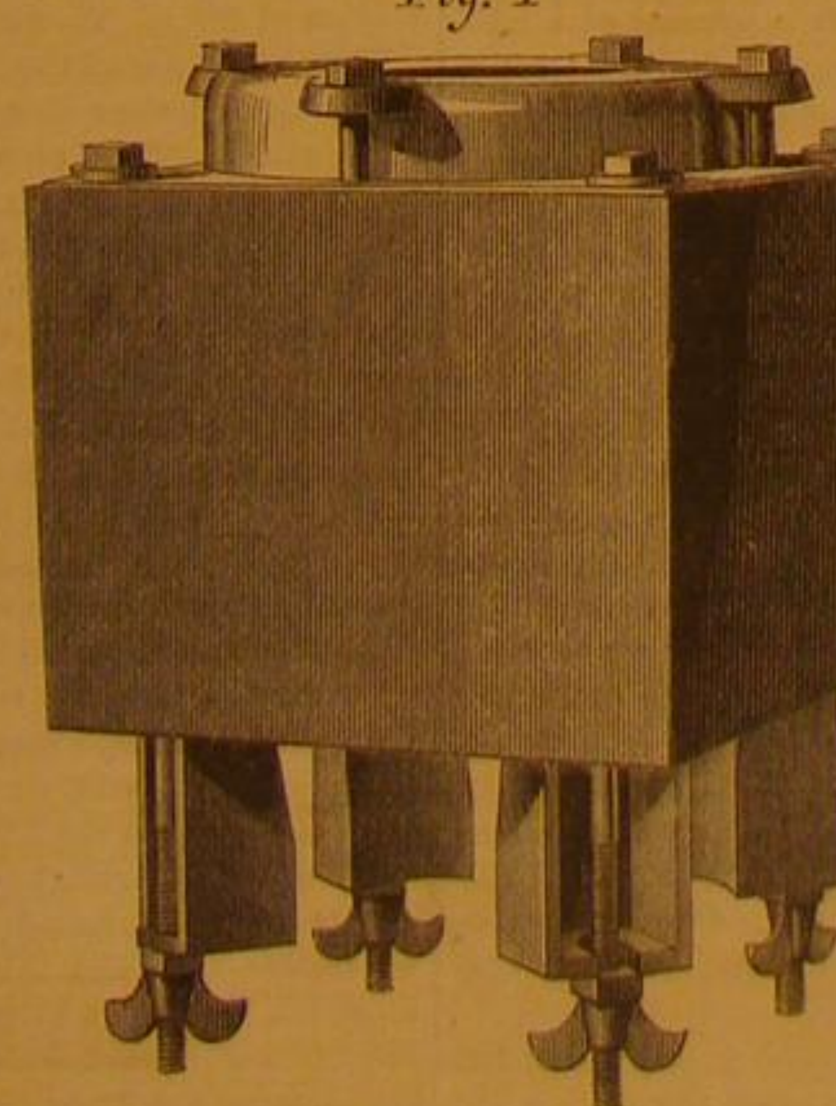
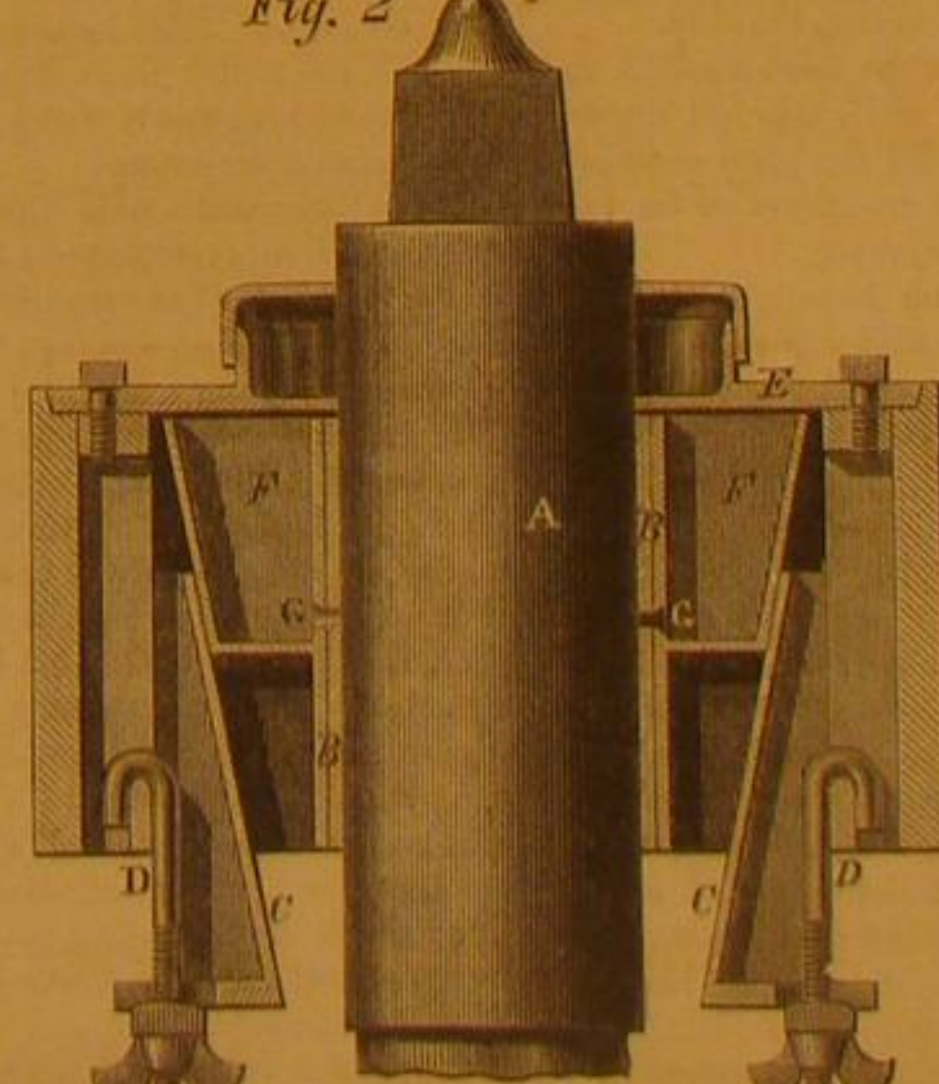


Fig. 2



CUSTER'S IMPROVED MILL BUSHES.

Steel Springs.

RULE 1ST. To find elasticity of a given steel-plate spring: Breadth of plate in inches multiplied by cube of the thickness in 1-16 inch, and by number of plates; divide cube of span in inches by product so found, and multiply by 1·66. Result, equal elasticity in 1-16th of an inch per tun of load.

RULE 2D. To find span due to a given elasticity, and number and size of plate: Multiply elasticity in sixteenths per tun, by breadth of plate in inches, and divide by cube of the thickness in inches, and by the number of plates; divide by 1·66, and find cube root of the quotient. Result, equal span in inches.

RULE 3D. To find number of plates due to a given elasticity, span, and size of plates: Multiply the cube of the span in inches by 1·66; multiply the elasticity in sixteenths by the breadth of the plate in inches, and by the cube of the thickness in sixteenths; divide the former product by the latter. The quotient is the number of plates.

RULE 4TH. To find working strength of a given steel plate spring: Multiply the breadth of plate in inches by the square of the thickness in sixteenths, and by the number of plates; mu tiply also the working span in inches by 11·3; divide the former product by the latter. Result, equal working strength in tuns burden.

Rule 5th. To find span due to a given strength and number, and size of plate: Multiply the breadth of plate in inches by the square of the thickness in sixteenths, and by the number of plates; multiply, also, the strength in tuns by 11·3, divide the former product by the latter. Result, equal working span in inches.

Rule 6th. To find the number of plates due to a given strength, span, and size of plate: Multiply the strength in tuns by span in inches, and divide by 11·3; multiply also the breadth of plate in inches by the square of the thickness in sixteenths; divide the former product by the latter. Result, equal number of plates.

The span is that due to the form of the spring loaded. Extra thick plates must be replaced by an equivalent number of plates of the ruling thickness, before applying the rule. To find this, multiply the number of extra plates by the square of their thickness, and divide by the square of the ruling thickness; conversely, the number of plates of the ruling thickness to be removed for a given number of extra plates, may be found in the same way.

THE FRENCH ATLANTIC TELEGRAPH.

From Chambers' Journal.

(Concluded from page 273.)

When the *Great Eastern* left Portland for Brest, after taking in her supply of coal, she had on board about four hundred and fifty persons, including the members of the electrical and engineering staffs, the cable hands, and the crew; and one would think, looking at the list of stores that the whole of London had been ransacked for the sustentation and inner edification of this miniature army during the voyage to Newfoundland and back. Leaving out a thousand items of but little consequence, we need only refer to the 100,000 pounds of meat and poultry, 30 tuns of vegetables, 35 tuns of bread and flour, 15,000 eggs, and over 2,000 dozen of liquors of various kinds, to give our readers some idea of the provision necessary to be made for a six weeks' trip.

We have made a rough calculation of the cargo of the ship, including her engines and boilers, when she left Portland, and believe the following to be a very near approximation—it is certainly not *over* the mark: Cable, 5,520 tuns; cable-tanks and water, 400 tuns; timber shorings for tanks, 500 tuns; paying-out and picking-up machinery, 120 tuns; ship's stores, 250 tuns; coals, 6,400 tuns; engines and boilers, 3,500 tuns; total, 16,690 tuns. Her draft at starting was about 34 feet aft, and 28 feet forward. This, of course, decreased as the cable was paid out, until, at the end of the voyage, it was only about 25 feet aft, and 23 forward.

Before proceeding with a narrative of the laying of the cable, we wish to describe the arrangements made for the electrical testing of it during submersion. These were, with one or two slight exceptions, identically the same as in 1866. Their most interesting feature is the keeping up of a constant test on ship and shore for insulation, by a plan devised by Mr Willoughby Smith in 1865, at the same time allowing of tests for the continuity of the conductor, and free communication between ship and shore to be kept up without in any way interfering with the insulation test. By this means, should a "fault" pass overboard into the sea, it is detected at once, and the paying-out may be stopped before any considerable length of the cable has been allowed to run out. The advantage of this system over the old is apparent from the fact, that formerly it was possible for three or four miles of cable to run out between the occurrence of the fault and its detection; whereas now, except under very peculiar circumstances, within two or three minutes after a "fault" passes overboard, it can be detected, and the signal given to stop the ship.

In conclusion, nothing that could in the least possible way facilitate the execution of the great work was left undone. All the arrangements were of the most complete character, and were placed in charge of men who are unrivaled for their practical knowledge of submarine telegraphy.

The expedition started from Brest on Monday, the 21st of June, and the American end of the cable was safely landed at Duxbury, near Boston, on Friday, the 23d July. The five weeks which elapsed between those two dates were enlivened with incidents of the most interesting nature, and it is to these we shall now refer.

For the first three days all went well. The weather was very fine; the paying out of the cable proceeded without a hitch, and all were beginning to indulge hopes that, as in 1866, the voyage would be made without the occurrence of those unfortunate "faults" which cause such delay and trouble. But our hopes were soon upset, for on the fourth day, the 24th June, shortly after daybreak, we were struck with consternation by the intelligence that there existed an electrical fault in the cable. The intelligence was conveyed all over the ship by means of a powerful gong, which was planted outside the electrical room, ready to be hammered upon as soon as anything of a suspicious nature was indicated on the testing instruments. In obedience to the gong, the ship was speedily stopped, and the engines reversed. The tests showed the fault to exist very near the ship; so, without any more ado, the picking-up engines were set to work, and hauling back commenced. At every three hundred or four hundred yards of cable hauled back, a fresh test was made, until, in about a couple of hours, it was found that the faulty place had come on board. Other two hours were sufficient to make a fresh splice between the cable paid out and that remaining on the ship, and then operations were resumed as if nothing had happened. Fortunately, the weather was very fine and the sea calm, and the hauling back was in consequence attended with but little danger. The occurrence of the fault was perhaps advantageous, inasmuch as it served more fully to impress the staff with the importance of having everything in c mplete readiness for an accident.

The fault was afterwards found to consist of a minute hole penetrating the coatings of gutta-percha; whether caused accidentally or purposely it is impossible to say. It may be asked why it could not have been discovered before it left the tank. The answer probably is, that it was of too minute a nature to indicate its existence on the testing instruments, until, by passing through the paying-out machines, and then undergoing the pressure of the sea, it became more fully developed.

To give our readers some idea as to how a fault is detected, we may (for this purpose only) compare the cable to a long pipe, sealed up at one end into which water is being forced. As long as the pipe remains perfect, only a certain amount of water can be put into it, according to its capacity, and once filled, there is no flow of water; but if, when the pipe is full a small hole be made in it, the water will of course rush out at once, indicating the existence of the hole by causing a fresh flow of water into the pipe. Now, the cable is always kept charged with electricity up to its full capacity—or, in other words, till it can take no more—and as long as it remains perfect, there is practically no current flowing from the battery into it; but immediately on the development of a fault, or communication between the conductor of the cable and the earth, a portion of the charge escaping through the fault causes a fresh supply of electricity to flow from the battery. By having a delicate instrument fixed between the battery and the cable, this increased flow is at once made apparent.

Another similar fault occurred on the 26th, fortunately unattended with any more serious consequences than in the first case.

On the 29th June, the weather, which had up to that time been so fine, suddenly changed. A strong breeze sprung up towards evening, which, by the morning of the 30th, had increased to a heavy gale. The sea was very rough indeed; and the frequent violent lurches of the ship began to cause some apprehensions as to the safety of the cable. Everybody devoutly hoped that we might get through the gale without having to stop and haul back on account of a fault; but our hopes were frustrated, for just in the very hight of the gale, the dismal notes of the gong announced that another fault had indicated its existence on the testing instruments. The engines were reversed, and hauling back commenced, amid the greatest excitement. At every lurch of the ship, the strain indicated on the dynamometer rose to an alarming extent, and as the hauling in proceeded, it seemed continually as if nothing could prevent the breakage of the cable. Still the testing showed the fault to be outside the ship, and still the strain on the cable kept increasing, until at last, in one tremendous lurch of the ship, a whiz was heard, sending a thrill of horror into the bosom of every one on deck. The cable had parted; but by the greatest good fortune the rupture occurred inside the ship, and by a most admirable promptness, the breaks were successfully put on before the broken end could run out over the stern.

The gale was still far too heavy to risk hauling in any longer, so, with not a moment's delay, the end of the cable was secured to a huge buoy, and sent adrift, to be picked up again as soon as the weather became more moderate. The remainder of that day and the whole of the next were spent in steaming about in the vicinity of the buoy, keeping as near to it as possible—the great ship continually rolling in a most ungainly fashion.

On Friday, the 2d of July, the weather was sufficiently fine to enable us to pick up the buoy to which the cable was attached, and a very few hours sufficed to get the end of the cable on board. After hauling in about a quarter of a mile of cable, the faulty place, which had been the original cause of the stoppage, was brought on board, and very speedily the ship resumed her course.

These three faults well illustrated the advantages of the system of testing employed; for in each case, the existence of the fault must have manifested itself within three minutes after it left the ship—in fact, as soon as the pressure of the sea could force the water into the flaw. After stopping the engines, of course the "way" of the ship would carry her seven or eight hundred yards before the paying out could come to a dead stop, and this, added to perhaps a quarter of a mile run out previous to the detection of the fault, would account for the three fourths of a mile, more or less, which in each case had to be hauled in before the fault was secured. Practically, however, we may say that each of the faults was discovered immediately on its leaving the ship—and this is the great advantage of Smith's system. Neither of the faults was bad enough to prevent the most perfect communication taking place between ship and shore while the tests for localizing the fault were being made, so that the ship could give any instructions whatsoever to the shore which were considered necessary.

On the 5th July, we experienced another heavy gale; but as the testing of the cable remained perfect, the paying out was not interrupted at all. In fact, after the 2d July, nothing occurred to interfere with the progress of the work. The St. Pierre shore end had been laid in readiness for our arrival by the *William Cory*, and the work of the *Great Eastern* was completed on the 13th July.

The rate of paying out the cable was from five and a half to six knots per hour, the ship running five to five and a half knots. Very likely this speed might have been increased without incurring danger; but, considering the immense size and weight of the ship, and the difficulty of stopping her in case of accident, it was no doubt best to keep the speed within narrow limits.

As to the track of the cable, it seems from the soundings taken that the bottom is composed, the greater part of the distance, of the fine mud usually called "ooze" consisting of very minute shells—so minute that without a microscope the shape is not discernible. This "ooze" constitutes the very best bed for a submarine cable. In fact, judging from the experience of 1866, the cable lies in it as securely and as free from harm as when coiled in the tanks at the manufacfactory; and if picking up should become necessary, the softness of the "ooze" renders the grappling of the cable comparatively easy.

The position of the present cable has one advantage over that of the English cables—namely, that it has been kept carefully off the Newfoundland Banks, and will therefore not be liable to the breakage by icebergs which have already caused such expense and trouble to the English company. The cable is conducted several miles to the south of the "Great Newfoundland Bank," and then proceeds in a northwesterly direction to the western side of St. Pierre Island, passing along a deep gully between the "Green Bank" and the "St. Pierre Bank." The length of the course selected is about 2,330 knots, and the amount of cable paid out 2,580 knots—making about ten per cent allowance for "slack," or spare cable paid out to cover the inequalities of the bottom, and to allow of picking up, should such become necessary Without taking notice of the 300 knots from the Brest shore, and the 500 knots from Newfoundland, where the water is shallow, the depth varies from 1,700 to 2,700 fathoms, the deepest part being situated in about 45° north, and longitude 43° west.

Two days after the completion of the Brest and St. Pierre section, the laying of the section from St. Pierre to Boston was commenced. The cable was divided into three pieces, coiled respectively in the *William Cory*, the *Scanderia*, and the *Chiltern*.

The course of this cable runs through shallow water nearly the whole distance, and therefore the paying out of it was not attended with that excitement which existed during the voyage from Brest to Newfoundland. It was felt that if even the cable should break, and be for a time lost, it would be a perfectly easy matter to grapple for it and pick it up; so that when, on the 20th July—through a "foul-flake" or tangle in the tank of the *Scanderia*—the cable did actually snap, a very few hours sufficed to drop the grappling-iron, haul up the cable, make a fresh splice, and resume operations in the usual way. The foul-flake was about the only thing that caused any considerable delay in the paying out of the cable, which was completed on Friday, the 23d July, in the presence of a large number of spectators, including about a hundred representatives of the American press, who came down *en masse*, each of them struggling to obtain the earliest information.

The landing place of the cable was at Duxbury, a few miles from Plymouth, celebrated as the spot whereon the Pilgrim Fathers first landed—a coincidence which the Americans did not fail to make the most of in the speechifying which followed the completion of the work.

The length of this shorter section of the cable was 750 knots; adding which to the 2,580 knots from Brest to St Pierre, we have continuous submarine communication for 3,330 knots. The signals through the whole of this immense length are as distinct and readable as between any two points on an English land line, and can be sent at a much greater speed than the business of the line is likely to require. The signals at present consist of the oscillations of a spot of light on a screen, reflected from the mirror of a "Thomson's Reflecting Galvanometer," as in the English cables; but we believe this is likely to be superseded by a very delicate printing instrument, also, if we are rightly informed, the invention of Sir W. Thomson.

Thus is completed the first direct line of submarine communication between Europe and the United States. No doubt there will be found plenty of room for it, without injuring, in any material degree, the interests of the English companies. We notice that the latter have already reduced their tariff, in order to keep up with the French company. This, of course, will be a great boon to a large section of the commercial fraternity, to whom the high tariff hitherto existing has been an insuperable barrier to frequent communication with America.

But, setting aside the interests of private companies, which are of comparatively little consequence, we believe that the present cable will serve still more strongly to unite in sympathy the Old World to the New, and to make it more apparent that the interests of the two worlds are bound up together. We would fain hope that by the increase of traffic, induced by a decreased tariff, there will be found room for still another cable across the Atlantic.

We confess to a slight feeling of pride that this great work has been accomplished by Englishmen; but waiving this, we rejoice that the three greatest nations of the world—England, France, and the United States—have joined in the execution of a work which cannot fail to help forward in a high degree the progress of civilization.

The material growth of the South during the last four years is strikingly shown by the editorials in some of the Southern papers. The official figures at the Department estimate that the cotton crop of the Southern States this year will be worth $240,000,000; while the total value of the exports of the South is set down at $328,500,000. At this rate, the value of Southern products is about $31·32 per head for the entire Southern population.

CHARLES READE ON "LIFE LABOR AND CAPITAL."

Charles Reade runs to constructive mechanics. The heroes of his tales are apt to be great fellows for making anything, from kites up to statuary. They are, moreover, brave generous, and noble heroes as well as inventive geniuses. Captain Dodd, in "Very Hard Cash," Hazel, in "Foul Play," and lastly, Henry Little, in "Put Yourself in His Place," are all represented as being great mechanical geniuses.

The latter powerful story, now appearing in serial form in the *Galaxy*, has evidently for its object the elucidation of that most absorbing topic of the time the labor question. It is written in no spirit of prejudice for or against either labor or capital, and while it has not as yet given any solution of the problem how to adjust the interests of these two elements of industry, it has shown in vivid colors many of the shortcomings of each.

Among these shortcomings is a general carelessness and recklessness in regard to life. One of the men who had attempted the life of Little, loses his own life through the bursting of a stone, grudging the few hours of labor necessary to hang and race a sound stone.

Dr. Amboyne, a philanthropic physician in the manufacing town which the novelist has called Hillsborough, and in which the manufacture of cutlery is the staple, sets young Little to work to observe and report upon the sanitary condition of the workmen in that town.

He accordingly makes a statement which may be inferred to embody the results of Mr. Reade's observations and reflections upon this subject, the report being however confined to the file cutters. This report, which we reproduce, appears in the form of an appendix to the part of the story which appears in the November number of the *Galaxy*. It is not only exceedingly racy but very suggestive to inventors:

[Extract from Henry Little's "Report."]

THE FILE CUTTERS.

"This is the largest trade, containing about three thousand men, and several hundred women and boys. Their diseases and deaths arise from poisoning by lead. The file rests on a bed of lead during the process of cutting, which might more correctly be called stamping; and, as the stamping chisel can only be guided to the required nicety by the finger nail, the lead is constantly handled and fingered, and enters the system through the pores.

"Besides this, fine dust of lead is set in motion by the blows that drive the cutting chisel, and the insidious poison settles on the hair and the face, and is believed to go direct to the lungs some of it.

"The file-cutter never lives the span of life allotted to man. After many small warnings, his thumb weakens. He neglects that; and he gets touches of paralysis in the thumb, the arm, and the nerves of the stomach; can't digest; can't sweat; at last can't work; goes to the hospital; there they galvanize him, which does him no harm; and boil him, which does him a deal of good. He comes back to work, resumes his dirty habits, takes in fresh doses of lead, turns dirty white or sallow, gets a blue line round his teeth, a dropped wrist, and to the hospital again or on to the file-cutter's box; and so he goes miserably on and off till he drops into a premature grave, with as much lead in his body as would lap a hundredweight of tea."

THE REMEDIES.

"*A. What the masters might do.*

"1. Provide every forge with two small fires, eighteen inches from the ground. This would warm the lower limbs of the smiths. At present their bodies suffer by uneven temperature; they perspire down to the waist, and then freeze to the toe.

"2. For the wet grinders they might supply fires in every wheel, abolish mud floors, and pave with a proper fall and drain.

"To prevent the breaking of heavy grindstones, fit them with the large, strong, circular steel plate—of which I subjoin a drawing—instead of with wedges or insufficient plates. They might have an eye to life, as well as capital, in buying heavy grindstones. I have traced the death of one grinder to the master's avarice; he went to the quarry and bought a stone for thirty-five shillings the quarry master had set aside as imperfect; its price would have been sixty shillings if it had been fit to trust a man's life to. This master goes to church twice a Sunday, and is much respected by his own sort; yet he committed a murder for twenty-five shillings. Being Hillsborough, let us hope it was a murderer he murdered.

"For the dry-grinders they might all supply fans and boxes. Some do, and the good effect is very remarkable. Moreover, the present fans and boxes could be much improved.

"One trade—the steel fork-grinders—is considerably worse than the rest; and, although the fan does much for it, I'm told it must still remain an unhealthy trade. If so, and Dr. Amboyne is right about life, labor, and capital, let the masters co-operate with the Legislature, and extinguish the handicraft.

"For the file-cutters, the masters might—

"1st. Try a substitute for lead. It is all very well to say a file must rest on lead to be cut. Who has ever employed brains on that question? Who has tried iron, wood, and gutta-percha, in layers? Who has ever tried anything, least of all the thing called Thought?

"2d. If lead is the only bed—which I doubt—and the lead must be bare—which I dispute—then the masters ought to supply every gang of file-cutters with hooks, taps, and basins, and soap, in some place adjoining their workrooms. Lead is a subtile, but not a swift poison; and soap and water every two hours is an antidote

"3d. They ought to forbid the introduction of food into file-cutting rooms. Workmen are a reckless set, and a dirty set; food has no business in any place of theirs, where poison is going.

"*B. What the workmen might do.*

"1st. Demand from the masters these improvements I have suggested, and, if the demand came through the secretaries of their unions, the masters would comply

"2d. They might drink less, and wash their bodies with a small part of the money so saved; the price of a gill of gin, and a hot bath, are exactly the same; only the bath is health to a dry-grinder, or file-cutter; the gin is worse poison to him than to healthy men.

"The small wet-grinders, who have to buy their grindstones, might buy sound ones, instead of making bargains at the quarry, which prove double bad bargains when the stone breaks, since then a new stone is required, and sometimes a new man, too.

"4th. They might be more careful not to leave the grindstone in water. I have traced three broken stones in one wheel to that abominable piece of carelessness.

"5th. They ought never to fix an undersized pulley-wheel. Simmons killed himself by that, and by grudging the few hours of labor required to hang and race a sound stone.

"6th. If files can only be cut on lead, the file-cutters might anoint the lead over-night with hard-drying ointment, soluble in turps, and this ointment might even be medicated with an antidote to the salt of lead.

"7th. If files can only be cut on *bare* lead, the men ought to cut their hair close, and wear a light cap at work. They ought to have a canvas suit in the adjoining place (see above); don it when they come and doff it when they go. They ought to leave off their insane habit of licking the thumb and finger of the left hand—which is the leaded hand—with their tongues. This beastly trick takes the poison direct to the stomach. They might surely leave it to get there through the pores; it is slow, but sure. I have also repeatedly seen a file-cutter eat his dinner with his filthy, poisoned fingers, and so send the poison home by way of salt to a fool's bacon. Finally, they ought to wash off the poison every two hours at the taps.

"8th. Since they abuse the masters, and justly, for their greediness, they ought not to imitate that greediness by driving their poor little children into unhealthy trades, and so destroying them body and soul. This practice robs the children of education at the very seed-time of life, and literally murders many of them; for their soft and porous skins, and growing organs, take in all poisons and disorders quicker than an adult.

"*C. What the Legislature might do.*

"It might issue a commission to examine the Hillsborough trades, and, when accurately informed, might put some practical restraints both on the murder and the suicide that is going on at present A few of the suggestions I have thrown out might, I think, be made law.

"For instance, the master who should set a dry-grinder to a trough without a fan, or put his wet-grinders on a mud floor and no fire, or his file-cutters in a room without taps and basins, or who should be convicted of willfully buying a faulty grindstone, might be made subject to a severe penalty; and the municipal authorities invested with rights of inspection, and encouraged to report.

"In restraint of the workmen, the Legislature ought to extend the Factory Act to Hillsborough Trades, and so check the heartless avarice of the parents. At present, no class of Her Majesty's subjects cries so loud, and so vainly, to her motherly bosom, and the humanity of Parliament, as these poor little children; their parents, the lowest and most degraded set of brutes in England, teach them swearing and indecency at home, and rob them of all decent education, and drive them to their death, in order to squeeze a few shillings out of their young lives; for what?—to waste in drink and debauchery. Count the public houses in this town.

"As to the fork-grinding trade, the legislature might assist the masters to extinguish it. It numbers only about one hundred and fifty persons, all much poisoned and little paid. The work could all be done by fifteen machines and thirty hands, and, in my opinion, without the expense of grindstones. The thirty men would get double wages; the odd hundred and twenty would, of course, be driven into other trades, after suffering much distress. And, on this account, I would call in Parliament, because then there would be a temporary compensation offered to the temporary sufferers by a far-sighted and beneficent measure. Besides, without Parliament, I am afraid the masters could not do it. The fork-grinders would blow up the machines, and the men who worked them, and their wives, and their children, and their lodgers, and their lodger's visitors.

"For all that, if your theory of Life, Labor, and Capital is true, all incurably destructive handicrafts ought to give way to machinery, and will, as Man advances."

Improvements in Paper-making Machines.

The invention we are about to describe has been recently brought out in England, and it consists in the application to paper-making of a roller coated with vulcanite and with vulcanized india-rubber, and which is substituted for the ordinary metal under press roll of the machine, and may be used as an under or upper second press roller. We are indebted to the *Mechanics' Magazine* for the details which follow:

"In the paper-making machine now in use, the pulp for forming the material of the paper is projected, in a fluid state, upon an endless wire cloth, and is kept from overflowing at the sides by endless bands (commonly termed deckle straps) after having a greater portion of the water sucked from it by capillary attraction and the action of air pumps. The endless wire cloth, carrying the moist pulp upon its upper surface, passes between a pair of couching rollers, the upper roller of which is usually made to press upon the under roller. These couch rollers are usually covered with a woolen jacket, and, also, are constructed of metal in the case of the under, and of wood in the case of the upper roller. The web of paper, having passed between the upper and under couch rolls, next passes between another pair of rollers called first-press rollers, which have an endless woolen cloth or felting of open texture (technically called a wet felt) between the web of paper and the surface of the under first press roll for the purpose of expressing or discharging the water contained in the paper.

"The under press roll is made of iron, the endless woolen cloth or felting passing between the under press roller, and the upper press roller carries the web of paper with it between the upper and under press rollers. In so passing between the press rollers, the web of paper, as at present manufactured, is subjected to considerable pressure, by which the substance of the paper is made thinner, and the natural elasticity of the fibrous pulp of which the paper chiefly consists becomes greatly impaired. The woolen cloth or felting also being subjected to considerable pressure while passing in a damp state between the ordinary metal first press rollers carrying the moist web of paper, suffers great tear and wear from the attrition caused by the hardness and unyielding character of the two metal rollers.

"By the substitution of a composite under press roller possessing a slight degree of elasticity, the web of paper, in being carried upon the endless woolen cloth or felting between the press rollers, is subjected to a less pressure than is received by the ordinary pair of metal rollers, while, at the same time, a sufficient pressure is given to effect the purposes for which the web of paper is passed through the press rollers, viz., to express or discharge the waters still remaining in the pulp to a degree sufficient to enable the web of paper to be led round the drying cylinders of the machine. From the slightly elastic and softer character of the new under press roller, the natural elasticity of the web of paper is preserved, and the fibrous substance of the web of paper not being crushed together, as in the case of the ordinary metal first press rolls, permits the web of paper in the succeeding process of drying upon cylinders to become more valuable than by the ordinary process, and thereby the character of paper so made thus becomes more akin to paper made by hand, by the great increase of body or bulkiness acquired by the freedom from the effects of the severe pressure imposed in the case of the use of ordinary metal first press rollers. The endless woolen cloth or felting, from being subjected to an elastic pressure, suffers very much less attrition, or tear and wear, in passing over the softer and elastic material of the under press roller, and the action of the felting is thereby such, that it goes much longer without washing, and is not liable to cut by its creasing or otherwise.

"In those paper-making machines in which a second set of press rollers is employed, a composite rubber roller is substituted for the second under press roller, except in those machines in which the second upper press roller serves to carry the wet felt, and which has the wet felt between it and the paper. In this latter instance, the composite rubber roller will be applied to the second upper press roller as it thus performs functions similar to the first under press roller. The materials of which the roller is composed, are as follows, viz:—a metal roller of the ordinary size at present in use has applied to it a first or inner coating of vulcanite cured and hardened only to such an extent or degree as to adhere or stick firmly to the metal shell of the roller, which it covers, and then an outer coating covering the vulcanite coating, composed of vulcanized india-rubber, or india-rubber not so highly cured, and therefore of a softer and more elastic character than the inner coating. With rollers thus covered, there is no tendency in the covering to separate from the metal, and the rollers are thereby much better fitted to withstand the pressure which they receive when in use, and, in consequence of the interposed coating of vulcanite, are not liable to strip."

Horse Nails.

A patent has been taken out in England for a new method of making horse nails. It consists in providing a machine employed in this manufacture with a special furnace through which the nail rod is passed continuously before arriving at the anvil or anvils; also in an automatic feed motion for propelling the nail rod, and in the employment in such machines of two distinct anvils and hammers, one of which anvils is stationary and the other movable. One of these anvils has formed on its face a die representing a nail on its side, and the other a die representing a nail on its flat, or these dies may be formed on the faces of the hammers of the respective anvils, or partly in the hammer and partly in the anvil in each case.

TO PICKLE MUSHROOMS.—Button mushrooms are best for pickling. Peel them, cut the stocks off close to the button; do not pull them off, as that draws out the heart. The appearance of every button will be improved by rubbing it with a piece of flannel and salt. Now put the mushrooms into a frying-pan in single layers, sprinkle them with salt and pepper, and allow them to cook over a gentle fire for about a quarter of an hour. Remember, they are not to be fried, but merely gently cooked in their own liquor. This done, put them into pickle bottles, with a few layers, here and there, of whole pepper, mace, long pepper, and whole ginger. Fill up the bottles with good vinegar, and tie them down air-tight with bladder. In six weeks they will be ready.—*S. Piesse.*

SPANISH PROTESTANT CHURCH PROPOSED TO BE BUILT AT MADRID.

Among the changes wrought by the recent Spanish Revolution, are the establishment of the right of trial by jury and freedom of religious worship. Several Protestant rooms for preaching the Gospel have been opened at Madrid, and it is now proposed to erect the First Protestant Church. In connection with the historical importance of this event, our readers will be interested in the architectural design of this church, an engraving of which we herewith present, M. Juan Madrazo being the architect. The elevation is that of the west end of the building.

To the Madrid committee the municipal corporation have granted, gratuitously, a piece of ground 17,000 square feet in extent, for the purpose of building this church.

The entrance to the building will be at the west front, through a sort of cloister or narthex, separating the baptistery from the body of the church, above which the clock and bell tower, with a perforated stone spire, will rise about 155 feet high. Entering the church, there will be found accommodation for 500 persons in open seats. A small court will separate the chancel from the schools and clergyman's house, forming a rear wing. These buildings will be of stone (a kind of Bath stone). Both nave and chancel will have an open timber roof, supported by arches built of brick, spanned across. In the center of the transept a louver in the roof will be provided for ventilation, taking externally the appearance of a spire. This and the roofs will be covered with slates and lead. The cost of the whole is estimated at £10,000.

On Fresh Meat Preservation, by John Gamgee.

After many trials, the process which was found to act best was the exhaustion of air from the vessel containing the meat to be preserved, and the introduction of various vapors. Among other substances, the following were tried: Ozone, chloroform, ether, tetrachloride of carbon, bichloride of methylene, carbolic acid, chlorine, hydrochloric acid, and binoxide of nitrogen; but these were ultimately abandoned for sulphurous acid, introduced into the preserving vessel condensed in the pores of charcoal. "I believe," writes Mr. Gamgee, "that charcoal, saturated with sixty-five times its volume of sulphurous acid, will remain, to the end of days, the cheapest, most manageable, and most universally employed antiseptic that the meat preserver can use. It is, perhaps, bold to predict, that which I do with the greatest confidence, that charcoal and sulphurous acid will, in a few years' time, to a great extent, supersede the use of salt." For various reasons, however, sulphurous acid could not be used alone; and the experiments of Hoppe Seyler suggested the simultaneous employment of carbonic oxide, as it was found to preserve the color of the meat and to expel the oxygen from the tissues; it also acted as a neutral gas to surround the meat in air-tight vessels in place of atmospheric air. The meat to be preserved was placed in a vessel capable of being exhausted by an air-pump; lumps of charcoal saturated with sulphurous acid were then added, and the vessel was exhausted as completely as possible; carbonic oxide was then introduced until the normal atmospheric pressure prevailed within the preserving vessel. Meat thus preserved was found to keep perfectly, not alone in closed cans, but in open vessels, and it could not be distinguished, as regards taste, from recently killed meat. Of course the chief obstacle to the adoption of the process is the expensive nature of the apparatus, and attempts have been made to displace the oxygen from the neighborhood of the meat, by driving carbonic acid through the preserving vessel by means of a fan; it is obvious, however, that the tissues would still remain charged with oxygen. Whatever may be the value of this process on the large scale, there can be no doubt that few inventions could, at the present time, be of greater value to the human race at large than one which would secure the utilization, as food, of the thousands of tuns of meat which are now wasted in Australia and Texas, and the Argentine Republic. To allow myriads of oxen to attain maturity, and to destroy them for the sake of their skins alone, seems an act comparable to that of the Roman Emperor who caused several hundred flamingoes to be destroyed that he might be provided with a dish of their tongues.

RAILWAY PLANT---SLEEPERS, TIES, AND CLIPS.

From Auchincloss' Report on Steam Engineering at the Paris Exposition.

The rapid extension of railway interests in tropical countries, as Egypt, India, Algeria, and South America, with the increased scarcity of timber for ties in more civilized portions of the world, have concentrated the efforts of inventive talent toward the production of what may justly be termed a permanent road bed. The present Exposition contains some interesting signs of progress in this direction; a few only will be selected as types, uniting simplicity of construction with practical utility.

The cast-iron pot sleeper introduced on the Alexandria, Cairo, and Suez Railway, by Mr. R. Stephenson, in the year 1851, receives the unqualified approbation of the local engineers, as best adapted to the compact sands of the Suez isthmus and the loose alluvial soil of the Nile delta. Even heavy engines running at high speeds over the Egyptian rails (which weigh 65 pounds per yard) have no serious effect on these sleepers. As to the rigidity of the road-bed compared with the wooden-sleeper system, we are sure that those who have traveled the length of this route must have discovered no cause of complaint; but, on the contrary, have admired the smooth running of the trains.

This sleeper known as Griffen's patent is an oval casting (26 inches by 17 inches) having a channel along the dome-like surface for the reception of the rail; distance bars are let into cored sockets and maintain the uniformity of the gage. The Economic Permanent Way Company, of London, manufacture a hollow chair whose upper surface forms portion of a cylinder 30 inches long, the chord of the arc 13 inches, and versed sine five inches. A channel cored in the back of the casting receives the rail, which is held in place by two bolts passing through four lugs, two fixed and two movable. Distance bars regulate the gage, and the chairs are placed 44 inches between centers. The system of Mr. J. Vantherim, of Fraisans, is adopted on portions of the Northern Railway of France and the railway of Lyons. He submits a rolled iron sleeper for wood, and retains the rail with gibs and keys passing through wrought-iron clamps and the sleeper. The latter has a base of 10 inches, hight of $2\frac{3}{4}$ inches; is 5 inches in width at the top and $\frac{1}{2}$ inch in thickness. A curvature with a versed sine of 3 inches is impressed on all the sleepers, thus carrying their centers below the ballast, and by the arched form imparting greater rigidity to the beam.

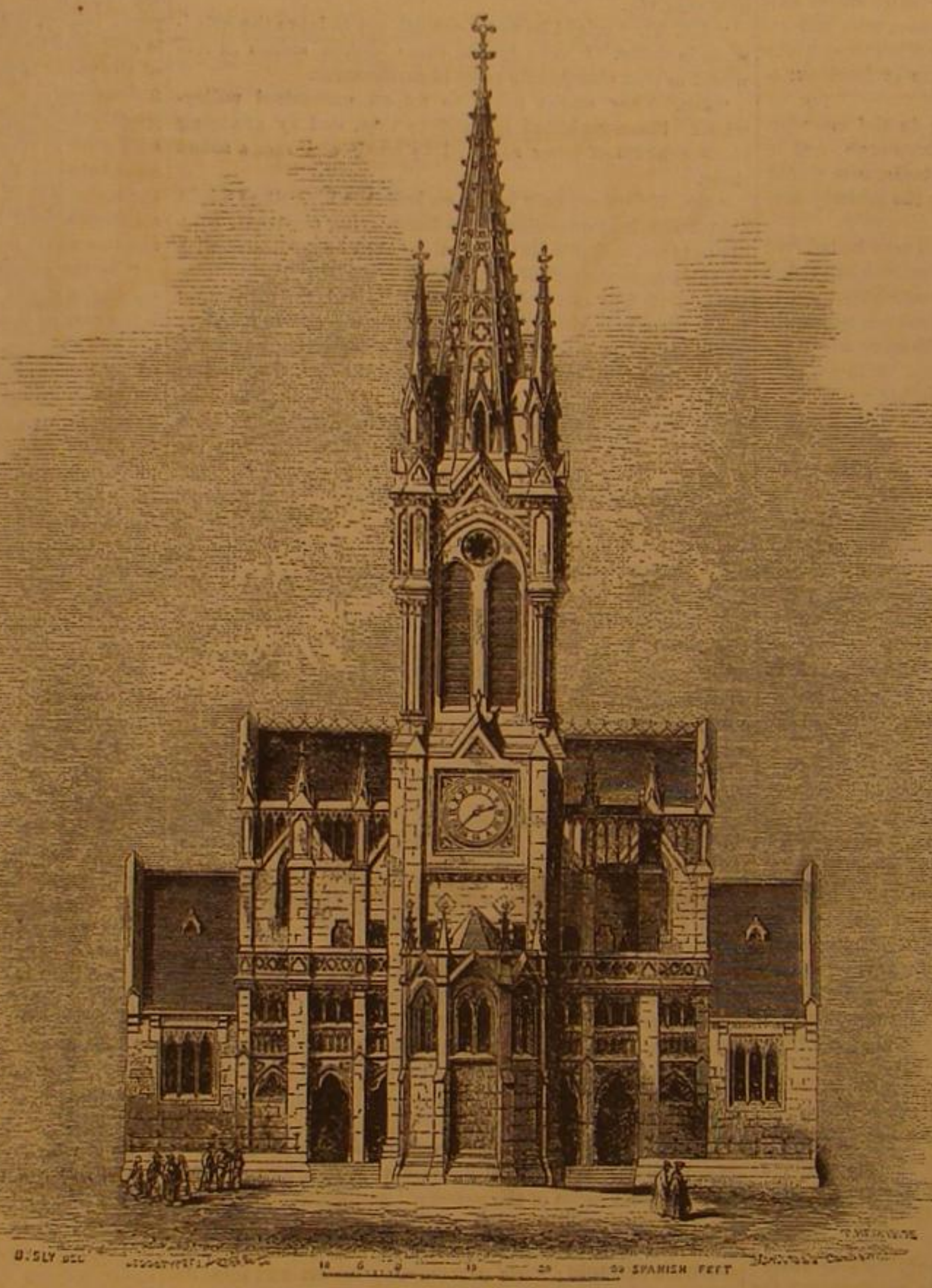
The Marcinelle Couillet Company, of Charleroi, Belgium, exhibit a section of railway with its wrought-iron ties attached, which has been in actual service during four and a half years, and gives evidence of great durability. It is worthy the attention of parties opposed to wrought-iron ties (from their want of the elasticity peculiar to wooden ones), since it forms a compromise between the two; in which wood acts as the mere cushion; iron the solid foundation. The rails are $4\frac{3}{4}$ inches deep, with $2\frac{3}{8}$-inch head and $4\frac{1}{2}$-inch base, the gage 4 feet $8\frac{1}{2}$ inches; all the joints are formed on the "fished principle," and secured with $4\frac{5}{8}$-inch bolts. The sleepers are simply rolled I-beams 8 feet 5 inches long (7 inches deep, $\frac{5}{16}$-inch web, and $2\frac{1}{2}$-inch heads), placed 36 inches between centers. Instead of resting directly on these, a painted oak block is interposed between them and the rail. Such blocks are 10 inches long, by $6\frac{1}{4}$ inches wide, by $2\frac{1}{4}$ inches thick, and have a channel $4\frac{1}{2}$ inches wide by $\frac{1}{4}$ inch deep, in which the base of the rail rests. Two $\frac{5}{8}$-inch bolts with $1\frac{5}{8}$-inch round washers) secure the rail to the I-beam; the latter, it should be observed, lies with its web in a horizontal position. The bolt holes are bored close to the flanges of the rails, to allow of the washers clamping the latter, and the points of the bolts are slightly burred to prevent the loosening of the nut. An increase in the diameter of the washer might be made with evident advantage.

The Hartwich system, introduced on the Rhénan and Cologne Railway dispenses with sleepers altogether by using very deep rails having broad bases. Their rails are rolled $9\frac{3}{8}$ inches deep (with $2\frac{5}{8}$-inch head, $4\frac{3}{4}$-inch base, $\frac{5}{8}$-inch web), and the gage regulated by 1-inch rods placed six feet three inches apart, having threads on their ends and a nut on each side of the rail webs. To preserve the upper parts of these deep rails from variation, the rods pass through holes only three inches below the head, and every fourth space between rods has an intermediate one near the lower flanges of the rails. Fish-joints give the rails the rigidity possessed by continuous beams, while the ballasting covers all except their heads. Steel rails, and iron rails with steel heads, are well represented in all the departments and produce the impression that the plain iron rail, for roads of very extensive traffic, will soon be a relic of the past. Several manufacturers show specimens of steel reversible crossings, while Austria and Holland are creditably represented by those of chilled iron.

Mr. G. E. Dering, of Lochleys, Welwyn Herts, England, exhibits samples of a tempered steel spring clip for rail joints, which appeared in the Exhibition in 1862, and has since performed good service on lines like the Great Northern, also Great Southern and Western Railways. This clip forms a steel case enveloping the extremities of the rail, and binds the same with increased tenacity under the pressure of heavy loads. A joint constructed on this principle was carefully tested by D. Kirkaldy, Esq., and found to have a deflection of 1·31 inch under a load of 26,000 pounds, with supports 36 inches apart. When the load was removed the clip assumed its normal condition free of permanent set. He also tested under the same conditions two rails united by the ordinary fish-joint. Seventeen thousand pounds served to produce a deflection of 2·78 inch, from which the joint failed to recover after the removal of the load. This clip is entirely free of bolts, nuts, etc., which are liable to become loose even under the closest inspection.

The subject of railway plant should not be concluded without first alluding to a new spike thimble. One serious objection to soft, cheap timber for railway ties has hitherto been the liability of the spikes holding down the rails to become loosened. This results in part from the tendency of the rails to spread under the action of heavy trains running at high speed, thus crowding the spike laterally into the soft fiber.

Mr. Desbrière, 68 Rue de Provence, Paris, has patented a cast-iron thimble for surrounding the spike and bringing a greater number of the fibers to bear in resisting its crushing effect. These thimbles are two inches in diameter, one and one quarter inch thick, having a three quarter-inch square or round hole cored in the center, and are slightly dished on the under side. A recess one quarter inch deep is left on the upper side in which the rail rests, and prevents any tendency to its rotation. Either spikes or galvanized wood screws (three fourths inch by four and a half inches) are used for retaining the rails. Specimens of ties laid with these thimbles



THE PROPOSED SPANISH PROTESTANT CHURCH.

in April, 1862, on the Algerian Railway, near Blidah, well illustrate the benefits to be derived. They are in use on the Northern Railway of France, at Charentes and at Mont Cenis. This principle might render important service in parts of our own country where ties of durable close-grained woods are difficult to procure.

THE MANUFACTURE OF SULPHURIC ACID.

From the Report of J. Lawrence Smith, United States Commissioner to Paris Exposition.

METHODS AND PROCESSES OF MANUFACTURE.

Burning the Sulphur—Sulphur Furnaces.—It is not necessary to dwell upon this part of the subject, from the fact that there are so many various ways, each said to be excellent, for securing the combustion of the sulphur used for the manufacture of acid. Reference will be made simply to the principles involved in the best form of furnace. It is better to have one large than many small furnaces (called the sulphur furnace), and to have all the sulphur used for one day's combustion (say from one to four tuns) introduced at one charge, and to have just sufficient air admitted to keep up the combustion without heating the mass too much, as thereby more sulphur is volatilized. The vapor from the sulphur furnace should pass to the combustion furnace, in which sufficient air is admitted to complete the combustion, allowing an excess of about two to three per cent of oxygen. From the combustion furnace the sulphurous acid therein formed passes to the niter oven, and from thence the mixed vapors pass into the lead chambers.

Lead Chambers.—Too great care cannot be given to the construction and working of the sulphuric acid chambers. The plumbers should be required to distribute the straps uniformly, and not to have too great a strain on any one, as the lead of the chamber is often torn by the neglect of this; the chambers should be kept in perfect repair and free from holes, or otherwise the sulphurous acid is lost in greater or less quantity. Where repairs are neglected, the practical yield with the same amount of material may range in three years from 82 to 68 per cent of product.

The sulphur is not often lost from an incomplete conversion of the sulphurous into sulphuric acid by too little steam, too much air, and an insufficient quantity of niter, but more frequently from too little chamber space to the amount of sulphur burnt.

In connection with lead chambers it is interesting to refer to the chambers of Kuhlmann, of Lille, that prince of industrial chemists, the neatness and cleanliness of whose immense works are only excelled by the skill exercised and the purity of the articles manufactured. His chambers have a capacity of about 53,000 cubic feet. There are six different compartments, the first a small one, which is a cooler and purifier; the second a small denitrifying chamber; the third a small nitrification chamber; the fourth a large chamber; and fifth and sixth small chambers, called the tail chambers. Nitric acid is employed for oxidizing, which is introduced into the third chamber, in a small stream divided into a spray by convenient arrangements. The circulation of the liquid acid proceeds from chamber five, which opens into chamber six; from this it flows into the large chamber, which receives also the acid from the nitrification chamber; the acid collected in the large chamber ultimately passes into the denitrification chamber before it reaches the evaporating pans; to secure a perfectly regular distribution of steam through the whole system, the lead pipes which deliver it into the chambers are provided with platinum nozzles, which prevent the orifices of the tubes from gradually collapsing.

Some of the chambers in Lancashire have over 100,000 cubic feet capacity; and, as a general rule, the larger the chamber the better the proportioned yield. One of the most important problems in the improvement of sulphuric acid chambers is to produce chambers of small dimensions capable of producing the greatest amount of sulphuric acid free from arsenic. To diminish the amount of capital in establishing a lead chamber for this acid, multiplies their number, and brings an article requiring a certain amount of useless water and bulky receivers nearer to the consumers, diminishing the cost of transportation.

At Bordeaux, Fournet has established the manufacture of sulphuric acid in a manner that deserves special attention, as it looks toward this economy just referred to. By means of apparatus skillfully arranged, in which the gas is made to circulate more than once in pipes filled with coke, so as to bring about an intimate mixture, and then passing it into a small lead chamber, Fournet has succeeded, with a chamber of only 12,000 cubic feet, in burning 1,000 pounds of sulphur a day, and obtaining a yield of three tuns of sulphuric acid, an amount nearly equal to the theoretical yield.

(To be continued.)

Drying Oils for Varnish.

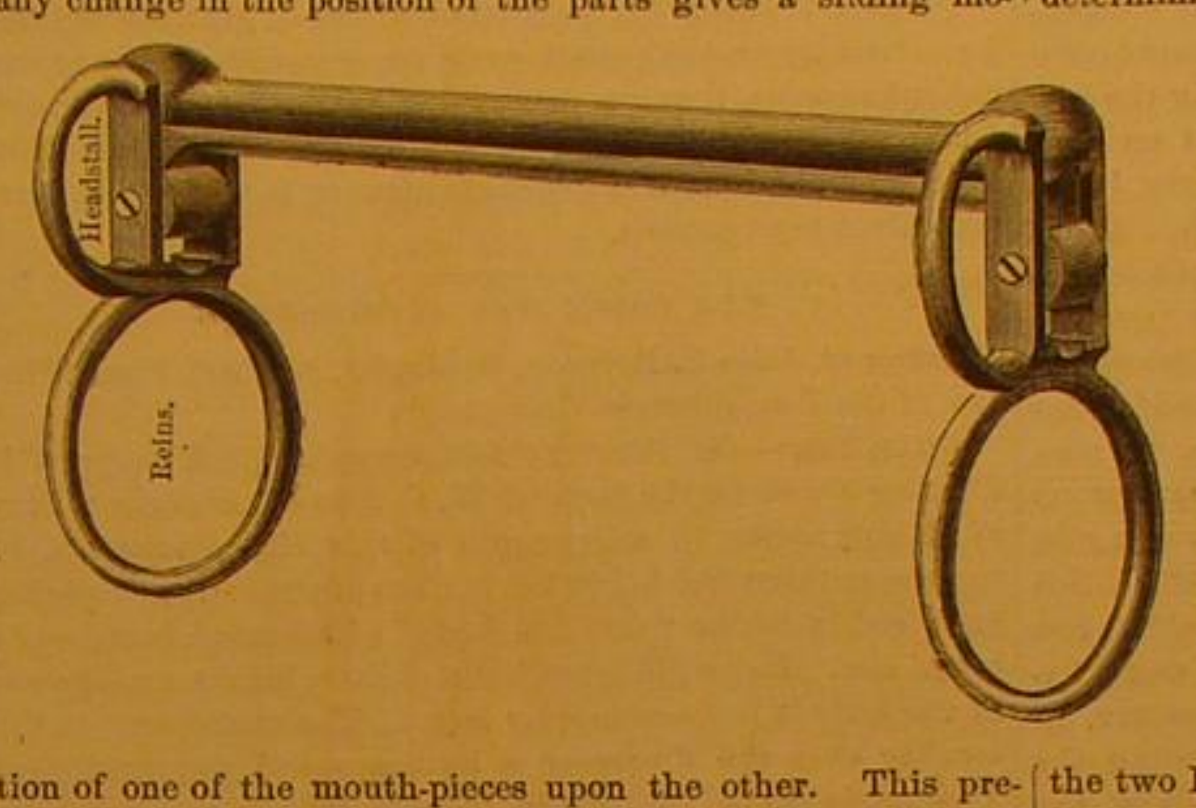
In a recent work on varnish, by Violette, he quotes as follows from a celebrated manufacturer: "The oil is allowed to stand in a reservoir of lead for one or two months, after which the upper three quarters of it are drawn off to make drying oils for varnish, while the one fourth remaining at the bottom of the tank can be sold to grind paints, it being utterly unfit for varnish making. This settling of the oil is indispensable, in order to separate the mucilaginous impurities which all oil contains, and it is a precaution that should always be faithfully observed." After converting this oil into drying oil, he adds: "We always take the precaution to have five or six months' stock of this prepared oil in advance; after which time it is better, and gives a varnish with more body and more solid drying."

When, in addition to the above, it is remembered that the varnish must be kept six months, after being made, in order to allow it to ripen, it may be seen that the capital required by some firms must be very large. It is by careful attention to the above points that the English manufacturers have attained their high reputation.

IMPROVEMENT IN BITS FOR HORSES.

This bit, known as the "Baldwin Bit," was patented May 22, 1868. Its appearance is shown in the accompanying engraving, and the principle of its working may be easily understood.

It consists of two parallel bars, one of which sets into a rabbet in the other which answers to the ordinary bit. The rings into which the reins are buckled are formed with two parallel projections, which extend forward to the ends of the principal mouth-piece, and are pivoted to the same. They are also pivoted further back, to the second mouth-piece, which plays in the rabbet in the principal mouth-piece, so that any change in the position of the parts gives a sliding motion of one of the mouth-pieces upon the other. This prevents the horse from seizing the bit and holding it in his teeth.



The proprietors of this bit have full confidence that those who believe in treating the horse rationally and humanely will realize its merits. It is the habit of many to place a very severe and cruel bit in the mouths of horses inclined to be vicious and unreliable. It is claimed that this bit will secure full control of the horse without cruelty. As soon as the horse attempts to catch the bit in his teeth, the weakest driver acquires great power over him by gently working one rein at a time, as it is so arranged that while one mouth-piece is stationary the other is moved at the will of the driver, so long as the reins are pulled unequally.

It is well adapted for ladies' use, and is claimed to be equally adapted to driving all horses, as its governing powers are such that a horse will obey it without fear, and it is easy for both the horse and the driver.

For further information address Jos. Baldwin & Co., 254 Market street, Newark, N. J.

HEAT FROM THE MOON.

[From The Spectator.]

A long-vexed question—one which astronomers and physicists have labored and puzzled and even quarreled over for two centuries at least—has at length been set at rest. Whether the moon really sends us any appreciable amount of warmth has long been a moot point. The most delicate experiments had been made to determine the matter. De Saussure thought he had succeeded in obtaining heat from the moon, but it was shown that he had been gathering heat from his own instruments. Melloni tried the experiment, and fell into a similar error. Piazzi Smith, in his famous Teneriffe expedition, tried the effect of seeking for lunar heat above those lower and more moisture-laden atmospheric strata which are known to cut off the obscure heat rays so effectually. Yet he also failed. Professor Tyndall, in his now classical "Lectures on Heat," says that all such experiments must inevitably fail, since the heat rays from the moon must be of such a character that the glass converging-lens used by the experimenters would cut off the whole of the lunar heat. He himself tried the experiment with metallic mirrors, but the thick London air prevented his succeeding.

The hint was not lost, however. It was decided that mirrors, and not lenses, were the proper weapons for carrying on the attack. Now, there is one mirror in existence which excels all others in existence in light-gathering, and therefore necessarily in heat-gathering power. The gigantic mirror of the Rosse telescope has long been engaged in gathering the faint rays from those distant stellar cloudlets which are strewn over the celestial vault. The strange clusters with long out-reaching arms, the spiral nebulæ with mystic convolutions around the blazing nuclei, the wild and fantastic figures of the irregular nebulæ, all these forms of matter had been forced to reveal their secret under the searching eye of the great Parsonstown reflector. But vast as are the powers of this giant telescope, and interesting as the revelations it had already made, there was one defect which paralyzed half its powers. It was an inert mass well poised—indeed, so that the merest infant could sway it, but possessing no power of self-motion. The telescopes in our great observatories follow persistently the motions of the stars upon the celestial vault, but their giant brother possessed no such power. And when we remember the enormous volume of the Rosse Telescope, its tube—fifty feet in length—down which a tall man can walk upright, and its vast metallic speculum, weighing several tuns, the task of applying clock-motion to so cumbrous and seemingly unwieldy a mass might well seem hopeless. Yet without this it was debarred from taking its part in a multitude of processes of research to which its powers were wonderfully adapted. Spectroscopic analysis, as applied to the stars, for example, requires the most perfect uniformity of clock-motion, so that the light from a star, once received on the jaws of the slit which forms the entrance into the spectroscope, may not move off them even by a hair's breadth. And the determination of the moon's heat required an equally exact adaptation of the telescope's motion to the apparent movement of the celestial sphere. For so delicate is the inquiry, that the mere heat generated in turning the telescope upon the moon by the ordinary arrangement would have served to mask the result.

At enormous cost, and after many difficulties had been encountered, the Rosse reflector has at length had its powers more than doubled by the addition of the long wanted power of self-motion. And among the first-fruits of the labor thus bestowed upon it, is the solution of the famous problem of determining the moon's heat.

The delicate heat-measurer, known as the thermopile, was used in this work, as in Mr. Huggins' experiments for estimating the heat we receive from the stars. The moon's heat, concentrated by the great mirror, was suffered to fall upon the face of the thermopile, and the indications of the needle were carefully watched. A small but obvious deflection in the direction signifying heat was at once observed, and when the observation had been repeated several times with the same result, no doubt could remain. We actually receive an appreciable proportion of our warmth supply from "the chaste beams of the wat'ry moon." The view which Sir John Herschel had long since formed on the behavior of the fleecy clouds of a summer night under the moon's influence was shown to be as correct as almost all the guesses have been which the two Herschels have ever made.

And one of the most interesting of these results which have followed from the inquiry confirms in an equally striking manner another guess which Sir John Herschel had made. By comparing the heat received from the moon with that obtained from several terrestrial sources, Lord Rosse has been led to the conclusion that at the time of full moon the surface of our satellite is raised to a temperature exceeding by more than 280° (Fahrenheit) that of boiling water. Sir John Herschel long since asserted that this must be so. During the long lunar day, lasting some 300 of our hours, the sun's rays are poured without intermission upon the lunar surface. No clouds temper the heat, no atmosphere even serves to inter pose any resistance to the continual down-pour of the fierce solar rays. And for about the space of three of our days the sun hangs suspended close to the zenith of the lunar sky, so that if there were inhabitants on our unfortunate satellite, they would be scorched for more than seventy consecutive hours by an almost vertical sun.

There is only one point in Lord Rosse's inquiry which seems doubtful. That we receive heat from the moon he has shown conclusively, and there can be no doubt that a large portion of this heat is *radiated* from the moon. But there is another mode by which the heat may be sent to us from the moon, and it might be worth while to inquire a little more closely than has yet been done whether the larger share of the heat rendered sensible by the great mirror may not have come in this way. We refer to the moon's power of *reflecting* heat. It need hardly be said that the reflection and the radiation of heat are very different matters. Let any one hold a burnished metal plate in such a way that the sun's light is reflected towards his face, and he will feel that with the light a considerable amount of heat is reflected. Let him leave the same metal in the sun until it is well warmed, and he will find that the metal is capable of imparting heat to him when it is removed from the sun's rays. This is radiation, and cannot happen unless the metal has been warmed, whereas heat can be reflected from an ice-cold plate. There has been nothing in the experiments conducted by Lord Rosse to show by which of these two processes the moon's heat is principally sent to us; nor do we know enough of the constitution of the moon's surface to estimate for ourselves the relative proportions of the heat she reflects and radiates towards us.

We do not mention this point from any desire to cavil at the results of one of the most interesting experiments which have recently been carried out. But the recent researches of Zöllner upon the light from the planets, have shown how largely the surfaces of the celestial bodies differ as respects their capacity for reflecting and absorbing light, and there is every reason to infer that similar peculiarities characterize the planet's power of absorbing and reflecting heat. The whole question of the heat to which the moon's surface is actually raised by the sun's heat depends upon the nature of that surface, and the proportion between its power of absorbing heat or reflecting it away into space.

Steeple Jacks.

"Steeple Jack" is commonly but erroneously supposed to be an individual, whereas, as we have before pointed out, he is a genus, or a species, though, it may be, few in number. As his way of working is not known to every one, the London *Builder* describes it, in connection with one or two of his more recent exploits. Some of the factory chimneys at New Swindon having got out of repair, the company resolved to employ a "Steeple Jack," who accordingly made his appear at New Swindon and set to work. His plan of proceeding was to fly an Indian kite, with two strings attached The kite rises nearly perpendicularly, and when above the chimney-top is guided over it. The second string is then pulled, and thus a complete communication is formed over the chimney. By means of the string a double copper wire is drawn up, and by this wire some pulleys and tackling. "Steeple Jack" then ascends hand over hand, and places an iron band around the chimney, which he secures tightly. Planks are then drawn up and laid upon irons projecting from the band, and thus in a short time a scaffolding sufficient for his purpose is erected, and at a cost very much less than that of a regular builder's. "Jack" had two or three assistants, and managed in his aërial manner, to pull down one of the factory chimneys which had become so badly out of repair as to require rebuilding. He is still engaged in repairing others. His scaffolding looks at a distance like a huge india-rubber band, around the chimney, with ropes depending from it.

An exciting occurrence, displaying great intrepidity, and involving the utmost peril to the person concerned, took place lately at Millbank Chemical Works, Garngad-road, Glasgow. Messrs. Burns & Son, of Ayr, who have been employed in similar duty at Townhead and other establishments, had been engaged to point a stalk at the works mentioned, measuring 260 ft. in height. The preliminary process of flying the kite was gone through no fewer than fifteen times, but on each occasion it failed, in consequence of the string being burnt through by the gas and flames emitted from the stalk. About an hour and twenty minutes were spent in these fruitless endeavors, when Mr. Burns, resolving that whatever personal risk might be incurred, the object must be accomplished, determined for this purpose to ascend the stalk himself. Accordingly, in spite of the remonstrances of his son, he proceeded to mount by the aid of the conducting-rod but no sooner had he got safely at the top than the rope was again burnt through, and he was left hanging by the hands. Not a moment was to be lost. The son flew the kite in about five minutes afterwards, and having succeeded in once more fixing the rope, the father was got down; he was, however, in an extremely exhausted condition, and notwithstanding the leathern gloves he wore, he was much burned about the hands, while his left side was likewise considerably scorched.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

English Iron and Iron Screw Steamers.

MESSRS. EDITORS:—The national—I may almost aid, the world's supply of iron, has hitherto been shared by England, Scotland, France, Germany, Belgium, etc.—Scotland doing the lion's share. Now, however, the laurels are fast being wrested from Scotland, and England must inevitably defeat all rivals. Imagine! The main Cleveland seam, in Yorkshire, has been estimated to contain 20,000 tuns of ore per acre, and at this rate there must be within the limits of the area named close upon five thousand million tuns of ironstone! It must be borne in mind that it is not poor ironstone, as it yields in many cases upward of 33 per cent of metallic iron, and in some instances 41 per cent. It is probable that something like 6,000,000 tuns of Cleveland ore will be required next year to keep all the blast furnaces in the district engaged! At present the annual make of Cleveland pig iron is estimated at 1,439,640 tuns, and at this time next year it is assumed that the make will be increased to 1,739,640 tuns of pig iron. At this moment Cleveland is making about one third of our production. The prime requisite in the shape of raw material is raised so cheaply that it can be laid down at the furnaces at a cost of 3s. per tun, less, at the present rate of exchange, than $1 per tun of 2,240 lbs. Containing, therefore, from 28 to 41 per cent of metallic iron, the ore for a tun of iron costs less than 10s., or $3!

Perhaps one of the applications of iron that interests Americans mostly is that for maritime purposes. Twenty years ago, and since, wooden ships as we all know, were discarded for iron, and a wooden-ship builder of consequence now-a-days is a thing of the past. But now iron ships—yes! iron shipbuilding is going to decay, so far as sailing vessels are concerned. Those that, at the time referred to, cost £25, say $150 per tun, can now be had at one half, and no takers! What next? Why, iron steamers—long, 300 to 400 feet iron screw steamers—these are to supersede everything and do the traffic of the world. The ink is scarcely dry on the prospectus of one of our new local companies, who have contracted to build twelve such iron screws. And they are right, apart from the question of capacity; they sail so shallow that they will float "almost wherever it is damp;" but, if not this, they will, at any rate, save the Cape of Good Hope by the Suez Canal, and, in due time, Cape Horn by the canal of Panama.

ALEX. S. MACRAE.

Liverpool, England.

Value Received.

MESSRS. MUNN & CO.:—Some four or five years ago I made a tool called "Substitute for the Slide Rest," which I advertised and sold through your paper. After I had made a number of them the party who manufactured absconded with the patterns, and brought me to grief. This is in the nature of things, and although I have held up my head since I don't wish to complain. But I *do* complain that for about every week since parties write to me asking for price list and cuts, and I wish they would stop it. How long after a man is dead and forgotten will people keep writing to him, if he has advertised in your paper?

This is to give notice that I have had the worth of my money in advertising and don't wish any more.

ROBERT P. WATSON.

New York city.

Testimony of a Veteran Inventor.

GENTLEMEN:—I have this day sent you a box containing two models, and shall be with you on Friday, to explain the same and have the papers drawn. I have taken out upwards of thirty patents, and have had some difficult cases, and I must say that nowhere have my interests been more zealously guarded than by you, nor any specifications more clearly and definitely drawn. I consider your efforts as second only in importance to the inventive genius of our country, in developing its resources at home, and honor abroad. With high esteem, I am respectfully yours,

JOSEPH A. MILLER, Mechanical Engineer.

Boston, Mass., Oct. 20.

Inventions at the South.

We are happy to recognize a gradual increase in the number of inventions coming to us from the South. Dr. R. J. Draughon, of Claiborne, Ala., under date of Oct. 11, 1869, writes us as follows:

MESSRS. MUNN & CO.:—It was with much gratification that I received by to-day's mail your communication, conveying the information that my patent was, on the 1st inst., allowed. I now write to convey to you my sincere thanks and kind wishes for the kind and generous manner in which you have conducted my business.

The Fossil Man of Onondaga.

Letter of John F. Boynton, Geologist, to Prof. Henry Morton, of the Pennsylvania University:

DEAR SIR:—On Saturday last, some laborers engaged in digging a well on the farm of W. C. Newell, near the village of Cardiff, about 13 miles south of this city, discovered, lying about three feet below the surface of the earth, what they supposed to be the "petrified body" of a human being of colossal size. Its length is ten feet and three inches, and the rest of the body is proportionately large. The excitement in this locality over the discovery is immense and unprecedented. Thousands have visited the locality within the last three days, and the general opinion seemed to be that the discovery was the "petrified body" of a human being.

I spent most of yesterday and to-day, at the location of the so-called "fossil man," and made a survey of the surroundings of the place where this wonderful curiosity was found. On a careful examination, I am convinced that it is *not* a fossil, but was cut from a piece of stratified sulphate of lime, (known as the Onondaga Gypsum). If it were pulverized or ground, a farmer would call it plaster. It was quarried, probably, somewhere in this county, from our Gypsum beds. The layers are of different colors—dark and light. The statue was evidently designed to lie on its back, or partially so, and represents a dead person in a position he would naturally assume when dying. The body lies nearly upon the back, the right side a little lower; the head leaning a little to the right. The legs lie nearly one above the other; the feet partially cross one another. The toe of the right foot, a little lower, showing plainly that the statue was never designed to stand erect upon its feet. The left arm lies down by the left side of the body, the fore arm and hand being partially covered by the body. The right hand rests a short distance below the umbilicus, the little finger spreading from the others, reaching nearly to the pubes. The whole statue evidently represents the position that a body would naturally take at the departure of life.

There is perfect harmony in the proportions of the different parts of the statue. The features are strictly Caucasian, having not the high cheek bones of the Indian type, neither the outlines of the Negro race, and being entirely unlike any statuary yet discovered of Aztec or Indian origin. The chin is magnificent and generous; the eyebrow, or superciliary ridge, is well arched; the mouth is pleasant; the brow and forehead are noble, and the "Adam's apple" has a full development. The external genital organs are large; but that which represents the integuments, would lead us to the conclusion that the artist did not wish to represent the erectal tissues injected.

The statue being colossal and massive, strikes the beholder with a feeling of awe. Some portions of the features would remind one of the bust of DeWitt Clinton, and others of the Napoleonic type. My opinion is that this piece of statuary was made to represent some person of Caucasian origin, and designed by the artist to perpetuate the memory of a great mind and noble deeds. It would serve to impress inferior minds or races with the great and noble, and for this purpose only, was sculptured of colossal dimensions. The block of gypsum is stratified, and a dark stratum passes just below the outer portion of the left eyebrow, appears again on the left breast, having been chiseled out between the eyebrow and chest, and makes its appearance again in a portion of the left hip. Some portions of the strata are dissolved more than others by the action of water, leaving a bolder outcropping along the descent of the breast toward the neck; the same may, less distinctly, be seen on the side of the face and head. I think that this piece of *reclining* statuary is not 300 years old, but is the work of the early Jesuit Fathers in this country, who are known to have frequented the Onondaga Valley from 220 to 250 years ago; that it would probably bear a date in history corresponding with the monumental stone which was found at Pompey Hill, in this county, and now deposited in the Academy at Albany. There are no marks of violence upon the work; had it been an image or idol worshiped by the Indians, it could have been easily destroyed or mutilated with a slight blow by a small stone, and the toes and fingers could have been easily broken off. It lay in quicksand, which, in turn, rested upon compact clay.

My conclusion regarding the object of the deposit of the statue in this place, is as follows: It was for the purpose of hiding and protecting it from an enemy who would have destroyed it, had it been discovered. It must have been carefully laid down, and as carefully covered with boughs and twigs of trees which prevented it from being discovered. Traces of this now decomposed vegetable covering, can be seen on every side of the trench, and it is quite evident, this vegetable matter originally extended across and above the statue.

Above this stratum of decayed matter, there is a deposit of very recent date, from eighteen inches to two feet in thickness which may have been washed in and likewise turned on by plowing. A farmer who had worked the land told me that he had "back furrowed" around it, for the purpose of filling up the slough where the statue now lies.

It is positively absurd to consider this a "fossil man." It has none of the indications that would designate it as such, when examined by a practical chemist, geologist or naturalist. The underside is somewhat dissolved, and presents a very rough surface, and it is probable that all the back or lower portion was never chiseled into form; and may have been designed to rest as a tablet. However, as the statue has not been raised, the correct appearance of the under surface has not been determined, save by feeling as I passed my hands as far as I could reach under different portions of the body, while its lower half lay beneath the water.

This is one of the greatest curiosities of the early history of Onondaga county, and my great desire is, that it should be preserved for the Onondaga Historical Society. Efforts are being made by some of our citizens to secure this in the county where it belongs, and not suffer it to bear the fate of other archeological specimens found in this region.

Syracuse, October 18th, 1869.

Peat Manufacture in Ohio.

According to a writer in "Putnam's Monthly," for November, the following is the method employed in the manufacture of Peat near Ravenna, Ohio:

"The peat is dug to a depth of from eight to fifteen feet with shovels and slanes, the latter being a kind of spade, with a wing at the side bent at right angles with the blade, so as to form two sides of a square, and loaded into dump cars which are drawn up an inclined plane upon iron rails by friction gearing, and the contents rapidly emptied into an immense hopper containing one hundred and fifty tuns of crude peat. At the bottom of the hopper is a large elevating belt, running over drums upon which the peat is thrown and rapidly carried into the condensing and molding machine. Two men are all that are required to keep the machine full. The condensing and manipulating machine is run by steam-power. It receives the crude peat from the elevating belt in a wet or moist state, and delivers it in a smooth, homogeneous condition, through ten oval-shaped dies, each 3¾ inches by 4¾ inches in area, from which it is delivered on drying racks, passing horizontally under the machine. Each rack is 26x72 inches, constructed of light pine, holding five bars or canes of peat, which, when dry, will yield, to each rack, from thirty to sixty pounds of fuel, according to the density of the peat. The racks are carried from the machine on an inclined tramway made of light friction wheels, so that the racks will almost glide from their own gravity. These racks are taken from the tramway and set up like an inverted V, on the drying ground, where, being exposed to the sun, and the air circulating freely around and between the bars, they dry in from ten to twelve days, and are ready to be loaded into cars for shipment and use. The distance between the legs or base of the V being the same as their length, the drying ground is greatly economized. An acre will hold about five thousand of these racks, from fifteen thousand to twenty thousand being a requisite complement for the machinery. Sixteen men and ten boys on the rackway will make eighty tuns of prepared fuel per diem—indeed, there is hardly a limit to the capacity of the machinery if labor enough is employed. With thirty-seven men digging and clearing off the racks from the tramway, one hundred and fifty tuns of dried fuel can be made per day. This fuel can be delivered at a less price than the best coal, and the cost of preparing it for market is lighter than that required in coal mining. It can be afforded as low as $4·50 per tun, and even lower, within a reasonable distance from the bogs, and it is more economical than coal.

"An analysis of the surface peat of this bog gives the following result: carbon, 68 per cent; oxygen, 18; water, 16; and ash 3·68 per cent. It also contains ammonia, acetate of lime, fixed and volatile oils. The deeper the peat found, the richer is it in carbon, and there are portions of the bog which will yield 70 to 75 per cent of carbon. The average amount of carbon, thus far ascertained by analysis of the various peat bogs of the United States, equals 50 per cent."

THE use of ornamental pyrographic woodwork is being revived in England. In the ordinary samples, the designs are burnt into veneers of sycamore or maple, and are supplied wholesale to builders, cabinet-makers and others, ready for laying in the ordinary manner; but, if preferred, the designs can be applied to the solid work, to insure greater durability. By the use of wood so ornamented all necessity for painting is, of course, avoided. It is inexpensive and worth looking to.

A VEIN of excellent coal has been discovered, extending along the line of the Kansas Pacific Railroad east of Denver. This discovery shows that the workable coal-beds of the Rocky Mountains extend miles eastward into the great plains, and is of the greatest importance both to settlers and to the railway company.

THE Union Pacific Railroad Company have commenced the erection of snow fences along the line of their road between Omaha and the Rocky Mountains.

Improved Traction upon Steel Rails and Steel-Headed Rails.

It has been too much the practice of railway managers to consider only the increased durability of steel. A less striking, but perhaps equally important advantage, is that it has double the strength and more than double the stiffness of iron. Some three years since, Mr. George Berkley made, in England, above 600 tests of the stiffness of steel and iron rails of equal section. The rails were supported on five feet bearings, and loaded with dead pressure at the middle. The first rails tried weighed sixty-eight pounds per yard, and loads respectively of twenty tuns and thirty tuns were applied. The average of 427 tests of the Ebbw Vale Co.'s and two other standard makers of iron rails, gave, with twenty tuns, a deflection of five-eighth inch and a permanent set of one-half inch. With thirty tuns the deflection was two and one-fifth inch and the permanent set two and one sixteenth inch. With Brown's steel rails, forty-five tests gave an average deflection of but five-sixteenth inch and a permanent set of one-eighth inch. With heavier rails and loads, the comparative stiffness of steel was still more marked. The great and constant resistence to traction, and the wear and tear of track wheels and running gear, due to the deflection of rails between the sleepers and the perpetual series of resulting concussions, may be much reduced, or practically avoided, by the use of rails of twice the ordinary stiffness; in such a case, however, reasonably good ballasting and sleepers would be essential. When a whole series of sleepers sinks bodily into the mud, the consideration of deflection between the sleepers is a premature refinement. If the weight of steel rails is decreased in proportion to their strength, these advantages of cheaper traction and maintenance will not, of course, be realized. The best practice here and abroad, is to use the same weight for steel as had been formerly employed for iron.

Many attempts have been made in England, on the Continent, and in this country, to produce a good steel-headed rail, and not without success. Puddled steel heads have all the structural defects of wrought iron, as they are not formed from a cast, and hence homogeneous mass, but are made by the wrought iron process, and are, in fact, a "high," steely wrought iron. They are, however, a great improvement upon ordinary iron, although probably little cheaper than cast steel heads. Rolling a plain cast steel slab upon an iron pile has not proved successful. The weld cannot be perfected, on so large a scale, and the steel peels off under the action of car wheels. Forming the steel slab with grooves, into which the iron would dovetail when the pile was rolled into a rail, has been quite successful. The greater part of some 500 tuns of such rails, made in this country, and put down where they would be severely tested, about four years ago, have outworn some three iron rails. Others failed in the iron stem, which was too light, after a shorter service. Rolling small bars of steel into the head of an iron pile has been recently commenced at various mills in this country and in England. No conclusions are yet warranted by the short trial of these rails.

There is a growing feeling among engineers and steel-makers that the compound rail, made wholly or partly of steel, will prove more safe and economical than any solid rail, and that the defects of the old compound iron rail, largely used in this State some years since, may be avoided, since these defects were chiefly due to the nature of the material. The experiments in this direction will be watched with great interest by railway managers, for if the same durability of track can be obtained with a steel cap as with an all steel rail, the first cost will be greatly decreased. A rail made in two or three continuous parts, breaking joints, is also a practical insurance against disaster from broken rails.—*State Engineer's Report on Railroads.*

Saline Solutions for Street Watering.

The Superintendent of street cleansing, etc., of Liverpool, has just issued his report to the Health Committee upon the trials made during the past season of Mr. Cooper's street watering salts. The main thoroughfare along Lord, Church, and Bold streets, chiefly macadamized, is considered to have afforded as severe a test as possible from the heavy traffic over it during the hottest period of summer. It is stated in the report that the use of these salts has been entirely successful, and beyond comparison superior to plain water. In practical results, two water carts with the weak solution were found equal to seven under the old system upon the macadamized road; but in paved streets one may be expected to do the work of five where the traffic is only ordinary. Financially, notwithstanding the saving of horses and carts, it appears that, at the price of £3 per tun hitherto charged for the salts, no economy can be effected; but then the supply has been so far in experimental quantities, and it should be stated that the patentee is now prepared to deliver in quantity at forty shillings. It is further considered that a reduction of 70 per cent would be effected in water wasted in the streets, and that there is the collateral advantage of the surface of the roadways being maintained in superior condition, a saving of 20 per cent in the cleansing being due to this effect. The system has also been tested in Greenock, and is reported upon equally favorably by Mr. Barr, C.E., the master of the works.

THE last trip of the *Pereire* from Havre to New York was performed in eight days and sixteen hours. If our memory serves us, this is the fastest trip on record.

A COMPANY of gentlemen are about erecting a large building in Hartford, Ct., for the accommodation of small families who do not wish to board under the present system, and yet cannot afford to keep house.

ON THE SUPPOSED ACTION OF LIGHT ON COMBUSTION.

BY CHARLES TOMLINSON, F.R.S., F.C.S.

The popular idea that "light puts out the fire," is so fixed, that probably no conclusions drawn from actual experiment are likely to disturb it, especially if they be averse to the notion. It is a matter of daily experience, people say, that, if the fire is nearly out, and you put a screen before it, or draw down the blind, or close the window shutters, it will immediately begin to revive. It is generally forgotten that a fire that looks dull, or "out," in a well-lighted room, will appear to be in tolerable condition in the same room when darkened. It only requires to be "put together" to make it burn up, and it might have been done so just as well in the light.

Experiments on this subject are not easy to make, on account of the many disturbing causes. In an old volume of the "Annals of Philosophy," is an account of some experiments by Dr. M'Keever, who took two portions of green wax taper, each weighing 10 grains, and ignited both at the same moment. One piece was placed in a dark room, at 67° Fah.; the other was exposed to broad sunshine, at 78° Fah.

In five minutes { The taper in sunshine lost........8½ grains.
" darkened room lost..9¼ "

The taper, divided into inches, was also burnt in the colored portions of the solar spectrum, when it was found that the time required to burn two inches of taper varied as follows:

	Minutes.	Seconds.
In the red ray it took..............	8	0
In the green it took........	8	20
In the violet it took........	8	39
In the verge of the violet...........	8	57

The conclusion is, that the solar rays, in proportion to their intensity, have the power of retarding, to a considerable extent, the process of combustion; and it is supposed that the chemical rays act, in some way, on the portion of oxygen about to combine with the fuel, so as to delay, if not prevent combination.

Supposing, in the experiments, the taper was so uniform, that one inch contained precisely the same quantity of matter as another inch, the time occupied in burning was too short to justify so important a conclusion as Dr. M'Keever arrived at, whether the results were taken by measure or by weight.

Every one engaged in photometrical observations must be aware of the difficulty of getting rid of disturbing causes and perplexing results. In comparing candles of the same make, the light is affected, both in quantity and economy, by a number of small circumstances, such as the warmth of the room, the existence of slight currents of air, the extent to which the wick curls over in burning, and so on. In testing the quality of gas, the standard candle defined by act of Parliament is a sperm candle of six to the pound, burning at the rate of 120 grains per hour. From such a standard we get the terms "twelve-candle gas," "fourteen-candle gas," etc.

Mr. Sugg, in his "Gas Manipulation," has pointed out some of the difficulties in obtaining a uniform standard candle. The wick does not always contain the same number of strands; they are not all twisted to the same degree of hardness; the so-called sperm may vary in composition—one candle containing a little more wax than another, or variable quantities of stearine or of paraffine; the candle may have been kept in store a long or a short time; the temperature of the store room may have varied considerably, and the temperature of the room in which it was burnt may have been high or low. All these circumstances affect the rate of combustion, and the illuminating power of candles, irrespective of the action of light, if such action really exist.

I have lately had a good opportunity of testing this action at the works of Price's Patent Candle Company, at Battersea. Under the direction of Mr. Hatcher, the accomplished chemist of the Company, the greatest possible care is taken to insure identity of composition and illuminating power in candles of the same name. There has lately been an extensive series of experiments on the photometrical value of sperm candles, during which, at my request, Mr. Hatcher was good enough to note the rate of combustion of such candles in a darkened room, and also in broad daylight, and even in sunshine.

In the first observation three hard and three soft candles were burned, each for four hours, in a dark closet. A similar set of candles, taken from one and the same filling, were burned during the same time, in open daylight, partly in sunlight. The average consumption per hour of each candle was as follows:

Sperm, in the dark....................134 grains
" " light....................141 "
No. 2 composites { In the dark...........133 "
" light..........140 "

It must be noticed that the temperature in the light was 72°, and in the dark 71°; moreover, in the light there was a much greater motion of the air than in the dark closet. Both these circumstances would operate in producing a larger consumption of candle.

In a second trial with No. 2 composites, the results were:

In the dark..........................140 grains
In the light..........................134 "

In a third trial, also with No. 2 composites, the results were:

In the dark..........................131 grains
In the light..........................129 "

In these two trials, the flames were protected, as far as possible, from currents of air; and, in a third trial, the temperature, both in the light and in the dark, was nearly equal.

The fourth trial was made on a bright, sunshiny day, with hard sperm candles, which are less affected by variations of temperature than the composites. The results were:

In the dark (temperature, 81°), 544 grains, or 136 grains per hour.
In the light (temperature, 84°), 567 grains, or 142 grains per hour, nearly.

It is evident that, in this case, the increase of temperature caused by the bright sunshine led to an increased consumption of material.

It will be seen that, in the first and fourth trials, there is a greater consumption of material in the light than in the dark; and in the second and third trials, the consumption is greater in the dark than in the light; but, in any case, the difference is so small—amounting only to from two to seven grains per hour—that it may fairly be referred to accidental circumstances, such as difference in temperature, in currents of air, and in the composition and make of the candles; the final conclusion to which I am led being that the direct light of the sun, or the diffused light of day, has no action on the rate of burning or in retarding the combustion of an ordinary candle.

Ammonia Powder.

The following account of a new explosive material appears in the "Kólnische Zeitung," May 19, which gives the "Militär-Wochen-blatt" as its authority: It is now some time since the proprietors of the Nora-Gyttorp Powder Mills obtained a patent in Sweden for the discovery of the so-called "ammonia powder," a substance which has hitherto been only employed in a few mining districts, but which otherwise seems wholly unknown. We are, therefore, fully justified in calling attention to the particular properties of this new explosive material. During the short time that it has been employed, it has won the approval not only of the proprietors of mines, but also of the working miners themselves. Its explosive force may be compared to that of nitro-glycerin, and, consequently, far surpasses that of dynamite. It cannot be exploded by a flame or by sparks, and the explosion is affected by a heavy blow from a hammer. Blast holes loaded with this powder are exploded by means of a powerful cap, or, better, by means of a cartridge containing common powder, for this forms a more reliable exploder. Miners who have been obliged to give up the use of nitro-glycerin, on account of the danger connected with this powerful explosive agent, have a most satisfactory substitute in the ammonia powder, as the danger of using it is so small that it surpasses in safety every other blasting material. One of the useful and important properties of this new powder is, that it does not require heating in cold weather, whilst nitro-glycerin and dynamite must first of all be warmed, and this has been the cause of many accidents. The price of ammonia powder is the same as that of dynamite. The same paper further adds: According to information we have received, ammonia powder was discovered by the chemist Norrbin. The German "Building News" contains extracts from a report of the Prussian architect Steenke, who makes the following remarks upon the safety of ammonia powder: Experiments were made by fastening a lamp to a pendulum, which was caused to oscillate; gunpowder, gun-cotton, nitro-glycerin, and dynamite all took fire as the flame passed over them, but the ammonia powder did not begin to burn till it had been touched by the flame twenty times. In making experiments upon the force of the blow required to explode it, it was found that, with the apparatus employed, where the fall of a weight from 4ft. to 5ft. would explode gunpowder, nitro-glycerin only required 1½ft. to 2ft., dynamite 2¾ft. to 3ft. fall, whilst a fall of from 12ft. to 15ft. was necessary to cause the explosion of the ammonia powder.

Varnish for Iron.

The following is a method given by M. Weiszkopf, of producing upon iron a durable black shining varnish: "Take oil of turpentine, add to it, drop by drop and while stirring, strong sulphuric acid until a sirupy precipitate is quite formed, and no more of it is produced on furthur addition of a drop of acid. The liquid is now repeatedly washed with water, every time refreshed after a good stirring, until the water does not exhibit any more acid reaction on being tested with blue litmus paper. The precipitate is next brought upon a cloth filter, and, after all the water has run off, the sirupy mass is fit for use. This thickish magma is painted over the iron with a brush; if it happens to be too stiff, it is previously diluted with some oil of turpentine. Immediately after the iron has been so painted, the paint is burnt in by a gentle heat, and, after cooling, the black surface is rubbed over with a piece of woollen stuff dipped in, and moistened with linseed oil. According to the author, this varnish is not a simple covering of the surface, but it is chemically combined with the metal, and does not, therefore, wear off or peel off, as other paints and varnishes do, from iron."

PORTLAND CEMENT.—We are in receipt of numerous inquiries relative to Portland cement, where it is made, whether it will make a good mill-dam, how it will answer for concrete pavements, what are all the details of mixing, etc., etc., and lastly, who makes and sells it in this country. We have already devoted considerable space to this subject. To answer all the inquiries put to us in regard to it, we should have to write a work equal in size to Reid's "Practical Treatise on Portland Cement," published by Henry Carey Baird, 406 Walnut St., Philadelphia. We recommend those desiring information to get this work, and those who are interested in the sale of this cement to advertise it in the SCIENTIFIC AMERICAN.

Improvement in Rotary Molding Cutters.

This machine is designed to cut all kinds of irregular, circular, or elliptic molding, for which kinds of work it possesses many advantages. These advantages will become apparent upon an examination of the accompanying engravings and a brief description of its construction.

The cutter, shown in Fig. 2, is made from a block of steel by first turning it on the outside to the form of the molding required. The inside is next turned out concave, as shown in the engraving, reducing the steel to the requisite thinness, then bored to fit the spindle. Portions are then cut from the outer part of the cup-shaped piece of steel formed by the outside and inside turning, leaving radial branches or segments, as shown in the engraving.

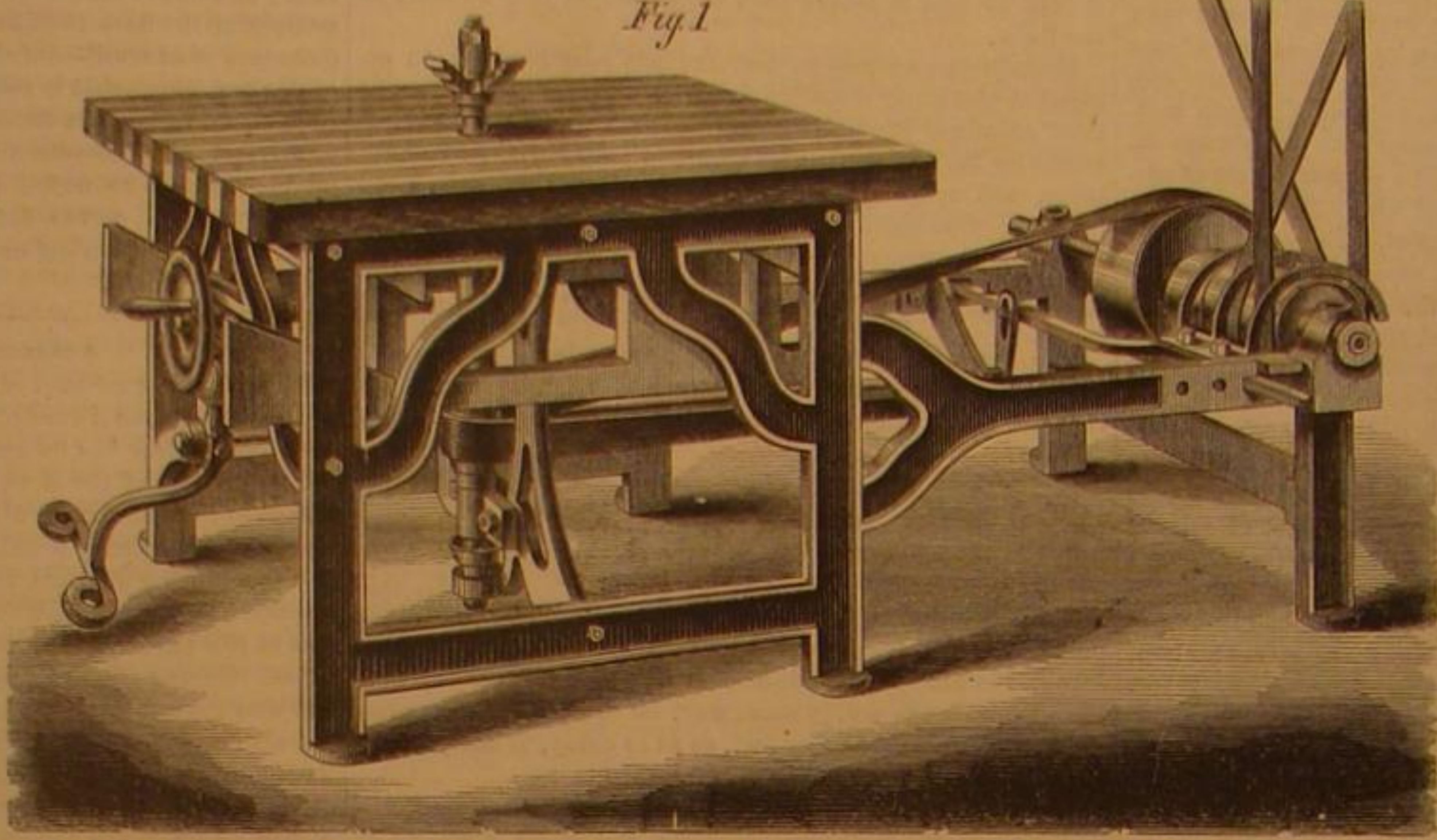
The cutter is secured to the spindle by a single nut turned down upon a collar which rests upon the flat portion of the interior of the cutter. It is shown thus attached in Fig. 1.

The advantages of this form of the cutter are, first, that the concave form of the interior affords ample space for the clearance of the cuttings; second, facility in sharpening, as an oil stone of the proper size and form may be readily applied; and third, the securing of thin beveled edges, whereby a much cleaner and smoother cut can be obtained.

The machine on which this cutter is placed, Fig. 1, is constructed as follows: The table is raised or lowered by parallel inclines operated by a hand-wheel and screw. By means of a straight and a cross belt, with fast and loose pulleys on the primary shaft of the machine, a right or left motion is given to the cutter at the will of the operator; the belt shipper being operated by a foot lever, as shown, attached to a longitudinal rock shaft, having at its opposite end a slotted arm, which moves the shipper.

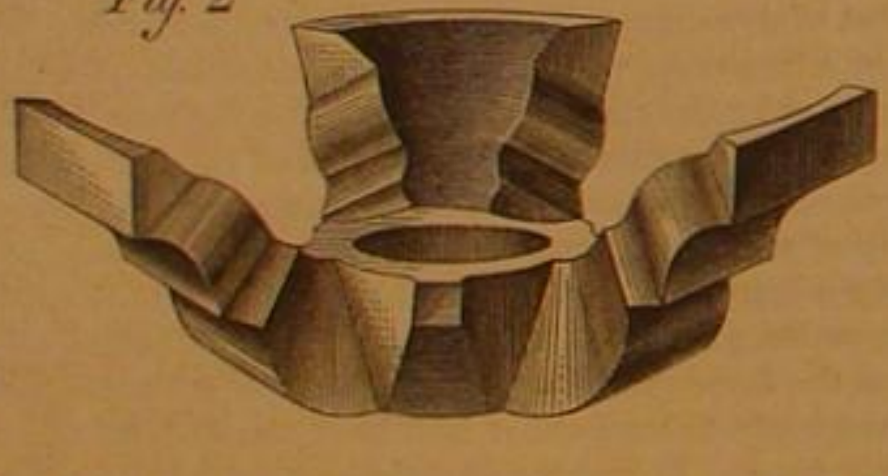
The advantages secured in this combination of machine and cutter are, first, the capability of running the cutter to the right or left by which the work is certain to match; second, the short time required to set the cutters; third, perfect freedom in moving the work on the table, as there is but one spindle; fourth, the sharpening of the cutters on the inside, by which the pattern remains unaltered; and fifth, working in a smaller radius than any other cutter.

Fig. 1



McKINLEY & MELLOR'S ROTARY MOLDING CUTTER AND MOLDING MACHINE.

Fig. 2



Those who have used these cutters state that they do the work smoother than any other cutter they have used, and we can ourselves testify to the beauty of moldings shown to us as the work of this machine. The machine is constructed in a neat, tasteful, and substantial manner, and cannot fail to do good work.

This machine, as we have described it, is covered by several patents, the property in which is now vested in the firm of Mellor & Orum, 448 North Twelfth street, Philadelphia, Pa., who may be addressed for further information.

The Hartford Steam Boiler Inspection and Insurance Company.

This Company makes the following report of inspections for the month of September:

Visits of inspection made, 357; boilers examined, 541; external examinations, 471; internal examinations, 176; number tested by hydraulic pressure, 67. The whole number of defects discovered are 512, only 29 of these, however, are regarded as especially dangerous.

These defects are as follows: Furnaces out of shape, 9; fractures in all, 212—5 dangerous. These fractures are usually the result of over-heating, and accumulation of deposit on the crown sheet. In one of the above cases, the tube sheet of an externally fired cylindrical boiler was in a very dangerous condition, and but for the timely examination of the inspector, might have been the cause of a serious accident. In other cases the fire sheets of boilers have been found covered with deposit, and, consequently, over-heated and badly fractured. These cases show the importance of frequently cleaning the fire sheets of boilers from all deposit and incrustation.

Burned plates, 23—1 dangerous; blistered plates, 35—6 dangerous; cases of incrustation, deposit, and scale, 74—4 dangerous; external corrosion, 34—4 dangerous; internal grooving, 7; water gages out of order, 20; blow-out apparatus out of order, 6; safety valves over-loaded, 31—4 dangerous (three of these last were corroded fast in their seats, showing that they had not been raised for some time, and being useless for the purpose intended); steam gages out of order, varying from 7 to 20 pounds, 44—3 dangerous; boilers without gages, 4; cases of deficiency of water, 4—2 dangerous; faulty bracing, 11.

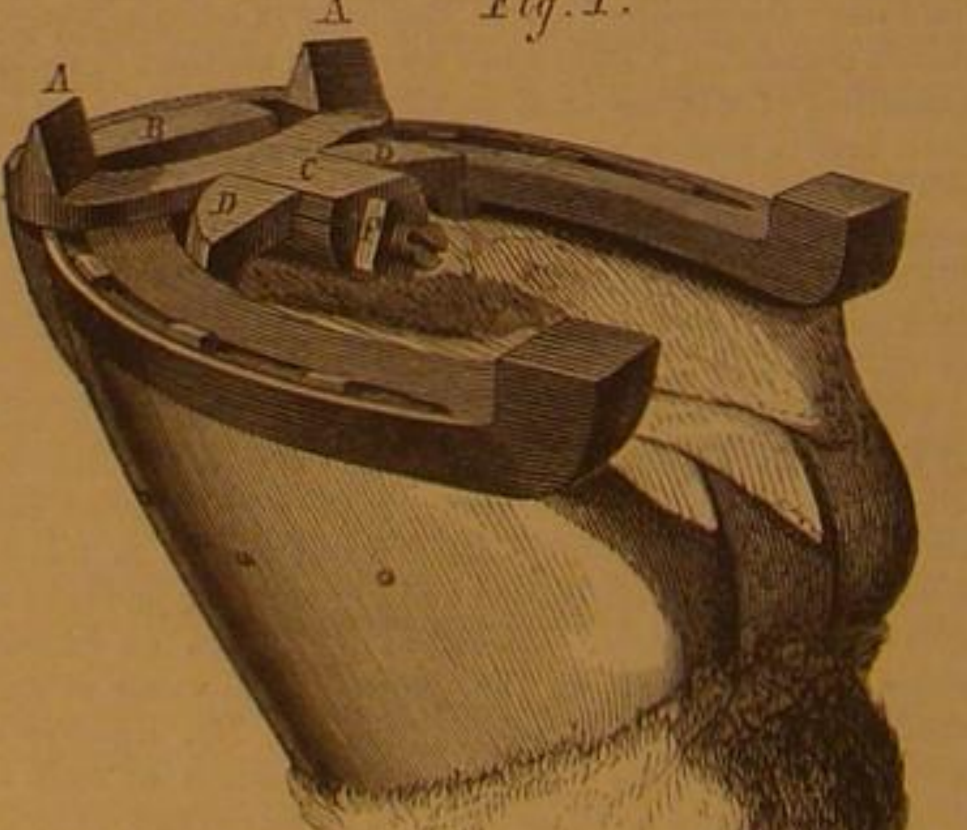
Relative to the mal-construction of boilers, we copy as follows from the report of L. E. Fletcher, Chief Engineer of the Manchester Steam User's Association. In commenting upon an explosion, he says: "The simple cause of the explosion was the mal-construction of the boiler. The manhole was not strengthened as it should have been, with a substantial cast-iron mouth-piece, through the neglect of which so many explosions have from time to time occurred. At present boiler makers can palm off on the public bad boilers, and steam users employ them with the certainty that when they explode with fatal consequences they will, by the help of a coroner and his jury, be publicly absolved from all responsibility and the event proclaimed to be accidental."

One of our inspectors writes us that he has examined a set of boilers which have been used for upward of thirty years, and although the water is in some respects bad, he regards them as in first-class condition. They have been under the care of a competent engineer for twenty-five years. This shows what careful management will do in prolonging the working age of boilers.

IMPROVEMENT IN DETACHABLE CALKS FOR HORSESHOES.

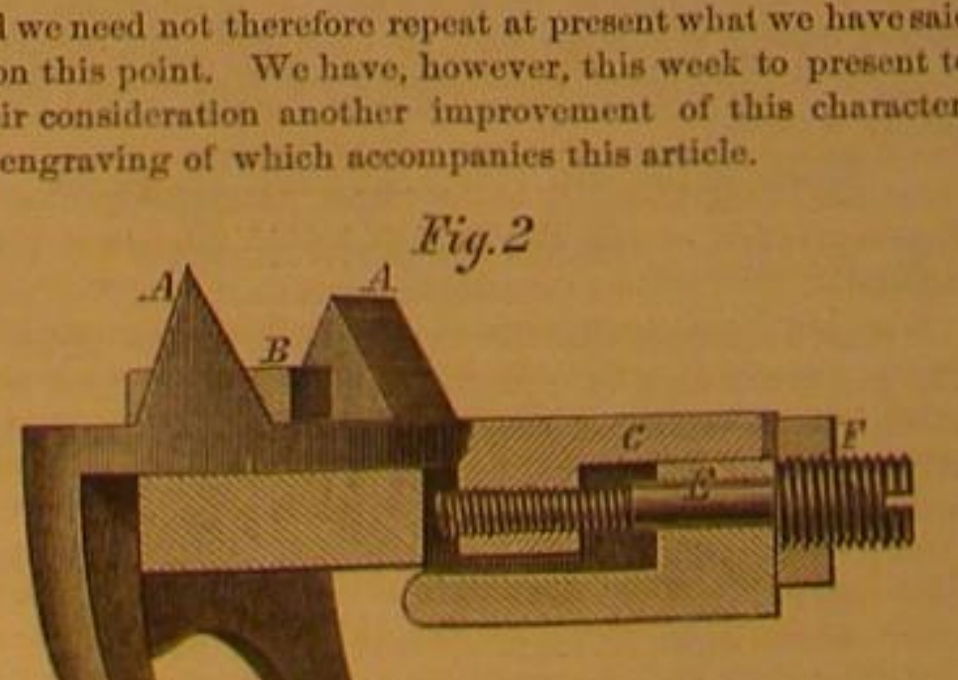
Our readers have several times had their attention called to the desirability of a good detachable calk for horseshoes.

Fig. 1.



and we need not therefore repeat at present what we have said upon this point. We have, however, this week to present to their consideration another improvement of this character, an engraving of which accompanies this article.

Fig. 2



The calks, A, may be formed upon a flat plate without any opening for the toe calk of the ordinary horseshoe, in which form they are made and used to some extent, but it is preferred to make the plate with an opening to admit the toe calk, B, as shown in the engraving.

A tongue, C, with beveled or dovetailed sides extends back a short distance from the calk plate. Upon this tongue slides a clasp, its two lateral wings, D, being dovetailed to fit C, and having its front edge made of the proper curve to fit the toe of the shoe. It also has on its under side a flange which fits under the horseshoe when the attachment is made. A screw, E, with a counter screw and nut, F, serves to draw and hold the flange of the clasp under the inner edge of the shoe. Two curved prongs, G, also rise from the front of the shoe and rest against the front of the hoof. To secure a uniform bearing, to obviate all rattling, and to protect the hoof, a rubber cushion may be inserted between the prongs, G, and the hoof.

The calk is easily attached or detached, and, being made of malleable cast iron, is very cheap. The calks, A, are case-hardened, and are placed so that their angles prevent side slipping. The attachment is made upon the strongest part of the hoof. It would seem that this calk must be useful wherever roads are icy, or whenever the toe calk on the shoe becomes worn.

Patented, May 18, 1869, by W. J. Berne, whom address for further information at Cincinnati, Ohio.

Telegraph Extension.

Schemes for constructing and laying submarine lines of telegraph from Europe to America are being promoted with a rapidity, which is marvelous, when the magnitude of the project is considered. We understand, says *Morgan's British Trade Journal*, that the Ocean Telegraph Company intends to lay a new line from the southwest of Ireland to Halifax, in Nova Scotia. A new submarine system is also to be constructed between Germany and America. A concession granted by the Chancellor of the North German Confederation to certain gentlemen interested in the scheme, provides for the landing of the cable at a suitable point of the North German sea coast, and also for the erection near the place of landing of all the appliances necessary for its working. The Chancellor reserves to himself the right of selecting a point at which the cable is to be landed and connected with the telegraph lines of North Germany. He, on the other hand, will make the arrangements necessary for guarding against the malicious destruction of the cable, and for protecting it against injuries from vessels or fishing boats. The incorporators may lay the line direct without touching any other territory than those of the two countries named, or *via* England and Newfoundland, to any point between New York and Boston. They have the option also of constructing a new cable, or of buying any submarine cable already existing which may be available for their purpose. If the latter alternative be adopted, the Chancellor reserves to himself the right, before the purchase of the cable or cables, to cause the same to be examined with a view to test the working capacity, as well as to consider the risks to which it or they may be subjected. He also reserves the right of refusing to allow the purchase. Those to whom the concession is granted, are permitted to enter into connection with the Indo-European Telegraph Company for the interchange of messages between America and Asia or Australia.

The Chancellor of the North German Confederation will promulgate the regulations regarding the transmission and exchange of cable telegrams. In order to secure connection between the new system and the telegraph lines of the interior, especially as concerns Hamburg, Bremen, and Berlin, provision will be made by the North German Bund.

Regarding the messages which will be transmitted from India *via* England to America, future arrangements must be made with the Indo-European Company. Though the telegraphic communication will be subject to the rules laid down in the International Telegraph Convention, made at Vienna in 1868, no higher rate will be charged than that adopted by the Transatlantic telegraph companies.

The construction of the cable, which, as may be conjectured, will be made after the most approved method, must, according to the conditions, be commenced within six months after the concession is granted, and the whole line must be completed within two years after the date referred to. The concession will become null and void if the working of the cable be interrupted for two years. The concession will expire after a lapse of twenty-five years unless it be resolved upon to make a new agreement.

Any differences of opinion between the Chancellor of the North German Bund and the incorporators will be decided by an arbitration of three judges, to be nominated for that purpose by the civil department of the Prussian Supreme Court. In Northern Germany it may be added that the telegraphs are under the control of the Government. The concession, therefore, substantially constitutes a treaty. It is expected that the *Great Eastern* will sail on or about the 10th of November with that part of the British Indian telegraphic system which is to be laid between Aden and Bombay.

It is probable that the newly designed floating telegraph stations round the coast will shortly be widely adopted, and several of them are being constructed at the present time.

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK

O. D. MUNN, S. H. WALES, A. E. BEACH.

☞ "The American News Company," Agents, 121 Nassau street, New York.

☞ "The New York News Company," 8 Spruce street.

☞ Messrs. Sampson, Low, Son & Marston, Crown Building, 188 Fleet st.; Tubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.

VOL. XXI., No. 19...[NEW SERIES.]...*Twenty-fourth Year.*

NEW YORK, SATURDAY, NOVEMBER 6, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

THE MEASUREMENT OF HEAT WITH THE THERMOMETER.

Two classes of instruments are employed for the measurement of heat, namely, thermometers and pyrometers. Thermometers are only employed to measure comparatively low temperatures, and we shall confine our remarks entirely to this class in the present article.

Modern physics having demonstrated that heat is merely a mode of motion in matter, the principles upon which its measurement depends are, perhaps, more difficult to understand than the false theory prevalent before the establishment of this doctrine. So long as heat was considered a substance, even though an imponderable one, it was not difficult to understand how its absorption into a body might definitely enlarge that body, as wood is enlarged by the absorption of water. Why a body becomes enlarged by the increased motion of its particles is more difficult of comprehension. If we, however, drop the consideration of the why in this case, and confine ourselves to the law or manner in which this expansion takes place, we may arrive at definite and practical results. It is, nevertheless, proper to state that the ultimatum which science has reached in regard to the reason for this expansion is, that heat is in some way opposed to cohesion. At present it is entirely futile to seek to go further than this. The fact, however, that such expansion takes place in both solids and liquids, and that it is, within certain limits, sufficiently uniform in certain substances to become a means of measuring the temperatures to which these substances are exposed, is the basis of thermometric measurement.

But another point must be distinctly borne in mind; thermometers only measure sensible heat. Thus one pound of steam at 212° Fah. contains heat enough to raise five and one half pounds of water to the same temperature, a fact easily demonstrated by experiment. It follows that the absolute or total number of heat units contained in any substance, must be determined by some other means than the thermometer, and that a degree on the thermometer cannot be considered a unit of heat. What then is a unit of heat? It has been agreed to consider the amount of heat necessary to raise one pound of water from 32° Fah. to 33° Fah. as a unit of heat, and although doubtless there are some small sources of error in the method, it is sufficiently accurate to regard the amount of heat necessary to raise one pound of water one degree, anywhere between 32° Fah. and 212° Fah. as a constant quantity.

It is also a correct inference that any particular substance in a uniform state, as regards the cohesive power of its particles, must exhibit the same temperature so long as it maintains that condition, since heat is the opposite force to cohesion. The more heat the less cohesion, and *vice versa.* Water, when passing from the liquid to the solid state, maintains such a uniformity of condition; its temperature may, therefore, be regarded as constant. It also maintains the same uniformity of condition while passing from the liquid state into steam at the boiling point. The freezing and boiling points of water may therefore be considered as the two prominent landmarks of temperature from which the amount of expansion of some uniformly, or nearly uniformly expanding substance, as mercury, immersed in water in the two conditions named, being noted on a scale, divisions may be arbitrarily made each way on the same scale, which will indicate temperatures above or below these points.

The Centigrade scale makes the hight of a mercury column immersed in freezing water, zero, and divides the distance between this point and the hight of the same column immersed in boiling water, into one hundred degrees, while the Fahrenheit scale makes the first named hight 32 degrees above zero, and divides the space between this hight and the hight at which the mercury stands in boiling water, into one hundred and eighty divisions, or degrees.

How it is possible to determine the amount of heat in any body from thermometric indication next claims our attention. The following law has been established. The *total amount* of heat in any body is the sum of its latent heat and its sensible heat. The latent heat is determined by the known capacity of the body under examination, at given temperatures to absorb heat, or, in other words, to render it latent. This term, latent heat, is not a good one, though we are still obliged to use it for want of a better. We use it only to distinguish the heat which, acting within a mass of matter, and expending its energy in antagonism to cohesive attraction, cannot be recognized by sensation, like the free or sensible heat. The latent, or specific heat of various bodies has been made the subject of careful study, and tables of reference have been constructed to afford a ready means of computation; but the specific heat of all bodies is changed by any cause which lessens or increases the distance between the particles which make up their mass. The compression of steam lessens its specific heat while it increases its temperature, and *vice versa.* The specific heat of steam, then, is only constant at *a constant pressure.*

It will now be seen that the total amount of heat contained in any body can be determined by the assistance of a thermometer, only when its specific heat for all temperatures has been predetermined. This has been done for many substances, including water and steam, to which the application of heat measurement is of the highest importance, as it is only by such measurement that questions of economy in steam generators can be settled. The amount of water evaporated from a constant temperature per pound of combustible consumed, under a constant pressure, being the only reliable test of the economy of a steam boiler. When the evaporation takes place at 212° the required uniformity of pressure and consequently of temperature is easily maintained, which would not be the case if an engine were driven by the steam generated, or if an attempt were made to produce the steam at a constant higher temperature. The temperature of the feed water may be easily maintained at a constant point, either at 212°, or at a lower temperature, and the amount of this water which a pound of fuel will convert into steam at 212° is an exact index of the power of the boiler to transmit heat through its shell into the contained water.

A NEW METHOD OF SETTING TIRES.

The old method of tire setting, as our readers are well aware, consists in first expanding the tires by heat and then allowing them to contract upon the wheels. In this way a powerful—sometimes too powerful—pressure is brought to bear upon the wheel, consolidating its parts and increasing what is known as the dish of the wheel.

A patent has been recently taken out in England for an entirely new method of setting tires without heat, which, while we are not prepared to admit the value claimed for it, is sufficiently ingenious to warrant some notice; and if on trial it should be found to answer the purpose, it will really be an important improvement.

The invention is based on the general principle that action and reaction are equal. In a wagon wheel the tire cannot exert any greater pressure upon the woodwork than the woodwork exerts upon the tire. If then, the woodwork can be contracted and permitted to expand against the interior of the tire, the same effect would be produced as is now obtained by the contraction of the tire.

If a wheel be laid flat, and supported only by a circular bearing on which the side of the rim rests, no other part being supported, and downward pressure be applied to the hub, a contraction of the rim will take place relatively to the dish given to the wheel by the pressure on the hub, provided the rim were so firmly attached to the spokes, and the spokes to the hub, that no withdrawal could take place.

As, however, the parts of a wheel are not so strongly attached to each other as to overcome the resistance of the rim to pressure, the method we are describing employs also external pressure upon the rim of the wheel, an hydraulic pump being employed to generate the required pressure.

As the pressure is applied and the wheel contracts, it is made to descend into a funnel-shaped support, so that when the external pressure is taken off of the rim, the pressure upon the hub, giving dish to the wheel, being still maintained, the contraction of the rim is kept up till the tire is placed around it.

The hub being next released from pressure, the elasticity of the woodwork carries the hub back to its normal position with reference to the other parts of the wheel, a general expansion takes place, and the tire becomes permanently set.

It is said that the method can be applied with great rapidity and that the results seem satisfactory. It can, within certain limits, be applied to wheels of different diameters, and with greater economy than the old method of heating, a saving in time and labor, as well as a total saving of fuel being secured.

Our readers will concede the ingenuity of the system, but will probably share our doubts in regard to its excellence; nevertheless, it may prove upon extended trial to be just the thing required. If so, it will be another demonstration, that even in those things long generally regarded a having reached the limit of impsovement, there is still scope for inventive genius.

THE EDUCATION OF THE HAND.

People, with a few unfortunate exceptions, have each two hands. We should not mention this fact, were it not that in the education of youths, only one seems to be generally considered. Children are told to hold their knives in the right hand when cutting their food, and when this necessary operation is completed, to lay it down and use their forks while eating, still employing the right hand. The only further instruction they receive in regard to the left hand, is to keep it clean in common with the right hand, and not to get into the habit of thrusting it into their pockets. They are taught that whenever one hand only is required, the preference is to be given to the right. Thus the left hand is, with the large majority of people, a comparatively useless member, employed only to supplement the other in all manual operations.

Without pausing to inquire into the origin of this senseless custom, it is sufficient for our purpose to say that it has no foundation in the anatomy of the hand, or in any natural peculiarity of the human mind. To the anatomist both hands are alike gifted by nature, and constitute most beautiful and complex machines. So much does the power and dominion of man over inferior animals, crude materials, and natural forces, depend upon the hand, that were it possible to deprive the human race of this important member, and put in its stead a mere paw, or a hoof, it might well be asserted that man would soon find a common level with the beasts, notwithstanding his superior intellect. This assertion, of course, does not admit the possibilty of using the foot as a substitute for the hand, which has been successfully done in several remarkable instances.

Should any one of our accomplished book-keepers, editors, or any other class of professional men, accustomed all his life to write with his right hand only, get that hand crushed by an accident on his way home some evening, the inconvenience, loss of time, and perhaps loss of lucrative position that would be likely to accrue before he could recover its use, or in case of its total loss, before he could acquire the art of writing with his left hand, would be a serious matter. Many a young man found the loss of the right hand a serious matter during the recent war, and many another has thanked God while submitting to the surgeon's knife, that it was only the left arm that had to be sacrificed.

As well might we teach children to hop about on the right foot, to keep the left eye closed, and to stop the left ear with cotton, as to teach them to magnify the value of the right hand at the expense of the left. Nor, in renouncing this absurdity, would it be necessary to violate existing social conventionalities. The fork may be held in the right hand when eating, and the knife may take its place in cutting food. These are small matters, observed only for conventional reasons. In driving on country roads we always turn out to the right, but on that account we do not consider a spavin on a horses left leg, any less serious than one on his right leg.

The first thing then to be considered in the education of the hand is the establishment of both hands on an equal footing. We may next pass to the consideration of its uses and structure.

The hand is essentially the organ of touch. Few people appreciate the vast amount of information we obtain through this one avenue to the mind; what subtile ideas of texture and quality in material, of comparative weight, of unseen motion and temperature, are obtained solely through the sense of touch. Fewer still appreciate to what an extent this sense can be educated. The blind substitute it for sight, and are enabled to gain ideas, and perform feats of manual skill through its exercise which are indeed surprising to those who see. Surgeons cultivate this sense till by laying a finger upon an artery throbbing under a stratum of overlying tissues, they can judge how deep to make the incision over it, without endangering the blood-vessels. Moreover, all very skillful surgeons use the knife in either hand with equal facility.

Such nicety of touch is essential in all very nice and delicate manipulations. And here let us note a fact first brought to our notice by a very skillful German watchmaker, to wit, that the practice of punishing children with the ratan or ferule on the hand, prevalent in many of our schools, must necessarily be detrimental to this sense. It was his custom when taking his children to school, to request the teacher to adopt some other mode of punishment than this barbarous method, explaining that as his children were to be bred to the art of watchmaking, it was essential that their delicacy of touch should remain unimpaired. While we do not intend to discuss here the much debated question of the necessity of corporal punishment, in the training of children, we will say that if such punishment is ever needed, nature seems to us to have provided for the emergency, and that no delicate nerves, muscles, and bones need be endangered in its administration.

We should extend this article too much, were we to attempt a minute analysis of the anatomy of the hand; but we assert that the most complete education and development of its powers can only be obtained through a perfect knowledge of its parts, and their offices. This fact has been appreciated by at least one of the authors of piano-forte methods now in use in the schools, and also by private music teachers; and in a long experience and observation upon this subject we have found that pupils progress much more rapidly both in music and penmanship, who are first prepared by a knowledge of the structure of the hand, and by special exercises calculated to develop the weaker muscles, and to render each independent of the others. In the education of the fingers, the first thing the instructor has to surmount, is not only natural but artificial inequalities in their strength and mobility. The fingers are not naturally of equal power, and the relative disability of the weaker ones is increased by the employment of the stronger, and disuse of the weaker ones. In the playing of musical instruments, it is necessary to eliminate inequalities of power, and render the fingers, as nearly as may be, of equal power, without weakening the naturally stronger ones. In other words, the weak fingers should at least be as relatively strong as is natural, while all ought to be much stronger than any would be without a thorough course of education.

It is a fact known to all good teachers that excellence in penmanship—ease and rapidity being assumed as indispensable elements of excellence—is only obtained by first securing a proper position for the hand and arm while holding the pen. All teachers must have observed how difficult of attainment a proper position is with the majority of pupils. One pupil finds it impossible to flex the thumb properly without aiding the feeble muscles, thus called almost for the first time into play, by gripping the pen as though it were to be pinched in two. Another braces the hand by sticking out the third and fourth fingers upon the paper, and almost drops the pen when he attempts to withdraw them; his muscles will not act independently. Others seem to have only the power to open and close the fingers all together, and clutch the pen as though it were a miniature club, with which the fair sheet before them is to be thrashed. Their efforts are absolutely painful to them, and are apt to be uncharitably looked upon by teachers. As well might they be expected to stand upon one foot with ease and comfort as to control the feeble, undisciplined, aching, and trembling muscles, upon which these new and extraordinary demands are made.

A common sense view of this subject suggests that long before the hand grasps a pen, or the fingers touch the keys of a piano, the weak muscles should be gradually strengthened by proper exercise; and while it is not our purpose to specify such a course of exercises, we suggest to those now engaged in promoting physical education in our schools, that they ought to prepare proper exercises designed to meet the requirements of the case. They might easily be adapted to music, and introduced into the schools, and could be practiced by even the youngest, while singing, or with the accompaniment of an instrument.

If proof were wanted of the generally deficient education of the hand, nothing better could be adduced than the fact that, notwithstanding writing is one of the most important and universal of manual operations, it is on the average perhaps the most imperfectly executed. There are many men who can peg shoes, or do fine sewing, or play a violin for many hours together; but there are comparatively few who can write many consecutive letters without great fatigue. On the contrary, the extent to which its powers can be developed is shown in the manipulations of jugglers, and in very many important mechanical operations.

The subject of physical education is now attracting universal attention, and its importance is generally admitted. It has, however, been too exclusively considered in its relation to health, and instruction has been confined principally to the development of the larger muscles of the body and increase of general strength. This is all right so far as it goes, but it ought not to be forgotten that in the emergencies of life the hand plays by far the most important part of all the members, and that to enlarge its powers, is to add directly to the resources of its possessor. If legs are lost, skillful hands can supply partial substitutes. If eyes are extinguished, the hand if educated can still supply the physical necessities of the blind. If hearing fails, the hands replace spoken language by an inferior but intelligible language of signs, but if the hands are lost what can in any measure compensate for this overwhelming calamity? The feet can only in a measure take the place of hands after many years of practice, and immunity from the severe labor of walking; and it is very doubtful whether any adult could ever succeed in making toes do the work of fingers, although children born without arms have been known to do so.

What excuse can there be then, for neglecting the early and careful instruction of *both* hands. We are not speaking of an impracticable thing when we say it is possible to rear children so that whatever one hand can do the other may do equally well. We know this has been accomplished in many notable instances, where the disability of the left hand has been rectified, in spite of all obstacles arising from bad habits acquired in childhood. We have seen surgeons transfer an instrument from one hand to the other during an operation whenever convenience required it, without the least awkwardness. We have seen draftsmen using both hands in coloring drawings, an immense advantage both to rapidity of work and eveness of shading. We have seen woodmen chop timber "right or left handed," and one carpenter who used a hammer or saw with either hand with nearly equal facility. In all these cases, the use of the left hand in common with the right gave very much greater efficiency.

We have seen many instances of children whose parents were foreigners, growing up among children of American birth, and speaking the language of their parents, or of their playmates with equal facility, and we are confident that the two languages are acquired in such cases as easily as one would be. The same ease would undoubtedly attend the learning to use either hand for all necessary manipulations, so that no fear that both would become awkward need be apprehended.

Thus the resources of those dependent upon manual labor for subsistence would be nearly doubled, much time and expense would be saved in the acquirement of arts specially requiring the employment of the left band, and the superior grace and dignity attending complete and symmetrical development would be in a much larger measure attained.

Much more might be said in regard to the education of the hand, but as this article is only intended to arouse the attention of thinking people to a radical defect in physical education, we may appropriately close our remarks with the following quotation from that admirable poem "The Hand and its Work," by Mrs. Hale.

"All wants that from our nature rise,
Life's common cares, the hand supplies
It tends and clothes our myriad race,
And forms for each a resting place;
And ceaseless ministry doth keep
From cradle dream to coffin sleep."

DEPRESSION IN AMERICAN COMMERCE.

The present depression and decline in American commerce has had few parallels. So marked has this depression become, that scarcely any investment can be made with a leaner promise of profit than a purchase of shipping. Under this state of affairs a special Congress committee are engaged in trying to discover the causes for the decline, and if possible to apply a remedy.

To this end a session was held by the committee in New York, ending Saturday the 16th October, in which a number of gentlemen, prominent in commercial circles, were examined.

The general causes of the existing depression as elicited from these gentlemen, may be enumerated as follows:

First, high prices of labor and materials.

Second, depreciation in our currency.

Third, increased cost of sailing our vessels after they are built, consequent upon injudicious taxation, as well as high prices.

Fourth, the subsidizing policy of England which gives her commerce great advantages not enjoyed by our shipowners.

Fifth, the substitution of iron and steel vessels, in the building of which we cannot, under existing circumstances, compete with England.

Sixth, the high duties on shipbuilding materials.

In relation to the first four causes enumerated we cannot do better than to quote from the testimony of Mr. A. A. Low:

"Most of our laws are framed with a view to protect our various industries, but the laws which generally protect our interests bear pretty heavy upon this special interest. They are really a burden upon our shipping interest."

"By the Chairman.—We would like to have you give your views on the causes that have operated to produce this effect upon our commerce." "We have high-priced labor and material which enter into the construction of a ship, and we have a depreciated currency. We have the increased cost of the ship in the first instance and also the increased cost of sailing the ship after she is built. I think the American shipping interest had suffered before the war. The California trade had caused the building of high-priced ships, and in large numbers, and the traffic in that direction soon proved unremunerative. The war came on, and the privateers burned our vessels. Insurance could not be obtained, and these combined drove our commerce from the ocean. My own belief is that the policy of England in subsidizing lines of steamers to various ports of the world, has given her a prestige almost insuperable.

"We have just now one important steam line, and its property has been greatly injured since the completion of the Pacific Railroad. We have given $60,000,000 to a railroad, together with lands, and, out of all support from the Pacific Mail lines, I suppose we have suffered an injury of six or eight millions of dollars.

"The capital of the line two years ago was $20,000,000; now it is $6,000,000. It would have been just as good now if it had not been that Congress had given money to the railroad. There does not seem to be a law on the statute book that does not seem to inflict an injury. Then the policy of England is perfect. They are a nation of large supplies; they have manufactories in abundance to supply the distant markets; their colonial policy is excellent, and all their laws are in the interests of commerce. Our opportunities here for the employment of commerce are so great that our Legislature has not given them that advantage. I think they have acted wisely in subsidizing their lines. It is easier to tell the causes of the depression than to find the remedy. If subsidies could be given to ocean iron steamers, it would be an offset to the extra cost of building them. My own impression has been that large subsidies should be given. These subsidies, while they cost the Government largely in the beginning, cost nothing in the end."

Mr. Low also explained that the English Government allow all their steamers to receive their supplies from bonded warehouses, while American shipowners are obliged to pay duties on their supplies.

Mr. George Opdyke, ex-Mayor of New York city, a gentleman of acknowledged ability on all subjects connected with political economy, gave more prominence to the fifth and sixth causes above specified, but dwelt mainly upon the depreciation of our currency. He maintained that everything is about 75 per cent higher than under the old currency. The American shipbuilder has, therefore, to pay a difference of 75 per cent over the foreign shipbuilder. He thought it would be very many years before we can build ships of iron as cheaply as they can be built in Europe. As long as protection is the policy in this country we cannot expect them to make an exception in this regard. If we should adopt the policy of free trade, shipbuilding would increase. Subsidizing is another remedy. While he was opposed to all government subsidies, it would seem essential that we should try to control commerce, and that, to some extent, our Government should follow the policy of Great Britain. How far that policy should go, he was not prepared to say. He was opposed to it altogether, but from the present crippled condition of our commerce we desire to regain the position that we once held, and he believed that it would be judicious for the Government in proper cases where lines are established between this and other important countries, to meet Great Britain with her own weapons.

The question arises, Can these causes be removed without great and permanent injury to other industries? We believe they can. A sound protective policy does not merely imply indiscriminate imposition of duties; and if the burdens of shipowners are too great they should be lessened. Subsidies and drawbacks are protection in the most ultra meaning of the term. Permission to take supplies from bonded warehouses is only another form of protection. England protects her commerce; always has protected it. Let us now protect ours by the same means she employs, and, as Mr. Opdyke recommends, turn her own weapons against her.

CLOSE OF THE FAIR OF THE AMERICAN INSTITUTE.

It is officially announced that the Fair of the American Institute will positively close on the 30th of October.

The managers may congratulate themselves upon the success of the exhibition. It has been well attended, and has generally, we believe, satisfied both exhibitors and visitors.

A common remark of narrow-minded people is, that such exhibitions are mere advertising dodges, got up for the special benefit of the exhibitors, that there is really very little that is new exhibited, and that it does not pay to visit them. Yet these same narrow-minded people are to be found annually in attendance at such displays, finding, it is to be supposed, sufficient pleasure in grumbling to compensate for a trifling expenditure of money and time.

There is very little novelty to be expected in any such display in proportion to the large number of things exhibited. The world never gets on so fast as to satisfy those to whom it owes nothing. No class of men work harder to benefit their fellows than inventors, and yet those croakers who never had an original idea in their brains, and never would have should they live to the world's end, find fault at the slowness of mechanical progress.

These people will spend an evening strolling up Broadway, gazing in at the shop windows at the beautiful things displayed, and never think of finding fault that these things are placed in the windows to advertise them; yet, at one of these fairs where a collection of curious, instructive, and beautiful articles and machines is brought together, such as they could not see in a week of strolling and gaping at windows, they make complaint because the exhibitors are likely to reap some pecuniary benefit. Of course they are; and if you who grumble object to this sort of thing, you are welcome to stay away, a thing which you cannot do, for it is a characteristic of such people to be found in every place where their growling can mar the pleasure of others.

For ourselves, we are satisfied to see the gradual improvement made in old and standard manufactures, and do not complain that it is only now and then anything meets our eye that can be called a "novelty." It is this gradual improvement that makes up the bulk of human progress.

We have, in our notices of various departments, already called attention to the most noteworthy improvements exhibited. We have, doubtless, overlooked some, although it was our intention to treat impartially all exhibitors of important improvements. Some of the departments not calculated to greatly interest our readers, we have not specially mentioned at all. Those, however, who have followed us in our weekly notices will own that we have dealt very liberally indeed with exhibitors, and we have received ample assurances that the exhibitors themselves so regard it.

We shall now discontinue these notices, with the hope that the future exhibitions of the American Institute may be as successful as this has been, and with the heartiest wishes for the success of such of the exhibitors as are endeavoring through the facilities thus afforded, to introduce new inventions. Many of these will date the commencement of success from the Exhibition of the American Institute for 1869.

A Perilous Balloon Voyage.

The Saginaw (Michigan), *Enterprise*, relates the story of one of the most perilous balloon voyages on record. Professor La Mountain was the only occupant of the balloon, which ascended from Bay City on the afternoon of the 12th instant. The balloon had leaked badly, and his companion was obliged to get out of the car, when those who held the balloon let go suddenly, and the air vessel passed upward with dreadful velocity, without either ballast, instruments, food, or companion. In a few minutes the balloon had attained an altitude of two miles, and was driven by a very strong gale directly towards the lake. It passed into a snow cloud, which speedily coated it and everything in and about it. The escape valve was frozen tight, and Professor La Mountain, in pulling with all his might to open it, drew out the rope and thus cut off another means of escape. The balloon still passed upward, and emerged into the clear cold air above. The involuntary traveler felt that something must be done, and quickly. He climbed the ropes above the hoop and felt for his knife, but he had left it below. Clinging with one hand to the ropes, he tore with his other hand and his teeth a hole in the side of the balloon. Passing to the other side he repeated the process and then returned quickly to the car. His fingers had been frozen while thus exposed. He heard the cloth tear and saw the rent open from the bottom to the top. The balloon had gradually slackened its upward progress, rested a moment in equilibrium, and then began to descend, slowly at first and then with a velocity more frightful than that of the ascent. At the hight of two miles from the ground the gas had completely left the balloon, but the air had rushed in and made it a sort of parachute. Professor La Mountain was in a half unconscious state during the descent, although he remembers passing through the cloud, less distinctly the sensation on seeing and nearing the earth, and then he became wholly unconscious. When his senses returned he was lying in a wood, and several persons had come to his assistance, having seen him fall. He had been stunned and severely bruised, but had broken no bones, and suffered no internal injury. The spot where he landed was seven miles from Bay City ; the time he had been in the air is not stated.

Bells and Carillons, or Continental Chimes.

Mr. Thomas Walesby communicates to the *Builder* an interesting article on bells. He says :

"Our great musical historian, Dr. Charles Burney, in his interesting work, 'The present State of Music in Germany, the Netherlands,' etc. London, 1773, speaking of his visit to Courtray, says :

"'It was in this town that I first perceived the passion for *carillons*, or chimes, which is so prevalent throughout the Netherlands. I happened to arrive at eleven o'clock, and half an hour after the chimes played a great number of cheerful tunes, in different keys, which awakened my curiosity for this species of music so much, that, when I came to Ghent, I determined to inform myself, in a particular manner, concerning the *carillon* science. For this purpose I mounted the town belfry, from whence I had a full view, not only of the city of Ghent, but could examine the mechanism of the chimes, as far as they are played by clock-work, and likewise see the *carillonneur* perform with a kind of keys, communicating with the bells, as those of the harpsichord and organ do with strings and pipes. * * * * * * The great convenience of this kind of music is, that it entertains the inhabitants of a whole town without giving them the trouble of going to any particular spot to hear it.'

"So far so good. The respected author then goes on to say—

"'But the want of something to stop the vibration of each bell, at the pleasure of the player, like the valves of an organ, is an intolerable defect to a cultivated ear ; for by the notes of one passage perpetually running into another, everything is rendered so inarticulate and confused, as to occasion a very disagreeable jargon.'

"Now, having myself examined the bells and mechanism —*cylindre et clavier*—of the most celebrated *carillons* in Europe, and repeatedly listened to their music at various distances, I beg to assert most distinctly that the statement made by the learned doctor in the last paragraph is false. I deny that 'everything is rendered inarticulate and confused,' or disagreeable. On this point I speak the more plainly, because almost every Englishman who has written a line about *carillons* since 1773, has followed Burney's dictum, and told us that the great defect is the want of a damper to each bell. Several examples relating to Boston and other chimes have been contributed to public journals since Christmas last.

"Perhaps the following observations may suggest what led the Doctor to entertain and publish the notion just mentioned :

"Every musician worthy of the name knows that instruments strung with wire 'which have nothing to stop the sounding-strings, make an intolerable jangle to one that stands near,' as, I may add, bells do to one that is *in the bell chamber*, and hears the continuing sound of dissonant tones. Such an instrument of the wire-string kind is the dulcimer. But the piano-forte has a simple contrivance—a damper—for stopping the vibrations of the strings when the fingers are lifted from the keys.

"If, then, instead of going to a spot at some convenient distance from the tower, as he ought to have done, with a view to 'inform himself in a *particular* manner' concerning *carillon music*, Dr. Burney stood *in the bell chamber* during a performance, the effect must indeed have been intolerable to a cultivated ear.

"I maintain, however, that musical bells suspended in a tower, require no damper whatever ; for, when their sounds have issued from the openings in the sides of the building, they spread themselves in the air, and ultimately reach the auditor with precision in subdued and pleasing tones. Even rapid passages in *carillon* music, if properly harmonized so as not to weaken or confuse the melody, and executed by, or upon, a good instrument, produce an admirable effect.

"It would be well if the vibrations of many noisy and discordant things called bells were completely stopped. But to say that musical tower bells require dampers in order to produce the desired effect is truly absurd. It is equal to any of the 'moonshine' on bells in general with which we have been favored during the last fourteen years."

Convenient Method of Ascertaining the Constitution of Flames.

M. Dufour recommends the following process for demonstrating, for instance, that the flame of a candle is formed of a hollow cone, luminous on the outside only, and dark in the interior. For this purpose it is necessary to cut the flame ; the most preferable method of doing this is by means of a sheet of water or air. The arrangement is as follows: A caoutchouc tube has, at one of its extremities, a gas jet, such as is used for common gas flames ; this jet has an almost semicircular slit of 0·4m.m. in depth. The other end of the tube communicates with a reservoir of water placed at a convenient hight. Upon a suitable pressure, the water flows out by the slit in the jet, producing a clear sheet, capable of preserving for a sufficient length of time, an invariable form and size. The slit is placed in such a manner that the sheet presents a horizontal surface ; and this will easily cut the flame of a candle, showing a perfect section. The hot gases and carbonaceous particles are carried off by the water. On placing the eye above the hollow cone, the luminous wall, etc., can be distinctly seen. Sections may easily be made near the wick or near the point ; nothing hinders observation, which may be prolonged at pleasure, and a lens may be used if desired. A flame of gas may be cut and examined in the same manner, but the current of gas must not be strong enough to traverse the sheet of water. If a current of air be caused to come out of the slit by bellows, an invisible sheet of air is formed which is, also, very convenient for making a section of flame. Close observation is quite possible ; for the aërial current prevents the heated gases from reaching the eyes, and a lens may be used, as in the former case. The flame forms a cone, whose luminous walls are extremely thin, and their interior can be plainly seen. A platinum wire may be introduced across the section ; and on being plunged as far as the wick, it will remain unreddened in the dark interior of the cone.

A jet of gas issuing from a circular opening, of from 1 to 2m.m. in diameter, may also be cut very conveniently by the sheet of air. It will be seen to consist of a cone whose walls are brilliant and extremely thin. Upon bringing the sheet of air close to the aperture whence the gas escapes, the flame will be divided at its base and will reappear a little higher. By this means, the entire length of the luminous cone, its thin walls, and their interior may be examined.

If a jet of gas produced by a fan-tail burner be cut, the luminous fan will be found to consist of two brilliant blades, between which there is a narrow obscure space. The blades are at a greater distance apart, and the dark space is wider towards the end of the fan-tails ; and, by assuming a suitable position, it is easy to see through the section of flame into the dark space which separates the brilliant walls, and at the end of this will be seen the slit by which the gas escapes.

Instead of throwing the sheet of air perpendicularly to the flame, M. Dufour thinks it better to throw it partly on one side, on such a plane as to make a slight angle with the axis of the conical flame, or with the plane of the fan shaped flame. A lateral suction is then produced by the influence of the current, which draws the flame, and inclines it against the sheet of air, by which it is cut. By placing the sheet of air on a more or less inclined plane, and approaching or removing it from the base of the flame, the section is easily made at points more or less distant from that base.

The method described above may, of course, be applied to any kind of flame. M. Dufour suggests that it might be of service in the chemical analysis of flames. When a flame is cut by a sheet of water, the water draws off the gases of which it is composed. If the section be made with a sheet of air, it will be easy, by placing suction pipes through the length, and ending at fixed points in the interior of the cone, to collect the gases whose composition is desired to be ascertained. —*Les Mondes.*

The Mound Builders in the Rocky Mountains.

An account was recently given of the opening of an ancient mound in Southern Utah, similar to those of the Mississippi Valley, in which were found relics of the unknown builders indicating much artistic skill. It was stated that this was the first evidence found of the existence of the Mound Builders west of the Rocky Mountains. We are now able to announce, for the first time, as we suppose, the discovery of similar mounds, evidently built by the same race, high up on the Rocky Mountains. The discovery was made by Mr. C. A. Deane, of Denver, while at work on a Government survey, in the mountains, a few weeks since. He found upon the extreme summit of the snowy range, structures of stone evidently of ancient origin, and hitherto unknow or unnoticed. Opposite to and also north of the head of South Boulder Creek, and on the summit of the range, Mr. Deane and his party observed large numbers of the granite rocks, many of them as large as two men could lift, in a position that could not have been the result of chance. They had evidently been placed upright in a line, conforming to the general contour of the dividing ridge, and frequently extending in an unbroken line for one or two hundred yards. Many of the stones have fallen over or are leaning, while others retain their upright position. In two places, connected with this line, are mounds of stone, loosely laid up, about two feet in hight, and embracing a circular area of about ten feet in diameter. The stones were evidently collected on the spot, as the surface is cleared for a space of several yards around the structures. These lines and mounds of stone bear every mark of extreme antiquity, as the disintegrated granite has accumulated to a considerable depth at their base, and the rocks in the mounds are moss-grown. The feature, more particularly identifying these structures with those of the Mound Builders elsewhere, is that they present, at intervals, projections pointing to the westward. We are thus particular in the description of these Rocky Mountain mounds which are extraordinary in position if not in character, in the hope that antiquarians, visiting our Territory, may be induced to examine them. It would not involve much labor to open them and possibly they cover relics that may add something to our small stock of knowledge of the ancient race who constructed these and similar works all over the continent. The walls and mounds are situated 3,000 feet above the timber line. It is, therefore, hardly supposable that they were built for altars of sacrifice. They were not large enough for shelter or defense. The more probable supposition is, that like the larger mounds elsewhere, they were places of sepulture, and perhaps, also, at the same time, historical memorials, pointing, with their stone fingers, in the direction of the country from which the builders, or their ancestors, migrated. The three mounds may mark the resting places of those who, for some distinction, were buried as near to heaven as possible.—*Rocky Mountain News.*

Steam Plowing.

We learn from the *Engineer* that a highly interesting test of steam apparatus for cultivating and plowing the soil was carried out recently at Eye, near Peterborough, England. The object on this occasion was two-fold, viz., to introduce an improved self-acting anchor for using with the round-about system, and to show what could be done with more powerful machinery and direct action by the use of two engines. The latter system was exhibited by Messrs. Fowler and Co., of Leeds.

The new application referred to was invented by Mr. Champion, a practical farmer near Shalding. It consists in what we may term a self-acting anchor. The form of the invention is simply a cross-bar in which are fixed spikes or claws for entering the ground. There are two or three spikes fastened by clasps on each side of the square iron bar, according as the soil may be, hard or soft, and more or less resistance is required. The iron bar which carries these spikes is placed across the back part of Messrs. Fowler and Co.'s disk anchor and outside the frame, attached to the revolving bar, is a ratchet with four catches, into which falls the stop notch of a lever. The distance, therefore, which the anchor advances depends on the square and the length of the spikes and the size of the ratchet. The one shown at work on this occasion was so constructed that the anchor advanced three feet each time the lever was raised, and the ratchet turned round one fourth of its circle or side. When a plow or digger, however, has four breasts or "diggers" on it, and more than three feet of work is done at a drag, the anchor does not advance sufficiently far if the ratchet is allowed to turn only one fourth round. Every three or four drags, therefore, which the plow takes, it is allowed to turn half round, which keeps it in the right position for a direct action of the rope. But this is a matter of minor detail.

The result of this application is, the claw anchors, which required a man at each end to shift and keep in their place, are entirely dispensed with, and three men and two boys, viz., one man at the engine, one at the windlass, and one on the plow, with the two boys at the rope-porters, can now do the work more easily than the five men and two boys previously required, could do. An important difference in the cost on first outlay is also the result of this system.

The anchor is undoubtedly the most simple and efficient that has yet been introduced. It will bear a strain of 20-horse power, and it has never been turned over ; while in hard ground the claw anchors are difficult to insert, and in soft ground it is next to impossible to keep them in a proper position.

In this method of plowing, clip-drum engines are placed at each end of the field, and the gang of plows is drawn backward and forward by a wire rope. Results, therefore, need only now be given. Here almost a revolution is just now occurring. The small 10-horse engines are being replaced by 30-horse engines, and for the superior work and greater economy of this increased power it has been satisfactorily calculated that 50-horse engines will be even more efficient. By 30-horse engines and thirteen-tined cultivators an average of thirty-six acres per day has been accomplished, the cost of which is actually 2s. 6d. per acre. The calculation mentioned with regard to the 50-horse engines is that the cost can thereby be reduced to 1s. 6d. or 1s. per acre at a depth of 10 inches.

The practical experience which has led to these conclusions has occurred at Buscote Park, Berks. Mr. Campbell has there worked since harvest the 30-horse engines, weighing twenty-eight tuns each, which we saw at the royal meeting at Manchester. He has done between two thousand and three thousand acres at the actual cost named—2s. 6d. per acre—his land being of the strongest and heaviest kind. The rate at which he works is from three and a half to four miles per hour, at which pace from three to four acres are broken up in the same time. The increased efficiency, too, of the work done by this greater power is greatly due to the increased pace which it permits, for not only is the soil smashed up, but it is shattered at the same time.

The work done with the 10-horse engine and cultivator was perfection itself. Nothing could be better at the depth of 10 inches. Between 7 A. M. and 2·30 P. M. eighteen acres were done in the way described.

APPLICATIONS FOR EXTENSION OF PATENTS.

MACHINE FOR HEADING BOLTS.—William S. Booth, of New Britain, Conn administrator of the estate of H. M. Clark, deceased, has petitioned for an extension of the above patent. Day of hearing, December 29, 1869.

MEANS FOR REGULATING AND WORKING STEAM VALVES AS CUT-OFFS.—Charles H. Brown and Charles Burleigh, of Fitchburg, Mass., have applied for an extension of the above patent. Day of hearing December 29, 1869.

MAKING CLOTHES PINS.—Ephraim Parker, of Marlow, N.H., has petitioned for the extension of the above patent. Day of hearing, December 29, 1869.

LUBRICATOR.—William Gee, of New York city, has applied for an extension of the above patent. Day of hearing, January 24, 1870.

SPREADING ROLLERS FOR STRETCHING CLOTH.—Jonathan I. Hillard, of Fall River, Mass., has applied for an extension of the above patent. Day of hearing March 28, 1870.

SHINGLE MACHINE.—Edward Hedley, of Philadelphia, Pa., has applied for an extension of the above patent. Day of hearing May 3, 1870.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

During the week ending October 17, over 1,100 passengers arrived in California by the Central Pacific Railroad.

The London house painters held a meeting recently, for the purpose of forming a society of workmen to promote technical education in connection with house painting and decoration.

It is said that the railroad connecting the Hudson River railroad at Spuyten Duyvil with the Harlem Railroad, and the new Union depot to be built on Fourth avenue, will be begun this fall.

The citizens of Louisville, Ky., have voted on a proposition to subscribe $500,000 in aid of the projected Louisville, New Albany, and St. Louis air-line railroad. The motion was carried by a majority of about 500.

The extent of omnibus travel in Paris may be judged from the fact that, during the year 1868, the number of persons carried in omnibuses amounted to 120,000,000, or nearly sixty-five times the population of that city.

Russia has established at Warsaw a mechanical school for women, with the object of training them in all kinds of handicraft that may be pursued without injury to health. The school is to be under the immediate supervision of the government.

It has been discovered by careful experiments in Charleston that the weight of a bale of cotton varies slightly with the temperature. A fall of ten degrees in the thermometer causes a bale of cotton to gain about a pound and a half in weight.

The San Francisco papers say that the first article of tinware manufactured from tin mined in the United States has just been completed in that city. It is a case to contain the Pioneers' certificate of honorary membership presented to the Hon. Wm. H. Seward.

The Austrian Lloyds Steam Navigation Company's fleet, at the end of 1868, consisted of 69 steam vessels of an aggregate tunnage of 62,220, and of 15,800 horse power, and at the present time the total number of vessels has been increased to 73, with a tunnage of 70,000.

The car shops of the Lake Shore Railroad were destroyed by fire on the 17th of October. Passenger and freight cars, lumber, car material, and tools were entirely destroyed. The loss is over $300,000; fully insured. One hundred and fifty workmen were thrown out of employment.

The *Ironmonger* suggests the desirability of constructing trains almost wholly of iron. They might be so constructed of this material as to offer greater resistance in case of collision without materially increasing their weight, while the danger from fire would be almost nil. Durability and economy are other advantages claimed.

The proprietor of an extensive cotton factory near Stockholm, Sweden, has purchased 12,000 acres of land in Dunklin and Stoddard counties, Missouri, where he will build factories, mills, etc., establish colonies, and carry on the cultivation and manufacture of cotton. The enterprise will give employment to 1,300 families. Some of these are on the way from Sweden.

Within the city of Portland, Maine, and a circuit of ten miles around it, there are about twenty brick yards, which produce about 20,000,000 bricks per year. They are all operated in the old-fashioned way, except the steam works at Stroudwater. These works give employment to 80 hands, and turn out about 33,000 bricks per day, which bring in Boston $2 a thousand more than common bricks.

An important experiment is about to be tried at the South Kensington Museum, London, to promote the instruction of women in science. By the permission of the Lord President, Professors Huxley, Guthrie, and Oliver are about to commence a course of lectures on natural science in November. The fees are low, and many ladies of high position in society have expressed their willingness to assist in the experiment.

Professor Maillefert continues his blasting operations at Hell Gate with, so far, very encouraging success. He has raised and carried ashore 1,575 cubic yards of fragments of rock, besides a large quantity which has been washed away after being broken up. Since August 2, the date of commencing operations, 279 blasts have been made on Way's Reef, besides 44 on Shell Drake, and 15 on Pot Rock. The probability is that in a few months longer a depth of 25 feet at low water will have been obtained.

A modification of Thenard's process for the purification of lamp oil is proposed by M. Michaud. He blows air through the oil while sulphuric acid is caused to fall into it, in very finely divided streams, to the amount of 1 or 2 per cent. Agitation is thus produced, and the froth is skimmed off as long as it forms. When the froth ceases to appear the oil is purified, and has only to be washed by a current of steam, so arranged as to keep the liquid at a temperature of 100° Cent., for about half an hour.

Professor Morren states that the actinic rays of solar heat can be thoroughly arrested by a thin layer of a perfectly limpid solution of sulphate of quinine, not more than a few millimeters in thickness. He says that a useful application of this property would be to manufacture double panes of glass which could contain the solution, and replace by them the less efficacious yellow glass used by photographers in their dark room. They would thus be enabled to work in a light instead of a dark room.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

STOVE.—H. Stickney, Cleveland, Ohio.—This invention relates to improvements in magazine or base burning stoves, and consists in the combination with the same of a weight or follower to force the coal down and secure a uniform and reliable feeding of the same. It is well known that although these magazines are made larger at the bottom and gradually tapering to the top, yet where large lumps of coal, or bituminous coal of any size is used, they often fail to feed; in the case of the large coal by reason of the pieces becoming cramped and wedged together, and in the case of the soft coal by reason of the fusing of the parts into a mass, under the action of the heat. It is the object of this invention to overcome this clogging and secure a uniform feed.

PLOW.—Wm. B. West, Utica, Wis.—The object of this invention is to provide an improved rotary mold-board attachment for plows, as a substitute for a part of the common mold-boards, whereby an anti-friction roller may be employed to receive the earth from the front part of the mold-board, and turn it over more easily and without packing as the plows do as now constructed.

WATER WHEELS.—S. H. Barnes, Lanesboro, Pa.—This invention relates to improvements in water wheels designed to provide certain improvements in the gates calculated to facilitate the operation thereof, also the delivery of the water upon the buckets in a manner to have the best effect.

FRUIT DRYER.—R. H. Sipes and D. Deßbaugh, Bloody Run, Pa.—The object of this invention is to provide a cheap and economical drying apparatus for fruit and other articles. The invention consists in a peculiar arrangement within a case of a heating furnace, radiating apparatus, and drying pans.

IMPROVED BRICK MACHINE.—John Whiteford, Pond City, Kansas.—This invention has for its object to furnish a simple, convenient, and effective machine for molding brick and distributing them through the yard.

MOWING MACHINE.—Joel V. Strait, Litchfield, Ohio.—This invention has for its especial object to improve the construction of the gearing of mowing machines so that a faster or slower movement may be given to the cutters at the will of the operator, and which may also be applied with advantage to other gearing where a different rate of movement is sometimes required.

RAILROAD CHAIR AND COUPLING.—Frederick Nicklin, Troy, N. Y.—This invention has for its object to furnish a simple, convenient, safe, and reliable chair for coupling the ends of railroad rails.

FLOUR BOLT.—Wm. H. Allen and William Stoddard, Winona, Minn.—This invention relates to the knockers, so-called, of the flour bolts of grist mills.

SLACK BELT ATTACHMENT FOR COTTON GINS.—J. W. Howard, Greenville, Ala.—This invention has for its object to furnish an improved attachment for cotton gins, to be interposed between the pulley of the gin and the driving wheel to bring the belt together and into proper position before it passes to the pulley, and which shall, at the same time, be simple in construction, easily adjusted, and effective in use.

COMBINED PLOW AND HARROW.—Albert Moore and Friederick Wendell, Chillicothe, Ohio.—This invention has for its object to improve the construction of plows, so as to make them more convenient and effective in operation, enabling them to harrow the furrow as it is turned, and enabling them to be adjusted to run deeper or shallower in the ground, even when at work.

TOOL FOR SHARPING HORSESHOES.—Butler, Dunham & Wann, Marshalltown, Iowa.—This invention relates to the sharping of the calks of horseshoes. The invention cannot be here well described without the aid of an engraving.

BOX OPENER.—Henry C. Van Giesen, Paterson, N. J.—This invention relates to a new and useful improvement in an instrument for opening wooden boxes, as, for instance, dry-goods boxes.

WASHING MACHINE.—Wm. Leighty, Ebensburg, Pa.—This invention relates to new and useful improvements in machines for washing clothes, and consists in the construction and general arrangement of parts.

ROTATING CULTIVATOR.—Theodor Uehling, Logan, Nebraska.—This invention consists in forming on a central eye and rotating on a central pivot a number of arms with cultivator teeth, either formed on or attached to their ends.

PUMPING ENGINE.—Robert Allison, Port Carbon, Pa.—This invention consists in so operating the valve gear of the engine, that the jar produced by concussion, which has heretofore proved so destructive to pumping engines, is avoided.

PEAT MACHINE.—John S. Kelly, New York city.—This invention has for its object to furnish a simple, convenient, and effective machine for scarping, or scarifying condensing, and partially drying peat upon the bed and without removing it therefrom, thereby enabling the peat to be prepared for market at trifling expense, by cutting the peat, compressing it, and forcing out the water from the porous, fibrous mass, while still in mass upon the peat bed.

STEAM HEATING APPARATUS.—John H. Clark and John B. Clark, Providence, R. I.—This invention relates to a new apparatus for heating houses of all kinds, and has for its object, first, and chiefly, economy in the use of fuel and in the first cost of the apparatus; also to secure the most efficient heating and radiating surface in a compact and cheap form, as well as safety from accident.

SUGAR-CANE PRESS.—William Aiken and William Bennett, Louisville Ky.—This invention relates to certain improvements in sugar-cane mills, and has for its object to simplify the construction of the whole apparatus, and especially to provide adjustable and good bearings for the rollers and facilities for lubricating and repairing the same.

SEWING MACHINE.—J. H. Butterworth, Dover, N. J.—This invention relates to certain new and useful improvements in the construction of sewing machines and their shuttles, and has for its object to provide a simple means of operating the shuttle, an adjustable and reliable tension apparatus for the needle thread, and a shuttle in which the thread cannot break or become spoiled when drawn from one end of the bobbin.

SLIDE VALVE.—John F. Allen, Tremont, N. Y.—This invention relates to a new equilibrium slide valve, which is so arranged that it forms four openings for the steam inlet, those on top conducting the steam through the body of the valve. The invention consists in the application of a flat valve, which is vertically perforated through the middle, and which rests on an elevated plane of the steam chest, and under a grooved or recessed cap, so as to admit steam at both ends both from top and bottom.

CUT-OFF NOZZLE FOR CANS.—John McLeod Murphy, New York city.—This invention consists of the application to the vertical nozzles commonly applied to the cans at the top, and provided with screw caps, which are removed both for filling and pouring the contents out of a laterally projecting tube or spout, arranged to rotate on the said nozzle to be brought into coincidence with a hole in the side thereof for pouring the contents out through the said spout, or for turning it away and closing the said hole by a ring encircling the nozzle, and to which the spout is connected, the the same being arranged to operate without removing the screw cap, and especially adapted for pouring from the cans when inclosed in packing cases of wood, a slot being made in the side of the case below the cover, from which the spout may project when coincident with the hole in the nozzle

MILKING APPARATUS.—Eugene Spedden, Astoria, Oregon.—This invention consists in the attachment to the milking pail by a flexible tube of a funnel provided with flexible wristlets or straps for buckling around the wrists for holding the funnel close up to the udder to receive the milk and ensure the delivery in the pail.

PNEUMATIC PUMP.—J. A. Bailey, Detroit, Mich.—This invention relates to improvements in pumps, such as are actuated by the force of compressed air, and adapted more particularly for use in mining shafts, the object of which is to dispense with the employment of connecting rods of great length or other connecting mechanism, such as has been heretofore necessary to apply the power from the surface of the earth to the pumps located in deep shafts, also to facilitate the location of the pumps in any part of the shaft without reference to the conditions required when connecting rods are used, with respect to the placing and securing the said connecting rods.

WEATHER STRIP.—David H. Horner, Battle Ground, Ind.—This invention consists in an improved arrangements of suspending bracket arm-spring devices in combination with a hinged strip for closing it down over the door sill when the door is shut, and for raising it up to pass over the sill when the door is opened.

CANAL TUGS.—Stephen R. Kirby, New York city.—This invention relates, in part, to that class of tugs used in drawing canal boats, and, in part, to tugs for general traction purposes, and the first part of the invention is applicable only to tugs that have stern or central wells, in which the propeller wheels are placed.

SNAP CATCH FOR BREECH-LOADING FIRE-ARMS.—Wm. Golcher, St. Paul, Minn.—The object of this invention is to provide a simple, convenient, and effective means for fastening down the breech of guns of the class above named, it being so constructed, that it occupies but little space, is cheap, easily applied and operated, and not liable to break or get out of order.

CAN OPENER.—Wm. M. Bleakley, Verplank, N.Y.—This invention relates to a new implement for opening sheet metal cans, and is arranged to cut out larger or smaller pieces, as may be desired. The invention will, in a short time, be illustrated and fully described in the Scientific American.

APPARATUS FOR CUTTING AND DRESSING MILLSTONES.—John Hine, Cockermouth, England.—This invention relates to a new apparatus for facilitating the cutting or dressing of millstones by means of diamonds, or other hard stones or cutters, and consists in a novel arrangement and combination of parts for producing an adjustable and effective apparatus.

SPRING EYE GLASSES.—Louis Black, Detroit, Mich.—This invention consists in connecting the springs to the projections, by means of clamps, either pivoted to the said projections, and provided with eccentric clamping pawls, or with rivets, arranged to be tightened by wedging against wedge-shaped projections, widest at the outer ends, toward which the clamps, when connected around the narrower parts, are drawn, the ends of the springs, in all cases, being placed between the projections and the clamps, and provided with locking devices to prevent sliding out between the clamps and projections.

WATER WHEEL.—J. J. Kimball, Naperville, Ill.—The object of this invention is to provide an improved construction of water wheels, calculated to utilize the power of the water to a greater extent than is done by the wheels now in use, and, also, for more ready and economical application of the said wheels to the flume or pen stocks.

FRUIT DRYER.—J. Harvey, Martinsville, Ind.—This invention consists in an arrangement, in a rectangular-shaped sheet-metal case, of heating flues and ventilating passages, also, fruit-holding shelves.

SAW FILING MACHINE.—Henry C. Bell, Emporia, Kansas.—This invention relates to improvements in saw filing apparatus, whereby it is designed to provide a simple, portable machine, which may be readily attached to any saw for filing the same.

MUSICAL PANORAMA.—Franz Friederich Kullrich, Berlin, Prussia.—This invention relates to a new combination with a music box, of an apparatus for displaying, through a suitable opening, a series of pictures in succession so that, whenever the music is played, the panorama will be in motion.

WATER WHEEL.—José Tort, Mexico, Mexico.—This invention relates to improvements in water wheels, having for its object to utilize both the direct and reacting forces of the water.

WATER WHEEL.—A. J. Jack and D. E. Brand, Des Moines, Iowa.—This invention comprises an arrangement of buckets, whereby they serve the function of gates also, thereby dispensing with the cost of the same. It also comprises a peculiar form of the buckets whereby better results are attained, and, also, an arrangement of operating devices for working the buckets to open or close them whether the wheel is running or not.

CLOTHES-DRYING FRAME.—J. C. Longshore, Mansfield, Ohio.—This invention consists in an arrangement of parallel extensible and contractible frames of "lazy tongs" construction, united by transverse bars, and provided with supports capable of supporting the same when extended horizontally or vertically.

WATER-DRAWING APPARATUS.—L. Taylor, Jordan, Wis., and J. C. Richardson, Prairie du Chien, Wis.—This invention relates to improvements in apparatus for drawing water in buckets from springs or wells situated at long distances from where the water is to be delivered. The object of the invention is to provide simple and efficient apparatus, to be automatically operated by the turning of a crank to draw the water, convey it to the place for delivery, and to deliver it.

STRAW CUTTER.—Wilson Elder, Mill Hall, Pa.—This invention relates to improvements in straw cutters, whereby it is designed to provide more durable and efficient cutters of that class, in which a vibrating knife is worked by hand, than now in use. The invention has reference mainly to the arrangment of the fulcrum pin to prevent the nut from working loose, and the bearings around the fulcrum, whereby the cutter lever and cutter are maintained snugly against the metallic end plate of the box upon the bottom part of which the straw is cut.

ANIMAL TRAP.—Joel Manchester, New York city.—This invention relates to new and useful improvements in traps for killing or destroying noxious animals.

PIPE COUPLING.—Levi Abbott, Lewiston, Me.—This invention relates to a new and useful improvement in the mode of coupling pipes of lead, rubber, other material.

LAMP FILLER.—Henry W. Staples, Saco, Me.—This invention relates to a new and useful improvement in vessels for filling lamps, and consists in an air tube attached thereto.

STABLE HORSE TIE.—E. D. Cramer, Hackettstown, N. J.—This invention relates to a new and useful improvement in a safety device for hitching horses in stables and in other places.

COMBINATION BRAN STOCK BIT.—J. S. Zerbe, Delaware, Ohio.—This invention relates to a new and useful improvement in arranging bitts, and other tools and implements, for boring and performing other operations in wood and metal.

CLOTHES-LINE HOLDER.—Albert Cooper, Harrisburgh, Pa.—This invention relates to a new and useful device for holding clothes lines, and consists in arranging two circular disk wheels on a center piece, and pressing the line between two rigid surfaces, and thereby holding it by means of double reversed inclined planes on the face of the disks.

SOUND AND STRAIN DIMINISHING MACHINE.—Frederick Kohler and A. J. Alsing, New York city.—This invention has for its object to provide a simple mechanism for preventing the noise produced by machinery, or by the splitting of wood, chopping of meat, and other pounding devices, as well as for reducing the strain produced by the striking or pounding process.

SAW.—Hermann Cramer, Sonora, Cal.—This invention relates to a new manner of constructing the blade and handle of a hand saw, so that the same may be employed as a square bevel gage compass and measure as well as for sawing purposes, and also as a spirit level and plumb.

BOAT-DETACHING APPARATUS.—Daniel S. Brown, Astoria, Oregon.—This invention relates to a new device for facilitating the instantaneous detachment of boats from their davits, and consists in such a new combination of retaining jaws, with rods, levers, and catch, that the simultaneous detachment of both ends will be certain, and accidents on account of improper operation impossible.

DEVICE FOR PROPELLING VESSELS.—G. A. Milani, Frankfort, Ind.—This invention relates to a new mechanism for propelling small boats, flat boats, and other small vessels, and consists in the general arrangement of machinery, connected with an oscillating lever, that is worked by persons seated upon its ends. The motion imparted to the lever by the see-sawing process is transmitted to a pair of shafts which are geared together with the paddle wheel shafts.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

J. S. B., of Md., asks an explanation for the stoppage of an exhaust steam pipe only three inches from the valve, occurring about four years after it had been in use. The deposit was as hard to chip as the iron itself and resisted the action of acids. We have not met with precisely a case of this kind, but presume it was a gradual accumulation of scale until the exhaust became reduced so much as to interfere with the working of the engine when it was discovered. It is a mistake to suppose such deposits may not be formed in the exhaust. Boilers which prime and carry wet steam into the cylinder, are liable to form a scale in the exhaust pipe, or even to throw out a fine floury deposit from the mouth of the exhaust pipe, consisting of an impalpable powder of carbonate of lime. See article on "Formation of Deposits in Steam Boilers," page 282, current volume.

W. C., of Mass.—Perfect exhaustion ought to reduce the pressure on the exhaust side of a piston to atmospheric pressure in a non-condensing engine, worked non-expansively, or to about fifteen pounds per square inch, during the greater part of the stroke. Practically however, there are circumstances connected with the working of steam engines, which make the mean pressure throughout the stroke on the exhaust side somewhat more than than this. It takes time for the steam to escape sufficiently to reduce the pressure to this point, and when compression is used by closing the exhaust before the completion of the stroke; or, when lead is used, the pressure will be increased at the latter part of the stroke. To compute the mean pressure, therefore requires the knowledge of many data, none of which you supply, and which you probably cannot obtain in the case specified.

W. E. S., of Conn.—The oxide of lead is, as explained in the paragraph referred to, litharge, or protoxide of lead. We do not know the proportion in which this is mixed with concentrated glycerin to make the cement referred to on page 235, current volume, but we presume it need only be mixed to give the proper consistence. If you make a trial of this cement, we should be glad to learn how it succeeds with you.

B. R., of ——. We do not credit the assertion made by teamsters, that wagons with wooden axles—all other things being equal—have a lighter draft through mud, sand, or up an inclined plain. It will be time enough to look for a reason when the fact has become established by accurate experiment.

E. R. K., of Ill.—We are informed that shellac dissolved in alcohol will stick paper labels to tin and hold them, and we see no reason to doubt the statement. We think, however, the cans ought to be warm when the labels are applied, to speedily evaporate the alcohol, still the latter is only an opinion.

H. C., of Pa.—If the description of the art of graining on paper from the natural wood, given on page 309, Vol. XX, does not give you a sufficient idea of the process, it must be obvious to you that no "recipe" will enable you to apply it.

W. R. T., of Miss.—You can make a beautiful mirror, which will withstand a high degree of heat without injury, of platinum. It is the only thing we can recommend you for the purpose you specify. It is quite malleable, and from your evident skill in working metals you will have no difficulty in making it for yourself.

F. A. B., of Ill.—We have already discussed the irregularity of piston movement on crank engines *ad nauseam*. You will find the whole thing explained in back numbers, or in Auchincloss' "Link and Valve Motions," published by D. Van Nostrand, 23 Murray street, New York.

J. T. S., of Pa.—The front flue sheet ought to be taken into account in determining the heating surface of your boiler.

T. J. B., of Wis.—There is no possible danger of bursting in the pipe which supplies your factory with water from the great head used. It will stand at least twice that head. A cast iron pipe, fifteen inches in diameter and three quarters of an inch thick, will sustain 600 feet head if the iron be of best quality.

C. L. M., of Texas.—Sand is the best material for molding for brass casting. You will not succeed with plaster-of-Paris. It is not sufficiently porous to allow the gases to escape.

H. C., of Ca.—Unless the peculiar exigencies of the case require it, experience has shown a direct connection of crank and piston to be better than intermediate gearing. We cannot here enter into a discussion of the reasons for this, but you will find the subject fully treated in various works on steam engineering.—Fine paper may be made impervious to air by coating it with gums. So may cloth. Whether either of these will "answer your purpose," we cannot say, as you forgot to mention what that purpose was.

S. and C., of Mass.—We can see no reason why the cemented floor of one part of a cellar should be wet, while another part, made more recently, should be dry, unless it be that the composition of the older portion is different. It probably contains something which attracts moisture. The sand employed might have been beach sand not properly washed to free it from salt.

G. W., of Md.—To prevent the formation of dandruff on a healthy scalp, wash the head daily in pure cold water, and weekly with water containing a little borax in solution, and use as little oil in dressing the hair as possible. Above all, keep the general health good by proper diet and exercise, avoid late hours, and you will have little trouble either from dandruff or dyspepsia.

C. S. K., of Pa.—No septum, solid, fluid, or gaseous, has yet been discovered that, placed between a magnet and its armature, will overcome the attraction of the former for the latter. It has been long sought by would-be inventors of electro-magnetic motor engines, and we receive very often queries similar to yours. There is no such substance.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING OCT. 19, 1869.

Reported Officially for the Scientific American

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years ... $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from ... $1 *upward, but usually at the price above-named.*

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them ... $1·25

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, No. 37 *Park Row, New York.*

95,868.—STEAM ENGINE SLIDE VALVE.—John F. Allen, Tremont, N. Y.
95,869.—SAW SWAGE.—Emanuel Andrews, Williamsport, Pa.
95,870.—LAMP BURNER.—Henry M. Beidler, Philadelphia, Pa.
95,871.—SAW-FILING MACHINE.—Henry C. Bell, Emporia, Kansas. Antedated October 13, 1869.
95,872.—SPRING EYE GLASS.—Louis Black, Detroit, Mich.
95,873.—CAN OPENER.—Wm. M. Bleakley, Verplank, N. Y.
95,874.—TUCKING ATTACHMENT FOR SEWING MACHINES.—H. E. Bodwell, Jr., South Norwalk, Conn.
95,875.—HAY SPREADER.—Milton Bowker, Newark, N. J. Antedated October 9, 1869.
95,876.—ADDING MACHINE.—Benjamin B. Brown, Delaware, Ohio.
95,877.—BOAT-DETACHING APPARATUS.—Daniel S. Brown, Astoria, Oregon.
95,878.—DRIVEN WELL POINTS.—Augustus O. Brummel, Memphis, Tenn.
95,879.—HAY STACKER.—T. N. Bunnell, Reynolds, Ind.
95,880.—SPRING BED BOTTOM.—W. Newton Cook, Grand Rapids, Mich.
95,881.—CLOTHES-LINE HOLDER.—Albert Cooper, Harrisburg, Pa.
95,882.—MANUFACTURE AND PRESERVATION OF METALS.—John Corson (assignor to himself and Danies Breed), Washington, D. C.
95,883.—STABLE HORSE TIE.—E. D. Cramer, Hackettstown, N. J.
95,884.—SAW.—Hermann Cramer, Sonora, Cal.
95,885.—CAR SPRING.—Mitchell R. Dand, Philadelphia, Pa.
95,886.—SHAFT COUPLING.—Hiram Dodge, Beaver Dam, Wis.
95,887.—STRAW CUTTER.—Wilson Elder, Mill Hall, Pa.
95,888.—MACHINE FOR SAWING LATH.—Ervin H. Ewell, St. Louis, Mich.
95,889.—CIRCULAR SAW MILL.—Wm. M. Ferry, Grand Haven, Mich.
95,890.—NUT LOCK.—J. Hyde Fisher, Chicago, Ill. Antedated April 19, 1869.
95,891.—SAUSAGE STUFFER.—John J. Flansburgh, Berne, N. Y.
95,892.—PHOTOGRAPHIC PRINTING.—Egbert Guy Fowx, Baltimore, Md.
95,893.—ANIMAL TRAP.—Calvin G. Frushour, La Gro, Ind.
95,894.—BOX TOE FOR BOOTS AND SHOES.—Horace W. George, Danvers, Mass., assignor to John H. Young and John A. Greene.
95,895.—HARNESS SADDLE.—Algernon Gilliam, Pittsburgh, Pa.
95,896.—POTATO DIGGER.—Dennis Gorman, Hornellsville, N. Y.
95,897.—LOCK NUT.—Merritt W. Griswold, New York city.
95,898.—RULER.—Joseph D. Hall, Trenton, N. J.
95,899.—ROSE FOR DOOR KNOBS.—Wm Hall, Boston, Mass., assignor to himself and Samuel Peck & Co., New Haven, Conn.
95,900.—FRUIT DRYER.—John Harvey, Martinsville, Ind.
95,901.—MACHINE FOR DRESSING MILLSTONES.—John Hine, Cockermouth, England.
95,902.—WEATHER STRIP—David H. Horner, Battle Ground, Ind.
95,903.—SLACK-BELT ATTACHMENT FOR MACHINERY.—J. W. Howard, Greenville, Ala.
95,904.—HEAD-BLOCK OF SAW MILLS.—Joseph Hubbell, Zanesville, Ohio.
95,905.—WATER WHEEL.—A. J. Jack and D. E. Brand, Des Moines, Iowa.
95,906.—CORN PLANTER AND CULTIVATOR.—Jesse Jenkins (assignor for one-half to Abram Dobbs), Andrew county, Mo.
95,907.—SLEIGH AND SLED RUNNER.—C. H. Johnson, Chelsea, Mass., assignor to himself and Charles Libbey, Whitefield, N. H.
95,908.—WASH PAVE KEY HANDLE.—William H. Johnson, Philadelphia, Pa. Antedated October 5, 1869.
95,909.—BROILER.—Wm. J. Johnson, Newton, and Henry A. Hildreth, Lowell, Mass.
95,910.—WATER WHEEL.—John J. Kimball, Naperville, Ill.
95,911.—LUBRICATOR FOR LOOSE PULLEYS.—Chas. A. King, Springfield, Mass.
95,912.—LUBRICATOR FOR LOOSE PULLEYS.—Chas. A. King, Springfield, Mass.
95,913.—ROTARY VEGETABLE GRATER.—Wm. E. Knight, Shrewsbury, assignor to Darius A. Martin, Mount Holly, Vt.
95,914.—SPRING POUNDING AND CHOPPING BLOCK.—Frederick Kohler and A. J. Alsing, New York city.
95,915.—PICTURE CASE.—Franz Friederich Kullrich, Berlin, Prussia.
95,916.—WASHING MACHINE.—William Leighty, Ebensburg, Pa.
95,917.—CLOTHES DRYER.—J. C. Longshore, Mansfield, Ohio.
95,918.—MACHINE FOR MAKING WIRE FERULES.—Henry O. Lothrop, Milford, Mass.
95,919.—CORE-BOX FOR CAR WHEELS.—Thos. Maher, Cleveland, Ohio.
95,920.—ANIMAL TRAP.—Joel Manchester, New York city.
95,921.—STOVEPIPE.—Horace A. Mears, Pecatonica, Ill.
95,922.—PROPELLING VESSEL.—George A. Milani, Frankfort, Ind.
95,923.—WAGON STAKE.—Edward Milner, Marquette, Mich.
95,924.—APPARATUS FOR DECANTING LIQUIDS.—Titus Molinier, New Orleans, La.
95,925.—COMBINED PLOW AND HARROW.—Albert Moore and Friederich Wendel, Chillicothe, Ohio.
95,926.—SOAP-CUTTING MACHINE.—Charles S. Murphy and Donald McGregor, Detroit, Mich.
95,927.—CUT-OFF NOZZLE FOR CANS.—John McLeod Murphy (assignor to James Lorimer Graham), New York city.
95,928.—RAILWAY-RAIL CHAIR.—Frederick Nicklin (assignor to himself and Reuben Willis), Troy, N. Y.
95,929.—ICE CREAM SERVER.—Jorge Oyarzabal, Malaga, Spain.
95,930.—WIND-WHEEL PUMP.—L. D. Parsons, Tremont, N. Y.
95,931.—PROCESS FOR AMALGAMATING GOLD AND SILVER.—Almarin B. Paul, San Francisco, and J. L. Wood, Independence, Cal.
95,932.—FENCE STAKE.—James N. Pease, Panama, N. Y.
95,933.—MANUFACTURE OF IRON AND STEEL.—John Player, Philadelphia, Pa.
95,934.—STEAM GENERATOR.—Wm. J. Reed, West Middlesex, assignor to himself, John M. Clapp, and Warner Pearson, Newcastle, Pa.
95,935.—MACHINE FOR MAKING HORSESHOES.—Andrew J. Roberts, Boston, Mass.
95,936.—HOOKS AND EYES.—Edward P. Roche, Bath, Me.
95,937.—BUTTER PACKAGE.—Theodore W. Ryding, Tully N. Y.
95,938.—RAILROAD CAR VENTILATOR.—Albert G. Safford Boston, Mass.
95,939.—PRESERVING DEAD BODIES.—George W. Scollay St. Louis, Mo. Antedated October 5, 1869.
95,940.—SOIL PULVERIZER.—Warren Shumard, Richmond Ind. Antedated Oct. 5, 1869.
95,941.—MANUFACTURE OF ILLUMINATING GAS.—Benj. Silliman, New Haven, Conn.
95,942.—FRUIT DRYER.—R. H. Sipes and D. Defibaugh, Bloody Run, Pa.
95,943.—PUMP.—Anthony Sluthoin, Cleveland, Ohio.
95,944.—TRAVELING BAG.—J. R. Smith, Chicago, Ill., assignor to Cornelius Walsh, Newark, N. J.
95,945.—BED BOTTOM.—W. C. Smith, Warrensburg, Mo.
95,946.—WAGON BRAKE.—D. T. Snelbaker (assignor to Alexander Delorac), Cincinnati, Ohio.
95,947.—MILKING APPARATUS.—Eugene Spedden, Astoria Oregon.
95,948.—LAMP FILLER.—H. W. Staples, Saco, Me.
95,949.—COAL STOVE.—H. Stickney, Cleveland, Ohio.
95,950.—MOWING MACHINE.—J. V. Strait, Litchfield, Ohio.
95,951.—BOOT PATTERN.—William Swarts, Pent Water, Mich.
95,952.—AIR HOIST.—Lewis Taws and J. M. Hartman (assignors to Louis Taws and J. M. Hartman), Philadelphia, Pa.
95,953.—WATER ELEVATOR.—L. Taylor, Jordan, and J. C Richardson, Prairie-du-Chien, Wis.
95,954.—WATER WHEEL.—Jose Tort, Mexico, Mexico.
95,955.—STONE-CUTTING MACHINE.—Frederick Townsend, Albany, N. Y.
95,956.—ROTATING CULTIVATOR.—Theodore Uehling, Logan, Nebraska.
95,957.—BOX OPENER.—H. C. Van Gieson, Paterson, N. J.
95,958.—APPARATUS FOR EVAPORATING LIQUIDS TO OBTAIN SUGAR, ETC.—Reuben Wakefield, Hardwick, Vt.
95,959.—COFFEEPOT.—S. V. Warner, Buffalo, N. Y.
95,960.—PLOW.—Wm. B. West, Utica, Wis.
95,961.—EXCAVATOR.—B. R. Wehner, Mankato, Minn.
95,962.—BRICK MACHINE.—John Whiteford, Pond City, Kansas. Antedated Oct. 9, 1869.
95,963.—FENCE.—Henry Wicker, Olean, N. Y.
95,964.—COMBINATION TOOL.—J. S. Zerbe, Delaware, Ohio.
95,965.—MODE OF HANGING WINDOW CURTAINS.—Henry Aiken, Philadelphia, Pa.
95,966.—REFLECTOR FOR STREET LAMP.—J. N. Aronson, New York city.
95,967.—STOVEPIPE DAMPER.—J. M. Baker, Aurora, Ill.
95,968.—RAILWAY MOVING MACHINE.—Wm. Ball, Wilmington, Ohio.
95,969.—GAME.—C. B. Barlow, Portsmouth, N. H.
95,970.—COMPOSITION FOR CLEANING STONE.—Frederick Baumann, Chicago, Ill.
95,971.—SAFETY TACKLE.—Benjamin Bellair, Paris, France.
95,972.—FIREPLACE STOVE.—Jacob Benner, Pittsburgh, Pa.
95,973.—FEED MECHANISM FOR GRINDING MILLS.—H. L. Bennett, Geneva, Ill.
95,974.—APPARATUS FOR APPLYING ROOFING COMPOSITION TO FELT.—R. O. Benton, Buffalo, N. Y.
95,975.—SPARK ARRESTER.—John William Bowker, Sacramento City, Cal.
95,976.—SECTIONAL COFFER DAM.—Thomas Bracher, Rahway, N. J.
95,977.—PAINT AND PIGMENT.—Joel Prenton (assignor to himself, F. C. Epting, Alpheus Catler, J. L. Giddings, and Richard Brenton), Pittston, Pa.
95,978.—DOOR LATCH.—E. W. Brettell, Elizabeth, N. J. Antedated Oct. 9, 1869.
95,979.—SHUTTER FASTENER.—F. T. Brown, New York city.
95,980.—COMPOSITION FOR BEVERAGE.—R. F. Brown, Provincetown, Mass.
95,981.—STEAM AND AIR WHISTLE.—Thomas Brown, Chicago, Ill.
95,982.—FENCE.—J. S. Burch, Buffalo, N. Y.
95,983.—AUTOMATIC BOILER FEEDER.—J. E. Burdge, Cincinnati, Ohio.
95,984.—SPRING MATTRESS.—Edwin L. Bushnell, Poughkeepsie, N. Y.
95,985.—DEVICE FOR BURNING SAWDUST IN STEAM GENERATOR FURNACES.—E. S. Chase, Eau Claire, Wis.
95,986.—HAND CULTIVATOR.—Ebenezer Clark, Rushville, Ill.
95,987.—MANUFACTURING FLOUR.—D. R. Clem, Edinburg, Va.
95,988.—MACHINE FOR GRINDING CYLINDRICAL-FLUTED CUTTERS.—A. G. Coes, Worcester, Mass.
95,989.—WASHING MACHINE.—John W. Cord, Pleasant Hill, Ind.
95,990.—METALLIC ROOFING.—J. B. Crowley (assignor to him self and Manning, Bowman & Co.), Middletown, Conn.
95,991.—LOCOMOTIVE SIGNAL LIGHT.—J. M. Crull (assignor to himself, A. C. McCulley, W. A. Middleton, and Jacob Walters), Harrisburg, Pa.
95,992.—ROTARY ENGINE.—John Cuthbert, Glenham, N. Y.
95,993.—CURTAIN FIXTURE.—Alfred S. Dickinson, New York city.
95,994.—CURTAIN FIXTURE DEVICE FOR STOPPING THE MOTION OF CORDS.—A. S. Dickinson, New York city.
95,995.—MACHINE FOR DESTROYING WORMS FROM COTTON PLANTS.—William Ewing, Columbia, La.
95,996.—SADIRON HOLDER AND CLOTHES DRYER.—H. L. Franklin and Eugene Clark, Nashua, N. H.
95,997.—GANG PLOW.—W. J. Funk, Portland, Oregon.
95,998.—BREECH-LOADING FIRE-ARM.—William Golcher, St. Paul, Minn.
95,999.—PHOTOGRAPHERS' PLATE VISE.—V. M. Griswold, Peekskill, N. Y. Antedated Oct. 7, 1869.
96,000.—PUMP.—W. M. Hamilton, Jacksonville, Ill.
96,001.—FURNACE FOR STEAM AND OTHER DEVICES.—David Harger, Des Moines, Iowa.
96,002.—GATE.—Jesse Harpster, Clyde, Ohio.
96,003.—CHALK FOR USE AT BILLIARD TABLES.—Thomas Harrison, Detroit, and William Hollman and William Chart, Three Rivers, Mich.
96,004.—STRAW CUTTER.—F. B. Hunt, Richmond, Ind.
96,005.—HORSE HAY RAKE.—J. G. Huntington, Atkinson, assignor to himself and F. E. Wilson, North Bradford, Me.
96,006.—SNOW PLOW.—A. H. Jackson, Bear Valley, assignor to J. C. Garland, Sacramento, Cal.
96,007.—POTATO DIGGER AND CULTIVATOR.—Moses Johnson Three Rivers, Mich.
96,008.—SAW GUMMER.—Nelson Johnson, Jasper, N. Y.
96,009.—SAW SWAGE.—Nelson Johnson, Jasper, N. Y.
96,010.—SHOVEL PLOW.—E. A. Kamerer, Greentown, Ohio.
96,011.—MACHINE FOR MAKING NEEDLES FOR SEWING MACHINES.—Geo. Karrmann, Ansonia, assignor to himself and Chas. Alvord, Wolcottville, Conn.
96,012.—VARNISH FOR PLASTERED WALLS AND FOR COATING OTHER SURFACES.—W. M. Kimber, Sacramento City, Cal.
96,013.—CANAL TUG.—S. R. Kirby, New York city.
96,014.—WINDOW SHUTTER AND BLIND.—Frederick Hartt Knevitt and Henry Herbert Hazard, London, England, assignors to Frederick Hartt Knevitt.
96,015.—CORN-PLANTER, SEED-SOWER, AND CULTIVATOR.—D. P. Leach, Franklin, Ind.
96,016.—BREAST STRAP ATTACHMENT FOR HARNESS.—Joseph Letchworth, Buffalo, N. Y.
96,017.—FEEDING MECHANISM FOR SEWING MACHINES.—Henry Lomax, Over Darwen, Great Britain.
96,018.—METALLIC DOUBLE SHOVEL PLOW.—W. W. Love, Athens, Ohio.
96,019.—CATCH-BASIN FOR SEWERS.—J. J. Lyon, Cincinnati, Ohio.
96,020.—MANUFACTURE OF HOLLOW RUBBER GOODS.—J. C. Lyons, New York city.
96,021.—MANUFACTURE OF SEWER PIPE.—John Lyth, Buffalo, N. Y.
96,022.—PLASTERERS' HAWK.—T. J. McGeary, Newark, N. J.
96,023.—HEEL-STIFFENER.—J. R. Moffitt, Chelsea, Mass.
96,024.—STUMP-JOINT FOR CARRIAGES.—F. B. Morse (assignor to himself and Plants Manufacturing Company), Plantsville, Conn

96,025.—Stump-Joint for Carriages.—F. B. Morse (assignor to himself and Plants Manufacturing Company), Plantsville, Conn.
96,026.—Music Stand.—A. R. Nettleton, Unionville, Conn.
96,027.—Shingle Machine.—P. D. Northcraft, Thurston county, Washington Territory.
96,028.—Carriage-Hub Shell.—James O'Connor, Jackson, Mo.
96,029.—Distilling Whisky and other Spirits.—J. S. Oliver and Edward Harris, New York city.
96,030.—Coffee Roaster.—C. T. Palmer, Norwich, Conn.
96,031.—Water-Proof Coating or Paint for Wood and other Materials.—J. K. Palmer, Cambridge, Mass.
96,032.—Spool Rack.—W. P. Patton (assignor to himself and Alfred Bomgardiner), Harrisburg, Pa.
96,033.—Compression Cock.—Charles Perkes, Philadelphia, Pa.
96,034.—Spouted Can.—T. C. Phinney and C. E. Bancroft, Montpelier, Vt.
96,035.—Reamer.—A. J. Prescott, Catawissa, Pa.
95,036.—Apparatus for Administering Medicated or Pure Steam to Brutes.—Leonard Quetsch, Urbana, Ill.
96,037.—Art of Making Metallic Tubes.—J. B. Root, New York city. Antedated October 13, 1869.
96,038.—Apparatus for Dividing Powders.—Frederick Shaeffer, Philadelphia, Pa.
96,039.—Attachment to Rolls for Calendering Paper Boards.—E. A. Seeley, Scotch Plains, N. J.
96,040.—Machine for Cutting and Dressing Stone.—Thomas Sharp, Carlisle, Pa.
96,041.—Gate Latch.—Daniel Sheets, Suisun, Cal.
96,042.—Corn Stalk Cutter.—J. B. Sherlock, Port Byron, Ill.
96,043.—Carriage Axle.—A. E. Smith, Bronxville, N. Y.
96,044.—Galvanic Apparatus.—Elias Smith, Normal, Ill.
96,045.—Mode of Attaching Diamonds for Stone Drilling.—H. J. Smith, Boston, Mass.
96,046.—Superheating Device for Steam and other Generators.—Wright Smith, St. Louis, Mo.
96,047.—Mode of Ventilating and Cooling.—D. E. Somes, Washington, D. C.
96,048.—Process and Apparatus for Cooling and Preserving Perishable Articles.—D. E. Somes, Washington, D. C.
96,049.—Reversible Latch.—W. E. Sparks (assignor to Sargent & Co.), New Haven, Conn.
96,050.—Fly Trap.—August Staudinger, St. Louis, Mo.
96,051.—Railway Car Brake.—S. R. Stinard, Paterson, N. J.
96,052.—Plane.—E. G. Storke, Auburn, N. Y.
96,053.—Lantern Globe.—Michael Sweeney (assignor to Sweeney, Bell, and Co.), Wheeling, West Va.
96,054.—Cotton-Seed Separator and Planter.—S. W. Thompson, Otsego, Ohio, assignor to himself, Wm. L. Ward, and Wm. D. Whitecar, Philadelphia, Pa. Antedated October 16, 1869.
96,055.—Flour Sifter.—C. J. Tripp, Wallingford, Conn.
96,056.—Apparatus for Ageing Spirituous Liquors.—R. D. Turner, New York city.
96,057.—Rotary Coulter.—F. J. Underwood, Rock Island, Ill.
96,058.—Tail-Board for Wagons.—William Vanscoyoc, Oxford, Ohio.
96,059.—Railway Car Coupling.—W. V. Wallace, New York city.
96,060.—Spike.—W. V. Wallace, New York city.
96,061.—Lasting Hammer.—J. W. Warner, Dover, N. H.
96,062.—Laying Street Pavement.—Gardner Warren, Boston, Mass.
96,063.—Seed-Wheel for Grain-Drills.—William Weusthoff, Dayton, Ohio.
96,064.—Grain-Drill.—W. Weusthoff and Charles Schmidt, Dayton, Ohio.
96,065.—Car Coupling.—J. M. Wheeler and C. W. Chase, Batavia, Iowa.
96,066.—Device for Grinding Metal Plates.—Earl A. White (assignor to himself and B. D. Buford & Co.), Rock Island, Ill.
96,067.—Steam Generator.—S. L. Wiegand, Philadelphia, Pa.
96,068.—Washing Machine.—J. B. Wilson, Philadelphia, Pa.
96,069.—Tesselated Floor.—J. F. Worth (assignor to himself, I. W. Gregory, and Alfred Gregory), Brooklyn, N. Y.
96,070.—Railway Car Coupling.—J. S. Merriken (assignor to himself and William Colton), Baltimore, Md.

REISSUES.

93,685.—Door Latch.—Dated August 17, 1869; reissue 3,675.—F. W. Dean, Tremont, Ill.
55,764.—Brush.—Dated June 19, 1866; reissue 3,676.—Florence Manufacturing Company, Florence, Mass., assignee, by mesne assignment, of A. C. Estabrook.
90,160.—Manufacture of Glue.—Dated May 18, 1869; reissue 3,677.—W. A. Fieck, Philadelphia, Pa., assignee of Hugo Fieck.
80,179.—Machine for Drying and Scouring Sheet-Metal.—Dated July 21, 1868; reissue 3,678.—C. E. L. Holmes, New York city.
92,457.—Dumping Car.—Dated July 13, 1869; reissue 3,679.—Isaac Keith, H. T. Keith, and I. N. Keith, West Sandwich, Mass., assignees of Isaac Keith.
88,730.—Breech-Loading Fire-Arm.—Dated April 6, 1869; reissue 3,680.—J. D. S. Newell, Tensas parish, and A. G. Brice, E. Tomatis, and Thomas Pickles, New Orleans, La., assignees of J. D. S. Newell.
67,213.—Lock.—Dated July 30, 1867; reissue 3,681.—Necolas Petre, New York city.
22,990.—Mop-Head.—Dated Feb. 15, 1859; reissue 3,192; dated Nov. 10, 1868; reissue 3,215, dated Nov. 24, 1868; reissue 3,682.—Luke Taylor, Springfield, Vt.
35,355.—Means of Attaching Rubber to Pencils.—Dated May 20, 1862; reissue 3,683.—W. C. Vosburgh and W. A. Ludden (assignors to J. J. Merritt), Brooklyn, N. Y., assignor to Rubber-Tip Pencil Company, New York city.
80,125.—Broiler.—Dated July 21, 1868; reissue 3,684.—The American Broiler Company, Elmira, N. Y., assignee of Sylvester Bowers.

DESIGNS.

3,713 and 3,714.—Tack Head.—O. L. Bassett (assignor to the Taunton Tack Company), Taunton, Mass. Two patents.
3,715.—Tack Head.—T. R. Bearse (assignor to the Taunton Tack Company), Taunton, Mass.
3,716.—Ornamenting Glass Ware.—John Bryce, East Birmingham, Pa.
3,717 and 3,718.—Carpet Pattern.—Jonathan Crabtree (assignor to James Bromley & Brothers), Philadelphia, Pa. Two patents.
3,719.—Stove.—D. K. Innes and W. W. Magill, Cincinnati, Ohio.
3,720.—Range Front.—J. L. Mott, Mott Haven, N. Y.
3,721.—Iron Wash-Stand Slab.—J. L. Mott, Mott Haven, N. Y.
3,722.—Shutter-Hook or Bar.—Emery Parker (assignor to the Russell and Erwin Manufacturing Company), New Britain, Conn.
3,723.—Combined Inkstand and Penrack.—Henry Whitney, East Cambridge, Mass.

City Subscribers.—The Scientific American will be delivered in every part of the city at $3·50 a year. Single copies for sale at all the News Stands in this city, Brooklyn, Jersey City, and Williamsburgh, and by most of the News Dealers in the United States.

Subscribers—who wish to have their volumes bound, can send them to this office. The charge for binding is $1.50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

Receipts—When money is paid at the office for subscriptions, a receipt for it will be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgment of their funds.

Advertisements.

The value of the Scientific American *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2·50 per line to advertise in one of thirty thousand.*

RATES OF ADVERTISING.

Back Page..............................$1·00 *a line.*
Inside Page..............................75 *cents a line.*

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

NEW AND VALUABLE BOOKS
For Practical Men.
RECENTLY PUBLISHED BY
Henry Carey Baird,
INDUSTRIAL PUBLISHER,
No. 406 Walnut Street, Philadelphia.

The Metallurgy of Iron and Steel. Theoretical and Practical, in all its Branches; with special reference to American Materials and Processes. By H. S. Osborn, LL. D., Prof. of Mining and Metallurgy in La Fayette College, Easton, Pa. Illustrated by 230 engravings on wood and six folding plates. 8vo, 972 pp. $10

A General Treatise on the Manufacture of Soap. Theoretical and Practical. By Prof. H. Dussauce. Illustrated. 8vo, 807 pages $10 00

The Painter, Gilder, and Varnisher's Companion. 13th edition. Revised, with an Appendix containing Colors and Coloring, Theoretical and Practical, etc., etc. Together with Chevreul's Principles of Harmony and Contrast of Colors. 12mo, 350 pp. $1 50

A Manual of the Hand Lathe. By E. P. Watson, author of "Modern Practice of American Machinists. Illustrated by 78 engravings. 12mo....$1 50

The Practical Draftsman's Book of Industrial Design, and Machinists' and Engineers' Drawing Companion. By Armengaud, Amouroux, and Johnston. Illustrated by 50 folio steel plates. A new edition. 4to....$10

A Practical Workshop Companion for Tin, Sheet Iron, and Copperplate Workers. By Leroy J. Blinn, Master Mechanic. Illustrated. A new edition, 12mo....$2 50.

A Practical Treatise on Heat, as Applied to the Useful Arts, for the Use of Engineers, Architects, etc. By Thomas Box. Illustrated. 12mo....$4 25.

A Treatise on the Teeth of Wheels; demonstrating the Best Forms which can be given to them for the purposes of Machinery, such as Mill-work and Clock-work. From the French of M. Camus. By J. I. Hawkins. Third edition. 40 plates. 8vo....$3

Mechanical Saws. By S. W. Worssam, Jr., illustrated by 18 large folding plates. 8vo....$5

A Dictionary of Dyeing and Calico Printing. By Chas. O'Neil, Analytical Chemist. To which is added an Essay on Coal-tar Colors and their application to Dyeing and Calico Printing. By A. A. Fesquet, Chemist and Engineer. 8vo....$6

The Art of Dyeing, Cleaning, and Finishing on the most Approved English and French Methods. By Thomas Love. Second American edition, to which are added General Instructions for the Use of Aniline Colors. 8vo....$5

A System of Chemistry Applied to Dyeing. By James Napier, F.C.S. A new and thoroughly revised edition. Completely brought up to the present state of the Science, including the Chemistry of Coal Tar Colors. By A. A. Fesquet. Illustrated. 8vo..$5

A Practical Treatise on the Manufacture of Worsteds and Carded Yarns. By Chas. Leroux. Translated from the French by Horatio Paine, M.D., and A. A. Fesquet, Chemist and Engineer. Illustrated by 12 large plates. 8vo....$5

The American Cottage Builder. A Series of Designs, Plans, and Specifications for Homes for the People, together with Warming, Ventilation, Painting, etc. By John Bullock. Illustrated by 75 engravings. A new edition. 8vo....$3 50

The Rudiments of Architecture and Building. For the use of Architects, Builders, Draftsmen, etc., etc. By John Bullock. Illustrated by 250 Engravings. A new edition. 8vo....$3 50

A Practical Treatise on Gas and Ventilation. With special relation to Illuminating, Heating, and Cooking by Gas. Illustrated. By E. E. Perkins. A new edition. 12mo....$1 25

A Practical Treatise on Railway Curves and Location. For Young Engineers. By W. F. Shunk, C.E. A new edition. Tucks....$1 50

The Miller, Millwright, and Engineer's Guide. By Henry Pallett. Illustrated. A new edition. 12mo. $3 00

The Complete Practical Brewer. By M. L. Byrn, M.D. Illustrated. A new edition. 12mo..$1 25

The Complete Practical Distiller. By M. L. Byrn, M.D. A new edition. 12mo....$1 50

The Builders' Companion. By A. C. Smeaton, C.E. Illustrated. A new edition. 12mo....$1 50

☞ My New Catalogue of Practical and Scientific Books, Nov. 1, 1869, 74 pages, 8vo, sent free of postage to any one who will furnish his address.

WANTED—Second-hand Iron and Wood-working Machinery of every kind. Address MACHINERY, Postoffice Box 4499, New York.

SECOND-HAND
Engines For Sale.
One 10½x32-in. Putnam Machine Co. Patent Cut-off, in good order. One 10x30-in. Slide Valve, with Expansion Valve, in good order. Two 15x30-in. Upright Campbell & Whittier, handsomely finished. One 15x.6-in. horizontal Campbell & Whittier, with expansion Valve. One 7x16 in. Slide Valve, with pump and heater, in good order. One 10x36-in. Slide Valve, with 10-in. Pulley.

These Engines, having been replaced by Babcock & Wilcox Engines, will be sold very cheap.
BABCOCK, WILCOX & CO.
No. 44 Courtlandt st., New York.

A WATCH FREE—GIVEN GRATIS TO every live man who will act as agent in a new, light, and honorable business, paying $30 a day. No gift enterprise. No humbug. No money wanted in advance. Address R. MONROE KENNEDY & CO., Pittsburgh, Pa.

HAIR, WOOL, AND COTTON DUCK FELT, for sale by the Square foot, or boilers covered by Contract. RUSSIAN FELT, of every description, a SPECIALTY, by HENRY J. DAVISON, 77 Liberty st., N. Y.

FOR SALE—Lease, or Exchange—One Eight-ton Rolling Mill at Memphis, Tenn., new and in good order, or will take a partner to run same on joint account. Apply to DONOHO, JOY & CO., Southern Real Estate Brokers, Memphis, Tenn.

PORTABLE ENGINES—Manufactured by WALTER WRIGHT, Danvers Center, Mass., with a variable cut-off, worked by the governor. For economy of fuel, simplicity of construction, regularity of speed, and non-liability to derangement, they are equal to any in the market. Patent Rights for sale.

MATERIALS for FIRE-PROOF CEMENTS and Paints, Silicate of Soda, Chloride of Calcium, Asbestos, Talc, Soapstone, Black Lead, Manganese; also, Steel and Glass Makers, Potters and Chemists' Materials, Crude Minerals, Drugs, and Chemicals, for sale by L. & J. W. FEUCHTWANGER, Chemists & Drug Imp's, 55 Cedar st., New York.

JERSEY CITY LOCOMOTIVE WORKS.
MACHINERY SALE.
Great Reduction in Prices. Descriptive Catalogue and Price List furnished on application to Company's Agent, WILLIAM S. AUCHINCLOSS, Office, Steuben and Warren sts., Jersey City.

PAT. SEAMLESS TIN BOXES—For Blacking, Salves, Ointments, etc. Sheet Metal Stamping. Apply to W. H. HOAG, 214 Pearl st., N. Y.

DENMEAD & SON,
BALTIMORE, MD.

MANUFACTURERS Of Pulverizing Mills for Guanos, Phosphates, Bones, Ores, and other hard materials, Engines, Boilers, and Machinery in general. GEO. E. WHITE, 160 Front st., New York, Agent.

WROUGHT IRON
Beams and Girders.
THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-Iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address the Union Iron Mills, Pittsburgh, Pa. 21 tf

PARKER POWER PRESSES.

Are what are universally known as the
"FOWLER PRESS,"
improved, and are without a rival as regards strength and durability, combined with delicacy of adjustment of the Punch. NOTICE is hereby given that the
STILES POWER PRESS
Is a direct INFRINGEMENT OF OUR PATENT dated April 17, 1855, and reissued Aug. 24, 1869, and ALL PARTIES are hereby CAUTIONED against BUYING OR USING said presses WITHOUT OUR PERMISSION.
PARKER BROTHERS, West Meriden, Conn.
New York office with CHAS. PARKER, 27 Beekman st.

STEAM PIPE FOR HEATING FACTORIES. MANUFACTURED BY PARKER BRO'S, WEST MERIDEN, CONN.

THE BEST PUNCHING PRESSES ARE made by the Inventor and Patentee of the famous Eccentric Adjustment. Infringements upon said Patent will be severely dealt with. N. C. STILES, Middletown, Conn.

WOODWORTH PLANERS a SPECIALTY—From new patterns of the most approved style and workmanship. Wood-working Machinery generally. Nos. 24 and 6 Central, corner Union street, Worcester, Mass. Warerooms, 42 Cortlandt street, New York. WITHERBY, RUGG & RICHARDSON.

CAMDEN
Tool and Tube Works.
Camden, N. J. Manufacturers of Wrought Iron Tube, Brass Work and Fittings, and all the most improved TOOLS for Screwing, Cutting, and Fitting Pipe. Screwing Machines for Pipe, of five different sizes. Pipe Tongs, Common and Adjustable; Pipe Cutters, Pipe Vises, Taps, Reamers, Drills, Screwing Stocks, and Solid Dies. Peace's Patent Screwing Stocks, with dies. No. 1 Screws ¼, ⅜, ½, ¾ Pipe. Price complete, $10. No. 2 Screws 1, 1¼, 1½, 2 Pipe, $20. No. 3 both screws and cuts off, 2½, 3, 3½, 4, $65.

To Electro-Platers.
BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with books of instruction, manufactured and sold by THOMAS HALL, Manufacturing Electrician, 19 Bromfield st., Boston, Mass. Illustrated catalogue sent free on application.

STOCKS, DIES, AND SCREW PLATES Horton's and other Chucks. JOHN ASHCROFT, 50 John st., New York. 16 tf

IRON STEAMERS, HULLS, & LIGHTERS. Estimates & Specifications furnished on application. HENRY J. DAVISON, 77 Liberty st., New York, Agent for Pusey, Jones & Co. 21 tf

E. TURNER, Civil, Railway, and Mechanical Engineer. Address, care of W. JACKSON 504 Walnut st., Philadelphia, Pa.

SCHWEITZER PATENT BOLT CO., Greenpoint, L. I. Office 120 Chambers st., New York. Machine Bolts, Forged Nuts, Washers, Lag Screws, etc., cheap. Bolts made by this Company are superior in strength and finish to any in market.

PLATINUM. H. M. RAYNOR, 57 Bond st., N. Y.

MASON'S PAT'T FRICTION CLUTCHES are Manufactured by Volney W. Mason & Co., Providence, R. I. Agents, R. BROOKS & CO., 123 Ave. D, New York; TAPLIN, RICE & CO., Akron, Ohio 16 tfeow

$25 A DAY.—33 new articles for Agents. Samples sent FREE. H. B. SHAW, Alfred, Me

WROUGHT-Iron Pipe for Steam, Gas, and Water; Brass Globe Valves and Stop Cocks, Iron Fittings, etc JOHN ASHCROFT, 50 John St., N. Y.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st., New York. 17 1

THE INVENTOR'S AND MECHANIC'S GUIDE.—A valuable book upon Mechanics, Patents, and New Inventions. Containing the U. S. Patent Laws, Rules and Directions for doing business at the Patent Office; 112 diagrams of the best mechanical movements, with descriptions; the Condensing Steam Engine, with engraving and description; How to Invent; How to Obtain Patents; Hints upon the Value of Patents; How to sell Patents; Forms for Assignments; Information upon the Rights of Inventors, Assignees and Joint Owners; Instructions as to Interferences, Reissues, Extensions Caveats, together with a great variety of useful information in regard to patents, new inventions, and scientific subjects, with scientific tables, and many illustrations 108 pages. This is a most valuable work. Price only 25 cents. Address MUNN & CO., 37 Park Row, N. Y.

WANTED—AGENTS—$75 to $200 per month, everywhere, male and female, to introduce the GENUINE IMPROVED COMMON SENSE FAMILY SEWING MACHINE. This Machine will stitch, hem, fell, tuck, quilt, cord, bind, braid, and embroider in a most superior manner. Price only $18. Fully warranted for five years. We will pay $1000 for any machine that will sew a stronger, more beautiful, or more elastic seam than ours. It makes the "Elastic Lock Stitch." Every second stitch can be cut and still the cloth cannot be pulled apart without tearing it. We pay Agents from $75 to $200 per month and expenses, or a commission from which twice that amount can be made. Address SECOMB & CO., Pittsburgh, Pa., Boston, Mass., or St. Louis, Mo. CAUTION.—Do not be imposed upon by other parties palming off worthless cast-iron machines, under the same name, or otherwise. Ours is the only genuine and really practical cheap machine manufactured.

ASHCROFT'S LOW-WATER DETECTOR will insure your Boiler against explosion. JOHN ASHCROFT, 50 John st., New York. 16 tf

WANTED—AGENTS—To sell the AMERICAN KNITTING MACHINE. Price $25. The simplest, cheapest, and best Knitting Machine ever invented. Will knit 20,000 stitches per minute. Liberal inducements to Agents. Address AMERICAN KNITTING MACHINE CO., Boston, Mass., or St. Louis, Mo.

MAYS & BLISS,
MANUFACTURERS of PATENT SCREW and Lever Presses, Power Presses, Double-acting Presses, Cutting and Stamping Dies
Machinery for Petroleum Cans.
Tinner's Tools made to Order. Plymouth st., near Catharine Ferry, Brooklyn, N. Y.

POWER LOOMS. Improved Drop Box.
Spooling, Winding, Beaming, Dyeing, and Sizing Machines. Self-Acting, Wool-Scouring Machines, Hydra Extractors. Also, Shafting, Pulleys, and Self-Oiling Adjustable Hangers, manuf'd by THOS. WOOD, 2106 Wood st., Philad'a, Pa.

WOODBURY'S PATENT
Planing and Matching
and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery. S. A. WOODS, 91 Liberty street, N. Y.; Send for Circulars. 67 Sudbury street, Boston.

BOILER FELTING SAVES TWENTY-five per cent of Fuel. JOHN ASHCROFT, 16 tf 50 John st. New York.

THE
Whitlock Exposition,

Nos. 35 and 37 Park Place, NEW YORK.
This consists of a
Perpetual Fair
of New Inventions and Manufactured Articles of every description. For terms, etc., see THE WHITLOCK EXPOSITION RECORDER (specimen copy sent free,) a Semi-Monthly Journal, $1 per annum. Agents wanted.

ROBERT McCALVEY, Manufacturer of HOISTING MACHINES AND DUMB WAITERS. 602 Cherry st., Philadelphia, Pa.

STEAM AND WATER GAGES, STEAM Whistles, Gage Cocks, and Engineers' Supplies. 16 tf JOHN ASHCROFT, 50 John st., New York.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK, P. O. Box 1,057, Boston, Mass. N. B.—This detector is covered by two U. S. patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

LATHE CHUCKS—HORTON'S PATENT —from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks, Conn.

SALESMEN—Wanted, a few reliable, energetic salesmen, to sell by sample standard goods. Address H. H. RICHARDS & CO., 413 Chestnut st., Philadelphia, Pa.

VINEGAR.—How Made from Cider, Wine, Molasses, or Sorghum in 10 hours, without using drugs. For circulars, address F. I. SAGE, Vinegar Maker, Cromwell Conn.

PATENT IMPROVED BAND-SAW MACHINES manufactured and sold by FIRST & PRYBIL, 452, 454, and 456 10th Avenue, between 35th and 36th sts., N. Y. city. We also offer hand Saw Blades, imported and domestic, of the best qualities at reduced prices. Send for Circular and Price List.

PORTABLE STEAM ENGINES, COMBINING the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than 700 being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address J. C. HOADLEY & CO. Lawrence, Mass.

L. W. Pond's New Tools.
NEW AND IMPROVED PATTERNS—Lathes, Planers, Drills, Milling Machines, Boring Mills, Gear and Bolt Cutters Punches and Shears for Iron. Dealer in
IRON & WOOD WORKING MACHINERY
Works at Worcester, Mass. Office, 98 Liberty st., N. Y. S. N. HARTWELL, General Agent.

CAST STEEL Name Punches, Letters, and Figures—all sizes and styles, and for all purposes, made by ROBERT ROGERS, Letter Cutter, 26 Spruce st., S. E. cor. William st., New York.

CATALOGUES 10 CENTS EACH, SENT BY MAIL.
MATHEMATICAL INSTRUMENTS, 112 pages.
OPTICAL INSTRUMENTS, 72 pages.
MAGIC LANTERNS and STEREOPTICONS, 100 pp.
PHILOSOPHICAL INSTRUMENTS, 84 pages.
JAMES W. QUEEN & CO., 924 Chestnut st., Philadelphia, Pa.

$2,000 A YEAR AND EXPENSES To agents to sell the celebrated WILSON SEWING MACHINES. The best machine in the world. STITCH ALIKE ON BOTH SIDES. First machine on trial. For further particulars address THE WILSON SEWING MACHINE CO., Cleveland Ohio, Boston, Mass., or St. Louis, Mo.

R. BALL & CO., Worcester, Mass., Manufacturers of Woodworth's, Daniel's, and Dimension Planers; Molding, Matching, Tenoning, Mortising, Shaping, and Boring Machines; Scroll Saws, Re-Sawing, Hand Boring, Wood Turning Lathes, and a variety of other Machines for Working Wood. Also, the best Patent Door, Hub, and Rail Car Mortising Machines in the world. ☞ Send for our Illustrated Catalogue. RICHARD BALL. E. P. HALSTED.

FOR SALE,
ABOUT EIGHT HUNDRED (800) feet of wire rope, made by John A. Roebling, of Newton, N. J., described in his circular as 49 wires, No. 16, 2 89-100 inches in circumference. It has been used but very little. Inquire of S. B. JANES, Treas., 16 Park Place, New York

Bolts. *Nuts.*
HINGES, PICKS, Etc.
Prov. Tool Co., Providence, R. I. 29 Beekman st., N. Y

THE CHURCHMAN.
The Best and LARGEST Weekly Newspaper, WITH THE circulation in the Protestant Episcopal Church. Sent FREE for one month for examination, and till Jan. 1, 1870, to new subscribers for that year. $3 a year, in advance. M. H. MALLORY & CO., Hartford, Conn.

FOUNDERY WORK.—The Mineral Vale Iron Co. are prepared to make all kinds of FOUNDERY CASTINGS, heavy and light, at their Works, Mineral Vale, Pa., by the piece or by weight. Work solicited. Address S. B. JANES, Treasurer, 16 Park Place, New York

MODELS, PATTERNS, EXPERIMENTAL and other machinery, Models for the Patent Office built to order by HOLSKE MACHINE CO., Nos. 528, 530 and 532 Water st., near Jefferson. Refer to SCIENTIFIC AMERICAN office. 14 tf

SHINGLE AND HEADING MACHINE—Law's Patent. The simplest and best in use. Shingle Heading and Stave Jointers, Stave Cutters, Equalizers Heading Turners, Planers, etc. Address TREVOR & CO., Lockport, N. Y

HOMINY AND SAMP MILLS.—The only Self-Feeding, Discharging, and Separating Mill in use. For Mills and Territory, address J. DONALDSON, Rockford, Ill.

BURGESS NON-CONDUCTING BOILER CEMENT (Snyder's Patent) for sale or applied to Boilers, Pipes, Generators, Fire Boxes, Heaters, etc. etc. Saves 25 per cent in Fuel, and will stand any degree of heat. Send for circular JOHN F. RIDER 47 Dey st., New York

AMERICAN TINNED SHEET IRON. Coating uniformly over the entire sheet, by an entirely new and patented process. All sizes and gages on hand and made to order. H. W. BUTTERWORTH & SON, 25 eow tf 29 and 31 Haydock st., Philadelphia, Pa.

BLACK DIAMOND FILE WORKS.

G. & H. BARNETT, 41 and 43 Richmond st., Philadelphia, Pa

Molding Machinery.
THE MOST VALUABLE MACHINE FOR Planing Irregular and Straight Work in all branches of Wood-Working, is the Combination Molding and Planing Machine Co.'s "Variety Molding and Planing Machine." Our improved guards make it safe to operate our combination collars save one hundred per cent; and for planing, molding, and cutting irregular forms, our Machine is unsurpassed. The right to make and vend these Machines is owned solely by us, and we will defend Purchasers in case litigation is forced upon them by any parties pretending to own Patents on any part of our Variety Machine. COMBINATION MOLDING AND PLANING MACHINE CO., 424 East 23d st., or Postoffice Box 2239 New York City. Silas M. Hamilton, Baltimore Samuel Leggett, New York. 19 tfeow

Gear's Variety Moulding Machine,
WARRANTED THE BEST IN THE WORLD FOR Moulding and Cutting Irregular Forms, with Patent Improvements for Combination Cutters, and Patent Guard to protect operator and material. Secured by six Patents Deeds of Right to use furnished with every Machine sold, to protect parties in using them. Before purchasing Combination Moulding and Planing Machine Co.'s or Grosvenor's Mongrel Infringing Machines (which they and their agents in behalf of the Singer Sewing Machine, and the Central Pacific R. R. Co., and others to whom they had sold Machines to be used out of the State of New York have been made to pay us for using) or Ball's or Fay's Infringing Machines which users have had to pay us for right to use. Address for particulars and Machines. Sole Owners and Lawful Manufacturers for all the United States, except New York A. S. & J. GEAR & CO., NEW HAVEN CONN., or 91 Liberty Street, New York.

HARTFORD
Steam Boiler
INSPECTION & INSURANCE CO.
CAPITAL.....................$500,000.

ISSUES POLICIES OF INSURANCE, after a careful inspection of the Boilers, covering all loss or damage to
Boilers, Buildings, and Machinery,
—ARISING FROM—
STEAM BOILER EXPLOSIONS.
The business of the Company includes all kinds of
STEAM BOILERS,
STATIONARY, MARINE, AND LOCOMOTIVE.

Full information concerning the plan of the Company's operations can be obtained at the
HOME OFFICE, in Hartford, Conn.
Or at any Agency.
J. M. ALLEN, President.
C. M. POND, Vice President.
T. H. BABCOCK, Secretary.

BOARD OF DIRECTORS:
J. M. Allen....President.
Lucius J. Hendee....President Ætna Fire Ins. Co.
F. W. Cheney....Ass't Treas. Cheney Bro's Silk M'fg. Co.
John A. Butler....Pres. Conn. River Banking Co.
Charles M. Beach....of Beach & Co.
Daniel Phillips....of Adams Express Co.
G. M. Bartholomew....Pres't American Nat'l Bank.
R. W. H. Jarvis....Pres't Colt's Fire-Arms Mfg. Co.
E. M. Reed....Sup't Hartford & N. Haven Railroad.
C. M. Pond....Treas. Hartford & N. Haven Railroad.
T. O. Enders....Sec. Ætna Life Ins. Co.
Leverett Brainard....of Case, Lockwood & Co.
Geo. Crompton....Crompton Loom Works, Worcester.
D. L. Harris....Pres't Conn. River R. R., Springfield.
Earl P. Mason....Pres't Prov. & Wor. R. R., Providence.
Hon. E. D. Morgan....U. S. Senator, New York.
New York Office,
106 Broadway.
THOS. S. CUNNINGHAM, Agent.
R. K. McMURRAY, Inspector.

H. BOARDMAN, Lancaster, Pa.—Superior Patent Cork-cutting Machinery, Hard-laid Twine, Cord, and Rope Machinery, with Pat. Stop & Condenser

Advertisements.

Advertisements will be admitted on this page at the rate of $1.00 per line. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

MECHANICS
WILL FIND THE
Scientific American
The Best Paper for Them Now Published.
It is the most Popular Journal in the world, devoted to Invention, Mechanics, Manufactures, Art, Science, and General Industry.
THE SCIENTIFIC AMERICAN
Has been Published for nearly a quarter of a Century and has a larger circulation than all other paper of its class in this country and in Europe. Every number of illuminated with
Superb Illustrations
by our own artists, of all the best Inventions of the day and descriptions and illustrations of
LEADING MANUFACTURING ESTABLISHMENTS, MACHINES, TOOLS AND PROCESSES.
Inventors and Patentees
will find in each number an official List of Patents, together with descriptions of the more important Inventions, with decisions in Patent Cases and points of law affecting the rights and interests of Patentees.

TERMS OF SUBSCRIPTION:—$3.00 a year, $1.50 for six months. $1 for four months.
To clubs of ten and upward, the subscription is only $2.50 per annum each.
Specimen copies will be sent gratis.
MUNN & CO., Publishers, 37 Park Row, New York.

PATENTS—*INVENTORS*
Who desire to secure their rights by
LETTERS PATENT
Are referred to an advertisement on another page.
An Illustrated Pamphlet containing the Patent Laws, and full particulars concerning the obtaining of Patents, will be mailed free on application. Also, a Pamphlet relative to
Foreign Patents and their cost furnished free.
Address
MUNN & CO. Patent Solicitors, 37 Park Row, New York.

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXI.—No. 20. [NEW SERIES.] | NEW YORK, NOVEMBER 13, 1869. | $3 per Annum. [IN ADVANCE.]

Canal of Isabella II., at Madrid.

We herewith present to our readers a view of a portion of one of the most remarkable works in hydraulic engineering of modern times.

It is called the "Canal de Isabella II.," and was originally designed to supply the city of Madrid with water. It has, however, also been employed for irrigating the vegetable gardens in the environs of the Spanish capital.

This canal and the magnificent works connected with it were sanctioned by the Spanish Government in 1851, and the work was brought to completion in 1858. Its cost was 57,897,368 francs, over eleven and one half millions of dollars in gold.

The engineer who designed this immense work was Don Lucio del Vallé, engineer-in-chief to the Spanish Government. For his services he received the honor of the order of Charles the Third. He was assisted by the present engineer of the works, Don Jose de Morer.

The total length of the canal is over forty-seven miles. In this length there are seven miles of subterranean galleries, four thousand six hundred feet of aqueducts, and eight thousand six hundred feet of siphons.

There are also many remarkable trenches, retaining walls, etc., and excepting the aqueducts, the entire canal is arched over.

The water is brought from the river Lozoya, where it emerges from the Guadarama Mountains to the north of Madrid. A dam, ninety-eight feet in hight, is erected at this point, abutting on the rocks which form the banks of the river. This dam is built of cut stone, and the lake formed by it contains one hundred millions cubic feet of water.

The two principal siphons are those of Guadalix and Bedonal. The latter is the subject of the engraving which accompanies this sketch. It is about four thousand six hundred feet in length.

The transverse section of the canal has an area of about twenty square feet, and it discharges about six millions six hundred thousand cubic feet of water per day. Only about one fifth of this supply is used for the town service, the rest being employed for irrigation.

The water, on emerging from the lake, passes through a tunnel, and between this tunnel and the city of Madrid there are thirty-one tunnels, thirty-two aqueducts—among which are some about ninety feet in hight and nearly three hundred feet in length—and three great siphons, besides the enormous one shown in our engraving, employed to carry the canal across valleys, each of which is composed of four pipes about three feet in diameter.

The water for purposes of irrigation is drawn off before the canal finally discharges itself into the reservoir del Campo Guardias, which occupies the highest ground in the vicinity of Madrid.

The lands irrigated comprise four thousand four hundred and forty-six acres.

The town service comprises over sixty miles of cast-iron pipes, and over forty-five miles of subterranean canals lined with brick and cut stone. The smallest of these are sufficiently high for workmen to stand upright.

In addition to the private service in the city, thirty-five public fountains are supplied, and three thousand orifices for irrigation and extinction of fires.

Of all the aqueducts, those of La Sima and Colmenarejo are the most noteworthy. It was first intended to carry the canal at La Sima across in a siphon like those described above, and one was commenced in accordance with that design, but it was subsequently decided to erect an aqueduct. This aqueduct is two hundred and fourteen feet long and eighty three feet high. It has an arch at the bottom of fifty-five feet span, above which are seven arches of about twenty-four ft. span.

The Colmenarejo aqueduct is three hundred and eighty-four feet long and sixty feet high. This aqueduct has fifteen semicircular arches of over twenty-five feet span, built of cut limestone and granite.

Previous to the erection of these works the city of Madrid depended for its water supply partly on wells and partly on a small stream which flows into the town; the water was raised by two large pumping engines at great expense. The works we have described, now furnish water at no cost except the interest on the cost of the works and the maintenance of repairs. The head is ample to throw water over the highest buildings in the city.

Hitherto the construction of such works has been opposed by the millers upon streams, who were reluctant to surrender their rights unless exorbitantly paid. Under the new law regulating such matters, they are compelled to sell their privileges at a price fixed by appraisal.

BEDONAL SIPHON OF THE "CANAL DE ISABELLA II.," SPAIN.

THE TIDAL WAVE.

In reproducing from the London *Spectator* the following popular article on the tides, we wish it understood that we do not invite a deluge of correspondence upon the subject. Experience has warned us that there is no subject so fertile as tides. Were we to oppose no barriers to tides, they would fill our columns, overwhelm, and sink us. Therefore while we publish this article as a reflex of the doubts entertained by hosts of thinkers on both sides of the Atlantic, we do not on that account commit ourselves to lengthy discussions of the topic in future numbers.

"The approach of one of the highest Tides which the combined attraction of the sun and moon can possibly raise has made many of us look up our acquaintance with the laws of Tidal Motion. Every one has satisfied himself why the coming spring tide will be higher than usual. We know that the moon will be near the equinoctial when new, and also near her perigee; and that the combination of these circumstances at a season of the year when the tidal wave raised by the sun is unusually high, must necessarily result in causing a very remarkable tide, even though the winds should be unfavorable. For if we do not have a particularly high tide, owing to the influence of the winds being opposed to the progress of the tidal wave, there will be the equally significant phenomenon of a singular withdrawal of the water at the time of low tide. A few years ago, when a very high tide was expected on the shores of France, the winds drove back the sea, and many who had come from far inland to witness the great influx of water returned disappointed. But had they waited for six hours or so, they would have been well rewarded for their journey, since at the time of low tide the water withdrew far within the usual limits, and strange sights were revealed to the wondering fishermen who lived along that shore.

"Wrecks of forgotten ships were to be seen half buried in the ooze and slime of a bottom which had remained sea-covered for centuries. Old anchors were disclosed to view, with the broken cables attached to them, on which the lives of many gallant men had once depended, so that every parted strand seemed the record of a lost life. And crawling things and stranded fish showed how far the great sea had retreated within its ordinary bounds. We may, therefore, expect that results well worth noting will under any circumstances accompany the tidal action of October 6th, on which day the effects of the conjunction of the sun and moon on October 5th will be most strikingly manifested.

"But our object at present is less to consider the effects of the great tidal wave of October 6th, than to dwell upon some interesting effects and peculiarities of tidal motion. When we learn that astronomers for the most part recognize in the tidal wave a cause which will one day reduce the earth's rotation so effectually that instead of twenty-four hours our day will last a lunar month—while many astronomers believe that the same wave will at a yet more distant day bring the moon into collision with our globe—it will be seen that the laws of the tides have a cosmical as well as a local interest. They involve more important considerations than whether the water in the Thames will rise a foot or two higher than usual at Vauxhall Bridge on any particular day. And though many thousands of years must elapse before either of the events looked forward to by astronomers shall have happened, yet we cannot but look with deep interest into the long vista of the coming centuries. To the astronomer, at any rate, the study of what will be, or of what has been, is as interesting even as the study of what is.

"But at the very threshold of the inquiry we are met by the question, "Do any of us know the law of the tides?" The reader may be disposed to smile at such a question. Does not every book of geography, every popular treatise on astronomy teach us all about the tides? Cannot every person of average education and intelligence run through the simple explanation of the tidal wave?

"Certainly it is so. Most of us suppose we know in a general way (and that is all that we at present want), how the moon or sun draws a tidal wave after it. The explanation which nine hundred and ninety-nine (at least) out of every thousand would give runs much on this wise. Being nearer to the water immediately under her than to the earth's center the moon draws that water somewhat away from the earth; and again, being nearer to the earth's center than to the water directly beyond, the moon draws the earth away from that water. Thus, underneath the moon a heap of water is *raised*, and at the directly opposite point a heap of water is left (so to speak). So that were it not for the effects of friction, the water would assume a sort of egg-shaped figure, whose longest diameter would point directly towards the moon.

"And not only is this the explanation which is invariably given in popular treatises, but scientific men of the utmost eminence have adopted it, as correctly exhibiting the general facts of the case. Recently, for example, when Mr. Adams had published his proof that the moon's motion is gradually becoming accelerated in a way which the lunar theory cannot account for M. Delaunay, a leading French astronomer, endeavored to prove that in reality it is the earth's rotation which is diminishing instead of the moon's motion which is increasing. He thought the tidal wave, continually checked by the earth's friction as it travels against the direction of her rotation, would act as a sort of 'break,' since its friction must, in turn, check the earth. And in discussing this matter he took, as his fundamental axioms, the law of tidal motion commonly given in our books of geography and astronomy. This presently called up the Astronomer Royal, who gave a very clear and convincing demonstration that there would always be *low* water under the moon, if there were no friction.

"But this is not all, nor is it even the most remarkable part of the case. Eminent as the Astronomer Royal deservedly is, and especially skilful as we know him to be in questions such as the one we are considering, yet if he were *solus contra mundum*, we might readily believe that there was some flaw in his reasoning since, as every one knows, the most eminent mathematicians have sometimes misconceived the bearings of a perplexing problem.

"But, as Mr. Airy himself pointed out, Newton and Laplace were both with him.

"How is it that the views of Newton and Laplace, admittedly the very highest authorities which could be quoted, have found no place in our treatises of astronomy? Their views have never been disproved. In fact, as we have seen, one of the most eminent of our mathematicians, in re-examining the question, has come to precisely the same conclusion. Can it be that the explanation actually given is preferred, on account of its greater simplicity? That would be reasonable, if the two explanations were accordant, but they happen unfortunately to be wholly opposed to each other, and therefore one of them must be false. Those who teach us our geography and astronomy ought to look to this.

"The worst of it is, that most of the consequences which astronomers ascribe to the action of the tidal wave depend on the choice we make between the rival theories. If the ordinary view is right, the moon's motion is continually being hastened by the attraction of the bulging tidal wave, and this hastening will bring the moon into a smaller and smaller orbit until at last she will be brought into contact with the earth, unless, as Professor Alexander Herschel suggests she should crumble under the increased effects of the earth's action, and so come to form a ring of fragments around our globe. If, however, the other view is right, the moon's motion will be continually retarded, her orbit will gradually widen out, and some day, presumably, we shall lose her altogether. This retarding and hastening refer to the rate at which the moon completes her revolutions round the earth. As a matter of fact paradoxical as it sounds, it is a continual process of retarding which eventually hastens the moon's motion. Every check on the moon's motion gives the earth an increased pull on her, and this pull adds more to her velocity than she lost by the check. And *vice versa*.

"Again, if the views commonly given are just, the earth's friction should cause the tidal wave to lag behind its true place. But if Newton, Laplace, and Airy are right, then, to use the words of the last-named astronomer, 'the effect of friction will be to accelerate the time of each individual tide.'

"We apprehend that there is room for improvement in the current account of the tides. Many eminent men, as Whewell, Lubbock, and Haughton, have discussed in the most elaborate and skillful manner the laws according to which the actual tidal wave travels along the great sea-paths. But as yet no one has tried to reconcile the theory of Newton, which may be called the dynamical theory of the tides, with that commonly given in our books, which may be called the statical theory."

THE "DOGWOODS" USED IN THE MANUFACTURE OF GUNPOWDER IN ENGLAND.

CONDENSED FROM A PAPER IN "THE STUDENT" BY JOHN R. JACKSON, A.L.S.

There are few branches of science more subject to change than that which rules the conduct of warfare. Looking back but a very few years, we may easily trace such a revolution in the construction of gunnery and projectiles, that the results when considered seem somewhat startling. Such immense strides have been made, both in gunnery and naval architecture, that it is difficult to say whether, except in scientific knowledge, we are in any way benefited by modern inventions in these branches of mechanism, for no sooner is some apparently invulnerable coating invented to incase our floating ocean monsters, than a gun is almost simultaneously produced to pierce its sides. The increased power of modern projectiles is due, more to the construction of the instruments themselves than to the composition of the combustibles used, for no new explosive agent has been brought into actual use to supersede gunpowder, so that gunpowder still holds its own, and its ingredients are identical with what they were in the time of Roger Bacon, who flourished about the middle of the thirteenth century, and died in 1292, and to whom has been ascribed its discovery, though there seems great reason to suppose that it was known to the Chinese at a much earlier period. A Franciscan monk, named Berthold Schwartz, is said to have been acquainted with it at a very early date. One Ferrarius, a Spaniard, who lived in the thirteenth century, appears to have known it by the name of "flying fire," and gives a recipe for its composition. Bacon was undoubtedly well acquainted with both its composition and its combustible nature, for he says, "A little matter about the bigness of a man's thumb, makes a horrible noise and produces a dreadful coruscation; and by this a city or an army may be destroyed several ways." Gunpowder seems first to have been used towards the latter part of the reign of Henry III., but perhaps it did not come into general use in England till early in the fourteenth century, or during the reign of Edward III.

Though, as we have already said, the chief ingredients of gunpowder are the same as they were six centuries back, many improvements have of course been made in its quality and composition, as for instance in the choice of the materials used, as well as in the careful preparation and mixture of them. The charcoal is considered by the best makers the especial ingredient upon which the quality of the powder chiefly depends, so that much care is required in the selection of the proper kinds of wood to produce a good charcoal. It is to this branch of the gunpowder manufacture that we wish especially to draw attention. It may, however, be as well in passing, to say that much of the intensity of the explosiveness and consequent value of gunpowder, is due to three great causes—primarily, the purity of its ingredients; secondarily, a careful knowledge of the proportions; and thirdly, a perfect admixture of them.

With regard to the choice of the woods for gunpowder charcoal, heavy or dense woods are always rejected, and the lighter kinds chosen. The woods which recommend themselves most for use with gunpowder makers, seem to be those most free from silica, and capable of producing a friable porous charcoal which burns quickly, leaving the least possible quantity of ash. After repeated trials of various woods, such as alder, willow, hazel, spindle, poplar, lime, horse chestnut, and others, a wood known to the gunpowder makers as dogwood, was acknowledged to be the most suitable, and is now always used by the best makers for the superior kinds of powder. The history of this so-called dogwood is somewhat remarkable, inasmuch as it shows how errors are perpetuated by authors quoting one from another, and so handing down preconceived ideas which have obtained ground for want of proper and careful scientific examination at the first.

In most books relating to economic botany, or to the application of woods, *Cornus sanguinea*, or dogwood, is referred to as yielding the best charcoal for gunpowder. Certain it is that the gunpowder makers all know the wood they use in such large quantities by the name of dogwood, and it was generally believed that *Cornus sanguinea* was the plant which furnished them with their supplies. Sometime since, however, a correspondence was opened between Dr. Hooker and one of the first gunpowder makers in the kingdom, on the subject of the woods used in their trade. Specimens of these woods were sent to Kew, some were thoroughly dried and ready for calcining, others were freshly-cut specimens, and with these were sent branches with fruits attached, gathered from the same plant for the purpose of identification. These specimens proved to be not the wood of *Cornus sanguinea*, but that of *Rhamnus frangula*. Samples of the dried wood and a portion of a young tree were forthwith obtained from the Government powder works at Waltham Abbey, the former from the stack of dried timber kept ready for use, and purchased in the ordinary course of business, and the latter from the plantation round about the works. These specimens were found to be identical with those previously examined and obtained from the private works. After this, specimens were obtained of foreign grown dogwood, which upon comparison with those of English growth again proved identical; here then is proof that the *Rhamnus frangula* is the plant from whence the gunpowder makers draw their supplies, and that *Cornus sanguinea*, or true dogwood, is never used now, nor, indeed, is there any proof that it ever has been, for the powder makers maintain that what they now call dogwood is the same wood which has always been used by them.

It is but a few years since, that the bulk of this wood was supplied to the powder manufactories from English plantations, chiefly from Suffolk, Norfolk, Essex, and Kent; but after the introduction of the Enfield rifle into the military service of this country, the superior kinds of powder came much more into demand, and it was found difficult to obtain a sufficient quantity of dogwood. It was taken to the powder works in the winter of the year after the woods were cleared, the supply was very uncertain. A difficulty was likewise experienced in obtaining the desirable degree of uniformity in the length and thickness of the sticks, and the perfect clearing or scraping of the bark. Although the trees grow scattered about in most woods and plantations, it is only where the plants are grown in large quantities that the wood can be collected and sold with profit; further than this, the wood having necessarily to be perfectly free of bark, it must be collected either in the winter or early spring, when the bark is easily removed. And this spring cutting is objected to by owners of property, inasmuch as it disturbs the game just at the breeding season. All these things considered, the attention of one of the dealers in gunpowder woods was turned, some four or five years back, to the possibility of its importation from the continent, and a cargo of foreign dogwood was accordingly brought from Holland. This met with a ready sale, and since then the trade has rapidly increased, so that at the present time there are many firms established in Holland, Belgium, and Prussian Germany, who tender for the annual supply of this wood to the several gunpowder works in this country. Large tracts of marsh land and forests lying between Berlin and Frankfort, as well as in various other parts of the continent, have their undergrowth composed almost entirely of this description of dogwood, which can be obtained at a very low price.

The wood is delivered at the works in sticks, usually about six feet long, and about the thickness of a man's thumb, and tied up with strong wire into bundles about a foot in diameter. The powder makers are very particular that the wood should be neither too fine, nor too young, but of a medium growth. Crooked wood is also objected to as it will not pack well in the cylinders in which it is calcined. At the present time foreign grown dogwood is preferred before that of English growth, it is more even and regular, and better sorted, and besides this it is cheaper, for while the English product fetches, at the lowest price, about £10 per tun, the foreign wood is supplied at from £8 to £10.

The bundles of dogwood, as supplied to the gunpowder makers, vary in size and weight according to where the wood is produced, and the wood itself also differs greatly in substance and density. Quick grown wood, produced on a free soil such as that of Westphalia, weighs considerably lighter than that grown on poor soil, such, for instance, as Hanover. The standard measure of a bundle of dogwood used to be six feet long, and two feet six inches in circumference, and such a bundle weighed from eighteen to twenty-one pounds. The foreign bundles, bound together with wire, are usually much larger, forty or forty-five bundles making one tun. The sizes of the bundles are so regulated as to be conveniently handled or carried about, and the above sizes are usually agreeable to the powder makers.

From the dangerous nature of the manufacture, gunpowder works are always more or less isolated, and the land immediately surrounding the buildings thickly planted with trees and shrubs to lessen the force of the concussion in case of explosion—thus, for instance, the Messrs. Hall's works at Faversham are spread over six hundred acres of land, and much of this land is planted with alder and Rhamnus, more especially the former, for though the wood itself is not so valuable as the latter for the actual manufacture of powder, the tree is owing to its larger size, more effectual in obstructing fragments of burning timber as well as diminishing the force of the shock in case of an explosion. In some works it is the custom to stack the wood for a considerable period after being cut previous to using; thus, for instance, alder and willow would be kept for about three years, and dogwood for, perhaps, a still longer period. It has been found, however, that alder loses about twenty-five per cent of its weight in the first month after cutting, and then remains stationary; therefore the system of stacking for so long a time appears quite unnecessary.

While most botanical writers allude to the wood of the *Rhamnus frangula* as being *one* of the best for powder charcoal, they do not apply to it the name dogwood, but refer that wood to *Cornus sanguinea*, which has been generally, though it appears wrongly, accepted as furnishing the bulk of the wood used in the manufacture of the finer kinds of powder; alder, willow, and other woods, being still largely used for blasting and the coarser kinds of powder.

THE MANUFACTURE OF SULPHURIC ACID.

From the Report of J. Lawrence Smith, United States Commissioner to Paris Exposition.

Furnaces for Burning Pyrites.—There is nothing specially new in the present construction of furnaces used for burning pyrites, but as these are scarcely used in America, but perhaps can be with advantage, it is well to refer to them here.

At first fuel was mixed with the pyrites to keep up the combustion, but this was soon abandoned, and it is found that pyrites in burning furnishes all the heat necessary to continue the combustion. The beds of pyrites are made quite thick; at Javelle, France, they are made over three feet thick, and the doors of the furnace are luted. The combustion goes on very slowly, so that forty-eight hours are required for the upper layer of the pyrites to descend to the grate bars. In this way most complete combustion is procured, and hardly two or three per cent of sulphur remain in the residue. However, to accomplish this complete combustion, the pyrites must be in lumps; but as the pyrites is obtained about 10 per cent of it is more or less pulverized, constituting one of the annoyances in this method of making sulphuric acid.

Various methods and furnaces are in use for the combustion of this fine pyrites, and they accomplish the result more or less perfectly.

The furnace of Spence, used almost universally at Manchester, is probably the best for this purpose. This furnace is a very long one, from forty to fifty feet long by six feet wide, and inclined about fifteen inches downwards. The floor of the furnace is of large flat tiles, and is heated from below by a lateral furnace three or four feet in advance of the lowest part. The fine pyrites is introduced by an opening in the top of the furnace, and is spread by means of rakes introduced through a lateral door only opened during the raking, and when it is necessary, by skillful movement, to push forward the pyrites to the lower part of the furnace. After being allowed to cool, it is drawn out of the furnace, at the front part, through an opening that supplies the requisite quantity of air by adjustment.

The roasting lasts about twenty-four hours—the furnace having twelve doors on the side, and two hours being allowed to the pyrites between each door before it is pushed forward. It is said that the fine pyrites can be made to give up all but two or three per cent of its sulphur, a result not far from what is realized with that in lumps; and when it is remembered that this fine pyrites bears a less price than that in lumps, these results are certainly of vast importance to the large factories. Kuhlmann, in his process, mixes the fine pyrites with clay, and makes small balls or cakes, that, after drying, are used in the same furnace in which he burns the lump pyrites. Five per cent of clay is sufficient to mix with the fine pyrites to form the little balls, and they can be made at a cost of about forty cents a tun in France.

The furnace that Michael Perret has introduced for burning fine pyrites in several establishments in France is highly spoken of. Instead of using the long furnace of Spence, he divides the furnace into a number of shelves, with large fire tiles, six centimeters thick and ten centimeters apart, and so placed in the masonry that the hot air and gases proceeding directly from the pyrites in lump, burning in the ordinary furnace, circulate back and forth (ascending all the time) over these shelves, on which the fine pyrites is spread to a depth of three centimeters. We may have ten or more of these shelves, until the furnace becomes inconveniently high. The operation lasts thirty-six hours, and each furnace can burn one tun of fine pyrites. This system is said to require one per cent more of niter in the subsequent operations.

Furnace of Gerstenhoffer.—We cannot omit giving a passing notice of the furnace of Gerstenhoffer, of Freiberg, which is employed by the Vieille Montagne Company, of France, and also at Swansea, in Wales. At the last-named place it is used for desulphurizing copper ores containing 30 per cent of sulphur, and from which they are now collecting the sulphurous acid and making sulphuric acid.

The furnace is composed of a quadrangular tower eighty centimeters square and six meters high, closed at the top, except a long, narrow opening extending from one side to the other. Above this opening is placed a hopper of the same length, provided with two feed rollers at the bottom, the movement of which feeds the furnace with pulverized pyrites. This pyrites, as it enters the furnace, falls on a triangular prism or cross-bar of brick fastened horizontally to the walls of the furnace, with its base uppermost. The powder gradually accumulates on this horizontal face, so as to make a pile with a triangular section, the base of which covers the face of the prism. After a short while the pyrites falls over on each side of the prism in two thin sheets, which, in descending, meet with two other prisms below so placed as to intercept it and cause it to accumulate again, and afterwards to fall over in four sheets, and so on. By successive descents over as many as twenty prisms the pyrites is brought thoroughly in contact with the heat and air of the furnace, and by the time it reaches the bottom there is not more than four or five per cent of sulphur left in it. By openings, closed by movable stoppers in the side of the furnace, the process of oxidation of the pyrites can be seen, and the influx of air can be regulated.

Utilizing the Residue from the Pyrites Furnace.—This residue, notwithstanding the little sulphur remaining in it, is used in the high furnace, mixed with ores for the production of iron. Mr. Bell, near Newcastle, and Perret in his operations, has shown that by the addition of a little common salt in the desulphurizing process, iron of a good quality can be made from this material. When this waste product from the manufacture of sulphuric acid becomes useful in a remunerative industry, another great impulse is given to the production of this acid from pyrites.

The Use of Fluxes in the Reduction of Iron Ores.

The principle upon which the use of all earthy fluxes is based, is, that, practically, no earth is fusible alone; argillaceous and silicious earths together are infusible, so with argillaceous and magnesian—so with silicious magnesian, but, when calcareous earth, lime, or limestone, is added to any mixture of the other two, all will combine and run into glass, which will become thin, with the same heat, according to the skill in proportion and treatment.

M. D'Arcet, a French chemist, made this experiment: He put into three crucibles, respectively, a ball of clay, a quartzose, or silicious sandstone ball, and a limestone or chalk ball, and exposed them to heat so great that the chalk ball fused slightly, where it had touched the sides of the crucible. They were unmelted. He then mixed them, and, in the same fire, they ran into a thin and transparent glass.

Kirwan found that argillaceous and magnesian, argillaceous and silicious, and silicious and magnesian earths would not melt in any proportion, but that silicious and calcareous earths, argillaceous and calcareous, by very strong heat, would vitrify, but not perfectly. When the earths are calcareous, argillaceous and magnesian, it requires a double proportion of the calcareous to make a glass. No glass can be made if the clay earth, or magnesian predominate. It has been found that the calcareous earth, argillaceous and silicious earths, or calcareous, magnesian, and silicious can be brought into perfect fusion, if the calcareous somewhat predominate. With a strong heat, argillaceous, silicious, and magnesian earths may form a glass without lime, and this is the only combination he tried that would thus produce glass without lime.

The metallic oxides (iron, of course, included) aided the fusion. Note, that, common clay sometimes contains one half, or more, of its weight of sand intimately mixed. If clay predominate in the iron ore the flux indicated is limestone, and if the iron be, on the contrary, mixed with limestone, the proper flux is not limestone, but clay.

Herein consists much of the practical knowledge in mixing ores so that they may flux one another, which are with difficulty fluxed alone.

Hence the necessity of a knowledge of the composition of ores to prevent the loss of fuel, of time, and of iron, by the iron becoming entangled in the scoria, or in a thick unyielding slag.—*Osborn's Metallurgy of Iron.*

Chemical Fire Engines.

Engineering states that the principle of extinguishing fires by the use of water saturated with carbonic acid, has recently been extended by a Glasgow firm to engines, which can be worked either by manual or steam power, in such a way that the component parts required for the generation of the gas are forced separately into a vessel within which they mix, and pass beneath the self-created pressure through the hose and nozzles in connection with the machine. The apparatus comprises a wheeled carriage, the body of which is in the form of a tank made with sheet iron fixed upon angle-iron frames, and which is divided into three compartments. Pumps are fitted into the compartments, and are arranged to be actuated by a beam, on a rocking shaft which is provided with the usual levers for the application of manual power. The pumps may, however, be worked by a portable steam engine, as in existing steam fire engines. The communications with the pumps are so arranged that they may draw from the tank compartments, by openings, in which case the liquids used are filled into those compartments, that is, the solution of carbonate of soda or other suitable carbonate is filled into one compartment, and the solution of tartaric acid is filled into the other compartment. Or the openings may be closed and the liquids may be drawn from other tanks or vessels by means of hose coupled to the ends of the pipes projecting out through the back of the carriage for the purpose. Air vessels, for equalizing the flow of the liquids are applied to the suction pipes. The delivery pipes from the pumps lead into a strong vessel in the front compartment, and in connection with this vessel there is a single delivery pipe, upon the projecting end of which the hose is to be coupled for leading the gas and water to the fire. A vessel receives the two liquids delivered by the pumps, and these liquids act upon each other in the vessel or generator, as it may be termed, and generate or set free the carbonic acid of the carbonate employed. This carbonic acid passes off along with the liquid and is by the hose directed upon the fire, against which it is thus in a most effectual manner made to exercise its well-known extinguishing power.

The arrangement of the various parts of the apparatus may be modified, and will depend more or less on the power intended to be developed. Thus the chemical liquids employed may form only a part of the liquid employed by the engine, water from any ordinary source being also pumped into the generator or delivery pipe either by separate pumps or by the same pumps; separate suction pipes being used in the latter case with valves or cocks to regulate the quantities of chemical liquids drawn in along with the simple water. Or, on the other hand, the two chemical liquids may be forced into the generator by separate and distinct pumping engines arranged upon the same or separate carriages.

The experiments which have been conducted with this machine show that it possesses in an extended form the merits of the smaller apparatus. The water and carbonic acid gas combined produce a far greater effect upon a fire than an equal bulk of unmixed water—an important consideration, for it happens not unfrequently that the means used for the extinction of fires are productive of as much damage as the fires themselves. A series of trials will shortly be conducted with the new chemical engines, and we shall then be able to ascertain the advantages they will actually offer over ordinary engines.

Damp Walls.

"Our attention," says the *Mechanics' Magazine*, "has of late been called to the question of rendering the walls of buildings impervious to moisture. We have received letters upon the subject from correspondents who ask us to point out a remedy for the evil. We, therefore, gladly take the opportunity of making known to our readers that there is a remedy, at once simple and efficacious. This is a process invented by Mr. Frederick Ransome, and which is being successfully carried out in practice by the Patent Stone Company, East Greenwich. It consists in the employment of colorless mineral solutions which possess the property of forming an insoluble and indestructible mineral precipitate when applied to buildings. The deposit takes place not only on the surface of the material to which it is applied, but enters the body of the substance. The application of the solution in no way alters the color of the material, a perfectly natural appearance being preserved in the building. The effect is permanent, neither atmospheric nor saline influences in the least degree affecting the indurating material. It not only renders the building water-proof, but it further most effectually indurates and preserves from decay the stone or bricks treated with it. This process has recently been applied to several buildings which are stated to have been untenantable, previously to the application, on account of exposure to a wind-driven rain. Paper now hangs well on the walls from which it formerly drooped in festoons and tatters, while dryness and a cleanly appearance have taken the place of dampness and mildew. This process of rendering buildings impervious to wet is comparatively inexpensive, therefore no one need longer to suffer from that source of discomfort and danger to health—damp walls.

Narrow Gage Railway.

The Portmadoc and Festiniog Railway, Wales, is now attracting much attention from railroad men. This is a little line in North Wales, which was originally constructed for the purpose of acting as a tramway for slate and stone from the hills of Merionethshire to the sea shore. It is now being used as a regular goods and passenger line. The chief peculiarity in its construction is that the gage is only two feet broad. Hence, though the line runs through a very difficult country, the expenses of construction and working are so small that the traffic yields the enormous revenue of thirty per cent. The reason is simple enough. It is because the proportion between the dead weight and paying weight is so much less than upon other railways. The engine and tender upon this line weigh about ten tuns, against forty tuns upon the wider gage of other lines. Instead of a first class carriage weighing seven and a half tuns, to carry thirty-two passengers, and representing nearly five cwt. of dead weight for each passenger, the carriages on the Festiniog weigh only thirty cwt. for twelve passengers, or two and a half cwt. for each person carried.

EFFECT OF STEAM HEAT ON HAY.—A correspondent from Rancocas, N. J., favors us with a specimen of hay wrapping which had been on a steam pipe for nine years; the pipe carrying steam at fifty-five lbs. The specimen is of a chocolate brown and very friable; but it burns no more readily than well dried fresh hay, although its appearance would seem to indicate great combustibility. We should have less fear of its ignition than of pine wood similarly carbonized.

Improved Implement for Opening Cans.

The want of a perfectly efficient, handy, and light tool for opening tin cans containing fruits, vegetables, etc., has been long felt. The practice of preserving fruits, meats, etc., in this manner has become general, and something of this kind is needed in almost every house.

The engraving tells its own tale. The instrument consists of two small levers, A and B, pivoted together at C. The pivot, C, is bent at right angles, and made sharp to act as a center punch.

Two blades, D and E, are held by clips and set screws to these levers, one blade being set at right angles to the other, These blades are adjustable to different diameters of cans.

In use the instrument is seized with both hands in the manner shown in the engraving, the center, C, is first punched vertically through the top of the can. The handles are then brought to a horizontal position, and the blade, E, is thrust through the tin, making a radial cut, shown at F. The center, C, and the blade, E, now hold the can from turning, while the lever, A, is made to perform a complete revolution, carrying with it the blade, D, and cutting out the top in a remarkably neat manner.

There is no liability of the can's turning, as in the case with many instruments made for this purpose, and thus a great annoyance is completely obviated.

Patented through the Scientific American Patent Agency, Oct. 19, 1869, by W. M. Bleakley, whom address for further information at Verplank, N. Y

BLEAKLEY'S CAN OPENER.

Steam on Common Roads.

In England, steam begins to be used on the common roads. A gentleman writes to the *Times* stating that he has received a visit in the dead of the night from a friend, who with four members of his family arrived in a steam wagonette. The reason for selecting that unearthly time for the visit was the existence of a law forbidding the use of steam carriages on the public thoroughfares except between the hours of ten at night and six in the morning, also limiting them to a speed of two miles an hour, and requiring them to be preceded by a man sixty yards in advance bearing a red flag. The writer suggests that these precautions are unnecessary, and that steam locomotives should be allowed the use of the roads at all hours, with no other precaution than a limitation of speed to twelve miles an hour. On this the *Pall Mall Gazette* remarks:

"If steam wagonettes are coming into general use, we earnestly hope that there may be some modification of the law referred to, but only for the sake of the visited. We are all delighted to receive morning visits from our friends, but there are cases in which we should be more delighted to be let alone, and we tremble to think what will be the effect of a host of visitors arriving in the early hours of the morning in steam wagonettes at the rate of two miles an hour, preceded by heralds with red flags. Why not transfer these restrictions from steam carriages to wagons, which are the cause of most of our street accidents? It would be an admirable plan to limit the speed of these vehicles and insist on their being preceded by a signal of danger"

The New York and Brooklyn Bridge.

The contract for building the caisson or foundation work of the bridge on the Brooklyn side has been awarded to the firm of Webb & Bell, of Greenpoint. The cost, with the necessary timbers, is to be about $200,000. The work is to be commenced immediately under the general superintendence of Mr William C. Kingsley, of the firm of Kingsley & Keeney. The central part of the tower on the Brooklyn side will be located at the upper slip of the Fulton Ferry. All the woodwork of the old docks and piers will be torn up, and every thing removed to low water tide. The bottom of the river will then be excavated to a depth of 22 feet below high tide, until a level area is obtained for the reception of the caisson. The dimensions of the caisson, the space to be thus cleared and leveled, is 170 feet long by 102 feet extending out into the river toward New York. The 102 feet front of the caisson, facing that city, will be on a level with the bulk head line as established by the Harbor Commissioners. The mass of large boulders with which the bottom of the river is believed to abound will be removed by blasting, and the pieces removed by powerful dredging machines. Experiments which have been made on the quicksand bed of the East River, while excavating a dry dock, prove its bearing power to be ten tuns per square foot. By Mr. Roebling's plan, it is proposed to rest upon this bed a weight of only four tuns per square foot. The weight of each tower is to be somewhat over 75,000 tuns. To distribute this vast weight so that no part of the pressure on the base shall be over four tuns per foot, it has been decided that the area of the foundation shall be 170 feet long by 102 feet broad. This area will be composed of huge timbers resting on the sand, and bearing the masonry work of the tower upon it. The timber will be 20 feet thick, and this vast mass of 20 feet by 170 by 102 will be securely bolted into one solid frame, so that the weight of the tower above can never deflect in the slightest degree at any point. The caisson, when launched, will draw 17 feet of water. It will be 170 feet long, 102 feet wide, and 15 feet deep, with a top five feet thick, and sides of a thickness tapering from 9 feet at the top to a foot below. The time required to build it will be about four months. As soon as it has been set afloat it will sink to within eighteen inches of the surface of the water and when the proper time arrives it will be towed down to the ferry and placed in position ready for being submerged. This is to be accomplished by building on the top of the caisson successive layers of timber and concrete to a hight of 20 feet. The weight of the caisson with this 20 feet of timber and cement above the "air chamber," will be 11,000 tuns.

The material excavated is hoisted from the "air chamber" through two water shafts by means of dredges, and as it is raised the caisson sinks, being uniformly undermined round the four edges and throughout its whole extent. As the caisson thus gradually sinks the mason work, inclosed in a coffer dam, is in progress on the top of the timber, thus adding the necessary weight. Access is had to this "air chamber" by means of two air shafts three feet in diameter. The depth to which it will be probably necessary to go into the bed of the river, will be about 55 feet below high water mark, so that all the timber of the foundation will be inclosed in the sand and other material through which an excavation has been made.

IMPROVEMENT IN FRAMES FOR SPECTACLES AND EYE GLASSES.

Some of our readers will be much interested in the simple but valuable improvement illustrated in the accompanying engravings. Many of them have been annoyed by glasses coming out of the frames, and have been sorely bothered in the absence of proper implements to replace them.

In the case of spectacles with spring frames, should the spring chance to break, it is difficult for people under ordinary circumstances to repair them, and much annoyance often results from the loss of time necessary in sending them to a jeweler.

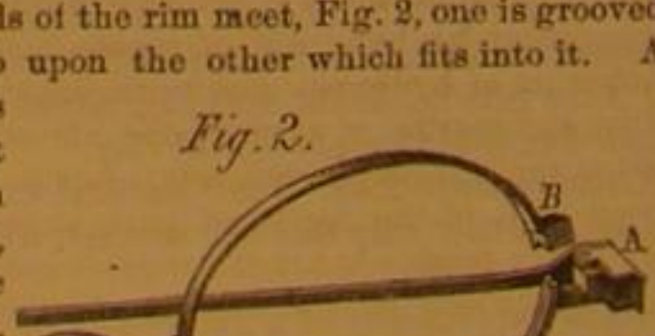
The present device obviates all these annoyances, and will add greatly to the comfort and convenience of those who are obliged to assist their eyes by the use of glasses.

Fig. 1.

Figs. 1 and 2 show the improvement as applied to the old style of spectacles; Fig. 1 exhibits the rim which holds the glass closed, and Fig. 2 the same unclasped for the insertion of a glass.

Where the two ends of the rim meet, Fig. 2, one is grooved to receive a slight rib upon the other which fits into it. A clasp, A, which plays upon the same pivot as that upon which the side bows play, when closed over the end of the rim, B, holds it in place far more securely than the old screw, and may be opened or closed with the utmost facility.

Fig. 2.



A person purchasing spectacles with this method of putting in the glasses, may provide himself with an extra glass or two, and at once replace a broken one for himself, or by sending the number to the makers he may obtain a glass to correspond and insert it himself without the slightest trouble.

Fig. 3

Fig. 3 shows an improved method of attaching the springs to eye glasses. A small metallic clasp, C, is riveted to the rim. To this clasp is pivoted a small lever eccentric, D.

This lever eccentric, when opened into the position shown by the dotted lines, releases the spring, E, which is not pierced for rivets, as such springs have hitherto been. When the eccentric is closed it holds the spring securely, and the liability of the spring to break at the point where it is riveted in the form heretofore employed is obviated, the spring being as strong in one place as another. Should it break, however, at the point of junction, the eccentric may be opened by the thumb nail, the end of the spring reinserted, and the glasses can then again be used, the only inconvenience being a slight shortening of the spring, scarcely perceptible to the wearer.

Fig. 4.

Fig. 4 is an application of the same principle to another form of frames for spring glasses, the lever eccentric being in this case identical with the piece formed to rest against the side of the nose. The manner in which the spring is clasped is sufficiently well shown to render description unnecessary; the dotted outline showing the position of the lever eccentric when open; this eccentric when closed being held from opening by a small metallic button, F.

The advantages claimed for this improvement, and which we are satisfied are fully attained, are very much greater convenience to the wearer, the ready insertion and interchangeability of glasses, greater strength, without any decrease in grace and lightness, as the addition of the clasp gives scope for ornament rather than otherwise, and the easy replacing of the glasses, or the springs when broken, *without tools.*

We have been much pleased with this improvement, and the inventor informs us that it is intended to make standard size glasses, so that glasses may be sent by mail to replace such as may be broken, all the required information being the number of the glass to be replaced. This will prove a great convenience to those at a distance, and will save much trouble.

Jewelers and others who keep spectacles for sale will also find this form of bows a great convenience, as, when a peculiar style of frame pleases a purchaser, and the glasses are not right, an interchange of glasses is but the work of a few seconds, which may be done as well at the show case as the work bench.

Patented through Scientific American Patent Agency, Oct 19, 1869. For further information, address the patentees, Louis Black & Co., Detroit, Mich.

Coal and Coal Mines.

Dr. Hill, of Queen's College, Birmingham, England, in a recent lecture on the "Chemistry of the Mine," made some interesting remarks on coal and coal mines. He said:

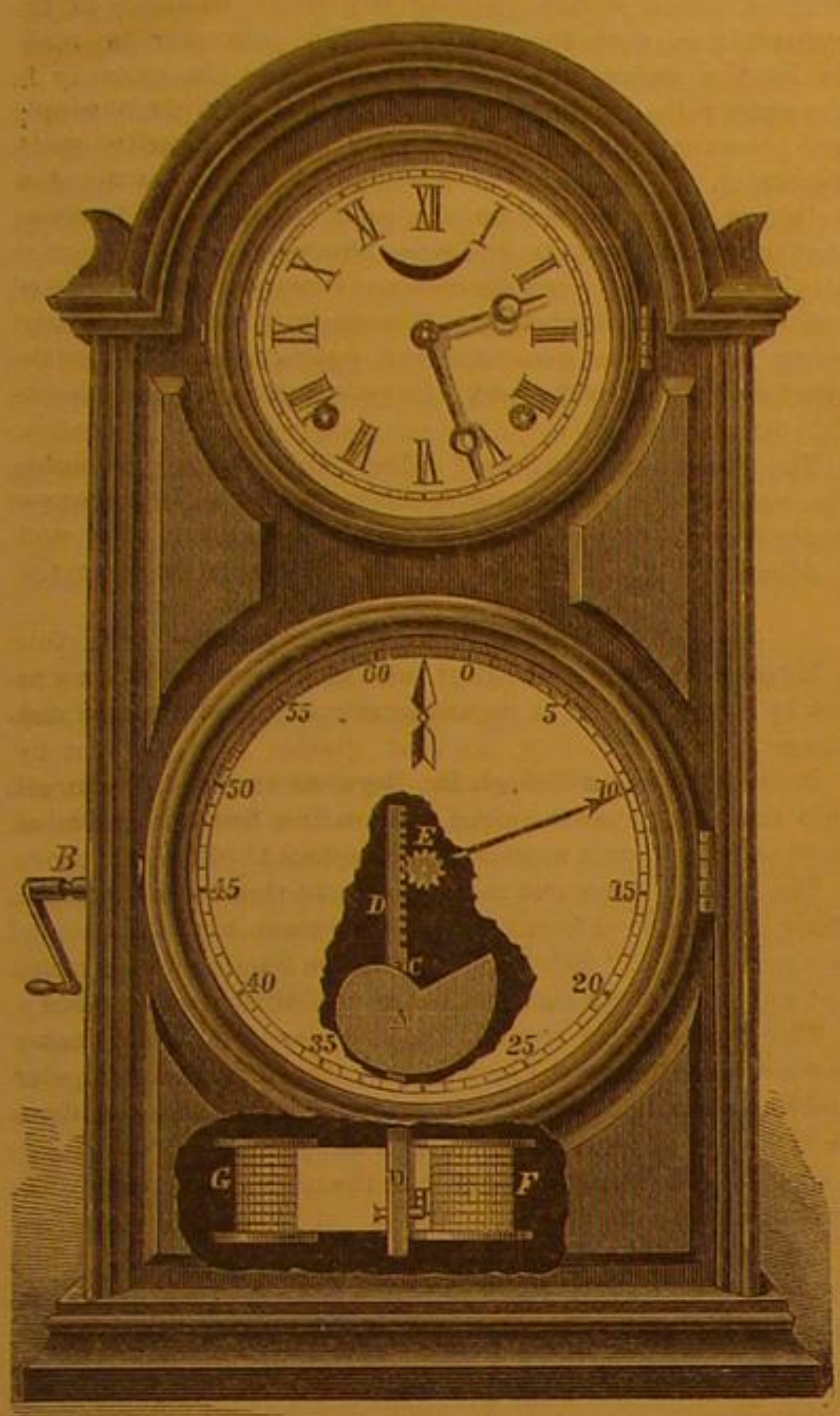
"The history of these formations was most interesting. Their age must be very great, as they have never been found with any traces of human remains. The principal animal forms were of a much lower type, consisting of snails, fish, reptiles, and insects. The impressions they have left, and the skeletons of them which remain, show that they were of a similar character to what are now known as "horsetails" pines, resembling the *Araucaria* of gardens, ferns, club mosses and a sort of palm. These were all of great size, the ferns branching to a hight of 50 feet; and the club mosses, now insignificant, were then 60 or 70 feet high. Taking into consideration the gigantic dimensions of the different plants, and the branched character of the ferns—such as only grow in hot climates—led them to conclude that England must at one time have had a tropical climate. A period when such rapidly growing and enormous plants of unlimited number existed is thus seen to have been highly favorable to the formation of those immense stores of vegetable matter—which may have been like peat beds, or carried on by river currents to their present beds—forming coal. There was no doubt but that coal was changed wood, such change being due to moisture, heat and pressure. They might look upon wood as carbon, hydrogen, and oxygen. As soon as a plant died it began to decay, and then the three elements entered into new combinations to form compounds which did not exist in the original wood. One part of the carbon entered into combination with part of the oxygen to form carbonic acid; another part combined with some of the hydrogen to form carbureted hydrogen, or "fire-damp;" while the remaining carbon, having no more oxygen or hydrogen to combine with, remains and constitutes black coal. If there were enough oxygen and hydrogen in the wood to combine with all the carbon, probably it would have been entirely removed by the same process, and there would have been no coal measures. Anthracite coal was that which had advanced furthest, and was most completely carbonized. They could easily understand after that how it was that coal had been formed, and also how carbureted hydrogen, the dangerous "fire-damp," was generated and confined in fissures in the coal, where there had been no outlet into the air. Fortunately it did not often appear among them. Coal was found at almost all elevations, from 8,000 feet above the level of the sea to 1,800 below it, as at Whitehaven, where, in addition to its depth, it is worked under the bed of the ocean for nearly a mile. It is, therefore, nearly certain that there are immense stores of coal existing at depths and in positions which render them inaccessible. Carbonic acid, known to the miners as choke-damp, is produced when carbon is burned with a sufficient amount of air or oxygen."

The Crown Prince of Prussia is said to have invented a new apparatus for the manufacture of vinegar.

THE VELOCIMETER--A NEW AID IN MECHANICS.

Modern machinists have long recognized the importance of knowing, as precisely as possible, what a machine is doing, while in motion, without waiting for ultimate results. The engineer must have his steam gage to inform him at all times the quantity of operative pressure in the boiler, and the applications of the dynamometer are made with the sole view to determine the motive power of machinery at the time of application.

Various contrivances have come into use for indicating the speed, that is to say, the number of revolutions performed within a given time, in the running of machinery. But all



hitherto employed may be resolved into mere "counters" of revolutions. A time-piece must be consulted both at the beginning and conclusion of the counting process, or nothing is ascertained as to the running rate. Prior to the invention which we are about to explain to our readers, nothing was ever patented in this country which proposed to indicate of itself, at all times, the running rate of machinery while in motion, so that, whenever glanced at, it would inform the observer how fast the machine was then running.

The invention referred to was patented through the Scientific American Patent Agency Nov. 26, 1867, to Mr. Edward A. Lewis, of St. Charles, Mo. It is about the size of an ordinary clock—it may be larger or smaller, according to taste—and may be connected with any running machinery either by immediate contact or in a remote part of the buildings occupied. It has two dials, placed similarly to those on calendar clocks; one an ordinary time dial, with clock movement and the other for indicating the running speed of the machinery. Its operative principle consists in a continually repeated division of time into minute periods—say of one to three seconds each—with corresponding divisions of the running movement of the machinery. The rate of speed in each of these divisions is shown on the dial by an index pointing to figures expressing, for standing machinery, the number of revolutions per minute; for locomotive engines, the number of miles per hour. Thus, the fractional period being three seconds—if a wheel makes exactly three revolutions in that time, the index will point to the figures "60" on the dial, showing sixty revolutions per minute—and will stay at those figures so long as the machinery continues to run at the same rate. The index does not move at all except when the speed is changed. Then it will move to the proper point, whether faster or slower, and there remain until another alteration is made in the speed. When the machinery stops the index recedes to "0."

The mechanism by which these results is attained may be comprehended by a reference to the accompanying engraving. A is a volute cam, or eccentric, which is caused to rotate from left to right by connection with the running machinery through the crank shaft, B. This connection is, however, so controlled by the clock movement above, that the cam moves only three seconds at a time, when it stops and returns quickly to its starting position. At C is a projecting pin in the rack bar, D, which rests on the periphery of the cam, and is thus caused to rise as the cam revolves from left to right, operating the pinion, E, which carries the index on the dial. Now it is obvious that the faster the machinery is running the higher the rack, D, will rise in the period of three seconds, and *vice versa*. When the three-second movement is accomplished, the rack and pinion are held in position by a ratchet arrangement not shown in the engraving, while the cam returns to its starting point and makes another like revolution. If the speed continues the same as in the preceding three seconds, the index will of course remain pointing at the same figures. If the speed be increasing, the index will be pushed further along. If it be decreasing, the release of the ratchet hold on the pinion, E, at the instant of the termination of the cam's three-second movement, permits the index to recede until the pin, C, again rests on the periphery of the cam, by which the diminished speed is indicated on the dial. Thus the index will always remain stationary, until there is a change in the speed of the machinery.

But the performances of this ingenious instrument do not stop with the mere indications of speed. It also records it; so that one may know at any time afterward the exact speed that was being made at any previous minute. The cylinder, F, by connection with the clock movement, is caused to revolve once per hour, winding upon itself a strip of paper from the spool, G. This paper is ruled with horizontal and perpendicular lines, similarly to that used on the steam indicator. A pencil, H, is fixed in the rack-bar, D; this marks the passing paper higher or lower as the speed is greater or less for the time being. The perpendicular lines indicate the minutes of time, while the horizontal ones represent the velocity. As placed in the engraving, the pencil mark would indicate a speed of ten miles per hour of the locomotive (supposing that to be its application) for as many minutes as there are perpendicular lines over which it passes. When the locomotive stops, the pencil will descend to the lowest horizontal line, and will there make its continuous mark, reporting the exact duration of the stoppage.

This registering apparatus is so arranged that it may be locked up within the instrument, and made inaccessible to any one but the key holder. The paper may be replaced daily or oftener. Railroad officers may thus have in their possession an exact history, as to speed and stoppages, of the movements of every train upon their road.

The dial represented in the engraving is the one designed for use on locomotives. For standing machinery the figures run up to 120, or higher if required.

An instrument of this kind is to mechanics what double-entry book-keeping is to business, a means whereby work may be done understandingly and accurately. By its use all machinery designed to be controlled by personal supervision may be made to perform its work with great uniformity, and its speed regulated with great accuracy.

As a legal evidence, in case of collisions on railways, or other accidents, its record would be of great value. Locomotive engineers are often placed in very unpleasant circumstances, by the testimony of persons incompetent to judge of the rate at which a train is moving at the time an accident occurs. This record would not only serve to protect them from such injustice, but would also keep them in check from exceeding the proper rate in crossing bridges, trestles, etc., since not only the rate at which they were running, but the precise time at which they were running it, could be accurately determined.

This instrument will prove an important addition to the means now in the hands of mechanical engineers, for the estimation of the performance of machines.

Further information may be obtained of the inventor, Edward A. Lewis, St. Charles, Mo.

AERIAL NAVIGATION.

NUMBER ONE.

There has probably been no age or generation since the earth has been inhabited by man in which the art of flying has not been a subject of study and research, if not of experiment. The apparent ease and pleasure with which the birds travel through the atmosphere cannot but induce in the hearts of human beings an earnest desire to partake of this delectable recreation; and this desire induced in one of the ancient kings the exclamation, "O that I had the wings of a dove," etc. The employment of artificial wings was the subject of experiment by hundreds of people before the nature and properties of hydrogen gas were discovered. The ponderability and inertia of atmospheric air must have been manifest at the earliest periods, being especially indicated by the locomotion of the feathered part of creation; but to what extent the science or art of aerostation had progressed prior to the founding of the Grecian Empire, history has not informed us; and even down to the sixteenth century there has been nothing recorded on the subject other than the most puerile and frivolous contrivances of wings, and the modes of operating them, by means of compound levers, springs, and cranks.

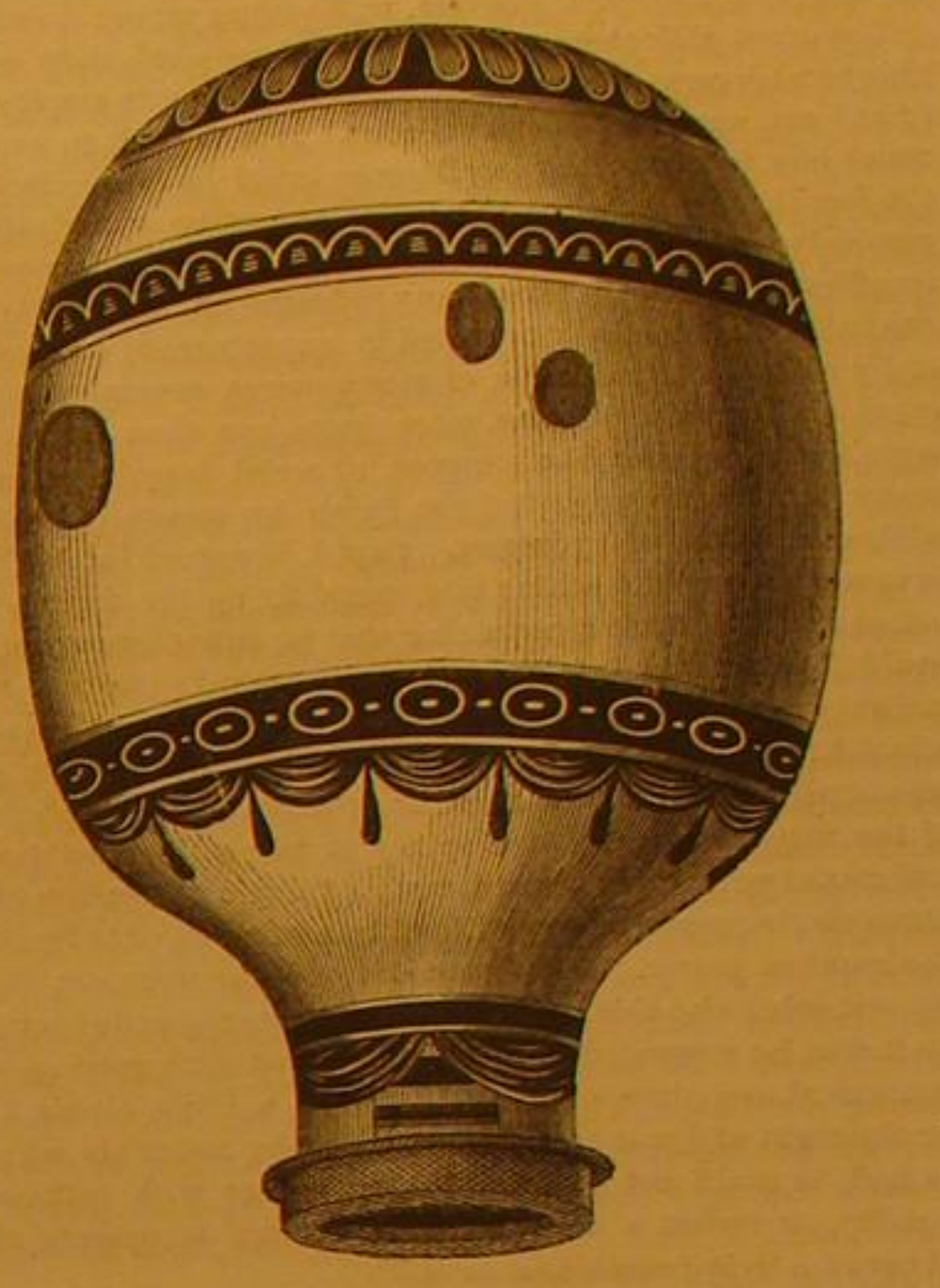
About 300 years before the Christian era, a Roman named Archytas, constructed a machine that would rise and fly "a considerable distance" through the air, by means of wings operated by springs, but as neither drawings nor description are given by historians, we are left to conjecture its peculiar mechanism. But this brief item of history serves to show that flying was a desideratum in those days as well as in more modern times.

In 1670, a man named Lana endeavored to produce an aerial float by pumping out the air from a delicately-made hollow metallic globe; but he soon discovered that if his globe was made so thin that its weight would not exceed that of the volume of air which it was capable of containing, whatever might be its dimensions or size, the external atmospheric pressure was sure to crush and collapse it before the internal air was all drawn out.

This method has recently been discussed by scientific men, but practically considered it is so absurd as not to merit a moment's serious thought.

Many experiments were made with light paper balloons (this word signifying globular, or pear-shaped bags) inflated with heated smoke or rarefied air; but no person attempted an ascension until 1783. The peculiar properties of hydrogen gas, and the mode of producing it, were discovered in 1766, and many experiments were made with it on a small scale. But it was not then expected that it would ever be produced in sufficient quantity to inflate a large balloon. Light paper balloons were exhibited, and many curious fancy figures, representing eagles and other animals floating in the air; and small illuminated balloons were sent up at night, but most of these were made to ascend by means of hot air.

In 1782, two brothers, Stephen and Joseph Montgolfier, after making many experiments on a small scale, attempted to inflate a large paper balloon with hydrogen gas, but failed on account of the escape of the gas through the pores of the unvarnished material. They then constructed a large paper balloon, seventy-four feet high and about fifty feet in diameter. This balloon had an opening at the bottom of fifteen



feet in diameter. Around this opening was arranged and fastened a gallery of wicker work, three feet wide, and around the outer edge of this was a balustrade of the same material, three feet high. This gallery was for the purpose of holding the passengers, fuel, etc. At the center of the large bottom opening was a wire grate, supported by wires, upon which the fire was made; and above the balustrade several port holes were made through the sides of the neck of the balloon for the purpose of feeding the fire with straw from the gallery outside. With this balloon, M. Pilatre de Rozier made several ascents to the hight of two or three hundred feet, while it was fastened with ropes of that length; and on the first of November, he, in company with the Marquis d'Arlandis, decided to make an aerial voyage. Accordingly, the balloon was prepared, with an ample supply of straw in the gallery, and Arlandis and Rozier stationed on opposite sides of the gallery, trimmed the straw fire, and at a given signal, the balloon was released from its moorings, and left free in air at 6 minutes to 2, on November 1, 1783; so this was the beginning of aerial sailing; it cannot properly be called navigation, as the voyagers had no control over the movements of the vessel. These adventurous balloonists sailed off gently for two or three miles till they came to a river, when the balloon turned up stream and descended nearly to the water; but another bundle of straw upon the fire lifted them up very suddenly, and, catching another current, they proceeded three miles further, and came down safely in about an hour from the time of starting, after having had sundry small holes burnt through the balloon by the sparks from the straw fire.

Rozier was killed in company with Laine his companion in an attempt to cross the channel from France to England in a hydrogen balloon in June, 1785. The balloon taking fire they were precipitated upon the rocks, thus becoming the first martyrs to the science of aerostation.

Prior to the successful experiment of 1783, a balloon of moderate size had been inflated with hydrogen gas, and permitted to ascend from Paris. It arose to a great hight, and continued in the air about an hour, in which time it traveled a distance of thirty miles. In December of the same year, two gentlemen named Charles and Roberts, made an ascent from Paris, in a balloon inflated with hydrogen gas, and traveled nearly thirty miles. This balloon was constructed under the superintendence of M. Charles, and was a truly wonderful production for that time. The balloon was nearly 100 feet in diameter, being made of varnished silk, and the upper part was covered with a net, from which a series of cords descended below the bottom of the balloon, and supported a car made of basket work, eight feet long, four feet wide, and three feet deep. The top of the balloon was also furnished with an efficient valve, for regulating its descent. This balloon appears to have been equal in all respects, to any of modern construction, no noticeable improvement having been made in balloons during the eighty-six years that have elapsed since that date.

From this time the attention of many inventors was turned to the subject of propelling balloons in any required direction; and so various and numerous were the projects and devices, that to describe them would require volumes. One man arranged a series of balloons upon a horizontal platform or flat boat, with broad horizontal wings at the sides, and an arrangement of sails at each end. Another arranged a series of balloons vertically, one above another, with various projecting arms and halliards for changing their relative positions. Many different plans were projected, in which horizontal planes were employed capable of being inclined for the purpose of producing horizontal progress by the inclination of the planes in one direction while the balloon was ascending, and in the opposite direction when the balloon was descending; the balloon being made to ascend and descend by alternately discharging the gas and the sand ballast.

The most rational and sensible plans projected, were those in which broad wings were employed in the manner of oars; the wings being thirty feet long, and the blade part about six feet wide; in rowing with them the blade was feathered, or brought to a horizontal position, while being moved forward.

The most ridiculous projects were those—and they were many and diverse—in which sails and rudders were employed, or at least, appended to the balloons. It is difficult to understand how people of any intelligence could have overlooked the fact that when when the entire apparatus was floating passively with the air current, neither sails nor rudders could be affected thereby, or exert any influence on the course of the balloon. But many persisted in experiments; and especially after the introduction of steam-power, several complicated and expensive plans, more ingenious than judicious, were introduced for the purpose of aerial traveling; and many plans were projected for flying by means of wings, without the aid of hydrogen. Capt J. Morey, of Fairlee, Vt., invented a winged machine that would fly by the force of a coiled spring. After ascertaining that no steam arrangement could be made to furnish sufficient power to support the weight of a steam boiler, he invented a very ingenious and scientific engine, in the operation of which, atmospheric air was expelled from a light metallic cylinder, by the explosion of the vapor of alcohol and spirits of turpentine combined, and mixed with about seven times its volume of common air; atmospheric pressure from without being employed to furnish the required power. Petroleum and gasoline were not then known, otherwise this invention might have succeeded better. As it was, he succeeded in propelling a boat with good speed, and was at one time offered $50,000 by a Philadelphia Co. for the right of his invention, but with the materials which he had, he could not produce the explosions with sufficient rapidity, or perfect a vacuum quick enough to operate the wings of a flying machine.

Prior to this, the effect of oblique revolving fans was discovered, and many were employed in aerial experiments. M Landelle invented a very expensive apparatus, consisting of a light boat about fifty feet long, with two tall masts or poles, upon each of which were mounted four horizontal fan wheels, similar to modern four-bladed propeller wheels, but much larger and lighter; and these were to be revolved in contrary directions by steam power, for the purpose of elevating the machine with its contents, and holding them suspended in the air, while other similar propelling wheels were adjusted at the stem, working vertically for the purpose of propelling the ship forward. This craft was furnished with rudders for steering, and a large horizontal wing, thirty by twenty feet, attached to each side of the hull, for the purpose of steadying it, and regulating its position. Below the hull, suspended by cords from each wing, was a boat-shaped car, which, with its contents, served as ballast, to keep the ship in an upright position. The steam engine was situated in the center of the main boat. The two rudders—one at each end—were judiciously formed and arranged, being very long, and each consisting of four broad leaves, two vertical and two horizontal, with a long stem in the center. Such, at least, was the project; but the voyages accomplished, or experiments made with this aerial ship, are not found in history.

On the 7th of January, 1785, a famous areonaut by name of Blanchard, accompanied by Dr. Jeffrier, an American gentleman, started in a balloon from the cliffs of Dover, England, for the purpose of sailing over sea to Calais, France. The balloon was well inflated with hydrogen, and furnished with what appeared to be an ample supply of ballast. They rose majestically, with a favorable breeze; but when they had proceeded nearly half way, they came into a vein of rarefied and chilly air, that refused to support the balloon, and they began to descend towards the middle of the channel. They threw out their ballast gradually until it was all exhausted, and then commenced throwing over all their bottles and books, next their grapples and cords, and lastly a portion of their clothing. But having nearly reached the French coast, the balloon began to ascend again, and rose to a considerable hight, so that they passed over the highlands, and, by letting out a portion of gas, they landed near the forest of Guiennes.

In consideration of this aerial feat, the King of France presented M. Blanchard with 12,000 livers, as a token of appreciation of his skill and perseverance. But the phenomenon of the sudden descent of the balloon, has never been satisfactorily explained. The balloon being wafted by, and moving in unison with the breeze, must have been surrounded by the same air, at the time of its descending tendency, that it was at the commencement of the voyage. It might have been the effect of electricity, which is known to move altogether independent of aerial currents, and which might have suddenly rarefied the air in the vicinity of the balloon, depriving it of its ordinary buoyant power; or in some inexplicable manner a vertical downward current, diffusing itself upon the surface of the ocean, might have overcome the buoyancy of the balloon.

Professor John Wise, of Lancaster, Pa., and several other popular aeronauts, have promulgated the theory that a balloonist might travel to any part of the world, by taking advantage of the various air currents at different altitudes of the atmosphere. And many announcements have been made by different aspirants for fame, of intended aerial voyages to Europe. These have been published and reiterated, and set times appointed for starting. But the uncertainties of the weather, or of finding congenial currents to waft them to the desired landing place; the difficulty of replenishing the balloon with gas by the way; the difficulty of ascertaining the direction and speed of the balloon, in a dark, cloudy night, and many other difficulties, appear to have deterred the bold aeronauts from attempting the voyage. To thus expose their lives to imminent dangers would have been worse than useless, when, even if successful, there was not the least possible prospect of anything useful being derived from the hazardous precedent. In fact, the apparent danger must have been of serious magnitude, to have discouraged Professor Wise, who has been the most daring high-flyer the world has ever produced. Upon one occasion he was bold enough to ascend to a hight of thirteen thousand feet, and there burst his balloon to demonstrate the truth of a favorite theory. He made his ascent from Easton, Pa., in the midst of a terrific thunder-storm, and rose to the hight of two miles and a quarter, and while the storm flashed and raged furiously a mile below him, he deliberately burst his balloon, thus permitting the gas to escape, and consequently he began to descend rapidly until the rush of air caused the lower part of the balloon to cave into the upper hemisphere, thus forming a mammoth parachute, whereby he was lowered down safely to terra firma, though in the midst of wind and rain. On several subsequent occasions he successfully repeated the experiment, minus the thunder and rain.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Friction and Percussion.

MESSRS. EDITORS:—On page 246 of your issue of October 16, there is an article on "Heat, and its Relation to Friction and Percussion," apropos, and in favor of the vibratory theory.

While I am not at all disposed to take issue with the writer, "Spectrum," I must beg to differ from him in deductions from some of the cases offered. He holds that the heating of a nail held upon a grindstone is the result of the percussion arising from the jumping of the iron from one particle of the stone to the next, and estimates, indirectly, that in the majority of instances heat claimed to arise from friction is the result of percussion instead.

Let "Spectrum" hold an old-fashioned brass-headed tack or a smooth brass button between his thumb and finger, and rub it briskly up and down the grain of a planed pine board until he can guess at the amount of percussion produced, and, in my opinion, he will drop the button if he does not the theory, before he finishes the calculation.

The heat conductibility of the metal suggests an illustration relative to the heating of the nail by rapid blows of a light hammer, when slower, but heavier blows failed to raise the temperature of a nail, alluded to by "Spectrum."

Several years ago a hammered horse nail machine, now in successful operation at Falls Village, Mass., came near proving a total failure because the nails would cool before they were finished; and it was finally discovered that in slow hammering the long contact of the hammer with the heated nail conducted away the caloric, while sharp, quick blows tended to raise rather than lower the heat.

Will "Spectrum" please inform me why it is that while iron can once be heated in this way by percussion, but, if suffered to cool, the heat cannot be reproduced in the same manner, until after the iron has been heated by the absorption of foreign caloric? Then the experiment can be repeated.

New Albany, Ind. C. C. H.

How to Observe the Sun.

MESSRS. EDITORS:—On page 139, present volume, your article, "Storms in the Sun," shows conclusively that visible disturbance there is instantly followed by electric disturbance here.

A regular daily record of the visible state of the sun, compared with our meteorological records, might lead to important discoveries.

Believing that a simple means of observing and accurately recording solar phenomena would induce amateurs as well as professionals to keep such records, I respectfully propose the following method, which I have never heard of being thus used by any one before: Take an astronomical refracting telescope, with Huyghenian eye piece, into a dark room, direct it on the sun through an aperture, push in the eye piece until it is between the object glass and its principal focus; now place a fine white screen at some distance from the eye piece and focus sharply; a large, clear, well defined, erect image of the sun is thus obtained, which may be enlarged or diminished at will; arrange the aperture, increasing or decreasing the light until the finest details are visible. The sun can now be examined without darkening glasses, and by several persons at once.

For uniformity of record, I would suggest the adoption of one regular size, say a circle inscribed within one square foot, divided into square inches. The spaces being numbered from right to left, and from top to bottom, the exact position of any disturbance observed could thus be easily ascertained and recorded.

The above is a very powerful and convenient combination offering advantages rarely obtained, except by very costly instruments; for instance, to-day with a 36-in. achromatic, 6 inches in diameter, taking the image in its principal focus as one, I threw an image of the sun on the screen, magnified 900 times, a faint spot appeared to be only one, but on increasing to 80,000 times it was resolved into five separate and distinct spots.

I know of no other combination that will give a like result so cheaply. JOS. VOGLE.

Tuscaloosa, Ala.

Steam Generators.

MESSRS. EDITORS:—In your American Institute notice of my Steam Generator, on page 282, your remarks are correct so far as they go; but permit me to add that the principle upon which this invention differs from all other attempts to produce steam without having any water standing in the generator, is, that the steam in the generator is made to let the water into it, and to graduate the quantity in the exact ratio demanded, so as to keep up any given supply and pressure required—limited only by the capacity of the generator. If 50 pounds of steam be required, the overflow valve, on the water stream the pump is throwing, is set at that number of pounds, and when the pump is set in motion all the water it injects is immediately evaporated into steam, and as soon as it reaches, say, 51 pounds, it resists any more being fed into the generator, and passes back through the overflow valve into the tank, the resistance being the least in this direction.

The steam now being used reduces the pressure, releasing the water in the pipe so that it discharges just the amount of water necessary to keep up the supply demanded.

Albany, N. Y. THOMAS MITCHELL.

The Fossil Man of Onondaga.

MESSRS. EDITORS:—In your last issue I notice a letter written by Prof. Boynton in regard to this supposed antique man-image.

It now seems that though Dr. Boynton was not humbugged into the belief that the stone was really a fossil, he made almost as ridiculous a mistake in his Jesuit theory.

The image turns out to be the handiwork of a Canadian stone cutter named Geraud; who fancying himself a second Michael Angelo, "fashioned an image in likeness unto a man," but unluckily the artist died before achieving immortality.

This is an age of speculation and parties "on the make" saw a speculation in the eyes of poor Geraud's St. Paul. Geraud had scarcely been himself buried, before his statue which he fashioned in secret, was spirited away and interred also in a spot judged fitting to carry out the plot of the fraudulent schemers.

A year elapsed and poor Geraud was almost forgotten, while the one or two individuals to whom his secret had been confided had ceased to think either of him or his statue of St. Paul, when in digging a well or something of that sort, the feet of the entombed saint were discovered by the astonished (?) diggers. Inch by inch the entire image was unearthed; the speculators built there a tabernacle and reaped there large profits from a gullible public. It is said that they made more money in three days than they ever saw before in all their lives, and certainly, as a joke, as well as a speculation this scheme is the best thing achieved since Barnum's palmiest days.

Hereafter, it will be wise not to admit exhumed saints into good society until their antecedents have been well ascertained. G. B.

Syracuse, N. Y.

[There are contradictory reports about this matter. We were at first inclined to suppose the matter a humbug, but we do not feel authorized to so pronounce it in the absence of further information.—EDS.

The Prize Offered by the Swiss Government for a Time and Percussion Fuse.

MESSRS. EDITORS:—In one of the late numbers of the SCIENTIFIC AMERICAN, I observe an inquiry by a correspondent relating to a certain prize offered by the Swiss Government for percussion fuses. They want what they term a "universal fuse." I send you an article bearing on the subject taken from the *Neue Freie Presse*, of Vienna, dated the 5th Oct., which conveys all the information that is required.

Hanover, Germany. C. G. MUELLER.

"The military department of the Swiss Government has given notice, that it will pay a premium of 10,000 francs for a fuse which will possess the following qualities—a full-sized model being required. The fuse must be a time and percussion fuse. The adjustment as to time should be manageable entirely by hand; the time of burning should be at least ten seconds, and admit subdivisions of one half and one fourth seconds, the latter being also the time for the shortest adjustment. The fuse should be so constructed that it can be made ready for firing only by uncovering and time adjustment; the jarring motion of the carriage should not be able to produce accidental ignition; the fuse should be adaptable to the hollow projectiles which are used in the Swiss army. The construction should be sufficiently solid so that no premature discharge in the barrel can take place. The composition of the fulminate should be well enough protected against atmospheric influences, that after a number of years no material variation in the time of burning can be perceived The method of construction should not be laborious and expensive, and the corrrectness of the process be easily regulated."

Fresh-Water Wells near Salt Water.

MESSRS. EDITORS:—In answer to your correspondent, J. Q. Adams, page 263, current volume, I offer the following explanation: The sand is saturated with rain water which, notwithstanding the tides, will be intermixed with sea water very slowly, because the minute spaces between the sand grains prevent immediate mingling, and successive rain falls will repel the slowly advancing sea water before it reaches the well. Therefore at a certain distance from the shore the sand is always saturated with fresh water which can be obtained and used in the manner described by your correspondent.

HUGO BILGRAM.

Philadelphia, Pa.

Fire from Steam Pipes.

MESSRS. EDITORS:—About twelve years ago, when in charge of a pattern shop in New York city, I had a steam glue heater for the use of the shop, and, having noticed a pine block lying upon it for several days, I picked it up to throw it away, but noticed it was partly charred through. It excited my curiosity, and I decided to replace it and watch it; but after watching it, and having the night watchman look after it nights for about a month I gave it up. By that time it was completely charred through, not like a piece of charcoal from a pit or kiln, for it had a dark-brown color, but would ignite and burn as easily as a piece of charcoal made from the same kind of wood. I have since always been careful in putting in steam pipes to keep the pipes from coming in contact with the wood work.

With clean wood, I think there is little danger; but with wood containing considerable pitch, or saturated with oil, I think danger from spontaneous combustion is imminent. Though requiring care in putting up, I consider steam pipes the safest and most economical means of heating a factory, store, or dwelling, and have advocated their use in different ways during ten years of engineering practice.

Marquette, Mich. A SUBSCRIBER.

INFLAMMABLE GAS-ENGINES.

[By F. A. P. Barnard, L.L.D., Commissioner to the late French Exposition.]

The enormous force developed in the explosion of gunpowder could hardly fail early to occupy the minds of the ingenious, with the effort to make it available for the uses of industry. Accordingly, we find that this problem formed a subject of study with such men as d'Hautfeuille, Huyghens, and Papin. But the intense energy of the force and the suddenness of its action seem to have discouraged the attempt to apply it directly as a motive power. The earlier experimenters occupied themselves with the endeavor to turn it to account by indirect means. The expedient which appeared to them most promising was to use it for the purpose of creating a vacuum. In fact, if a comparatively small charge of gunpowder be exploded in a closed vessel furnished with valves freely opening outward, the enormous expansion of the gaseous products of the explosion, an expansion due to the excessive heat developed, will drive out the atmospheric air through the valves, while the gases, contracting almost as suddenly as they expanded, will leave the vessel nearly void. It was first proposed to apply this principle to the elevation of water. A very simple apparatus suffices for this purpose. Let there be placed, for instance, such a vessel as has just been supposed, some fifteen or twenty feet above the level of a reservoir; a tube, open at both ends, communicating between this vessel and the reservoir will be all that is needed. So soon as the air has been expelled from the vessel by whatever means, the water of the reservoir will rise under the pressure of the atmosphere and occupy its place. This water may then be discharged at the superior level, and the apparatus will be ready for the repetition of the operation. In order to prevent the return of the water to the reservoir, when the orifices of discharge of the upper vessel are opened, the tube may have valves in it opening upward but closing under a downward pressure, or, what is simpler, it may be recurved at the upper extremity and enter the explosion chamber by the top. Such was the application of this power suggested by d'Hautfeuille. Huyghens perceived that it was capable of being turned to more varied uses. He proposed to employ a cylinder with a movable but air-tight piston to serve as an explosion chamber, with a view to obtain a reciprocating motion. In fact, by blowing out the air contained in such a cylinder through valves properly disposed, the atmospheric pressure could be made to force the piston downward, and thus indirectly to move the arm of a lever to raise a weight or to turn a crank. The valves suggested and perhaps actually used by Huyghens for this purpose were sufficiently rude. They were nothing more than open but flexible leather tubes, which, after allowing the air to escape, were expected to collapse under the pressure from without, and prevent it from re-entering. Papin substituted for these a much more efficient and neater contrivance. This was to make an opening in the middle of the piston sufficiently large for the free escape of the air, and to cover this with a bell. The bell, yielding to the upward pressure, permitted the air to pass out, but, dropping immediately after into its place, effectually prevented its return. But none of these expedients sufficed to make a practically useful gunpowder engine.

In 1791, John Barber, a British inventor, patented a project for a new motive power, which may perhaps be regarded as embracing the germ idea of the modern inflammable-gas engine. This project, however, for it amounted to nothing more, was of the crudest sort. The motive force was to be derived from the direct action of a powerful current of flame, which he proposed to create by the combustion of inflammable gas mingled in explosive proportions with common air. The gas was to be generated by the destructive distillation of any combustible substances in a tight vessel. From the generator it was to be conducted into another chamber, called the "explosion chamber," common air being simultaneously introduced into the same vessel by a different channel. Under such circumstances combustion would of course be explosive, generating a powerfully outrushing stream of flame, which might be maintained as long as the gas should continue to be supplied. As the plan was only to employ the "*vis viva*" of this stream to turn a wheel or a windmill, the unpractical nature of the scheme needs not to be pointed out.

In 1794, another British inventor, by name Robert Street, patented a gas engine, founded on principles somewhat more rational than those which seem to have guided Barber, inasmuch as he clearly perceived that if heated gas is to be made the medium of applying mechanical power, it is through its elasticity, and not through the momentum of its mass, that we must expect to see the useful effect produced. But inasmuch as Street proposed to make the cylinder of the engine itself the generator of the gas by which the engine was to be driven, his scheme in a practical point of view was not a whit less visionary than that of Barber.

These early, and, as they seem to us now, absurd projects, though they bore no fruit, and were probably never even subjected to a serious experimental test, deserve mention in the history of this subject, as marking the progress of an idea destined at length to be successfully wrought out. Indeed, considered as an idea merely, it was successfully wrought out only a few years later. The gas engine, in every essential particular, such as it is at the present time, that is to say, actually realized in a form available for purposes of industry, was invented as early as 1799, and patented in France by an ingenious artisan named Lebon. Nevertheless, this machine was not a success. It attracted no notice in the scientific world, and inspired no confidence in the industrial. After the lapse of about half a century it was re-invented, and re-invented, doubtless, quite independently; the resemblance of the modern machine to that of Lebon being so complete that a description of one of them might easily be supposed to have been taken from the other. At the date of Lebon's invention illuminating gas had not yet come into general public use, but the mode in which he proposed to prepare the gas for his engine was precisely that which is now in universal use in the works of the great city gas companies. Having thus provided himself with a sufficient reservoir of this essential material, his plan was to introduce a certain charge of this into the cylinder of his engine beneath the piston, and simultaneously through another channel to admit a proper proportion of atmospheric air. The mixed gases were then to be exploded by means of the electric spark, their consequent dilatation furnishing the desired motive power. The inventor seems to have overlooked no provision necessary to secure the perfect success of his plan. The engine was entirely self-regulating. It operated two pumps, one of them designed to introduce the supply of gas, and the other that of air. According to the descriptions, by which only we know it, it would seem to have combined every feature important to secure success, and yet, as already stated, it was not successful. Its failure is probably to be attributed to the influence of several causes, which, in the progress of improvement in the industrial arts, and the simultaneous advancement of experimental science, have since ceased to exist. In the first place, as just remarked, inflammable gas had not yet been introduced for purposes of general illumination; and the preparation of gas for the engine must have been troublesome and disproportionately expensive. Electrical science, moreover, had not then reached such a state of perfection as to be in condition to suggest an apparatus for producing the spark required to inflame the gases, capable of operating with the unvarying certainty indispensable in such a machine; and finally, the mechanic arts were probably yet unequal to the requisitions of a problem involving the peculiar difficulties which the construction of this engine presented. In point of fact it can hardly be doubted that mechanical difficulties were among the principal obstacles which prevented the full realization of a project which, abstractly considered, seems to have been entirely feasible. Many other inventors since Lebon, have occupied themselves with gas engines. Until within the past ten years, none have succeeded in establishing their inventions in the confidence of the industrial world. Of machines of this class which have left no trace except in history, it is unnecessary here to speak with minute detail. There is one of them, however, which deserves a passing mention, as having been distinguished from the rest by a feature which may be characterized as more bold than practical. This consisted in the proposed substitution of oxygen gas instead of atmospheric air in forming the explosive mixture by which the piston was to be driven, and hydrogen instead of coal-gas; the proportion being that required to form water by combination; so that after explosion the vacuum of the cylinder might be complete. It is true that immediately after the explosion, the water of combination would exist in the state of vapor, and that this would have a momentary elasticity so great as, by its direct action, to drive the piston to the end of the cylinder. But this vapor would be almost instantaneously condensed, especially if the cylinder were kept properly cooled; and a vacuum being thus formed practically perfect, the piston, on the opening of the valves for the admission of a new charge of gas to the opposite side, would be urged by the full pressure of the atmosphere upon its entire surface. If this idea could be practically realized, it would certainly be attended with very sensible advantage. In the gas-engine as now constructed, there is necessarily a period during each stroke in which the effective force is zero. This is the case during a great part of the time of admission of each successive charge of gas, which continues for one half the length of the stroke. If during all this time there should be a vacuum in the opposite end of the cylinder, the engine, instead of being powerless, would be actuated by a positive working force upon the piston equal to one atmosphere; an advantage which more than doubles the efficiency as yet secured in any motor of this class. The project here described was patented by James Johnson, a British inventor, in 1841.

Mr. Tresca, in an interesting article published in the Annals of the Conservatoire, has expressed surprise that subsequent inventors have not occupied themselves more with this idea of Johnson. But in point of fact, the plan is much more plausible than feasible. To say nothing of the trouble and expense of generating the gases, which in the case of oxygen, especially, would be sufficient to defeat the economical object, the violence of detonation of the pure gases in the proportions suggested would be such as to endanger the safety of the machine, or to render the power unmanageable. It is also perhaps questionable whether, in practice, the condensation could be determined so as to take place at the moment desired. If the piston were free to take on the velocity of a projectile discharged from a gun, no doubt the pressure would follow it to the end; but if, owing to the connections by which the force is to be utilized, the motion of the piston is comparatively slow, the collapse may occur before it reaches the limit of its course. In such a case the vacuum would be injurious. In order to reduce the violence of the explosion, the quantity of gas employed in each charge might be diminished, and the charge might be allowed to dilate to some extent, as it would naturally do in consequence of the movement of the piston, before being fired. But these expedients would reduce correspondingly both the direct effect of the gas, and the indirect effect of the vacuum which it is sought to utilize. It is not very surprising, therefore, considering all the difficulties in the way, that no successful gas-engine has yet been constructed, deriving its power from the explosion of hydrogen with oxygen.

Three engines present themselves in the present Exposition which derive their force from the combustion of inflammable gas. Two of these employ the direct pressure of the gases as dilated by combustion. The third reverts to the principle which chiefly occupied the earlier inventors, viz., that of using the gases only as a means of clearing the cylinder of air, and rendering available the pressure of the atmosphere. It is to this last, which, though not earliest in the order of invention, revives the idea which belongs to the earlier period of this history, that attention will be first directed. This prominence of position may also be considered as due to this machine, since it was rewarded by the jury with a gold medal, while the other two just mentioned received a less honorable distinction.

Sewing Machines Driven by Electricity.

It seems that the subtile force of electricity, which has annihilated space in intercommunication, is now to be called in to ameliorate the condition of that large and meritorious class of community, women who support themselves by work with sewing machines, and to make the operation of the sewing machine in the family no longer a task but a luxury.

All who have witnessed the operation of Gaumé's Electro-Magnetic Engine, ourselves among the number, are convinced that it must eventually be largely employed as a motor for this purpose. And all philanthropists must join us in wishing success to an invention so well calculated to do good.

As we will shortly illustrate and describe this machine at length, we will not at this time enter into its details. Suffice it to say that the numerous obstacles which have barred the way to success in this field seem all removed, and that the cheap compact motor so long sought is at last obtained.

Although involving well known principles of electric science, there has been much ingenuity displayed in their application, and in its scientific as well as practical bearings the machine is well worthy of earnest attention.

The manufacturers of this machine are represented by Mr. H. C. Covert, 535 Broadway, New York, at which place the machine may be seen in operation.

The Hotchkiss and Buss Brick and Tile Machine.

This machine, a notice of which, with illustration, was published on page 337, Vol. XIX of the SCIENTIFIC AMERICAN, has, we understand, taken premiums at the Ohio, Indiana, and Missouri State Fairs, and at the previous Fair of the American Institute.

The machine is a low priced one, an important consideration for men of small capital. It is so constructed as to be exempt from damage by roots, stones, etc., and makes as perfect a finished brick as we have ever seen. The bricks are not pressed into shape, but are cut from a mass of clay, previously rendered homogeneous in the clay mill and formed into a flat sheet of the proper thickness. It is as well adapted to the manufacture of tiles as of bricks.

For the details of its construction we refer the reader to the descriptive article referred to, which will give a better opinion of the machine to practical men than anything short of inspecting it in actual work.

A very large saving over hand labor is effected by this machinery, and we regard it as worthy the earnest attention of practical tile and brick makers who are anxious to obtain a cheap, durable, and effective machine.

PROFITABLE FARMING.—A gentleman called at our office a few days since with a very ingenious machine for gathering cranberries, for which we are soliciting letters patent. While explaining his invention, he incidentally remarked that he had over one hundred acres of cranberry land which he bought some years ago for 50 cents per acre. He has recently refused $20,000 for eight acres. It should be bore in mind, however, that it cost a good deal of time and money to get the land in condition to bear the cranberry successfully.

Improved Apparatus for Printing Photographic Vignettes.

In order that the general reader as well as the professional photographer, may understand the nature and use of this ingenious invention, we will state in as plain a manner as the subject will admit, the nature of the difficulty which it is designed to obviate.

In the printing of large vignettes which have no definite border in order to secure the delicately-shaded background which gradually grows lighter as it recedes from the outline of the picture, until it finally fades out altogether, a device usually consisting of cloth or paper painted black on the side toward the blank, to obviate reflection, and having an opening through its center for the transmission of light from the camera, is held by the operator and moved to and fro to intercept the light from the outer parts of the vignette. These outer parts are therefore less acted upon by the light, and are softened off in the manner desired.

The operation is a tedious one, and very trying to the eyes of the operator, as it not unfrequently requires from four to six hours to print a large-sized vignette. It is obvious that a machine capable of moving the screen automatically and in the manner required, would be a very useful improvement, relieving the operator from a most unwelcome task, and enabling him to devote the time required to execute it, to other more agreeable and profitable work.

Our engravings exhibit such an improvement, and upon examination we are satisfied it will prove a valuable addition to photographic apparatus.

The working parts of the machine are inclosed in a wooden case, like the works of a clock. The door of this case has a slide in the center, covering a round opening, which is opened when in use, an opening in the opposite side of the case being provided with a telescopic tube and a slide. The door is shown thrown open in the figure.

In this figure, A is the front plate of the works of an ordinary brass clock, to the axle of the fourth wheel of which is attached the wheel, B. This wheel is shown in detail in Fig. 2. Upon the wheel, B, is attached a plate, C, also shown in detail at Fig. 3.

The plate, C, is of concavo-convex form, or what would be called in common parlance, dished; its concave side being placed next the wheel, B, and held there by the buttons, D, Fig. 2. A tongue, E, Fig. 2, is pivoted to an arm of the wheel, B, and at its opposite end it has a round stud, F, which projects through the curved slot of the plate, C, Fig. 3. The plate, C, also has a hole in its center, which, when C is placed upon B, fits upon the axle of B. It is obvious that when C is thus placed upon B, that partially rotating C, while B is held stationary will carry the stud, F, further from the center or contrariwise, so that anything attached to F, and moved by it will have greater or less motion, according as F is placed further from or nearer to the center of B.

Now, upon the pivot, F, Fig. 1, plays a hole in the end of the bar, G, the opposite end of G being pivoted to a rock-bar, H, pivoted at I, H in its turn imparting motion to another rock-bar, J, pivoted at K, J through the bar, L, imparting motion to M, the latter being a projection from an annular frame, the form of which is shown in the dotted outline on the screen, N, this outline showing the position of the frame behind N. From the top of the annular frame rises another piece of the same form as M at the bottom, and is pivoted to F in common with the bar, G.

It will now be plain that the motion imparted to the wheel, B, will also be communicated to all the parts described in proportion as F is set near to, or away from the center of B by turning the plate, C, on the axis of B.

To the annular frame, shown in dotted outline on the screen or diaphragm, N, are attached supports, O, which serve to hold N firmly to the annular frame and to give N all the motion imparted to the annular frame by the top piece pivoted to F, and the bars and rock-bars, G, H, J, and L. Wings, P, are pivoted upon the screen, N, so that the oval apperture in the center of N, may be reduced to the general contour of the head and shoulders of a figure in a vignette when desired.

A wire support, Q, is loosely pivoted to R and M, which preserves the relative distance between the annular frame and the screen when the apparatus is worked in a horizontal position, as well as when it is in the upright position.

A weight, S, acts through a lever and suspending wire as a counterpoise to the weight of the annular frame and the screen.

It will now be obvious that the revolution of the stud, F, around the center of the wheel, B, will be imparted through the bars and rock-bars, G, H, J, and L, to the annular frame and the screen, N, all the parts of the latter revolving around a center in the oval aperture through the center of N, the exterior edges of which will intercept the light on the exterior edge of the background of the vignette, and soften it, but without some further provision the machine could not imitate handwork, as it is frequently desirable to soften off the background more at the top than at the bottom, or *vice versa*. In order to do this the pivot which works in the slot in the lower arm of the rock-bar, H, and through which the rock-bar, H, imparts motion to the rock-bar, J, projects from a slide, T, which is adjustable upon the rock-bar, J, being held at any point desired by a spring pawl, U, which engages with a rack cut on the inner side of the lower part of J. When T is slid up near to the pivot, I, upon which the rock-bar, H, plays, very little motion is imparted to J and through it and the bar, L, to the lower part of the screen, while the motion of the top remains the same as before. When T is made to approach the pivot, K, on which the rock-bar, J, plays, the motion imparted by H to J is greatly increased, so that the bottom of the screen, N, is moved considerably more than the top.

By these ingenious means all the movements required to be made in the printing of a vignette are automatically performed, and with much greater uniformity and accuracy than is possible when they are done by hand. It exhibits great fertility of resource in invention, and its merit eminently consists in the simplicity of the means employed to secure the complicated movements required.

Patented through the Scientific American Patent Agency, August 17, 1869. For further information, address, for two weeks, Jean Elie Richard, patentee, Sweeny's Hotel, New York city, after that time, Columbia, S. C.

Fig. 1

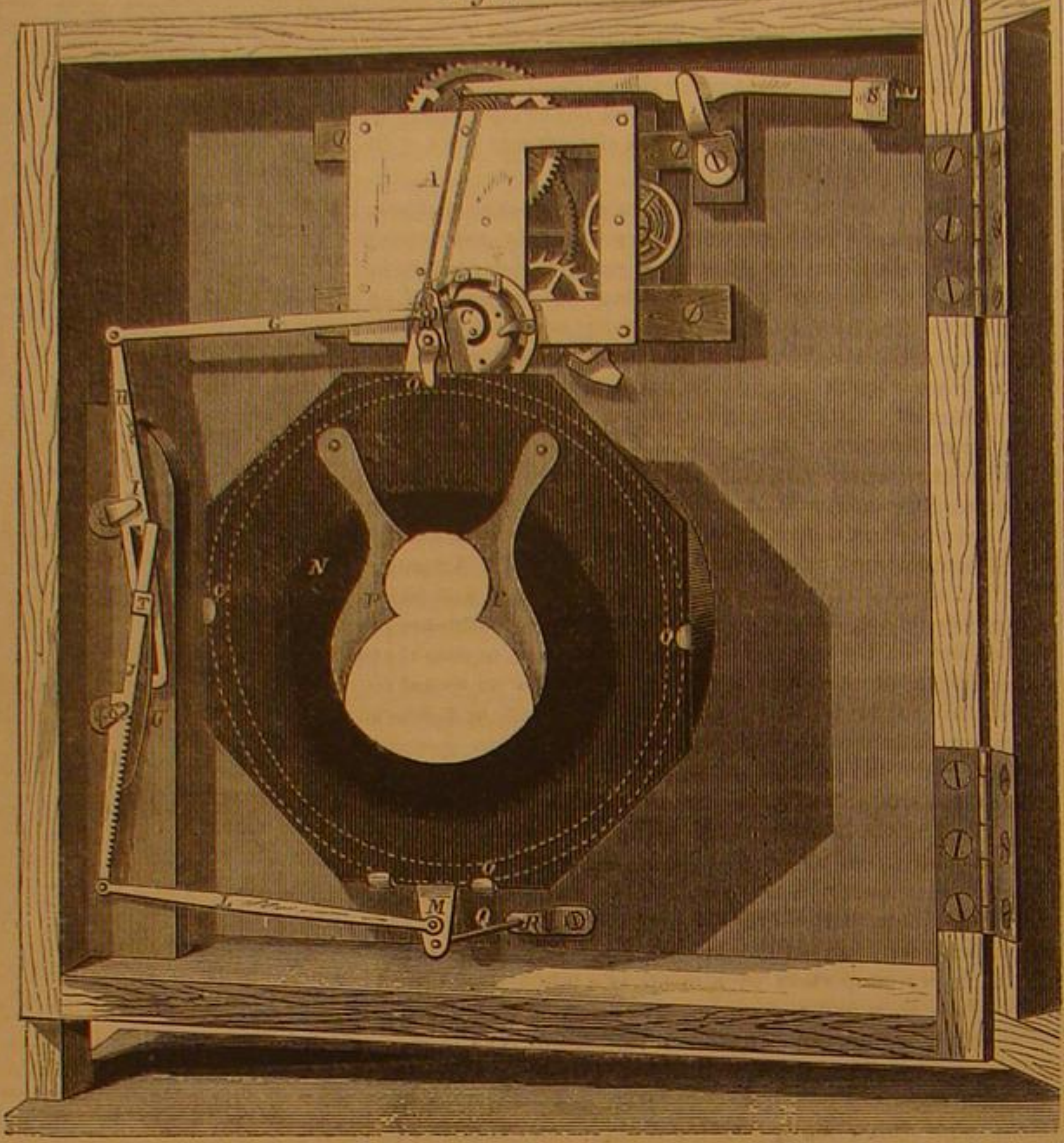


Fig. 2

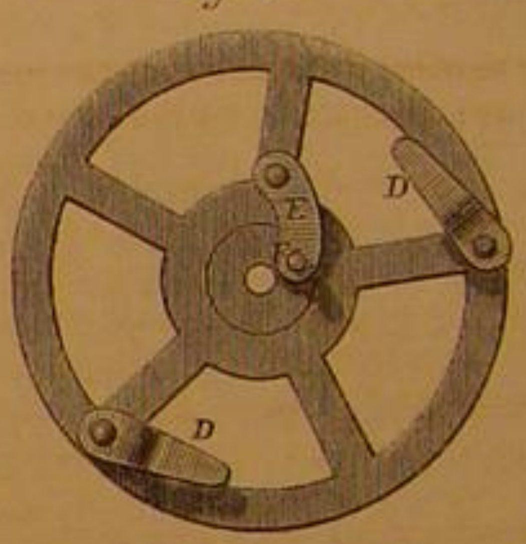
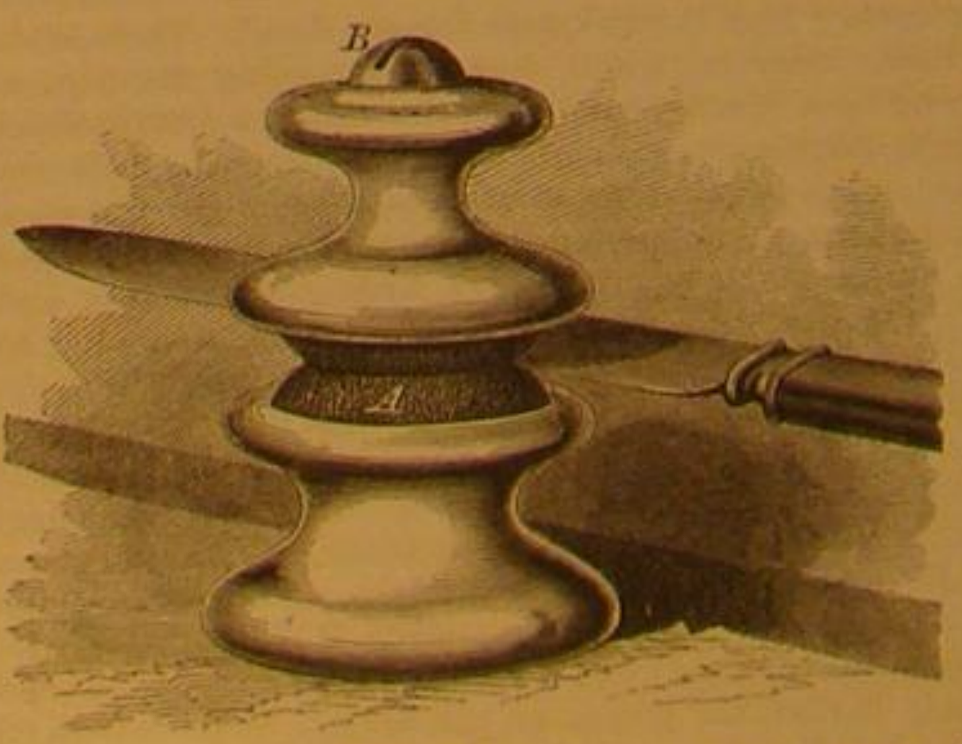


Fig. 3

JEAN ELIE RICHARD'S PHOTOGRAPHIC PRINTING APPARATUS.

IMPLEMENT FOR SHARPENING KNIVES.

Our engraving illustrates a convenient little implement for sharpening knives. The top and bottom pieces are of porcelain, the bottom of the top piece and the top of the bottom piece being recessed to admit the convex emery disks, A.



The two parts are held together by a vertical screw, B. In use the left hand grasps the top, and the bottom is pressed down upon a table. The edge of the knife to be sharpened is then drawn by the right hand through between the emery disks, the convexity of these disks, enabling a strong pressure to be brought to bear upon it, and, as a consequence, a rapid action upon the blade is secured.

Its appearance is tasteful, and it will be found a desirable substitute for many of the implements heretofore used for this purpose.

For further information, address W. H. Howland, 26 West Washington Place, New York city.

Steering by Steam.

A correspondent who was present at the occasion of a recent trial of the steam steering apparatus with which the small steamer *North Star*, of Muskegon, has been supplied, writes to the *St. Louis Dispatch* as follows:

The experiment was such a complete and marked success mechanically, and seems in its principle to foreshadow such immense benefits to steam navigation, that it deserves the earnest and instant attention of the public. While the arrangement of the machinery connected therewith is simplicity itself, the result on the motions of a vessel are instantaneous, and as powerful as can be desired. Instead of a cumbrous wheel in the pilot house, a lever like the starter of a locomotive stood up from the floor, which worked either way from side to side by no heavier pressure than could be given by the thumb and finger, but which made the *North Star*, a long, narrow river boat, almost turn on her centre, and then as instantly reverse with the same promptitude of action on a different application. A doubt having been expressed as to whether, by the same machinery, she could be "held" on the same steady course for a length of time, the steersman fixed on a mill chimney two miles distant, and made for it. After getting her from the previous violent swayings into true line, he dropped the bar and let her run for it, until all on board were satisfied of the truth of her course. Where the steam rudder is left there it stays, and no power less than that able to overcome all the steam force of the boilers can shift it till again manipulated by the lever.

Numerous experiments were made in turning, backing, twisting, and all with astonishing results. When standing still the rudder could be put down with such force as to swing the vessel a point or two. I really believe that, had such an apparatus been on the *Milwaukee* and *Lac La Belle*, when they met on the St. Clair flats, even at the late moment when the dire warning note was sounded, collision could have been easily avoided. The whole steam power of the vessels thrown instantaneously (as is possible) upon the taut wire rope rudder lines, it would have swung them so as to merely rub sides, if they touched at all. I have watched with admiration, on the rapids of the St. Lawrence, the old Indian pilot with his half dozen brawny assistants, grouped around the mammoth wheel, as with lightning speed he shot the long sault or plunged the cascades. I have watched his quick, nervous action and word of command so quickly sounded by his assistants, and wondered what our fate would be should these men mistake, even for an instant, larboard for starboard. But with a machine like this the doughty old red-skin could stand in all his native dignity alone, and with one hand, unaided, as lightly as a feather, make the steam power, as prompt as telegraph, work his wayward and oft-changing will, and swing his steamer as quick as changing a top.

Another beautiful contrivance connected with this, and one as much to be appreciated by the traveling public as the steam rudder by the regular marine, is what the patentees technically term the "life lines." If you will call back to memory almost any marine disaster from burning, either at sea or on our inland waters, you will readily recollect that generally the most painful and terrible portion of the calamity began when the ship lost steerage way and was going adrift—going any and every way before the wind. From the *Henry Clay* on the Hudson, to the *Sea Bird* on Lake Michigan, it has almost ever been the same story; a pilot-house deserted; a vessel unmanageable; refuge within almost easy reach, impossible of attainment by lack of steering power. This apparatus provides continuous communication from stem to stern, by which the vessel can be managed from any part of the deck. When the pilot-house gets "too hot to hold him," the wheelsman can take hold at the next cool spot. If the stern is in flames he can steer from the bow, and *vice versa*, as long as there is a bit of deck left the iron life-line is there, and until it melts the communication is as complete.

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK

O. D. MUNN, S. H. WALES, A. E. BEACH.

☞ "The American News Company," Agents,121 Nassau street,New York.
☞ "The New York News Company," 8 Spruce street.
☞ Messrs. Sampson, Low, Son & Marston, Crown Building, 188 Fleet st.; Tubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.
☞ A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.

VOL. XXI., No. 20...[NEW SERIES.]... *Twenty-fourth Year.*

NEW YORK, SATURDAY, NOVEMBER 13, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

WHAT IS TO BECOME OF OUR BROWN-STONE FRONTS?

One of the most striking features of modern American building is the great favor with which the material known as brown sand-stone or brown free-stone is regarded. It is a rich colored sand-stone admirably adapted to the production of fine architectural effects; it is cut with great facility and is not too expensive; yet notwithstanding these great advantages it lacks an essential quality of all good building stone—durability.

We have noticed lately several articles upon this subject, which would, independent of our own observation, have convinced us of this; but as long ago as 1854 we asserted that this stone could not endure our climate.

Since that time we have made numerous observations, all which have confirmed the opinion then formed. It is rare that the condition of brown stone exposed fifteen or twenty years to the action of weather cannot be expressed by the word "scaly;" and we were assured once by an extensive builder who has in his life erected a great many brown stone fronts, that in his opinion the life of the fronts would not without repairs, average over thirty years.

We have in mind a large building in which this material was employed and which has stood certainly not more than fifteen years, yet which now exhibits unmistakable signs of incipient decay. Nothing was omitted to make this building permanent but a proper selection of material. Fifteen years more unless the crumbling blocks shall be taken out and replaced by new ones will certainly make sad inroads into this costly and elegant structure.

A writer in *Appleton's Journal* has recently called attention to the condition of Trinity church in this city which he states to be in a state of incipient decay, though confessedly built of the best brown sand-stone this country affords. He also calls attention to the ultimate result of this decay as shown in the tablets and tombstones of old cemeteries, that of Trinity church in particular. Here, he remarks, "rough, unsightly slabs will be found, which once were tablets, recording the virtues of the mortals whose memory they were intended to perpetuate; yet now they stand, and that is all, a collection of scarcely cohering strata, ready to fall in fragments at a touch. The greater exposure of these stones has but accelerated a result which will be the fate of all things in which this material is used."

The writer of the article referred to, concludes as follows: "The present generation will scarcely see the palaces of our millionaires transformed into seamed and broken ruins; but what will be the condition of these buildings a hundred years hence, or even in fifty years?"

To suppose that our architects have been all along ignorant of the defective character of this stone would be scarcely more complimentary than to suppose they had encouraged its use in full knowledge of its deficiencies for the sake of gain. One or the other of these suppositions must, however, hold good. It can hardly be supposed that such material would have been placed in the many costly brown-stone churches to be found in this country in the face of an earnest protest from conscientious architects. Such protests would be likely to be regarded also by private individuals about to erect mansions for their own use, however little they might have availed when made in reference to buildings erected by the general, State, or city governments.

The history of the latter class of buildings has been one of shameful jobbing, in which private interests have nearly always been considered as paramount to the public welfare.

It is time that in American architecture the element of permanency should begin to be considered. Hitherto there has been some excuse for temporizing and there may still be the same excuse in new and rapidly growing cities, in which the changes twenty or thirty years will produce can hardly be predicted, but in older cities like New York or Philadelphia it would seem that no element of uncertainty need remain to interfere with the adoption of a solid and substantial method of building, in which mere outside display should not override every other consideration.

BOILER EXPLOSIONS.

So long as the use of steam continues to extend, and the causes which lead to explosions are permitted to remain, the number and frequency of these disasters must be expected to increase. In reading the reports of boiler explosions which almost daily reach us, we find a very large proportion of them referable to causes in no way connected with the original construction of the boilers, but to causes which have come into existence through carelessness or mismanagement. Here a valve is stuck fast, and there a piece of bungling patchwork has been applied, or a boiler has been altered in form and the stays removed in the alteration have not been replaced, although the change may have made them all the more necessary. In another case the boiler may have been over-heated, and so on through the entire category of causes of danger too well known to be dwelt upon at length. Now either the conditions under which a boiler may be safely worked are too manifold and complex to be complied with, or there is gross culpability connected with nine tenths of the explosions which occur. If, like nitro-glycerin, a boiler were likely to explode under the most ordinary circumstances of treatment, if it were a matter of extreme difficulty to secure proper care in their use, and when every thing had been attempted to secure immunity from explosion, the risk remained that there might still be something left undone, which, if undiscovered, would render the previous caution of no avail, there would be more excuse.

But this is not the case. A well-constructed boiler is not essentially such a terribly destructive agent as to endanger the lives of all who come near it. The conditions of safety are few and easily complied with. The care demanded in its use is not more than can be easily given, and the want of proper attention to the simple requirements of the case can be regarded in no other light than that of criminal neglect.

It is not our intention to enter upon the much-discussed topic of the ultimate causes of boiler explosions. There are certainly cases wherein all the conditions of safety seem to be fully supplied, and yet explosions occur. In such cases we must look for causes among those which have been treated by various authors and which we believe are mostly faults of construction. No amount of care can obviate dangers from this cause, but we have already said that cases of this kind are comparatively rare.

If, then, want of proper care in the management of boilers be admitted to be criminal, we submit that there should be a severer code adopted to enforce proper care. A proprietor should not be permitted to run a boiler which is in an unsafe condition, and ignorance should not be allowed as a mitigation of neglect.

There ought to be a system of rigid inspection adopted in this country, and it should be enforced by law, the expenses of which might be defrayed by paid licenses from the owners of boilers, who should be prohibited from running a boiler a single day after it is condemned by the proper authorities. Any violation of this law should incur severe penalties.

We have a system of inspection for marine boilers, but there are hundreds of boilers on land to one on water, and many of them are in charge of men who are utterly unfit for the work. Whatever of supervision exists under the present system—and, if we mistake not, there is something of the kind provided for on the statute books of most of the States—it is certainly very inefficient; so much so as almost to amount to nothing. This is not only evident from the number of explosions which occur, but still more evident from the condition of a large proportion of the stationary boilers scattered over the country.

It is time this matter was more vigorously taken in hand, and some efficient efforts made to reduce the number of accidents arising from this source. It would not, it seems to us, be difficult to draft a law providing for systematic inspection and summary action when compliance with its requirements should be refused.

IS THERE SUCH A THING AS SOCIAL SCIENCE?

There is a great deal said, now-a-days, under the captivating title of "Social Science;" but much of what is said and written warrants a doubt of even the existence of such a science. Still more does it warrant the doubt that those who attempt the discussion of social topics, have, even admitting the existence of such a science, ever mastered the first rudiments of it.

The wordy and weak discussions which have filled up the time of the so-called "Social Science Conventions," have not availed to fix public attention upon social evils more strongly than before they were uttered. The few suggestions made for reform, and the correction of acknowledged existing evils, have been of the most impracticable kind, and showed most glaringly superficiality of thought in those who offered them. If there be not now, it is high time there ought to be such a thing as social science.

It is painfully evident that society is, in some respects, going from bad to worse. We will not say that, on the whole, it is deteriorating; but granted even that it is growing in virtue and increasing in knowledge, that its sanitary condition is improving and its moral health better than in the dark ages—all this is not enough.

It is sad to reflect that whatever progress has been made, or is now making, is the result of bitter experience to those who have gone before us, and whose blood and tears have stained the pages of history for ages.

Is there no way to adjust society on immutable principles? Must all progress be in the future as in the past secured by experiment? And must what we call social science be forever a mass of ill-assorted facts culled from history? Surely there is some more solid basis than this for social organization.

Did we want proof that nothing like social science exists among us, it is found in all that surrounds us. Very little that passes current in society will stand the test of reason. Our eating, our working, our dress, and even our sleeping, are alike performed with a general disregard to physical law. Pauperism has become a profession. Disease though on the average, perhaps, not so deadly as it was a century ago, is, if not more general, still not less diffused. Perfectly healthy people are the exceptions, not the rule. The professions of law and medicine still find enough in the misery and crime of humanity to amply sustain them. The administration of justice is too often a mockery, and legislation has become a matter of barter and sale. The drones of society are on the increase, and honest hard-working producers are compelled to contribute to their support.

Could these things be if social organization had been reduced to a science? Blackstone, in his "Commentaries," has laid down some general principles upon which all society must be based, and any departure from which is a step toward anarchy; but these principles underlie the civil rights of people united in a national compact. They leave untouched great and fundamental physiological and biological laws, the disregard of which has burdened society with the greatest evils under which it now groans.

Until some prophet arises capable of grappling with this subject from a physical and biological, as well as a political and legal point of view, and beginning down upon hardpan, shows how society may be constructed in harmony with all the conditions of pure living, regardless of creeds, conventionalities, or traditions, let us not flatter ourselves that such a thing as social science exists. A heterogeneous mass of facts does not constitute a science, any more than a rude heap of stones and sand and lime may be called a temple.

MICA BROCADES—A NEW PRODUCT OF ART.

No doubt all of our readers are acquainted with the mica which is so extensively used in doors of stoves. But it may be stated that under this term a whole group of minerals is comprised, either occurring massive or disseminated in rocks. They have all a more or less foliated structure and pearly luster. They are elastic, transparent, or translucent, and have a specific weight of 2·7. In Germany mica has recently found application for the production of bronze-like colors which bear the names "brocades," "crystal colors," and "mica bronzes." The mineral is to this end well crushed, boiled in hydrochloric acid, then washed with water, and assorted according to the size of the laminæ. Mica scales thus obtained exhibit a glass-like luster combined with a silver-white appearance. The advantages of these brocades (which by the way may be colored) over the ordinary metallic brocades, are stated to be the following: 1. They do not contain any ingredient injurious to health. 2. They possess metallic luster like the ordinary brocades, and some surpass them even in liveliness of color. 3. Brown, black, blue, green, and rose are obtained in remarkable beauty, which is not the case with the metal bronzes. 4. They comport themselves with perfect neutrality toward sulphurous exhalations. 5. Their specific weight being very slight, their yield is consequently correspondingly great. In their application they may be fixed upon all kinds of articles of metal, wood, glass, plaster-of Paris, and paper board. They are consequently well adapted to the preparation of artificial flowers, fancy papers, sealing-wax, in tapestry, furniture-making, and painting. Theaters may employ them for imitating gold-rain and snow, for which purpose they recommend themselves on account of their lightness and cheap price. In short, they may be used for almost all the purposes to which the ordinary bronze powders have been applied. In fixing these brocades upon articles of any kind it is advisable to paint them first with a color similar to that of the bronze; for silver, a ground of white lead is suitable; for blue, one of ultramarine, etc. They are equally suitable for oil and glue colors, which latter are fixed with a mixture of four parts of glue and one of glycerin. Upon this coat, when hard, the binding material for the brocade is spread, and after one quarter of an hour this latter is sifted over. As binding material a paste, consisting of four parts of boiled starch and one of glycerin, is recommended. If desirable, the powder may be finally pressed down with a roller. If the ground is formed by an oil paint, the binding material for the brocade should be constituted of a dammar,or pale copal varnish, upon which, when only pitchy, the powder is sifted over. When finally coated with a suitable spirit, dammar, or copal varnish, the so-prepared articles assume a luster which, in beauty and durability, far surpasses any heretofore obtained with the common bronzes. When small particles of mica-silver are spread over articles coated with asphalt varnish, the result is a good imitation of granite. The crystal colors are also suitable for calico printing, and fabrics upon which they are applied, surpass in brilliancy the heavy bronze and glass-dust fancy fabrics from Lyons. Employed between or on colored gelatin plates, they give rise to superb crystallizations, which are used as inlayings for buttons and various other articles. They may be spread over finished porcelain and glassware, if these are heated again to the fusing point of their glazing.

According to Dr. C. Cech and L. Schneider, in Prague, these brocades may be colored with the following dye stuffs: Rose, with a decoction of cochineal; carmoisin, with the bluish magenta red; bright red, with fuchsine and Havana brown; violet, with Hofman's violet. A solution of Prussian blue in oxalic acid, serves for producing a bright blue, and Girard's violet for deep blue; light and dark green are imparted by aniline green and curcuma; gold with curcuma, dark brown with a proper bark extract, and black with litmus and haematoxylin or logwood extract. Silver needs no color. According to Dr. L. Feutchwanger's (*vide* his popular "Treatise on Gems"), mica is found in this country at Williamsburg, Mass., Hartford, Conn., and many other places. The green mica, which is of a beautiful grass-green color, is found in Brunswick, Me. The rose-red mica, which is also a very beautiful mineral, is principally found at Goshen, Chesterfield, Mass., Acworth, N. H., Bellows' Falls, Vt., etc. Mica, according to the above named mineralogist, when of good colors, may be used for jewelry and other ornaments.

POLAR EXPEDITIONS.

A difficult problem has a charm, by very virtue of its difficulty, which will attract and fix the attention of a certain class of mind. It is, moreover, a class of mind the world could ill dispense with, and which has conferred innumerable benefits upon mankind. It is mind which grapples with all questions, without regard to practical applications, is content to seek knowledge solely for the sake of knowing, leaving the useful applications of its investigations to another class of mind altogether. It is not inventive, but curious. It is sufficient that a thing is obscure, to secure at once the most ardent effort at solution from men of this class of mind.

Of such sort is the intellect now grappling with what may be called, when its difficulty alone is considered, the great geographical problem of the age.

It is hard for men of practical and inventive minds to see what earthly benefit can ever arise from these explorations, yet it would not be prudent to assert that no benefit could ever accrue, and many of the most proud mechanical, engineering, and chemical achievements of modern times have had for their germ, investigations seemingly as hopeless and impracticable as this.

Scarcely any scientific or literary periodical falls under our notice that does not bestow more or less of its space upon the subject of polar exploration.

Putnam's Monthly, for November, contains a long and interesting article on the "Gateways to the Pole," which maintains that the only true solution of the problem is that of Capt. Silas Bent, of "Japan Expedition fame," as put forth in an address, delivered by that navigator, before the St. Louis Historical Society. The date of Captain Bent's address is not given.

The author conceives "the true Arctic problem to be, not whether there is a passage to the pole," but "*Is there a permanent and navigable way to the pole?* This question is answered in the affirmative by Captain Bent, who, in the absence of direct confirmatory experience, undertakes to prove, that, from the very nature of things, such a passage must exist.

While we grant that the vast amount of heat, which passes into the sea at the equatorial regions, and passes to the north in the waters of the Gulf Stream, in the Atlantic, and the Kuro-Siwo, in the Pacific, would favor belief in the existence of open passages through which these waters find their way to the Polar Basin; yet to argue, that because a thing is probable, it is real, seems more speculative than sound. The scientific world will be slow to accept the two "gateways" of Captain Bent till somebody finds them unlocked. This aspirant for Polar Honors not only believes that these avenues actually exist, but, to use his own language, "the only practicable avenues by which ships can reach that open sea, and thence to the Pole, is by following the warm waters of these streams into that sea; and that to find and follow these streams, the water thermometer is the only guide, and that, for this reason, they may be justly termed 'the thermometric gateways to the Pole'."

One would suppose, that if open and navigable passages really exist, they might be seen as well as determined by the thermometer. This latter, it strikes us, is what might be called feeling our way to the pole.

We regard continuance upon the surface of the great streams alluded to, as entirely an unsettled question. The natural effect of heat upon the specific gravity of water would, if not counteracted by other influences, certainly keep these currents at the top; but who shall say, in the present state of our knowledge, that such influences do not exist.

Com. Rodgers made extensive deep-sea soundings in the Arctic Ocean, in 1856. He uniformly found warm and light water at the top, cold and heavy water at the bottom, and warm and light water again beneath the cold middle stratum. An important fact was also discovered in these soundings, namely, that the outflowing surface currents were salter than the middle stratum. It is inferred from this fact, that the water in these surface currents flows into the Polar Basin in under currents, from regions where much evaporation is going on, and where, consequently, a greater proportion of salt exists in the water than in other parts of the ocean.

The subject of an open Polar Sea is discussed in Maury's "Physical Geography of the Sea," Chapter VII. It is there stated, that an under current setting into the Polar Basin exists in Davis Strait, with a corresponding surface current flowing out. It is also a common thing for Arctic navigators to throw out an anchor upon icebergs floating north, impelled by these under currents, and thus get their vessels towed north gratis by these ice tugs. Dr. Kane, in his narrative, gives a most graphic description of an adventure of this kind, whereby he secured considerable progress in spite of a head wind and strong opposing surface current.

These facts show that Captain Bent's opinions are no less speculative than those of others who have preceded him. No amount of reasoning will convince thinking people upon this subject, no matter how plausible it may seem at first sight. Of all problems, the solution of which must depend upon actual experiment, this one, obscured as it is by a multitude of unknown conditions, must be regarded as the chief.

THE CARE OF HOUSE-PLANTS.

The recent frosts have admonished all amateur and professional horticulturists to remove all plants intended to be cultivated in the green-house or conservatory during the winter, from their beds to pots. We find in *Tilton's Journal of Horticulture*, a very seasonable article, from the pen of Wm. F. Channing, M. D., on the care of "house-plants," which will be of great service to those who have neither green-house nor conservatory, and who, notwithstanding, desire to preserve and enjoy the companionship of their summer favorites.

"How to make plants grow in the house is a much more important question than how to make them grow in the green-house. Few persons have conservatories. Almost every person has a window at which the spring and summer of plant-life may be fostered and maintained during the long winter months.

"Formerly almost every house had its plants. The children and the flowers were the chief ornaments of the old homestead. During the last generation, or since the introduction of furnaces and gas, the cultivation of plants in our houses has steadily declined. I propose now to show that this great deprivation and loss to our modern houses is unnecessary, and that plants may flourish as well under the dispensation of gas and the furnace as in the days of the old wood-fire and mold-candles.

"It may be true that plants will not grow in an artificially desiccated air. The skin and the delicate membranes of the throat and lungs parch in the dry furnace heat just like the leaves of the plants. The freshest complexion becomes wizened by a winter of this sirocco. What then shall be done in our furnace-heated houses? Simply introduce evaporators, which shall furnish to the air at least one-half as much moisture as the air naturally contains at the same temperature in spring or summer. The shrinking of the wood-work of the houses, or warping of furniture, are indications of an unnaturally dry heat, which is fatal to plant, and injurious to animal life.

"It is true also, that plants will not thrive in close rooms, charged with the sulphurous acid escaping from the combustion of anthracite or a product of combustion of impure illuminating gas; and in the same atmosphere the throat and lungs of human beings will suffer more or less severely. What is the remedy? Open a ventilator into the chimney, near the top of every room, if you can do no better, and keep it open, at least during the evening, while the gas is burning.

"I am prepared to say that furnace-heat and gas-light are no obstacles to the cultivation of plants, observing only the precautions which are equally essential to human health. I think the rule should be broadly stated, that any room in which plants refuse to grow is unfit for human life.

"In this connection, it is proper to enter a protest against the barbarous habit of excluding the sunshine from inhabited rooms, especially in winter. Its effect is almost as depressing on children and delicately organized women as upon plants.

"There is one other obstacle to the growth of plants in the modern house; which is the plague of insects. Some varieties, especially the microscopic red spider, are uncontrollable in a dry atmosphere, but retire at once before proper evaporation. For the rest improved resources of which I may speak at another time, make it toterably easy now to keep house-plants free from parasites.

"To illustrate theory by fact: I heat a moderate sized house, containing about twenty thousand cubic feet, with a furnace. I find it necessary to expose seven square feet of evaporating surface in the air chamber of the furnace to produce a proper degree of atmospheric moisture. Half this surface would answer with better exposure. About a pint of water is evaporated in twenty-four hours for each seven thousand cubit feet in the house, in raising the temperature from 40° to 70°, two pints in raising it from 30° to 70°, three pints in raising it from 20° to 70°, and four pints in raising it from 10° to 70°, and about five pints in raising it from zero to 70°. Thus, in the extremest of cold weather, it requires nearly six pails of water in twenty-four hours to keep the atmosphere of the house soft and agreeable though not appreciably moist; that is, not nearly as moist as the ordinary summer air at 70°.

"At twelve windows north, east, south, and west of the house thus heated, I have about seventy plants, mostly of the common kinds in very fine condition. During several years I have never known them to be injured by the furnace-heat and never by the gas, freely consumed, except in a single instance of an ivy growing near the ceiling of the room during an accidental leaking of gas.

"I find that ivies thrive peculiarly under the conditions described, growing well in positions furthest from the light; as, for instance, on the hearth, forming a magnificent fireboard. Six or eight varieties of variegated leaved ivy thrive well with the common. I find that roses which have blossomed during the summer in the ground, being potted after hard frost, stripped ruthlessly of every leaf, and trimmed in almost to bare poles are covered with buds within a month at my window, and blossom all winter, great authorities to the contrary notwithstanding. This winter a Madame Bosanquet has left all the rest, showing buds in three weeks, closely followed, however, by the Agrippina Souvenir de Desire, Sarfano, Hermosa, and Sanguinea.

"The Chinese-primrose, and coral-drop begonia are never out of blossom with me in the winter. A heliotrope, occupying a whole window, gives hundreds of its clusters, beginning in December. The orange, lemon, myrtle, and diosma grow with the greatest ease; and the Daphne odora and laurustinus blossom in their season. Among other plants which I find it good to have in the house, I will mention the varieties of winter and spring blooming cactus, geranium, oleander, abutilon, calla, Tradescantia zebrina (large and small leaved), hoya, maurandia, tropæolum, saxifrage, Coliseum vine, Maderia vine, and the usual bulbs."

[We would add to the valuable suggestions of Dr. Channing that a most excellent plan recommended by an accomplished florist, and used by us with great success, is to saturate sponges with water and place them upon plates around and among the plants and underneath the stand. A liberal use of these greatly assists in neutralizing the effects of dry heat.—Eds.

The New Thames Tunnel--How the Work is Carried On.

The new Thames Tunnel has progressed so fast since our last notice, that it may now be said to be virtually complete, and will, it is expected, be in a fit state for opening for public traffic about the middle or the end of next month. The whole length, from what may be called the summit of Tower Hill to the end of Vine st., in Tooley st, on the south side of the river, is just 1,320 feet, and of this distance more than 1,280 feet has already been accomplished and completed. Only about forty feet remain to make the junction with the Tooley st. shaft. This short distance, at the rate at which the tunnel has advanced, could be accomplished in about four or four and a half days, but the shaft itself cannot be ready within that time, nor, indeed, is it likely to be ready within the next fortnight. The shaft in Tooley st. is not so deep as that at Tower Hill by two ft. The former is to be fifty-eight ft., whereas the latter is sixty ft. Yet the Tower Hill shaft was sunk quickly and without the smallest difficulty, for, after passing through about twenty ft. of made earth, the clay was reached, a little below, and not a sign of water was detected. What we may call the Tooley st. shaft is a litttle over ten ft. diameter, and has been sunk to a depth of about twenty ft., where it has come upon a bed of gravel, in which the water is more abundant than could be wished. It is not, however, in sufficient quantity to prevent the shaft being very easily kept dry by means of pumping, but pumping is by no means wished in this case, for the shaft is near some very large buildings, and to pump out much water from beneath them would have the effect of causing their foundations to sink rapidly as the gravel beneath them was diminished in bulk as the water was drawn off. The Tooley st. shaft, therefore, is being sunk by means of a peculiar screw, which is called a "miser," an instrument used in works of this nature, and which brings up the maximum of gravel with the minimum of water. In this way the works are progressing steadily. As far as this shaft has yet gone, it is double lined with iron casing, the inner rim of iron keeping out the leakage which may find its way through the joints of the outer. These iron rings of the shaft are four ft. deep each, and they are forced, by weights, down into the soil before much dredging out within their circumference is attempted. The double iron lining to this shaft will not, it is expected, be continued to a much greater depth than it is at present. There is every sign that the water-bearing stratum has been nearly passed, and that the clay will soon be reached. When this is attained, only one lining of iron rings to the shaft will be used to within a few ft. of the bottom, where bricks, faced with glazed tiles, to reflect the light, will be employed, as in the shaft on Tower Hill. Night and day, every four hours, the shield driving the tunnel, moves forward eighteen inches, so that there is an advance of nine ft. every twenty-four hours.

The manner in which this rapid advance is accomplished is as simple and ingenious as it is safe and quick in its mode of operation. The shield is a disk of mixed wrought and cast iron, weighing about two and a half tuns. In the front next to the clay, it is concave; in the rear, where the men work, it looks like a gigantic cart wheel, having six spokes and an enormous open hollow felly in the center. To this shield, and extending backward over the men at work, is a powerful iron rim, just like the cap to the end of a telescope. Thus, the miners who work it excavate enough clay through the center opening to enable one man to pass in beyond the face of the shield, and he soon cuts away clay enough to find room for two, and when a comrade joins him, there is soon room made enough for three workers, but seldom for more. The clay is of the kind well known as the stiff London clay, of a blackish green color, just moist enough to give it a thorough tenacity, but without any water. When about two feet have been excavated all round in front of the shield, the miners return back through the central hole, and, with ordinary hand-screws, they force the shield on to the length of the distance they have excavated, its long rim still keeping them under shelter as it is advanced. Within this rim a segment of the iron tunnel is at once built in three segments, eighteen inches long, and so on, the process is repeated over and over again. The inner face of the shield is so constructed as to receive the pressure of six screw-jacks—one in each of the six spokes we have spoken of. By these means a pressure of sixty tuns could be brought to bear on the whole shield. As a rule, however, one screw-jack and one man is sufficient to move it forward, and this with ease. In case of any water being come to—such as a spring—for the whole tunnel is far below the bed of the river water—it would give indications of its presence in the moisture of the clay long before the miners reached it. In the course of the excavations of the shield, about 2,000 cubic yards of the London clay have been dug out for the tunnel alone. This, as fast as it was cut out, was run out in little "trolleys," to the Tower Hill shaft, and hoisted up to the outer air. But every "trolley" dropped its quantum in the tunnel till the base of the tube became covered with some six or seven inches of sticky, wet clay. This has all been removed, and the tunnel, as far as it has gone, is now clean from end to end.

The result is, that all that passes on the river over head is ten times more distinctly heard than ever. The passage of a steamer is heard with a noise so loud and vibrating in the at present confined air of the tunnel, that it is only the knowledge of the unalterable and almost immovable strength of the structure in which you stand that gives the hearer confidence. Not only can every vessel be heard passing—we speak of course of steamers, large or small—but even such slight noises as hammering on the ships in the Pool above can be distinguished not only by the sound, but even by the slight though perceptible vibration of the air. Yet, the whole tunnel is not only water-tight but air-tight. The tests taken for deflection, or any settlement in the iron tube, since it has been built, give results that show a stability that apparently nothing but an earthquake can unsettle. The greatest deflection was only one eighth of an inch from the true level, and in only two instances was it one sixteenth. As far as regards the tubes bearing pressure, they are equal now that they are formed in circles, to about ten times the pressure they can possibly have to bear, and to more than twenty times the pressure that is now laid on them. Altogether about 864 rings have now been laid and bedded in with blue lias cement. About twenty more rings will complete the entire tunnel from Tower Hill to Tooley st. The descent down the shafts will be by means of lifts. These are to be constructed on a special design of Mr. Barlow's, so as, in case of accident, such as the giving way of any of the apparatus, to clip the guiding rods and check the progress of the lift in a few feet. This invention, in fact, is only a very clever break, which, instead of acting instantly, and with a sudden jerk, as bad as a fall, slowly brings the lift to a standstill in about ten ft. This arrangement has one especial merit, which is, that it is never likely to be called upon; for the wire rope which is to raise and lower the lift is to be about fifty times stronger than its supposed strain, so that there seems very little chance of its breaking with the weight of ten people, when it has been tested to bear more than the weight of a hundred. The lift is to be a mere little iron room, built to hold ten people with comfort, though, from the ample space intended to be allowed, it might hold twelve with almost equal ease. The omnibus at the foot of the shaft is to hold fourteen. The time of transit from Tower Hill to Tooley st. is to occupy three minutes, and the fare is to be a penny.—*London Times.*

HORSFORD'S PHOSPHATIC BREAD.

RUMFORD CHEMICAL WORKS *vs.* JOHN E. LAUER.—In this case, tried before Judge Blatchford, it will be remembered a decision was given against the plaintiff on the first claim, on the ground of want of novelty; it being contended by the defense that a pulverulent phosphoric acid was made by Berzelius under the name of three fourth's phosphate as early as 1816. The plaintiff maintained that the three fourth's phosphate of Berzelius was used for making bread, and moreover that the experts for the defense had not made the three fourth's phosphate, nor had they followed the process of Berzelius.

Since the decision was rendered the chief witness for the defense has found that he was mistaken, and it appears that there is no evidence in the case impairing the claim for originality by the patentee.

Upon affidavits setting forth these facts, the Judge has ordered the case to be re-opened for further testimony, and a new hearing and a new decision. For particulars respecting the trial, see page 105 of the present volume of SCIENTIFIC AMERICAN—"When Doctors Disagree, who Shall Decide?"

Enormous Sale of Newspapers.

The *Herald* publishes a tabulated statement of the sales of newspapers in New York city for the six months ending September 30th, from which it appears that an aggregate of six million dollars' worth of city newspapers was sold in that time. The *Herald* has the largest daily sale; and the *Ledger* stands at the head of the weekly issues. The law requires a tax to be paid upon gross receipts in excess of $5,000 per annum. The *Herald's* table is compiled from the official tax list, and is no doubt correct. The SCIENTIFIC AMERICAN appears to be the only journal published in the city devoted to mechanical and engineering science whose receipts from the sale of papers exceed the sum exempt by law from taxation. The excess upon which we were required to pay taxes during the past year, amounted to $77,241.

There are but six papers reported in the table referred to whose circulation equals that of the SCIENTIFIC AMERICAN. It is, no doubt, by far the best advertising medium in its specialty to be found in the country.

Explosion at a Wood Preserving Establishment.

An explosion of one of the tanks used by Robbins' Wood Preserving Company, for saturating wood with carbolic acid, took place at their works in Third street, Brooklyn, on the evening of the 26th October, killing Mr. Martin Voorhees, the inventor of the peculiar form of tank used, also killing a laborer employed in the establishment, and injuring several others. A member of the firm has since publicly explained that the explosion was in reality a steam explosion; the new tank being an experimental one in which the wood was placed in the same tank with the dead oil from which the acid was distilled, and the steam being generated under high pressure from the sap contained in the green wood falling upon the hot oil at the bottom.

Per contra, a correspondent of the *Herald*, writing in regard to this explanation of Mr. Robbins, asks how it happens that the remains of the two unfortunate men who were killed were blackened and charred, and their clothing nearly burned off, if "superheated steam" caused the explosion. And again, whether this explosion, as well as the one in Jersey City last spring and the other in San Francisco last summer, which resulted from the attempts to put this same process into practical operation, are not attributable to some fatal error in the process itself, which renders it altogether impracticable. He also states that the explosion in San Francisco caused the loss of seven lives and more than $50,000 worth of property.

Editorial Summary.

TELEGRAPH APPARATUS.—Mr. Chas. Durant, of New York city, is the inventor of several improvements of a practical nature, intended to lighten and facilitate the labors of telegraph operators. The present improvement relates to the relay machines, and its object is to do away with the trouble commonly experienced in regulating the adjustments of the instrument. In this patent Mr. Durant, among other things, claims "So combining a relay machine and one or more batteries, or other electrical supply, with a telegraph instrument, that when, by the operation of the instrument, the main telegraph circuit is opened or closed, another circuit, communicating with the same relay machine will be correspondingly opened and closed, and the attractive power developed in the relay magnet will be thereby modified.

EFFECTS OF DISCHARGES OF ARTILLERY UPON CLIMATE.—A correspondent from Missouri suggests that continued discharges of artillery induce rain storms. He cites the observations of several gentlemen who stated that during the wars of Napoleon heavy battles were uniformly followed by heavy rain storms. He suggests also that perhaps the change in climate of the Plains (referred to on page 214, current volume) along the line of the Pacific Railroad, may be effected by the concussive effect, similar to that produced by the discharge of cannon, caused by the passage of trains over the hitherto undisturbed plains. All we can say on this matter is, that until a direct connection between atmospheric concussion and the fall of rain has been established, we must regard it as merely a conjecture.

METHOD FOR CROSSING STREETS.—Messrs. Adam and Nicolas Barth, of New York city, have submitted to us a plan for street crossing, which is perhaps worth consideration. It employs the principle of the elevator, with horizontal elevated rails to convey the platform from side to side. Passengers step upon the platform, are raised to the proper hight, conveyed across, and let down upon the opposite side of the street. Mechanically this is perfectly practicable, and it might prove more acceptable than bridges. The plan is certainly free from some of the objections raised against bridges, though it might be found on trial to have some defects which the bridges do not have.

OLEOGRAPHY.—This is the name given to the new art of fixing on paper the special forms which a drop of oil assumes when poured on water. These forms, or patterns, vary with every sort of oil, and are exceedingly interesting and beautiful. Oleography may be briefly described thus: Having obtained the oil pattern, lay on it for an instant a piece of glazed surface paper, then take it off and place it on a surface of ink or any other colored fluid in water or spirit. Now wash off any excess of color with plain water; when dry, the pattern is fixed. The paper becomes greasy where the oil is present and thus resists the action of the ink, but it is rapidly absorbed on the blank places.—*Septimus Piesse.*

STEAM JETS IN BURNING BRICKS.—The essential feature of this invention consists in so constructing a brick kiln that the products of combustion from fires contained in furnaces at one end of the kiln are caused to forcibly permeate the mass of bricks by the action of jets of steam or other equivalent exhausting device situate at the opposite end of the kiln and *vice versa*, the products of combustion being caused to pass through the mass from one end to the other of the kiln first in one direction and then in the opposite direction, thereby heating the bricks uniformly throughout; jets of steam are also directed into the combustion chambers and over the fuel of those fire-places which are in action for the time being, as well as into their corresponding ash-pits.

AERIAL NAVIGATION.—We would call the attention of our readers to an article on "Aerial Navigation," which appears in this number and which is the first of a series of articles to appear on this subject. Many practical and scientific men believe we are on the eve of new discoveries which will render the navigation of the air practicable, notwithstanding the failures which have hitherto attended experiments in this field. In this state of expectancy, the history of some of the most prominent events in the science of aerostation, especially those which have occurred in our own country, can not fail to be of interest.

A COMPANY has been formed in Lynchburg, Va., for the purpose of establishing works for extracting compounds from oak bark. They expect to begin operations very soon.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

The castor bean is becoming an important industry in Perry county, California. One prominent dealer received at his warehouse 1,000 bushels in one day, paying $3·18 per bushel. It yields more bushels to the acre than wheat.

Tanned cotton, or "cotton leather" is prepared by treating cotton fabrics in a manner similar to that in which skins and hides are treated for the manufacture of leather. Cotton is thereby made stronger and better able o resist the effects of moisture.

There is only one steam fire engine in France. This is one of the American pattern, and is owned by the city of Havre. The other French towns, including the capital itself, depend for the extinguishment of fires upon hand-engines, about the size of a garden hose, and worked by soldiers, called *pompiers*.

M. Morin states in *Cosmos* of October 2, that he has in his possession wooden water wheels which have been in use more than 1,500 years for the evacuation of water from a copper mine. These wheels are more than 18 eet in diameter. The wood was found on analysis to be perfectly sound, and to be partly converted into a compound of cellulose and copper.

The following statistics of coffee production are given by Professor J. Darby. Of the 713,000,000 lbs. produced by the world, per annum, Brazil furnishes 430,000,000, or more than half of the whole. Java 140,000,000, Ceylon 40,000,000, St. Domingo 40,000,000, Cuba and Porto Rico 25,000,000, Venezuela 25,000,000, Sumatra 25,000,000, all others, including the Mocha, 18,000,000

A ship called the *Ariadne*, of 1,400 tons register, and 200-horse power, is to sail from London on the 18th of November for Buenos Ayres, for the purpose of bringing live cattle from South America to England. The vessel was built expressly for the end contemplated. Her return is expected about February next, and if the voyage will prove a success, other ships are to be built on the same principle, and a regular trade in live cattle will be established.

Attention is called by the Argentine Government to the National Exhibition to be held at Cordova about the 17th of April, 1870. Foreign machines and products of art, industry, and science are to be admitted on an equal footing with those of native origin. Details regarding the conditions of exhibition, the provisions for transportation, etc., may be had, on application, from the Minister Plenipotentiary or any of the consuls of the Argentine Republic in this country.

Mr. Lange, the London representative of the Suez Canal Company has made some experiments on the canal with a corvette carrying ten Armstrong guns and driven by engines of 300-horse power. He has ascertained the following important points: First, the speed necessary to be maintained on a vessel of the dimensions of the ship experimented with, in order to enable a straight course to be steered, is from 3·2 to 3·7 knots an hour. Second, the embankments suffered no injury while the vessel was going at a rate of 5·4 or 6·4 knots an hour. Third, it was found that the loss of speed incurred by the vessel navigating the canal when compared with the rate on the open sea in smooth water, amounted to one fourth, the same power being employed in both cases.

While some of the workmen employed in a pit situated at the east end of Clark street, Airdrie, Scotland, were working in a seam of gas coal, called the Tongue seam, they turned out a frog which had been embedded in the coal. They had just fired a shot, and out of the debris issued a pretty golden-colored frog, dead, to be sure; but the body was warm and fresh, as though life had been newly extinct. The seam was 60 fms. deep, and had been previously worked as an ironstone pit at a less depth. There was, however, 30 fms. of rock penetrated before either of these seams were reached. The frog was about 6 in. long by 4 in. broad. The miners cut up the body, and discovered gas coal in a paste state in the stomach. Supposing the frog firmly embedded in the coal, how would the poor batrachian's jaws find room to perform the duties of mastication, even supposing it had got successfully located inside an uctuous seam of gas coal? Or are we to suppose that it imbibed the coal paste through the pores of the skin?

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

CULTIVATOR.—J. H. Lockie, Humphrey, N. Y.—This invention has for its object to furnish an improved cultivator which shall be so constructed and arranged that it may be readily adjusted to cultivate rows of plants at different distances apart, and which shall at the same time be strong, durable, and not liable to get out of order, or be broken by striking a stone or other obstruction.

PRINTERS' GALLEY.—William Quail, New York city.—This invention has for its object to improve the construction of printers' galleys so as to make them more convenient.

PORTABLE FENCE.—Jacob Closs, Decatur, Ind.—This invention relates to new and useful improvements in fences for farm and other purposes, and consists in supporting the fence clear of the ground by means of braces and double iron clevises.

PROPELLING WHEELS.—Thomas Bell, Bellport, N. Y.—This invention relates to a new and useful improvement in wheels for propelling vessels in the water, whereby they are rendered more effective than when made in the ordinary manner.

PROCESS FOR TREATMENT OF CANCER.—Lawrence Roy, Plattsburg, Mo.—This invention and discovery relate to an improvement in the treatment of cancer diseases

SPIRIT LEVEL.—A. P. Odholm, Bridgeport, Conn.—This invention relates to a new and improved plumb and level of that class in which the alcohol is confined within a circular chamber.

MACHINE FOR BLEACHING CANE JUICE.—Evan Skelly, Plaquemine, La.—This invention comprises an improved arrangement of automatic feeding and air supplying apparatus for the furnace; also, an improved arrangement of cooling devices through which the gas is passed and cooled in the presence of water; also, an arrangement of means for agitating the juice, exhausting the air, and providing the gas thereto, in a manner to produce the most intimate contact of the gas with the particles of juice for bleaching.

CLOTHES BARS.—L. J. Adams, Hoosick Falls, N. Y.—This invention relates to improvements in the construction of that class of clothes bars made in frames or panels and hinged together so as to swing open on the hinge joints horizontally when standing on one end. The invention consists in a peculiar way of hanging the said frames or panels to a common center, so that when extended they will radiate from a common center, instead of assuming a zigzag or serpentine line.

CAR COUPLING SHACKLE.—J. Marston, Saratoga Springs, N. Y.—This invention relates to improvements in shackles for connecting cars together in trains, and consists of an improved arrangement of double jointed bars specially adapted for connecting cars of different hights.

GATE LATCH.—F. M. Ransom, Little Shasta Valley, Cal.—This invention consists in a sliding latch having a hooked end and a spiral spring arranged to constantly draw the latch into the case which is fixed on the gate; also, of a double beveled catch which draws the latch lengthwise and at the same time raises it when the gate shuts, and behind which the hooked end of the latch is drawn back into a notch by the spring, the said notch holding the gate closed and preventing the latch from being lifted up by animals.

SOFA ATTACHMENTS.—H. C. Grube, Plaquemine, La.—This invention relates to improvements in sofas and lounges, having for its object to provide a convenient arrangement of table, wash stand, bureau, and drawer attachments calculated to combine in a sofa or lounge the necessary outfit of such articles for a room, in a portable form, and so arranged as not to give an objectionable appearance to the articles.

POTATO DIGGER.—J. J. Singley, Lafayette, Ind.—This invention consists in the application to a scraping plow, and endless screening device arranged in connection therewith on a frame borne upon two wheels, of certain vine cutting devices, to prevent, as much as possible, the gathering of the vines on the screen and clogging the same; also, an earth discharging apparatus and screen shaking and brushing apparatus.

STALK CUTTER.—R. A. Boulware, Doniphan, Kansas.—The present invention relates to a new and useful device for cutting up the stalks of corn, etc., in the field, preparatory to plowing the same, the machine for this purpose having a crushing or braking roller in front, which is immediately followed by a series of knives set in a revolving frame behind, which chops up the corn stalks and leaves them lying on the surface.

GUN LOCK.—J. M. Hill and R. D. Hay, Crooked Creek, N. C.—This invention consists in the application to the barrel around the nipple of a raised projection over which the hinged cap will close snugly when closed over the nipple, so as to wholly inclose the said nipple for better protection.

ENEMA NAVAL AND UTERINE SYRINGE.—J. J. Essex, Newport, R. I.—The object of this invention is to obviate the difficulty attending the use of the the ordinary syringes, which are worked by means of an elastic bulb, not being devised in such a manner that they can be placed in proper position so as to admit of a person applying or using it with facility and comfort. To obviate this difficulty the elastic bulb is connected with the valve box by means of an elastic tube, which permits the application and operation of the syringe to inflamed or diseased parts without pain or difficulty to the person using it.

MACHINE FOR CUTTING CORKS.—Olney Arnold, Pawtucket, R. I.—The object of this invention is to provide for public use, a machine which will grasp the bark, hold it firmly, and apply the cutting knives to it in such a manner as to cut out the corks rapidly, with great perfection, and with the utmost economy of material, each movement of the operator's lever producing a large number of finely cut corks.

FRUIT-PRESERVING APPARATUS.—C. C. Williams, Brooklyn, N. Y.—This invention has for its object to furnish an improved apparatus for preserving fruits, meats, vegetables, etc., by heating the said substances to the proper degree by the introduction of steam into the lower or bottom parts of the cans in which said substances are to be sealed up.

BOB SLEIGH COUPLING.—William E. Van Schaick, Delavan, Wis.—This invention has for its object to furnish an improved coupling for connecting the front and rear bobs of a bob sleigh to each other, which shall be simple in construction and effective in operation, enabling the movement of the rear bob to be fully controlled or guided by the movement of the forward one.

CAR COUPLING.—Matthew Quinn, Wataga, Ill.—This invention has for its object furnish an improved self-coupling car coupling, designed more especially for freight cars, but equally applicable to other cars, and which shall be so constructed and arranged as to conveniently couple cars differing in hight.

WEATHER STRIP FOR WINDOW SASHES.—Andrew Jackson Devoe, Hackensack, N. J.—This invention relates to a new weather strip for window sashes, by means of which air and water are effectually prevented from being blown through the crevices, between the sashes, and under the lower sash.

PITCHING BARRELS.—J. P. Benoit, Detroit, Mich.—This invention relates to a new and useful machine for pitching barrels for holding beer and other liquids, and consists of a furnace mounted on wheels with a suitable air chamber and pipes attached, connected with a blower, by means of which a current of heated air is forced into the barrel of sufficiently high temperature to open the pores of the wood, and render the pitch so liquid that it readily flows into the pores and is incorporated with the wood, while it is, by properly agitating the barrel, made to cover the entire inner surface and render the barrel perfectly tight.

HEAT RADIATOR.—A. Albee, Worcester, Mass.—This invention relates to radiators for retaining and utilizing the heat of a stove, and in combining therewith an adjustable shelf.

GRATE BAR.—Monroe Morse and Charles H. Morse, Franklin, Mass.—This invention relates to a new and useful improvement in grate bars for furnaces, and consists in a false bar, or rider, made in one or more sections, which false bar, or rider, is most exposed to the heat, and which may readily be removed or renewed.

WASH BOILER.—Daniel Lucas and James Lucas, Green Bay, Wis.—This invention relates to a new and useful improvement in boilers for washing clothes.

EXPLOSIVE COMPOUND.—William Mills, New York city.—This invention relates to a new and important improvement in the composition of compounds of an explosive character, designed as a substitute for gunpowder and for other explosive compounds.

SHOE LAST.—Wm. C. Shipherd, Willoughby, Ohio.—This invention consists of a graduated adjustable, circular, notched, catch plate attached to the last, and a spring catch on the instep block of peculiar construction, arranged for operation in conjunction with the said catch plate.

COTTON SEED HULLER.—Frank A. Wells, Memphis, Tenn.—The object of this invention is to provide a cotton seed huller more efficient in operation, less liable to clog or be damaged by foul or hard substances, and better adapted for adjustment of the cutters of the concave shell than the machines now in use. It is also intended to provide a more economical arrangement of the cutters in respect of grinding them.

WATER WHEEL.—B. W. Tuttle, Galena, Ill.—This invention relates to improvements in the "Barker mill," and other similar wheels, designed to improve the efficiency of the same, and consists in the application thereto of an improved method of supplying the water; also, an improved arrangement of hollow shaft for transmitting the motion and for employment as an air chamber buoying the wheel; also, in the arrangement of an air chamber at the bottom of the wheel for buoying it, operating as a float to support a portion of the weight of the wheel upon the tail water; also, an arrangement of adjustable buckets and mechanism supported upon the shaft, whereby the buckets may be adjusted while the wheel is in motion, and also several other arrangements of details.

HOP SODA.—Arnold F. Dückwitz, New York city.—Hops have long been esteemed for their valuable medicinal qualities, and Mr. Dückwitz gives them to the public in the shape of a healthful and palatable beverage, which promises to be quite an acquisition to the general stock of curatives. Hop soda is a combination of extract of hops and soda water.

TREADLE MOTION.—E. A. Goodes, Philadelphia, Pa.—This invention consists of a disk or other equivalent device connected to the lower end of a vibrating pendulum so as to vibrate thereon, and to which, at the top, the crank-connecting rod is jointed, and all arranged in such a way that the lower face of the disk being prevented from swinging, an oscillating motion imparted to the axis will swing the top back and forth, so as to impart rotary motion to the crank.

PUMP.—Thomas Metzler, Wooster, Ohio.—This invention consists in an arrangement of means for operating a collapsing bulb pump when suspended in or near the water of a well or cistern to protect it from frost.

GOPHER TRAP.—D. N. Smith, San Bernardino, Cal.—This invention relates to a new gopher trap, which is of very simple construction, and which will be sure to catch the animals if they pass through it.

BOOTS AND SHOES.—Edmund Brown, Burlington, Vt.—This invention relates to a new device for lining the edges of lace shoes and boots, and has for its object to facilitate the fastening of the two flaps or folds, so that the tedious lacing or buttoning heretofore required can be dispensed with.

ATTACHMENT TO ROVING MACHINERY FOR DISCHARGING ELECTRICITY.—Aaron Goodspeed, Granville, N. Y.—The object of this invention is to discharge the electricity which is produced by the reciprocating motion of the rollers of wool and cotton roving machinery.

BALLOT.—Austin B. Culver, Westfield, N. Y.—The object of this invention is to protect and secure the purity of the elective franchise by preventing fraudulent voting, and the invention consists in providing a band around each ballot in such manner that each ballot is kept separate to prevent one voter from intentionally or accidentally putting in two or more votes, or rather to detect such double voting in case it should be performed. The device is cheap and simple, and can be put on or taken off from the ticket in a moment. It would take less time to put it or to a ticket than it would the inspector to find the name on the register, which must be done before depositing the same. It also makes the ballot more compact, consequently they can be deposited, and the opening in the ballot box kept clear, with less trouble.

LIGHTNING RODS.—W. S. Reyburn and F. J. Martin, Philadelphia, Pa.—This invention consists in combining a sheet-copper covering, constructed in a peculiar manner, with a sheet-zinc center, similarly contrived, whence certain advantages result.

MACHINE FOR DRIVING RAKE TEETH.—N. M. and A. T. Barnes, Tiffin, Ohio.—The object of this invention is to construct a simple and convenient machine for driving wooden teeth into the heads of horse hay rakes, that will perform the work more quickly, cheaply, and accurately, and with less danger of breaking or battering the teeth than can be done by hand.

SCREW DRIVER.—J. C. Pinner, Newbern, Tenn.—The object of this invention is to provide for public use a simple and convenient tool with which a screw can be more readily and easily inserted or removed than with the other screw drivers heretofore brought into use.

ADJUSTABLE CIRCULAR SAW-MITERING MACHINE.—J. P. Grosvenor, Lowell, Mass.—The object of this invention is to obtain, in mitering machines having a circular saw, a more simple, cheap, and perfectly-operating device for adjusting the saw while keeping the belt taut at all times, and the table level and of uniform hight. The machine is an improvement upon those patented by the same party May 5th, 1868, and September 15th, 1868, respectively, the difference between the present and the former inventions consisting in the peculiar device for enabling the saw mandrel, although hung in an inclined frame, to be oscillated in a vertical plane. The same construction also enables the operator to raise or depress either end of the mandrel, and by changing the saw to one end or the other its inclination can be adjusted at pleasure in either direction.

BREECH-LOADING FIRE-CRACKER HOLDER.—A. E. Peck, Brooklyn, N. Y.—This invention has for its object to furnish an improved holder for holding fire crackers, which being discharged in such a way that the fire cracker may be discharged or exploded with perfect safety, while projecting the shell of the fire cracker from the muzzle of the holder, and which shall, at the same time, be breech loading.

PARLOR AND SIDEWALK SKATE.—N. W. Hubbard, New York city.—This invention has for its object to furnish an improved parlor and sidewalk skate, which shall be so constructed and arranged as to run with little friction and to pass over obstructions, adapting it for use in the parlor, upon the sidewalk, or upon a street paved with the Nicolson pavement.

MATCH SAFE.—August Steinbök, New York city.—This invention relates to a new match safe, arranged to contain a self-igniting wick—that is, one which will ignite as soon as brought in contact with the atmosphere.

RAILROAD TRACK.—Baron Ludwig Lo Presti, Vienna, Austria.—The object of this invention is to construct a cheap railway, which can be easily constructed, and which is capable of extended application and of ready transfer and displacement. In accordance with this new system railways can be rapidly constructed at a comparative small cost and without any reference to the natural formation of the ground.

SAW SET.—H. Sloat, Watertown, N. Y.—This invention relates to a new implement for setting all kinds of saws; it can be applied without removing the saw from the mandrel, and will set the teeth very accurately and evenly.

COAL STOVE.—George W. Herrick, Stuyvesant, N. Y.—The object of this invention is to construct a heater for burning Western bituminous coal and other tar coal depositing much lamp black, and the invention consists chiefly in providing for ample draft so that all the products of combustion and the solid matter carried off with the same will be burned.

VELOCIPEDE.—Edward A. Lewis, St. Charles, Mo.—This invention has for its object to so construct the cranks of velocipedes that they are made longer where the greatest power is required without increasing the diameter of the circle to be described by the foot. The invention consists in the use of sliding cranks, which project from both sides of the shaft, one end of each crank being guided by a fixed eccentric groove or track in such manner that the crank pin is moved away from the shaft as long as the power is applied to the same by the foot; when the power is not required on the return stroke, the crank pin is drawn close to the shaft, and thus, without describing a large circle, the crank lever is made longer than usual, when required for actual use.

BUCKLE.—D. S. Butler, Otterville, Mo.—This invention relates to a new self-fastening buckle, which can readily connect two straps without sewing or other tedious process.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

F. B.—The best water fence we have ever seen to be used in small streams was made as follows: A gate sliding in upright ways at the ends, like an old-style turnpike gate, has attached to the bottom board (a scantling is better as not so likely to be broken in high water) crutches which rest upon common empty barrels or casks. The uprights at the ends of the gate are provided with friction rollers, so that the gate slides up and down easily in the ways. Two or three casks will generally support the weight of the gate, so that it descends nearly to but does not enter the surface of the water. A gate thus constructed will rise and fall with the water, and if everything is properly made, is not liable to be washed away in high water. A good water gate for fencing purposes is in request.

C. S., of Va.—A simple test will enable you to distinguish between the pulverized carbonate of soda and the chlorate of potash, the crystals of which are so broken as to render them difficult for you to distinguish. Taste would be enough to a person familiar with these salts but premising that you are not sufficiently posted, you can detect the difference by adding to a little of each in the solid state a little sulphuric acid. With carbonate of soda there will at once ensue a great disengagement of colorless gas (carbonic acid) with much frothing. With chlorate of potash the action will be slow while the materials are cold, but when a gentle heat is applied the mixture becomes very yellow and a greenish irritating and suffocating gas (chlorine) is evolved.

C. B., of N. Y.—Time will remedy the disagreeable taste of the water in your newly cemented cistern. We know of nothing you can do but possess your soul in patience.

R. S. M., of Mass.—A cheap attractive device in the way of signs for shop windows is always salable, and there is no doubt that yours is patentable. You would do well to prosecute the case at once. Its amusing character would be sure "to draw."

T. L. B., of Vt.—Your method of preparing plumbago as a stove polish is old, except the form in which it is packed for use. You could probably secure a patent on that as its convenience is obvious.

R. C. D., of Minn.—The inventor of logarithms was John Napier, a Scotchman; born 1550, died 1617. He was a man of great inventive talents, and displayed them in mechanics as well as in mathematics.

R. S., of Ca.—The pressure per square inch in fresh water at a depth of ten thousand feet is 4,334 pounds nearly.

E. B. R., of N. Y.—Sand molds for brass castings are faced with either meal dust, flour, powdered chalk, finely-sifted wood ashes, pulverized charcoal, rotten stone, and sometimes with the soot of cork-shavings, or other carbonaceous material. Among these various substances you will undoubtedly find the one which you suppose is the secret of the founders you refer to.

R. L. J., of Ohio.—There is no rule by which the proportions of any one part of a marine engine can be computed independently of the other parts. Details vary greatly in different engines, according to particular circumstances. Your question, therefore, as to the proper hight of gallows frame above cylinder, is, in the absence of all other data, unanswerable.

T. D., of La.—The project of the Nicaraguan canal dates back to 1551, at which time the historian Gomara indicated four routes for such a canal. These routes have ever since been considered as the most favorable ones. A survey of one of these routes was made under the orders of the Spanish Government in 1781.

W. W., of N. Y.—The various kinds of self-raising flour in market are, we believe, all patented. If you wish, you can obtain the specifications of these patents from the Patent Office on payment of a small fee.

C. L., of Ky.—An instrument for measuring distances passed over in traveling upon roads by carriages, velocipedes, etc., may be properly called an odometer or perambulator. Your device is probably patentable.

Z. W., of Ind.—While we are aware that practical men are often led to use various solutions for tempering steel, their practice varies so much that many will be found to condemn what others praise in the highest terms. Scientific men have failed to detect any better results from solutions than from simple water. There is an amount of traditionary practice transmitted from father to son, and each workman generally favors that to which he has been bred. We do not believe in solutions, and therefore do not recommend any of the numerous salts which have been employed for this purpose.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING OCT. 26, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from .... $1 *upward, but usually at the price above-named.*

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them .... $1·25

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York.

96,071.—Heat Radiator.—A. Albee, Worcester, Mass.
96,072.—Stilt.—M. C. Ames (assignor to himself and W. E. Simonds), Hartford, Conn.
96,073.—Machine for Carbureting Atmospheric Air.—Arthur Barbarin, New Orleans, La.
96,074.—Apparatus for Carbureting Air.—Arthur Barbarin, New Orleans, La., and A. E. Dupas, Paris, France.
96,075.—Propeller.—Thos. Bell, Bellport, N. Y.
96,076.—Pitching Barrel.—J. P. Benoit, Detroit, Mich.
96,077.—Combined Sawset, Clamp, and Vise.—B. Blackstone, Warren, Ill.
96,078.—Machine for Sharpening Saws.—L. N. Borem, Kennard, Ohio.
96,079.—Stalk Cutter.—R. A. Boulware, Doniphan, Kansas.
96,080.—Samples for Shoe Dealers.—A. N. Breneman, Lancaster, Pa.
96,081.—Apparatus for Evaporating Cane Juice.—M. S. Bringier, Ascension parish, La.
96,082.—Lantern.—T. B. Burgert, Crestline, Ohio.
96,083.—Buckle.—D. S. Butler, Otterville, Mo.
96,084.—Portable Fence.—Jacob Closs, Decatur, Ind.
96,085.—Pallet and Brush for Graining.—Fred'k Cole, Kankakee, Ill.
96,086.—Ticket Clip.—Austin B. Culver, Westfield, N. Y.
96,087.—Surge Reliever.—C. D. Cutting (assignor to himself and W. J. Keefe), Boston, Mass.
96,088.—Sugar-cane Mill.—Anthony Demarce, Fairfield, Iowa.
96,089.—Aerated Medical Beverage.—A. F. Duckwitz, New York city.
96,090.—Telegraph Apparatus.—Charles Durant, Jersey City, N. J.
96,091.—Machine for Making Rope Moldings.—Charlton Eden, Indianapolis, Ind.
96,092.—Method of Hanging Bells.—Gilbert Eguillon, Paris, France. Antedated Oct. 16, 1869.
96,093.—Egg Detecter.—F. J. Eisenman, Chicago, Ill.
96,094.—Burglar Alarm.—Wm. H. Emmons, New York city, and Franklin Kissam, Newark, N. J.
96,095.—Uterine Syringe.—J. J. Essex, Newport, R. I.
96,096.—Folding School Desk.—Samuel F. Estell, Richmond, Ind.
96,097.—Process of Obtaining Useful Oil from the Acid Residium of Petroleum.—A. Farrar, Longwood, Mass.
96,098.—Railway Car Brake.—Eugene De B. Freer, Lima Center, Mich.
96,099.—Pump.—A. D. Gates, Surrey, Wis.
96,100.—Folding Desk and Seat.—H. E. Gillet, Oswego, N. Y.
96,101.—Refrigerator and Water and Wine Cooler.—L. M. Goldsborough, Washington, D. C.
96,102.—Apparatus for Removing Electricity from Wool in Roving Machines.—Aaron Goodspeed, Granville, N. Y.
96,103.—Sofa Attachment.—H. C. Grube, Plaquemine, La.
96,104.—Combined Horseshoe and Boot.—H. G. Haedrich, Philadelphia, Pa.
96,105.—Fluid Meter.—Wm. Hamilton, Toronto, Canada, assignor to himself and H. Kimba l, Randolph, Vt.
96,106.—Gate.—Reuben Hatch, Jr., Traverse City, Mich.
96,107.—Clothes Rack.—James Hatfield, Sparta, Wis.
96,108.—Paper Box.—G. M. Hendrickson, Albany, N. Y.
96,109.—Lime Kiln.—Geo. Hensler, Kankakee, Ill.
96,110.—Base-burning Stove.—George W. Herrick, Stuyvesant, N. Y.
96,111.—Stair Rod.—Selah Hiler, New York city.
96,112.—Nipple Guard for Fire-arms.—R. D. Hay and J. M. Hill, Crooked Creek, N. C.
96,113.—Implement for Laying Wood Pavement.—Philip Hinkle, San Francisco, Cal.
96,114.—Railroad Car Ventilator.—Robert Hitchcock, Springfield, Mass
96,115.—Filtering Sections for Tube Wells.—Edmund Holden, Hartford, Mich.
96,116.—Bung.—V. A. Houdaille, Paris, France.
96,117.—Parlor Skate.—N. W. Hubbard, New York city.
96,118.—Muff and Collar Box.—J. P. Jones (assignor to Jason Crane), Bloomfield, N. J.
96,119.—Egg Carrier.—P. P. Josef (assignor to himself and Wallace Johnson), Buffalo, N. Y.
96,120.—Heel-cutting Machine.—Samuel Keen, East Bridgewater, Mass.
96,121.—Sign for Street Lamps.—J. W. Larimore (assignor to himself and Alonzo Marks), Chicago, Ill. Antedated October 12, 1869.
96,122.—Handle for Pans and other Cooking Utensils.—J. A. Lawson, Troy, N. Y. Antedated Oct. 9, 1869.
96,123.—Washing Machine.—Fabius H. Lawton (assignor to himself, David W. Prosser, and Joshua Cheney), Fluvanna, N. Y.
96,124.—Velocipede.—E. A. Lewis, St. Charles, Mo.
96,125.—Machine for Making Tags.—Wm. Liddell (assignor to himself and B. S. Binney), Boston, Mass.
96,126.—Cultivator.—J. H. Lockie, Humphrey, N. Y. Antedated Oct. 16, 1869.
96,127.—Railway Track.—B. L. Lo Presti, Vienna, Austria. Patented in England Oct. 22, 1868.
96,128.—Velocipede.—Geo. Lowden, Brooklyn, N. Y.
96,129.—Wash Boiler.—Daniel Lucas and Jas. Lucas, Green Bay, Wis.
96,130.—Railway Car Coupling.—John Marston, Saratoga Springs, N. Y.
96,131.—Molding and Casting Pipe.—Louis Martaresche, Pittsburgh, Pa.
96,132.—Mode of Producing Useful Articles from Collodion and its Compounds.—J. A McClelland, Louisville, Ky.
96,133.—Tool for Expanding Boiler Tubes.—Robert McKenzie, New Orleans, La.
96,134.—Combined Knife and Fork.—James McMorries, Columbus, Miss.
96,135.—Coal Stove.—John McNeight, Wakefield, Mass.
96,136.—Pump.—Thomas Metzler, Wooster, Ohio.
96,137.—Pedals for Pianos, etc.—A. A. Mixer, Hamilton, Ohio.
96,138.—Grate Bar for Steam and other Enginery.—Monroe Morse and C. H. Morse, Franklin, Mass.
96,139.—Folding Chair.—J. Nicolai and J. Ph. Rinn, Boston, Mass.
96,140.—Spirit Level.—A. P. Odholm, Bridgeport, Conn. Antedated Oct. 16, 1869.
96,141.—Saccharine Evaporator.—R. Orford, Dowagiac, Mich. Antedated Oct. 12, 1869.
96,142.—Centrifugal Machine for Extracting Honey from the Comb.—H. O. Peabody, Boston, Mass.
96,143.—Fire-cracker Holder.—A. E. Peck, Brooklyn, N. Y.
96,144.—Flower Pot.—B. W. Putnam, Boston, Mass.
96,145.—Printers' Galley.—William Quail, New York city.
96,146.—Railway Car Coupling.—Matthew Quinn, Watага Ill.
96,147.—Gate Latch.—F. M. Ranons, Little Shasta Valley Cal.
96,148.—Compound for Making Water-proof Paper.—C. S. Rauh, Boston, Mass.
96,149.—Shutter Worker.—E. W. Scott, Wauregan, Conn Antedated Oct. 16, 1869.
96,150.—Key Face for Concertina.—L. A. Seward, New Orleans, La.
96,151.—Apparatus for Teaching Music, etc.—Louis A Seward, New Orleans, La.
96,152.—Shoe Last.—W. C. Shipherd, Willoughby, Ohio.
96,153.—Potato Digger.—J. J. Singley, Lafayette, Ind.
96,154.—Washing Machine.—R. H. Sipes, Bloody Run, Pa.
96,155.—Machine for Bleaching Cane Juice.—E. Skelly Plaquemine, La.
96,156.—Saw Set.—H. Sloat, Watertown, N. Y.
96,157.—Condenser for Alcohol Stills.—Ed. Smeeth Chicago, Ill.
96,158.—Faucet.—A. D. Smith, Grafton, Ohio.
96,159.—Gopher Trap.—D. N. Smith, San Bernardino, Cal.
96,160.—Sewing Machine.—E. H. Smith, Bergen, N. J. Antedated Oct. 13, 1869.
96,161.—Apparatus for Unloading Hay.—George Smith, Providence, R. I. assignor to himself and J. C. De Lang, Detroit Mich.
96,162.—Hand Stamp.—R. H. Smith, Springfield, Mass.
96,163.—Match Safe.—August Steinbok, New York city.
96,164.—Halter Clasp.—E. H. Stewart, Philadelphia, Pa.
96,165.—Blacking Brush.—Augusta N. Thompson, Holyoke, Mass.
96,166.—Thimble.—T. R. Timby, Saratoga, N. Y.
96,167.—Corn Cultivator.—D. W. Travis, Enfield, N. Y. Antedated Oct. 12, 1869.
96,168.—Water Wheel.—B. W. Tuttle, Galena, Ill.
96,169.—Sleigh Coupling.—Wm. E. Van Schaick, Delevan, Wis.
96,170.—Harvester.—J. P. Van Sickle, Geneva, N. Y.
96,171.—Blind Hinge.—Adolph Velguth, Milwaukee, Wis.
96,172.—Car Starter.—M. N. Ward, Bangor, Me.
96,173.—Horse Hay Fork.—C. E. Warner, Syracuse, N. Y Antedated Oct. 16, 1869.
96,174.—Chin Rest for Violin.—A. W. White, Boston, and J. J. Watson, Gloucester, Mass.
96,175.—Combined Latch and Lock.—T. Weaver (assignor to J. W. Moffitt), Harrisburgh, Pa.
96,176.—Weather Strip.—J. R. Webber, Chicago, Ill.
96,177.—Cotton Seed Hulling Machine.—F. A. Wells Memphis, Tenn.
96,178.—Means of Attaching Tops to Jugs, Cruets, etc —Homer Wright (assignor to himself, H. H. Collins, and B. F. Collins) Pittsburgh, Pa. Antedated Oct. 9, 1869.
96,179.—Apparatus for Preserving Fruit.—C. C. Williams, Brooklyn, N. Y.
96,180.—Attachment for Sewing Machines.—Enoch S. Yentzer, Ottawa, Ill.
96,181.—Clothes Dryer.—L. J. Adams (assignor to himself, Wm. Hyland, and A. B. Miller), Hoosick Falls, N. Y.
96,182.—Water Wheel.—J. S. Anderson, Oconomowoc, Wis.
96,183.—Clothes-line Supporter.—John Andrews, New Bedford, Mass.
96,184.—Machine for Cutting Cork.—Olney Arnold, Pawtucket, R. I.
96,185.—Machine for Driving Rake Teeth.—N. M. Barnes and A. T. Barnes (assignors to themselves and Tiffin Agricultural Works), Tiffin, Ohio.
96,186.—Centrifugal Sugar-draining Machine.—H. W. Bartol, Philadelphia, Pa.
96,187.—Method of Transporting Letters and Parcels.—A. E. Beach, Stratford, Conn.
96,188.—Show Counter.—Aaron Beardsley, Mount Zion, Iowa.
96,189.—Vise.—J. D. Beck, Liberty, Pa.
96,190.—Steam Generator.—C. G. Beitel, Easton Pa.
96,191.—Harrow.—R. N. Bennett, Union Mills, Ind.
96,192.—Horse Power.—W. N. Berkeley, Cedar Rapids, Iowa.
96,193.—Railway Cattle Gate.—Joel Bowman and J. B. Overmyer, Reading, Ohio.
96,194.—Lightning Rod Point.—J. F. Boynton, Syracuse, N. Y.
96,195.—Boot and Shoe.—Edmund Brown (assignor to himself and Artemus Prouty), Burlington, Vt.
96,196.—Cabinet Bedstead.—S. S. Burr, Dedham, Mass.
96,197.—Mode of Cleaning Gas Retorts.—C. A. Bush, New London, assignor, for one quarter of his right, to H. P. Ostrum, New Haven, Conn.
96,198.—Insulator for Telegraph Wires.—C. A Bush, New London, assignor for two thirds of his right, to H. P. Ostrum and T. C. Bush, New Haven, Conn.
96,199.—Galvanic Battery.—J. A. Calland, Nantes, France. Patented in France May 19, 1868.
96,200.—Lamp Burner.—G. H. Chinnock (assignor to New Lamp Chimney Company), New York city.
96,201.—Distilling and Treating Alcoholic Spirits.—George Clark, Buffalo, N. Y.
96,202.—Machine for Cleaning Cotton.—L. T. Clement, Smyrna, Tenn.
96,203.—Wrench.—Loring Coes, Worcester, Mass.
96,204.—Piano-forte Action.—B. E. Colley, Boston, Mass.
96,205.—Snow Plow.—M. A. Cravath and I. M. Cravath, Bloomington, Ill. Antedated Oct. 16, 1869.
96,206.—Rotary Puddling Furnace.—Samuel Danks, Cincinnati, Ohio.
96,207.—Lathe Chuck.—H. M. Darling, Bridgeport, Conn.
96,208.—Velocipede.—C. E. Dayton, Meriden, Conn.
96,209.—Extension Table.—Jacob Dourson (assignor to himself and F. A. Comstock), Columbus, Ohio.
96,210.—Shaft and Coupling Shield.—M. L. Drake, Rockford, Ill.
96,211.—Rocking Chair.—J. E. Emerson, Trenton, N. J.
96,212.—Tan Bark Leach.—L. C. England, Philadelphia, Pa.
96,213.—Wagon Seat.—W. R. English and Jason McClure English Centre, Pa.
96,214.—Tweer.—Samuel Epley, McGrawsville, Ind.
96,215.—Medical Compound for the Cure of Fever and Ague.—J. M. Ferguson, Summit, Miss.
96,216.—Spring Perch for Carriages.—E. R. Ferry (assignor to himself and P. Ferry, New Haven, Conn.
96,217.—Mode of Plating, Coating, and Ornamenting Articles of Iron and Steel.—Kasson Frazer, Syracuse, N. Y.
96,218.—Lock-nut.—P. L. Gibbs, Dunleith, Ill.
96,219.—Scrubbing Brush.—Samuel Gibson, Safe Harbor, Pa.
96,220.—Machine for Splitting Whalebone.—Nathan Goddard (assignor to himself and D. B. Saunders), Boston, Mass.
96,221.—Treadle Motion.—E. A. Goodes (assignor to F. M. Wood, H. F. Hays, Samuel Allen, J. S. Brown, T. E. Weidershiem, and T. S. Keyser), Philadelphia, Pa.
96,222.—Hat Tip.—S. H. Greenbaum, New York city.
96,223.—Air Blast Engine.—John Grim, St. Louis, Mo.
96,224.—Method of Adjusting Circular Saws.—J. P Grosvenor, Lowell, Mass.
96,225.—Horse Power Connection.—J. A. Hafner, Commerce, Mo.
96,226.—Extension Scaffold.—P. L. Hains, Freeburg, Pa.
96,227.—Drilling Machine.—John Hale, Scranton, Pa.
96,228.—Gas Flat Iron.—Albert Hallowell and A. T. Atherton, Lowell, Mass.
96,229.—Bag Fastener.—C. A. Haring, Peoria, Ill.

96,230.—Lock for Car Door.—A. V. Hartwell, Chicago, Ill.

96,231.—Manufacture of Putty.—G. W. Hatfield, Dayton, Ohio.

96,232.—Pruning Shears.—Virgil Hayes, Tekonsha, and Lewis Cuatt Eckford, Mich.

96,233.—Gutter for Door Sill.—J. A. Hemberger, Reading, Ohio.

96,234.—Plow Clod Fender.—James Higgins and J. W. Higgins, Orth, Ind.

96,235.—Wind and Tide Alarm.—G. M. Hoffman and Peter Hermas, Jr., Rahway, N. J.

96,236.—Traveling Trunk.—Thomas Hunt, New York city.

96,237.—Rubber Compound for Packing.—John Johnson, Brooklyn, E. D., N. Y.

96,238.—Hand Loom.—Abraham Jones, Clinton, Ill.

96,239.—Process of Reducing Wood and Woody Fibers for Paper Pulp.—V. E. Keegan, Boston Highlands, Mass. Antedated Oct 20, 1869.

96,240.—Railway Car Brake.—J. J. Kiser, Middletown, Ind.

96,241.—Method of Recovering Grease from Waste Soap Liquor.—William Koehler, Norwalk, Conn., assignor to J. M. Pendleton.

96,242.—Coloring Material for Dyeing and Printing.—Charles Lauth Paris, France.

96,243.—Fuel for Metallurgic Purposes.—C. E. Lester, New York city.

96,244.—Harrow.—J. S. Lewis, Elkader, Iowa.

96,245.—Compound for Treating the Human Hair.—W. R. Lount, Austin, Texas.

96,246.—Safe.—Egbert Macy, Brooklyn, N. Y.

96,247.—Washing Machine.—S. T. McDougall, Brooklyn, N. Y.

96,248.—Explosive Compound.—William Mills (assignor to himself, G. A. Lilliendahl, and J. J. Detwiller), New York city.

96,249.—Kerosene Stove.—R. B. Mitchell, Chicago, Ill.

96,250.—Die for Forming Thill Irons.—F. B. Morse, Plantsville, Conn.

96,251.—Series of Dies for Forming King-Bolts.—F. B. Morse Plantsville, Conn.

96,252.—Carriage Clip.—F. B. Morse (assignor to himself and H. D. Smith & Co.), Plantsville, Conn.

96,253.—Slat-iron for Carriages.—F. B. Morse (assignor to himself and H. D. Smith & Co.), Plantsville, Conn.

96,254.—Top-prop for Carriages.—F. B. Morse (assignor to himself and H. D. Smith & Co.), Plantsville, Conn.

96,255.—Bolt for Whiffletrees.—F. B. Morse (assignor to himself and H. D. Smith & Co.), Plantsville, Conn.

96,256.—Carriage Shackle.—F. B. Morse (assignor to himself and H. D. Smith & Co.), Plantsville, Conn.

96,257.—Cigar Machine.—Charles Muller, Albany, N. Y.

96,258.—Carpenters' Plane.—Georg Muller (assignor to himself and Francis Barnett), New York city.

96,259.—Lavatory Attachment for Railroad Cars.—John G. Murdock, Cincinnati, Ohio.

96,260.—Gas Heater.—Hiram B. Musgrave, Cincinnati, Ohio.

96,261.—Tool for Cutting Tubes.—Thomas Nelson, Philadelphia, Pa.

96,262.—Steam Enginery for Motive Power.—Alfred Colerick Pilliner and James Charles Hill, Oakfield Works, near Newport, England. Patented in England January 28, 1868.

96,263.—Screw Driver.—J. C. Pinner, Newbern, Tenn.

96,264.—Sugar and Sorghum Mill.—D. J. Powers and Henry B. Stevens, Madison, Wis. assignor to D. J. Powers, assignor to Buffalo Agricultural Machine Works.

96,265.—Pneumatic Diaphragm Water Elevator.—Silas G. Randall Providence, R. I.

96,266.—Lounge and Sofa Bed.—R. M. Reeby, Worcester, Mass.

96,267.—Furnace for Heating Tubes.—Patrick Reilly (assignor to Seyfert, McManus & Co.), Reading, Pa.

96,268.—Lightning Rod.—Wm. S. Reyburn and F J. Martin, Philadelphia, Pa.

96,269.—Medicine for Cancer.—Lawrence Roy (assignor to himself and Charles J. Nesbitt). Plattsburg, Mo.

96,270.—Lace-leader for Sails.—Daniel W. Sawyer, Booth Bay, Me.

96,271.—Combined Cultivator and Seeder.—Silas C. Schofield Chicago, Ill. Antedated October 16, 1869.

96,272.—Horse Rake.—Silas C. Schofield and A. Judson Wise, Chicago, assignors to Silas C. Schofield and Wm. D. Andrews, Rockford, Ill.

96,273.—Blind Hinge.—Alfred L. Seabury and Davidson Morris, Norfolk, Va.

96,274.—Oil Can Stopper.—Conard Seimel, Brooklyn, N. Y., assignor to Charles Pratt, New York city.

96,275.—Imitation Hair for Ladies' Head Dress.—Louise F. Shaw, New York city.

96,276.—Compound Rail.—E. R. Shepard, Scranton, Pa. Antedated October 16, 1869.

96,277.—Burglar Alarm.—Isaac Silvernail, Byron, Mich.

96,278.—Bridge.—Frederick H. Smith (assignor to Smith, Latrole & Co.), Baltimore, Md.

96,279.—Cultivator.—J. A. Smith, Lacon, Ill.

96,280.—Apparatus for Elevating and Distributing Water in Buildings.—James L. Smith, Passaic, N. J.

96,281.—Self-feeding Boiling and Evaporating Apparatus.—Michael M. Smith, St. Louis, Mo.

96,282.—Base for Bench Vises.—Anson P. Stephens (assignor to himself, Melvin Stephens, and Nathan Stephens), Brooklyn, N. Y.

96,283.—Cane Mill.—Henry B. Stephens, Buffalo, N. Y., and D. J. Powers, Madison, Wis., assignors to George L. Squier, Buffalo, N. Y.

96,284.—Steam Engine Piston Packing.—Edward Sullivan, Pittsburgh, Pa.

96,285.—Copying Press.—George Tangye, Birmingham, England.

97,286.—Hose and Pipe Coupling.—J. C. Thompson, Charlestown (assignor to himself and John H. Rogers), Boston, Mass.

96,287.—Wrench.—R. M. Thompson, Coshocton, Ohio.

96,288.—Fish Bait.—George T. Thorp, Philadelphia, Pa.

96,289.—Summer Furnace.—J. S. Van Buren, Green Island, N. Y.

96,290.—Cultivator.—Elisha Walker and Josiah J. Piatt, La Porte, Ind.

96,291.—Sash Holder.—Wm. M. Walton (assignor to himself and Joseph J. Walton), Newark, N. J.

96,292.—Photographers' Rest.—Edward L. Wilson, Philadelphia, Pa.

96,293.—Fender for Corn Plows.—Lewis C. Witt and W. F. Jones, Boston, Ind.

96,294.—Pruning Implement.—James R. Woodworth, Nunda, N. Y.

96,295.—Sash Holder.—J. C. Young, Toledo, Ohio.

96,296.—Straw Cutter.—Thomas N. Young, Richmond, Ind.

96,297.—Shoemakers' Last-holder.—Humphrey Calder and George Burgess, Richmond Va.

REISSUES.

75,836.—Horse Hay Rake.—Dated March 24, 1868 ; reissue 3,685. A. T. Barnes (assignor to "The Tiffin Agricultural Works"), Tiffin, Ohio.

86,644.—Settee Frame.—Dated February 9, 1869 ; reissue 3,686.—Thomas J. Close, Philadelphia, Pa.

16,266.—Machine for Folding Paper.—Dated December 23, 1856 ; reissue 3,687.—Charles A. Durgin, New York city assignee of Chauncey O. Crosby.

86,835.—Process of Utilizing the Waste Products of Combustion for the Manufacture of White Lead, and for other Purposes.—Dated February 9, 1869 ; antedated February 1, 1869 ; reissue 3,688. Henry Hannen, Thomas Woods, and Benjamin F. Pine, Philadelphia, Pa., assignees of Henry Hannen.

12,723.—Machine for Punching Metals.—Dated April 17, 1855 ; extended seven years ; reissue 3 617, dated August 24 1869 ; reissue 3,689.—Charles Parker, Meriden, Conn., assignee of George Fowler and the administrators of the estate of De Grasse Fowler, deceased, namely, Maltby and Sophronia Fowler.

39,235.—Rock Drill.—Dated July 14, 1863 ; reissue 3,304, dated February 16, 1869 ; reissue 3,690.—Asahel J. Severance, Middlebury Vt., assignee, by mesne assignments, of Rudolph Leschot.

58,455.—Spice Box.—Dated October 2, 1866 ; reissue 3,691.—Division A.—Joseph H. Steele, New Haven, Conn., assignee of Wallace A. Miles.

58,455.—Spice Box.—Dated October 2, 1866 ; reissue 3,692.—Division B.—Joseph H. Steele, New Haven, Conn., assignee of Wallace A. Miles.

80,375.—Tape-roll Clip Fastening.—Dated July 28, 1868 ; reissue 3,693.—Marcus Brown, Westhead, Manchester, England.

DESIGNS.

3,724 and 3 725.—Tack Head.—Orin L. Bassett (assignor to the Taunton Tack Company), Taunton, Mass. Two patents.

3,726.—Anchor.—Frederick Dellicker, Trenton, N. J., assignor to The East Trenton Porcelain Company.

3,727.—Covering Trunks.—Jonathan Smith Eaton, Boston, Mass.

3,728.—Fork or Spoon Handle.—George Sharpe, Philadelphia, Pa.

3,729.—Flower Shade and Pedestal.—Elizabeth Mary Stigale, Philadelphia, Pa.

3,730.—Printers' Type.—George Wm. Witham (assignor to MacKellar, Smiths & Jordan), Philadelphia, Pa.

EXTENSIONS.

Sewing Machine.—Isaac M. Singer, New York city.—Letters Patent No. 13,661, dated October 9 1855.

Grain Separator.—Peter Geiser, Waynesborough, Pa.—Letters Patent No. 13,644, dated October 9, 1855.

Chimney Stack.—B. F. Miller, New York city.—Letters Patent No. 13,620, Dated October 2, 1855.

Dust Deflector for Windows of Railroad Cars.—James M. Cook, Boston, Mass.—Letters Patent No. 13,676, dated October 16, 1855.

Wash Board.—Joseph Keech, Waterloo, N. Y.—Letters Patent No. 1 ,682, dated October 16, 1855.

Faucet.—Albert Fuller, New York city.—Letters Patent No. 13,677, dated October 16, 1855 ; reissue No. 752, dated July 5, 1859.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,746.—Purification of Spirits or Alcoholic Liquids and Apparatus therefor and the Separation of the Lighter from the Heavier Particles of Oils and other Liquids.—K. D. Turner, New York city. September 21, 1869.

2,758.—Thrashing Machine.—A. S. Whittemore, Willimantic, and J. E. Atwood, Mansfield, Conn. September 22, 1869.

2,824.—Manufacture of Horseshoe Nails and Apparatus therefor—J. D. Kingsland, Burlington, Vt. September 28, 1869.

2,826.—Harvester.—T. Fawcett, Pittsburgh, Pa. September 28, 1869.

2,250.—Mail Bag, etc.—John Dewe, Toronto, Canada. July 24, 1869.

2,777.—Car Brake.—A. I. Walker and T. E. Whitcomb, Lynn, Mass. Sept. 24, 1869.

2,807.—Sized Paper.—H. C. Hulbert and Z. C. Warren, Brooklyn, N. Y. September 27, 1869.

2,811.—Embroidering Looms.—K. Adams, South Orange, N. J. Sept. 27, 1869.

2,813.—Knitting Machine.—H. A. House, Bridgeport, Conn. September 27, 1869.

2,825.—Apparatus for Preventing Alteration of Values in Monetary Instruments.—M. E. Berolzheimer, New York city. September 28 1869.

2,827.—Aerial Carriage.—F. Marriott, San Francisco, Cal. September 29, 1869.

2,846.—Lock.—J. Dewe, Toronto. Canada. September 30, 1869.

2,851.—Screw.—W. A. Ingalls, Chicago, Ill. October 1, 1869.

2,855.—Sewing Machine.—B. P. Howe, New York city. October 1, 1869.

2,863.—Buckle for Cotton Bands.—J. S. Wallis, New Orleans, La. Oct. 2, 1869.

2,869.—Construction of Vaults, etc.—T. Hyatt, Atchison, Kansas. Oct. 2, 1869.

2,882.—Forging Bolts, etc.—W. Horsfall, New York city. October 5, 1869

City Subscribers.—The Scientific American will be delivered in every part of the city at $3·50 a year. Single copies for sale at the News Stands in this city, Brooklyn, Jersey City and Williamsburg, and by most of the News Dealers in the United States.

Subscribers—who wish to have their volumes bound, can send them to this office. The charge for binding is $1.50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

Receipts—When money is paid at the office for subscriptions, a receipt for it will be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgment of their funds.

Advertisements.

Advertisements will be admitted on this page at the rate of $1.00 per line. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

Ball, Black & Co.,

565 and 567 BROADWAY

MANUFACTURERS OF

ENGLISH STERLING

Silver Ware.

THE FACILITIES OF BALL, BLACK & CO. FOR MANUFACTURING, ENABLE THEM TO OFFER A LARGER VARIETY OF PATTERNS, AND AT LOWER PRICES THAN ANY OTHER HOUSE IN THE TRADE.

16 os tt

OAK LEATHER BELTING Manufactured by CHARLES A. SCHIEREN, 92 Gold st., N. Y.

HENRY W. BULKLEY, MECHANICAL ENGINEER, 70 Broadway, New York.

ALL KINDS Of Experimental Machinery, Models, Dyes, and Fine Tools, for any specialty. Patterns, etc., made to order at HENRY & CO.'S, 125 Eldridge st., New York.

CARVALHO'S

Steam Super Heater.

Saves Fuel and supplies Dry Steam. Address HENRY W. BULKLEY, Engineer, 70 Broadway, New York.

AGENTS WANTED—In every County in the United States, to sell by sample several of the most valuable household articles ever introduced. For particulars address J. S. LASH, 727 Market st., Philadelphia.

GEAR-CUTTING MACHINERY.—FOR SALE—A Second-hand Gear-cutting Machine in good order, and first-class. Apply to R. HOE & CO., 504 Grand st., New York.

W. W. VANDERBILT, Consulting Engineer & Contractor. Cor. Av. D & E.12th st., N.Y.

FOR SALE—One Corliss 16-Horse Power Engine, and 15-Horse Power Boiler. Will be sold cheap. Apply at 210 Eldridge st., New York.

CANVASSERS WANTED TO TAKE SUBscriptions and advertisements for THE WORKSHOP, a splendidly illustrated mechanical journal. Excellent pay for good men. Apply to E. STEIGER, 22 and 24 Frankfort st., New York.

STILWELL'S PATENT LIME EXTRACTING HEATER AND FILTER Combined, is warranted to prevent incrustation in Steam Boilers. Late improvements render it perfect. Tested over 5 years. 1200 in use. Send for Descriptive Pamphlet. STILWELL & BIERCE, Dayton, Ohio.

Gerner Boiler.

FOR SALE CHEAP.—A Vertical Patent Gerner Boiler, of 50-H. P., bought from Messrs. Kasson & Co. Constructed under the superintendence of Capt. Gerner, and not 3 months in use. Apply to Perth Amboy Fibre Co., Perth Amboy, N. J., or to McANDREW & WANN, 45 Broadway, New York.

2d-Hand Machinery

FOR SALE—viz:—50 Milling Machines, Index and Universal Milling Machines, Horizontal Milling and Drilling Machines, Drill Presses, Hand and Power Lathes, Edging Machines, Drops and Punch Presses, Screw Machines, etc., etc., 1000 feet of 1 3-16 Shafting, with Hangers and Pulleys, etc., etc., by O. F. WINCHESTER, New Haven, Conn.

REPEATING FIRE-ARMS

FOR SALE, viz:—

5,000	Winchester Repeating	Muskets.
5,000	" "	Carbines.
5,000	" "	Sporting Rifles.
2,000	Spencer "	Muskets.
30,000	" "	Carbines.
500	" "	Sporting Rifles.

2,000 Joslyn Single Breech-loading Carbines. Metallic Cartridges of all sizes, by WINCHESTER REPEATING ARMS CO., New Haven, Conn.

DEMUTH'S

PAT. GLASS LIGHTS. Patented Sept. 22d, 1868. Revolution in the system of Illuminating Offices, Banks, Churches, Restaurants, Dwellings, Steamboats, and Railroad Cars. Also for signal lights & lanterns. Increased light of exquisite softness, beautiful combination of colors, augmented translucency without transparency. If fractured, cheaply repaired. See articles in Scientific American, Oct. 16 and 23, 1869. For further particulars address VICTOR E. MAUGER, 110 Reade st., N.Y.

J. F. WERNER, Model Maker & Machinist, 62 Center st., New York. Working Models, Experimental Machinery, Gear Cutting, & Stud & Rivet Turning.

LECOUNT'S PATENT HOLLOW LATHE DOGS AND CLAMPS.—A set of 8 Dogs from ⅜ to 2-in., inclusive, $8. A set of 12 from ⅜ to 4-in., $17.50. Five sizes Machinists' Clamps, from 2 to 6-in., inclusive, $11. Send for Circular. C. W. LECOUNT. South Norwalk, Conn.

16 tf cow

UNION

Spoke Works.

SPOKES, HUBS, RIMS and Plow Handles. All goods warranted seasoned and of the best quality. JOHN G. DAVIS & SON, Southwest cor. of Leopard and Otter sts., Philadelphia.

Gerner Boiler.

SAVES 40 PER CENT IN FUEL.

SIMPLE, SAFE, & DURABLE.

SEE SCIENTIFIC AMERICAN OCT. 2.

Please Send for Circulars.

Postoffice Box } 5193. } KASSON & CO., 119 Broadway, N. Y.

SCHLENKER'S PATENT

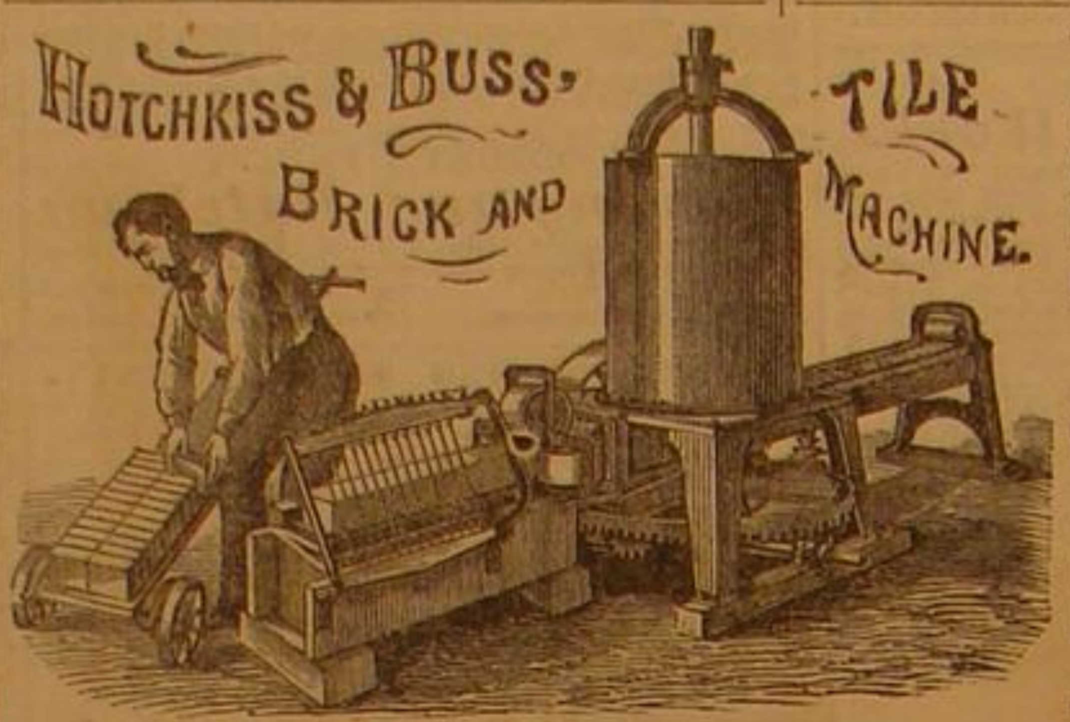
BOLT CUTTER

NEW INVENTION. ADDRESS, HOWARD IRON WORKS, BUFFALO, N.Y.

Reynolds'

Turbine Water Wheels.

No Complex, Duplex, or Triplex complications. All such are costly, perishable, easily clogged, inaccessible. Mill Gearing, Shafting and Pulleys. Send for Illustrated Pamphlet. GEORGE TALLCOT, 96 Liberty st., New York.



THIS MACHINE IS CONstructed and Operated on a different plan from all others, and, therefore, should not be confounded with them. We do not wish to bear the odium justly attached to other Brick Machines. We only ask a fair examination of ours on its own merits.

No Molds are Used with this Machine.

Any intelligent brick maker will, after an examination of ten minutes, be convinced that THIS IS THE ONLY WAY OF PRODUCING PERFECT BRICK, and he will then know WHY ALL OTHER MACHINES HAVE FAILED.

EVERY COMMUNITY should have one of our Machines, to make its own Brick and Tile, the price being low, and any intelligent person can work it.

We furnish with each Machine one Brick Die and three Tile Dies, making it complete for both Brick and Tile; the change from either can be made in a few minutes.

This is the only Machine that will make both Brick and Tile.

We have placed the Machine at the LOWEST CASH PRICE, hoping to meet the wants of those with limited means.

IT IS THE BEST, STRONGEST, AND CHEAPEST MACHINE EVER OFFERED TO THE PUBLIC.

Horse-Power will make from 10 to 15 thousand brick per day.
Steam " " " " 20 to 25 " " " "

Prices of Yard, Township, County, and State Rights according to location.

☞ DESCRIPTIVE CIRCULARS. FREE.

☞ The Machine can be seen in operation by calling on the

THE HOTCHKISS BRICK AND TILE MACHINE CO.,

38 John st., New York. Office 143 Main st., Cincinnati, Ohio.

WIRE ROPE.

Manufactured by JOHN A. ROEBLING'S SONS, Trenton N. J.

FOR Inclined Planes, Standing Ship Rigging Bridges, Ferries, Stays or Guys on Derricks & Cranes Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes.

ROOT'S

WROUGHT IRON SECTIONAL

Safety Boiler.

THE Position of this Boiler as absolutely safe from disastrous explosion, economical in fuel, and as a thoroughly reliable, durable, practical, and efficient Steam Generator, is fully established, as evinced by the sale of about One Hundred and Fifty Boilers, the sale, to many purchasers, of a second one after trial of the first, and by the experience of those who have used it. Its safety is self-evident, it not being built of any dangerous materials, as large wrought iron plates, containing unseen defects, nor cast iron, which cracks and gives way instantly, but being composed of the best Wrought Iron Boiler Tubes, tested to 500 lbs. pressure, water and steam inside of them, and having no large sheet iron shell to explode. Its economy of fuel, and many other advantages, resulting from its sectional form, as lightness, low freight, facility of enlargement, etc., are equally evident upon examination. Its use secures the economy of high pressure without danger. In view of the thousands of victims maimed or murdered by all the common forms of boilers, no humane man can afford to incur the risk of using a boiler in which such fearful results are POSSIBLE. They ARE POSSIBLE, and somewhat PROBABLE in all SHELL BOILERS, the danger being inherent in the large diameter, and ready to develop itself, at any moment, in an explosion. Root's Safety Boiler offers absolute immunity from such results. Send for Illustrated Pamphlet. Address ROOT STEAM ENGINE CO., Second ave., cor. 28th st., New York.

A Boiler of 120-H. P. at American Institute Fair until Oct. 30, 1869.

SENT FREE!

M. O'KEEFE, SON & CO.'S

SEED CATALOGUE

AND GUIDE TO THE

FLOWER AND VEGETABLE

GARDEN, FOR 1870.

Published in January. Every lover of flowers wishing this new and valuable work, free of charge, should address immediately M. O'KEEFE, SON & CO., Ellwanger & Barry's Block, Rochester, N. Y.

London ....48 Cannon street.

H. KOHNSTAMM, Manufacturer of

ULTRAMARINE,

And Importer of English, French, and German Colors, Paints, and Artists' Materials, Bronzes, and Metals. No. 3 Tryon Row, New York, opposite City Hall.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co., Leeds, Mass.

BOGARDUS' Eccentric Mills for Grinding Bones, Sugar, Clays, Salts, Guanos, Pot Shells, Ores, Feed, Drugs, Spices, Tobacco, Coffee, Paints, Printers' Inks, etc. JAS. BOGARDUS, cor. White & Elm sts., N.Y.

WE PUT GENUINE

HOWARD WATCHES

AND SELL NO OTHER—Into the hands of all respectable dealers throughout the country of our own manufacture. All Genuine Howard Watches are marked "E. Howard & Co., Boston," both on the plate and dial, and none without such marks are genuine, whoever may sell them. If you cannot find the real Howard Watches at the dealers, send to E. Howard & Co., 114 Tremont st., Boston, Mass., and you will be at once attended to. We have no place of business in New York, as is frequently supposed. E. HOWARD & CO., 114 Tremont st., Boston, Mass.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of Superior Quality, on hand and finishing. For sale Low. For Description and Price, address NEW HAVEN MANUFACTURING CO., New Haven, Conn. 5 tf os

FREE.—Our New Catalogue of Improved STENCIL DIES. More than $200 A MONTH is being made with them S. M. SPENCER & CO., Brattleboro Vt.

Pevey's Cupola,

WARRANTED to Melt, with one ton of Coal, 3000 lbs. of Iron more than any other Cupola now in use. ABIEL PEVEY, Patentee and Proprietor, Lowell, Mass. Van Tuyl & Co., No. 273 Cherry st., New York, Agents.

KIDDER'S PASTILES—A Sure Relief for Asthma. STOWELL & CO., Charlestown, Mass.

SEND FOR CIRCULARS

EARTH-CLOSET CO. HARTFORD, CONN.

EARTH-CLOSETS

SALESROOMS NEW-YORK, 597 BROADWAY. PHILADELPHIA, 513 MARKET ST. BOSTON, 19 DOANE ST.

THE GENUINE

Coes Screw Wrenches,

WITH A. G. COES' PATENT LOCK FERRULE, Manufactured by A. G. COES & CO., Successors to L. & A. G. Coes, Worcester, Mass. ESTABLISHED IN 1839.

GETTY'S PATENT PIPE CUTTER.

No. 1 cuts from 1 inch to ⅛ ....Price $8
No. 2 cuts from 2 inches to ⅛ ....Price $10
GETTY'S PATENT PROVING PUMP AND GAGE.
Pump and Gage................................Price $25
Gage alone................................Price $15

Address McNAB & HARLIN, MANUFACTURERS OF BRASS GOODS AND IRON FITTINGS, 86 John st., New York.

"MOUNT SAVAGE"

FIRE BRICK.

U. S. GOVERNMENT STANDARD, Manufactured exclusively by the CONSOLIDATION COAL CO., of Maryland, for Blasting, Puddling, Smelting, and Glass Furnaces, and all other purposes requiring the BEST QUALITY. Diagrams of Shapes, and Prices will be furnished by the undersigned. Also,

George's Creek Cumberland Coal

By the Cargo, from the Company's famous OCEAN MINES. C. H. DALTON, President, 4 Pemberton Square, Boston. JAS. S. MACKIE, Vice Pres't, 71 Broadway, New York. JAS. A. MILLHOLLAND, 2d Vice Pres't, Mount Savage, Md.

GREAT ECONOMY IN

WATER POWER.

LEFFEL'S DOUBLE TURBINE WATER WHEEL.—Best Wheel in Existence.—Manufactured by JAS. LEFFEL & CO., at Springfield, Ohio, and New Haven Conn. New Illustrated Pamphlet or 1869 sent free on application. 1osils eow tt

THE

Tanite Emery Wheel.

Does not Glaze, Gum, Heat, or Smell. Address THE TANITE CO., Stroudsburg, Monroe Co., Pa.

FRENCH BAND SAW MACHINES, SAWS, Taper Files, etc., Machines for Scroll, Re-sawing, and Log; Mongin & Co.'s Band Saw Blades, all sizes, on hand and made to order. All Styles of Band Saw Machines in operation at Mahogany Mill, 10th st., E. R. GEORGE GUEUTAL, Sole Agent for the U. S., 39 West 4th st., N. Y.

William A. Harris, Manufacturer of CORLISS

Steam Engines,

Cor. Park and Promenade sts., West of Passenger Station, Providence, R. I. An 80-H. P. Engine on Exhibition at the American Institute Fair, till Oct. 30.

Philadelphia Advertisements.

☞ T. V. Carpenter, Advertising Agent. Address hereafter, Box 773, New York city.

The Harrison Boiler.

THIS IS THE ONLY REALLY SAFE BOILER in the market, and can now be furnished at a *GREATLY REDUCED COST.* Boilers of any size ready for delivery. For circulars, plans, etc., apply to

HARRISON BOILER WORKS,

Philadelphia, Pa.; or, to JOHN A. COLEMAN, Agent, 36 Kilby st., Boston, Mass. 19 tf os

Drawing Instruments

OF Every Description, for Schools, Colleges, Civil Engineers, etc., of Brass, German Silver, and Swiss, Drawing Materials, Chesterman's Steel and Metallic Tapes, Transits, Levels, etc., etc. Priced Catalogues 10 cents each. WM. Y. McALLISTER, 728 Chestnut st., Philadelphia.

SAWS. EVERY DESCRIPTION Guaranteed under a forfeiture of $1000, to cut the most lumber with the least expense

Henry Disston & Son,

PHILADELPHIA. Special attention paid to our new style Circular, Belt, Cross-cut, Mill, and Hack Saws. Orders received from England, Ireland, and the Continent.

Drawing Materials.

WHATMAN'S PAPERS.—White and Yellow Roll Drawing Paper, 40 and 54 inches wide Tracing Muslin, Tracing Paper. Muslin-backed Drawing Paper, 40 and 54 inches wide. Winsor & Newton's Colors India Ink. Faber's Drawing Pencils, etc., etc. Priced Catalogues 10 cents each. JAS. W. QUEEN & CO., 924 Chestnut st. Philadelphia.

INCREASE TWIST DRILLS, FLUTED HAND REAMERS, exact to Whitworth's Gage, and Beach's Patent Self-centering Chuck, manufactured by Morse Twist Drill and Machine Co., New Bedford, Mass

VARIETY IRON WORKS, York, Pa., Grist & Saw Mill Machinery a Specialty. Burnham's Improved Turbine Wheel. Iron Railing, Architectural, Bridge, and Car Castings Sen for circular. E. G. SMYSER.

H. B. Smith's

PAT. WOOD-WORKING MACHINERY Molding, Mortising, Tenoning, Resawing, and Planing Machines, warranted to be the best in use, and give satisfaction, or be returned within thirty days. Address H. B. SMITH, Smithville, Bur. Co. N. J

THE NOVELTY IRON WORKS—Foot E. 12th st., and 77 and 83 Liberty st., New York Manufacture the most approved Stationary Steam Engine, with Variable Cut-off, now in use.

Factory, Trenton, N. J.. ...Office, No. 2 Jacob st., N. Y. ☞ Branch Office for Pacific Coast, No. 606 Front st San Francisco, Cal.

MECHANICS

WILL FIND THE

Scientific American

The Best Paper for Them Now Published.

It is the most Popular Journal in the world, devoted to Invention, Mechanics, Manufactures, Art, Science, and General Industry.

THE SCIENTIFIC AMERICAN

Has been Published for nearly a quarter of a Century, and has a larger circulation than all other paper of its class in this country and in Europe. Every number is illuminated with

Superb Illustrations

by our own artists, of all the best Inventions of the day and descriptions and illustrations of

LEADING MANUFACTURING ESTABLISHMENTS, MACHINES, TOOLS AND PROCESSES.

Inventors and Patentees

will find in each number an official List of Patents, together with descriptions of the more important Inventions, with decisions in Patent Cases and points of law affecting the rights and interests of Patentees.

TERMS OF SUBSCRIPTION:—$3.00 a year, $1.50 for six months. $1 for four months.

To clubs of ten and upward, the subscription is only $2.50 per annum each.

Specimen copies will be sent gratis.

MUNN & CO., Publishers. 37 Park Row, New York.

PATENTS—*INVENTORS*

Who desire to secure their rights by

LETTERS PATENT

Are referred to an advertisement on another page.

An Illustrated Pamphlet containing the Patent Laws, and full particulars concerning the obtaining of Patents, will be mailed free on application. Also, a Pamphlet relative to

Foreign Patents and their cost furnished free.

Address MUNN & CO. Patent Solicitors, 37 Park Row, New York.