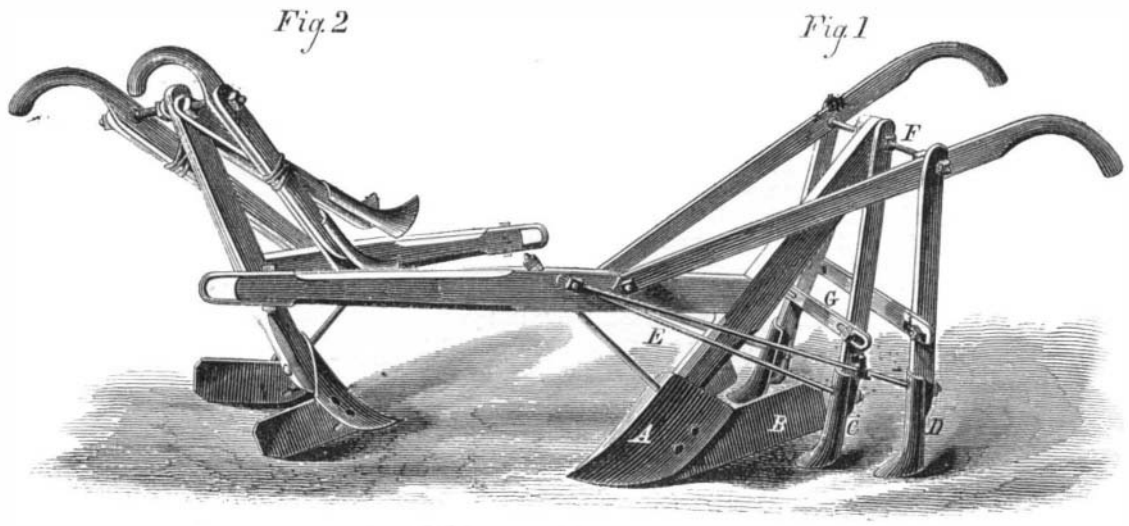
IMPROVED CULTIVATOR.

Our engraving illustrates a new form of cultivator, which is constructed so as to cultivate or loosen the earth between two rows of growing crops of corn, tobacco, sugar cane, cotton, or other products. The special improvement in the machine consists in the arrangement, in connection with a single shovel plow, of a series of hoes arranged in rear of the former and adjustably secured to the plow.

The standard, Fig. 1, projects above as well as below the beam, and carries on its lower end the shovel, A, upon the back of which, and at either side, are pivoted wings, B. These are secured by bolts and nuts, as shown, and may be adjusted so as to operate to the best advantage under varying conditions of soil. In rear of the shovel are four hoes, arranged in pairs, C C and D D, and connected by the tie rods, E, to the beam. The rods to which these hoes are attached extend upwards, and are hung upon a horizontal bar, F, which passes through the handles of the standard. This rod is preferably screw threaded, and provided with the requisite number of nuts to hold the different parts in their proper relative positions. The pair of hoes, C C, are held apart by a bar, G, and the other hoes, D D, are similarly separated by a like device. These bars are clamped to the hoes by bolts and nuts, and are at those points provided either with a series of notches or with longitudinal slots so that the blades may be spread apart as circumstances may require. The hoes are turned up on one side so that by changing them from one side of the plow to the other, they may be made to throw the earth up to or away from the row of growing plants.



KROGH'S FARM CULTIVATOR.

When it is desirable to use the single shovel plow without the hoes, the latter are disconnected from the tie rods, D, which, together with the hoes, D D, are tied up or hung upon the handles, as in Fig. 2, while the hoes, C C, are swung over and carried on top of the beam. Either pair of hoes may be thus disconnected while the other pair remain in operating position.

Patented December 10, 1872. For further particulars address the inventors, Messrs. C. and P. G. Krogh, Kroghville, Jefferson county, Wis.

AN IMPROVED HORSE COLLAR BRACE.

The weakest part of the ordinary horse collar is at the under side or throat, as it is at this point that the strain is principally applied. As a result, and especially in light collars, the article becomes worn out or breaks in this locality much sooner than in other portions. To obviate this difficulty, Dr. Edward Batwell, of Ypsilanti, Michigan, has recently patented, April 15, 1873, a metal plate which extends up some distance, and thus prevents the collar from closing on the horse's shoulder. The form of the device, which may be made of any suitable metal, together with its mode of application are readily understood from the annexed illustrations.

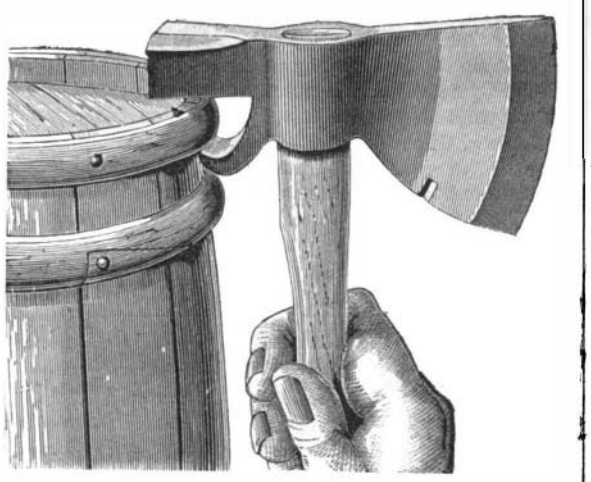
Dr. Batwell states that the invention has been fully tested, in preventing pressure and in retaining the collar in good shape, for the past two years, and that by its use he has been enabled to employ collars otherwise entirely worthless, from being broken or worn out at the throat. For further particulars regarding sale, rights, etc., address the inventor as above.

John Stray.

John Stray is employed as an engineer in a factory at Jersey City, N. J. He is a short, thick set man of fifty years or so, with a frosted beard, and does not look as if anything very serious had ever happened to him. But he is the hero of a patriotic exploit that will live in the memories of his fellow citizens. John Stray was a private in the First New York Volunteer Engineers, at Morris Island, Charleston, S. C., during the siege of 1863. An important gun—a 200 Parrott—had been spiked by the enemy, who were then enabled to occupy rifle pits very near the gun, and prevent its use by shooting down whoever ventured to attempt the removal of the spike. Stray was known to be a good mechanic, and at last yielded to the request of the commanding general to undertake the desperate job. He straddled the gun, and for fifteen minutes drilled away amid a shower of bullets, then hitched on the primer and lanyards and dropped to the ground. The enemy thought they had hit him and sent up an exulting howl, but the flash and roar of the great gun and the showering of grape through their ranks soon showed them their mistake. Those who could do so ran for their lives, but many were killed. It was found that twenty-two bullets had struck the gun while John Stray was working his drill.

NOVEL CLAW HATCHET.

The object of this handy little device is so clearly indicated in our illustration that little description is required. It consists, simply, in a claw, made upon the hammer end of an ordinary hatchet, which serves to grasp the top hoop of a barrel. By the aid of the handle as a lever and the hatchet head as a fulcrum, the hoop can be quickly removed uninjured, thus allowing the head of the barrel to be easily taken out. Patented Nov. 12, 1872, by Mr. D. E. Weaver, of Cheviot, Ohio.



NEW HEEL PLATE FOR BOOTS AND SHOES.

Mr. Gideon B. Massey, of New York city, is the inventor of this device, the object of which is to prevent the unequal wearing out of boot heels and their consequent unsightly twisting over to one side. A disk of rubber is arranged of a diameter to fit within a flange on a metal plate and to project below the same, forming a wearing surface of the heel. This is attached by a fastening screw and a conical metal washer formed to fit the under side of the screw head. The latter is forced into the disk, which it pushes into the dovetail flange by which it is securely held. As the wearer turns upon his heel, the plate will partially revolve and change its position, so that the heel will wear square and the foot be thrown flat upon the ground. The use of india rubber or other elastic material prevents slipping on the ice, and adds to the gracefulness of the step, while carpets are not injured by projecting nails or sharp angles. Patented September 17, 1872.

Progress of Astronomy in the United States.

Mr. Richard A. Proctor, the distinguished British astronomer, bears the following testimony to the progress and results of astronomical science in this country:

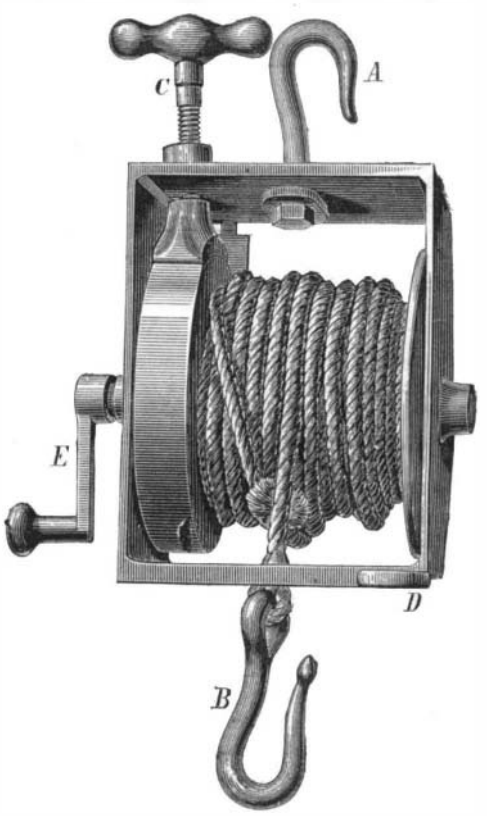
"The American arrangements for extending government aid to astronomy seem to me to afford a model which might be copied with advantage on this side of the Atlantic. We see their physical observatories attached to other government establishments, to universities, and so on. Their professors of astronomy are not only real working astronomers, but skillful mathematicians (for the most part university men) and men of admirable zeal in the cause of science. I have been struck with the abundance, I had almost said the superabundance, of labor which has been bestowed on work the record of which has recently reached me from America. Thus, in the mathematical investigations of the coming transits of Venus, a problem of difficulty has but to be suggested, to be at once attacked and solved to the utmost limits of exactness. The pictures of solar phenomena, spots, faculæ, and prominences, are the most striking and beautiful I have yet seen. Their lunar pictures are remarkable for artistic beauty, as well as scientific value, and, altogether, their work, as I have said, is a model for our astronomers."

A NEW FIRE ESCAPE.

Our engraving represents a new portable fire escape, by means of which, it is claimed, a person can lower himself with ease and safety from the windows of a burning building, or, if necessary, may be let down by some one within the edifice.

The apparatus is attached by the hook, A, to a suitable clamp, not shown, which is readily fastened to the window sill or casing. To the lower hook, B, is hung a sling seat in which the descending person is supported. Thus arranged, the device is operated by the individual within the building, who, by means of the screw, C, which presses a chock against the revolving disk attached to the barrel on which the rope is wound, governs the descent, causing the same to be fast or slow at will.

In case of a person lowering himself, the machine is inverted and suspended by the hook, B, to the clamp, the sling being hung to the other hook. The operator then grasps the handle, D, with the left hand, and the screw, C, with the right hand, and thus regulates his downward movement. By tightening the screw, a slow descent may be effected by means of the crank, E. The invention is stated to be cheap, efficient, and not liable to get out of order. For further particulars regarding agencies, sale, etc., address the patentees, Messrs. Merritt & Sweetser, P. O. Box 2,643, North Bridgwater, Mass.



PHENANTRENE.—This name has been given to a new hydrocarbon obtained from crude anthracene. It contains carbon and hydrogen in the same proportions as the material from which it is derived.

An Ocean Race of Seventeen Thousand Miles.

An ocean race between an American and an English clipper ship has just been heard from. The American clipper-built ship Young America and the English La Escocesa sailed from San Francisco for Liverpool on the 27th February last, laden with wheat. Distance 17,350 miles. The Young America made the passage in 106 days, and her British antagonist in 117 days. About $20,000 was wagered in San Francisco on the result. The running time for making the same distance by our fastest Atlantic steamers, without stoppage for coaling, would be 58 days.

Collecting Wild Animals for the English Market.

In London there are one or two concerns which make it a business to collect wild animals, in India and in other countries, which are brought to the English metropolis and kept in stock until sold to zoölogical gardens and menagerie proprietors in other parts of the world. From this source, Barnum and others recruit their exhibition stock. In a recent number of *Land and Water*, it is stated on the authority of a Singapore paper that: "For some time past an emissary from Mr. Jamrach, the celebrated proprietor of menageries, has been staying in Singapore. The business which brought him here is to purchase specimens of the *feræ naturæ* indigenous to the Malay Peninsula and surrounding countries. The result of his exertions may be seen at the yard attached to the *Hotel de la Paix*, where are assembled the animals and birds obtained up to the present time. These of themselves form a curious and very interesting collection, that has attracted a number of visitors. The gentleman in charge most courteously exhibits the creatures to those desirous of seeing them, and the amusement to be derived from a visit more than repays the trouble involved, as will be evident from the following list: Four large male and female tapirs from Malacca, two cassowaries from Macassar, three Victoria crowned pigeons from the Celebes, two orang outangs, two black parrots, a black panther, a young female elephant, a bear from Borneo, and a pair of Borneo fire back pheasants. Of the above, the panther, which is a very snarling, ferocious looking customer, and the elephant were purchased from H. H. the Maharajah of Johore. Young Bruin is comical looking, with already a tendency to practical joking. A short while ago, he slipped his collar, and, getting into a house where were some young children, evinced his playful tendencies by a desire to rub noses with them. The timid owner of the house ran for the two revolvers he keeps beneath his pillow, but before he had time to uncase them, Master Bear's keeper came up, and rescued his *protégé* from impending destruction. The little creature looks as harmless and innocent as a puppy. We hear that these animals, with a rhinoceros or two expected next week, will be shipped for England by the next steamer of the Ocean Steamship Company; and in addition to them, Mr. Jamrach's agent has entered into a contract with two local Nimrods (Messrs. Fernandez Brothers) to hunt and buy up, within the next six months, eight live specimens of each of the following animals, namely, rhinoceri, tapirs, tigers, and black panthers, and sixteen male and female Argus pheasants. The hunters for the rhinoceri have a number of pits dug for entrapping these animals; and if they fall in, that ardent naturalist, Mr. Frank Buckland, will probably ere long have the pleasure of chronicling the birth of another cockney rhinoceros.'"

Concrete Chimneys.

The first chimney ever built of concrete, and without scaffolding, has, according to the *Engineer*, been constructed at the Chain Cable and Anchor Testing Works, at Sunderland, England. The structure at the base is 7 feet 6 inches by 7 feet, and is carried up square to a hight of 22 feet 3 inches, up to which point no especial novelty in its construction is presented. The corners, however, are gradually cut away; and at the hight of 24 feet above the surface, the octagonal form of the tapering portion of the chimney begins. This part of the work was molded as follows: Panels three feet in hight and made of ¾ inch boards were hinged together at their outer edges in such a manner that, if the lines of the inner edges were produced, they, the lines, would come into one point at half the hight of this section of the chimney. These panels on the interior and exterior of the chimney formed shells, between which the concrete was packed. To fill up the intermediate space between the inner edges of the panels, wedges were introduced, which, as the concrete set, were gradually reduced in order to allow for the decrease in size. Stud bolts connected the wedges with uprights of the frame, and this reduction, made as above, was just sufficient to take off the holes through which the bolts passed.

When the shaft had been erected half its hight, the panels were reduced sufficiently to admit a second set of wedges of exactly the same dimensions as those first introduced, bringing the inner edges of the panels (produced as before) to one point at the center of the top of the chimney; that is to say, in a manner similar to that in which, at their original dimensions, they had been brought together at half the hight. The uprights, to which the panels were secured, were 6 feet in length; and as the latter were but 3 feet, the uprights had a continual hold of 3 feet on the completed work, thus insuring regularity of line.

The cement used was one part Portland cement to eight of gravel, and at one time these parts were increased to one to five. The chimney, when completed, was stuccoed with cement, and drawn in courses to imitate stone.

ROBERT WILHELM BUNSEN.

The labors of the savant whose career we are about to portray belong essentially to researches which are not exclusively chemical, or exclusively physical, but appertain to both, and have added largely to that branch of science known as physical chemistry. As Berzelius will always live in our memory as the founder of the electro-chemical system, Gerhardt as the discoverer of the theory of types, and Liebig as the originator of agricultural chemistry, so will Bunsen always be remembered as the one who has most contributed to the application of chemistry to physical inquiries. Like all men of great genius, the subject of our biographical notice was less occupied with the reinvestigation of phenomena and laws already known than with the exploration of new regions and the discovery of facts which, in themselves, indicated new scientific truths.

The discoveries which have done most to extend Bunsen's renown are those pertaining to spectrum analysis; but his name will always be recalled when we speak os the theories of periodical fountain springs, or of the phenomena of the absorption and combustion of gases, or of the chemical action of the different rays of the sun.

Robert Wilhelm Bunsen was born on March 31, 1811, in Göttingen, a town in Hanover, known by its famous university, in which his father occupied one of the chairs of lan-

ROBERT WILHELM BUNSEN.

guages. At the age of seventeen he entered the university of his native town, in order to pursue physical and chemical studies; and after having passed through all the grades, he took the degree of doctor in 1833. In 1836 he removed to Cassel, in order to fill the chair of chemistry at the polytechnic school of that city, which had been vacated by Wöhler. Two years later, Bunsen was elected professor of chemistry in Marburg; and, in 1851, he removed in the same capacity to Breslau. In 1852 he was nominated professor of chemistry in the university of Heidelberg, which position he still holds.

His earlier labors were devoted to researches on double cyanides, on the various kakodyl compounds, and, in connection with Schischkow, on the gases of detonating compounds. He also discovered in the freshly precipitated hydrate of oxide of iron an excellent antidote for arsenic. In the domain of physics, we see him engaged in determining the specific weight of various bodies, in studying the law of the absorption of gases, and the influence of pressure upon the solidification of liquids. We owe to him important contributions relative to the combustion and diffusion of gases, etc. Bunsen is the discoverer of the galvanic battery which bears his name, and which is now most commonly in use, also of that wonderful instrument known as Bunsen's burner. In the summer of 1846 he undertook, with Descloizeaux, a voyage to Iceland, in order to investigate the periodicity of the fountain springs, especially that of the great geyser. The result was that beautiful theory of the geyser eruptions which was afterward illustrated experimentally by Müller in Freiberg. In 1859, Bunsen first prepared the metal magnesium on a large scale, and showed that it yields the most brilliant artificial light known, and that its photo-chemical action was one thirty-sixth of that of solar light. In conjunction with Roscoe, he determined the chemical action of the various rays of the sun.

The researches of Bunsen on spectrum analysis date from the year 1860. Since that time he has contributed a large number of exhaustive memoirs on this subject to Poggendorff's *Annalen* and to the *Annalen der Chemie und Pharmacie*, besides many special volumes.

Herr Bunsen, although now in his sixty-second year, enjoys excellent health, and is still unceasing in the pursuit of his investigations. His style of lecturing is very happy, and has always attracted a large audience. His modesty is unsurpassed; and even when speaking in his lectures on spectrum analysis, he never mentions having contributed anything to this science, but speaks only of the discoveries of his friend Kirchhoff. Among his pupils are Roscoe and Tyndall, who, as is well known, are among the most ardent laborers in the field of science.—*Science Record* for 1873.

A New Scientific College.

A new institution, somewhat on the plan of the Stevens Institute, Hoboken, N. J., is soon to be built at Birmingham, Eng., founded on the generous endowments of Sir Josiah Mason. The institution is to be called "Josiah Mason's College," or "Josiah Mason's College for the Study of Practical Science." Regular systematic instruction is to be given in mathematics, abstract and applied physics, both mathematical and experimental; chemistry, theoretical, practical and applied; the natural sciences, especially geology and mineralogy, with their application to mines and metallurgy; botany, and zoölogy, with special application to manufactures; and physiology, with special reference to the laws of health. The English, French and German languages will also be taught. The trustees have power to include mechanics and architecture and all other subjects necessary to carry out the objects of the founder. Mere literary education and instruction are excluded, as well as all teaching of theology and subjects purely theological. No principal, professor, teacher, or other officer of the college is ever to be called upon to make any "declaration as to or submit to any test whatever of his religious or theological opinions," nor are these in any wise to be considered either as qualifications or disqualification for holding any office, fitness to give the instruction required being the sole and only test. Provision is also made for giving lectures and opening classes for popular or unsystematic instruction, at which the attendance shall be open to all persons, "without distinction of age, class, creed, race, or sex." The founder's object being to promote the prosperity of the manufactures and industry of the country, the college will be open to qualified persons of all classes who have to rely on science, art, or manufactures for a livelihood, "especially the more intelligent youth of the middle class." Provision is also made, when the funds permit it, to provide instruction for females as well as males.

Comparative Heat and Brilliancy of the Sun and the Moon.

The Earl of Rosse, in a recent lecture before the Royal Institution, gave some interesting information concerning the various experiments heretofore made to detect the heat of the moon, and then described his own efforts in this line, which are the latest that have been made known. By means of a specula-mirror, a thermo-pile, and a pair of reflecting galvanometers, made on Sir William Thomson's plan, such as are used for sending messages over the Atlantic cable, the Earl was enabled to demonstrate the presence of heat from the moon, but the temperature of the lunar surface still remains far from being determined. My calculations, he says, lead me to estimate the heat from the moon as the eighty thousandth part of that from the sun. Bouger's experiments give the brilliancy of the full moon as the 300,000th of that of the sun, Wollaston gives it as the 80,172d, Zöllner as from 618,000th to 619,000th, and Bond as the 470,980th. The maximum of the lunar heat appear to be a little before full moon; the unequal distribution of its mountains and plains, perhaps, goes to explain this phenomenon.

Aniline Black.

BY CH. LAUTH.

Aniline black, being necessarily absolutely insoluble, cannot be fixed like another coloring matter, but must be formed in the place which it is to occupy upon the fiber. To mix, with a salt of aniline, oxidizing agents capable of producing the black, and to wash the yarn in such a bath until the color is developed, is a method which does not yield good results, because the black, instead of fixing itself upon the fiber, remains suspended in the liquid.

The improvement consists in fixing on the fiber an insoluble oxidizing agent, and passing it subsequently into the solution of a salt of aniline.

The agents in question are the higher oxides of manganese, binoxide and chloride of lead, etc. Binoxide of manganese has especially attracted my attention. To get an intense black, it is necessary to mordant in chloride of manganese at 40° B., working the cotton in this bath for an hour, wring out well and, without rinsing, pass it into boiling soda lye, at 12° B., holding lime in suspension. Or the cotton may be first mordanted in a boiling manganese bath, and then passed through cold alkali. After the fixation of the oxide, the cotton is washed in much water, and passed into a lukewarm chloride of lime bath, regulating the proportion of this agent so that it may never be found in great excess, which might injure the fiber. It is best to add the chloride of lime, little by little, till the manganese bronze is sufficiently intense.

I have endeavored to modify the conditions of fixing the manganese. I mention a single remarkable result. A tissue, mordanted with manganese and placed in a chamber filled with ammoniacal gas, is found of a deep brown when taken out, the protoxide of manganese becoming readily peroxidized under these circumstances.