A Curious Experiment.

We have now at Central University a singularly beautiful experiment in operation, showing the motion of the earth. It has been contrived and successfully completed by Professor T. W. Tobin, who has charge of the department of chemistry and physics in the University. The apparatus may be briefly described as follows: Upon an iron stand, about six feet in height, an exceedingly delicate pendulum is suspended; attached to the upper portion is some mechanism and a fine index needle. The apparatus was brought to a state of perfect repose, and then the pendulum, by means of a fine silk, vibrated north and south. In the course of six minutes the index showed that the normal relation between the pendulum and the earth had altered, and a longer interval indicated an increased variation. In 1851 Foucault, a French scientist, reasoned that while all bodies are governed by gravity, independent motion is not: that in virtue of inertia, a body moved will continue in motion forever; so a pendulum once started in vibration will continue to oscillate in the same direction until gravity and the friction of the air bring it to a state of rest.

The earth's revolution being a circle, there must be a variable relation between the two motions, namely, the circle and the straight line of the pendulum's direction. The apparatus now described shows this relation. An experiment was made by Foucault in Paris with a pendulum over 200 feet long; a similar experiment at Bunker Hill and then at Yale College prove the principle: but the apparatus employed was costly and cumbersome. The instrument at Central University is simple and delicate, and is calculated to create interest in scientific circles.—*Kentucky Register, Richmond, Ky.*

Hot Water for Tire Shrinking of Wheels.

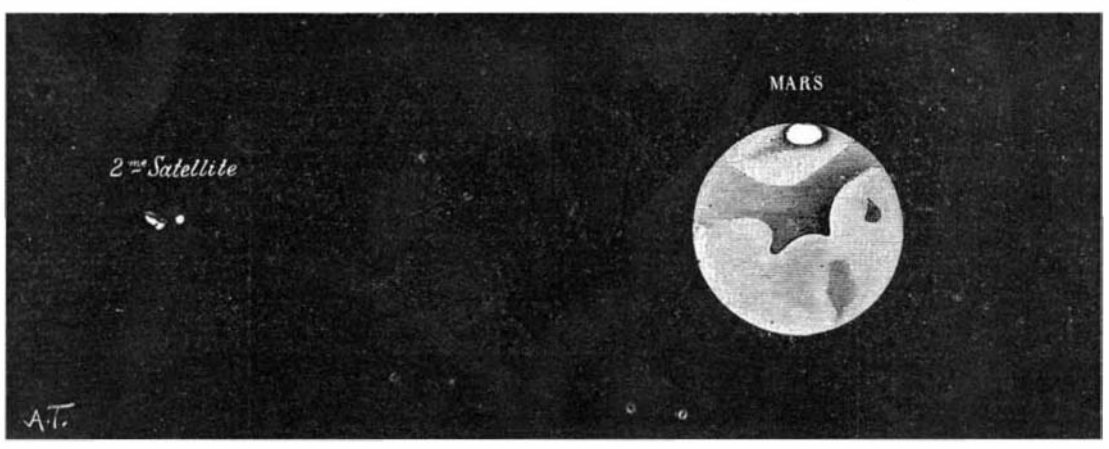
The expansion of tires by hot water, though not claimed to be new, is believed by the author to be much superior to the ordinary method of using fire. As applied on the Moscow-Nijni Railway, an iron tank, one fourth filled with water, is fixed near a stationary boiler, a steam pipe from which is led through it, capable of heating the water to 212° Fah. Into this the tire is plunged by means of a portable crane, and after an immersion from ten to fifteen minutes, is taken out and immediately placed on the wheel. Three men only are employed, who will fix from twelve to fourteen tires in a day of eleven hours. The allowance for shrinking (the difference between the diameter of the skeleton and that of the tire) is 0·75 millimeter to a meter. This is ascertained by gauges of great accuracy, and, if deviated from, the tire will be either loose after cooling or too small to get on the wheel. When fire is used, the tire can never be heated equally or cooled equally in all parts, and in consequence is sure to be more or less oval in form, which is not the case in hot water. The above railway made a comparison between the two, the results of which are given. It appears that, during a six years' trial of fire-shrunken tires, 37 per cent ran loose and 5 per cent were broken; while during a three years' trial of water-shrunken tires less than 1 per cent ran loose, and only a single tire was broken. The liability to breakage in the former (produced by the irregularity in form) is much insisted on by the author as being, of course, more dangerous and costly than the loosening of the tire.

THE SATELLITES OF MARS.

We take from *La Nature* the annexed engraving of the planet Mars and its second satellite, as the same appeared through the great telescope at the observatory of Paris, at 10:15 P.M., on August 27 last. The first satellite moves around the planet in 15 hours, at an average distance of 9,000 miles; the second completes its course in thirty hours, and is distant about 15,000 miles. Both bodies are very small, and their observation requires powerful instruments. Judging, however, by its brilliancy, the diameter of the second satellite is estimated at only some 30 miles.

Future observation of their motion will lead to the exact determination of the elements of their orbit, and will show whether the revolution is relatively direct, as in the case of the moons of Jupiter and Saturn, or relatively inverse, as in the case of the satellites of Uranus and Neptune. It will also lead to more exact data relative to the mass of Mars.

In a former article on the discovery of these bodies, we noted the fact that while most astronomers did not regard it even as probable that Mars might have satellites, others had admitted the possibility, and had predicated their admission on certain physical characteristics of the planet itself. *Les Mondes* has recently published an extract from a work by Béron, a French astronomer, entitled "Celestial Physics," and printed in 1867, wherein the author says: "Mars is distinguished from the seven other planets by its satellite, which no one has ever seen, although it exists, because Mars has thrown out jets of burning matter, to which are due, first, its rotary movement, and, second, the existence of two recesses which appear to be movable spots. It appears, incontestably, that these spots are due to light reflected in different degrees by the slopes of these recesses, which are constantly being differently exposed to the sun and to the earth."



MARS AND ITS SATELLITES.

ORCHIDS.

The orchids constitute a beautiful family plant, so called from *orchis*, their ancient name. Popularly any one of the family, of whatever genus, is called an orchis. Their number is legion, and includes a veritable host of smaller flowering kinds, whose blossoms yield in nothing but size to their larger compeers; and their beauty and conformation, when looked for, is often more extraordinary and interesting.

The large illustration on the preceding page gives a comparative idea of some of the orchids, collected from different countries. For instance, the *Restripui*, Fig. 10; the *Burlingtonia*, Fig. 6; the brown and golden twisted *oncidians lentiginosum*, Fig. 5; and the brilliant *odontogossons*, Fig. 11; are inhabitants of North America. The strangely tinted, blue, white, and brown *banda tricolor*, Fig. 7; the white *pholœnopsis*, Fig. 8; the orange and brown *dendrobium chrysanthum*, Fig. 12; belong to Asia. South America gives the beautiful *cattleya maxima*, Fig. 9, with its varying colored lips; the curiously formed purple *coryanthes*, Fig 13; and the large *stanhopea ornatissima*, Fig. 14; with its

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

sweet scented yellow and brown dotted blossoms. The Chinese *cymbidium aloefolium*, Fig. 15, with its yellowish brown blossoms forms, the link between the orchids of the tropics and the temperate zone.

In the lower group is given the modest flowers which are the parents of their larger and more grotesquely developed descendants. In this group are represented the lady's slipper (*cypripedium calceolus*) Fig. 3, and the shoe-shaped *orphrys apifera*, with a bee-like lip; the sweet scented meadow hyacinth, *platonthera bifolia*, Fig. 1; and the common *orchis morio*, Fig. 4, from which the class receives its name.

The distinguishing feature of the orchids is the column and it is embodied in them all, be they large or small. Figs. 1 and 2 give an enlarged representation of this column, Fig. 1 being a front view, and Fig. 2 a side view, of the same of the indigenous orchid (*latifolia*) while Figs. 3 and 4 give the same views of the exotic flower.

Orchids are among the most valued of cultivated flowers, some for their beauty, others for their fragrance, while others are admired for their grotesque forms. The forms are sometimes wonderfully simulative. The flowers of one species resembling the mouth of a cuttle fish, others resemble a large spider, while in other species the flowers bear a great resemblance to various insects, for instance the butterfly orchid (*oncidium papillo*) which in form, size, and color resembles somewhat a gaudy butterfly.

The cultivation of orchids is a passion with many horticulturists, who spare neither time nor expense in their favorite pursuit.

A New Military Arm.—The Torpedo Hunters.

A correspondent of a German journal, writing from Erzeroum, gives the following account of the new corps of divers which has been organized by the Turkish government for the purpose of removing the torpedoes laid down by the Russians in the Danube and on the shores of the Black Sea:

The divers are Mohammedans from Lazistan, and a certain number of them are attached to each of the Turkish squadrons cruising in the Black Sea. When the ships arrive near a spot where the existence of torpedoes is suspected two of the divers row to the place in a very light boat, drawing so little water that there is scarcely any danger of its striking against the torpedoes. On arriving at their destination one of the rowers dives into the sea; if he finds a wire or rope by which the torpedo is attached he cuts it with a sharp instrument and returns quickly into the boat. The liberated torpedo floats to the surface of the water, the men pass a short lasso around it, take it in tow, and then row back to the ship as quickly as possible. For each torpedo thus captured the divers are paid $45, and also a sum of money equal to one half of its value. Although the men have been often employed on this dangerous service, not a single accident has occurred to any of them.

Effects of Timber Waste.

Colonel Playfair, British Consul General for Algiers, has sent to his government a report which offers some striking instances of the injury done to a country by the reckless destruction of forests. He states that the principal cause of the decadence of the entire region of Tunis and Algiers and the exhaustion of the soil is directly owing to tree felling. Meteorological observations have been carried on in Algiers since 1838. During the first twelve years of the intervening period the rainfall averaged 32 inches annually, during the second twelve years it had decreased to 30·8 inches, and during the last fourteen years it has been but 25·5 inches. The decrease became apparent after the first serious clearings of wood in 1845, and during 1876 so exhausted had become the soil that a famine seemed imminent in Western Algeria.

Magnetization of Sheffield Steel Bars.

M. Gaugain, who for some time has been conducting investigations with the influence of heat on magnetization, has recently announced some very curious results obtained with Sheffield steel bars. He found that, when certain bars were magnetized at a high temperature and cooled, their magnetism entirely disappeared, and then changed sign; so that if a bar had been magnetized when hot in a certain direction, it was found to be magnetized in the opposite direction after returning to the ordinary temperature. When heated afresh, the inverse magnetism, which is always very feeble, vanished, and the primitive magnetism reappeared. The same change of sign is reproduced when the bar is again cooled.

Experiments with the Dynagraph.

The Springfield (Mass.) *Republican* of recent date says: A very interesting series of experiments have been in progress on the Boston and Albany road the past few days by means of the dynagraph car of the Eastern Railway Association, in charge of P. H. Dudley, which has been run between Springfield and Worcester on both freight and passenger trains, to test the relative amount of power required at different points along the road, especial reference being had to the Springfield and Charlton grades. The experiment on the Modoc train, leaving Springfield at 6.30 A.M., which, on the day in question, consisted of two sleepers, four passenger and baggage cars, and the dynagraph car, showed power required as follows: For the first 2,920 feet out of the depot the tension on the draw-bar was 6,526 lbs.: for the next mile 6,469 lbs., the rate of speed being 32 miles per hour; for the next, 6,200 lbs., the speed being 36 miles and for the last 1,100 feet, to the top of the grade, 6,250 lbs. The last mile required the engine to produce 19,625,800 foot pounds of power per minute.

In going up the grade from East Brookfield to Charlton, beginning at the station, the tension on the draw-bar for the first 3,880 feet was 5,722 lbs.; for the first full mile, the velocity being 37·5 miles, 4,280 lbs.; for the second mile, with 37 miles velocity, 5,232 lbs.; third, with 36 miles velocity, 5,450 lbs.; fourth, which contains a sharp curve, with 37 miles velocity, 5,612 lbs.; fifth, with 41 miles velocity, 5,230 lbs.; and sixth, which ran a little past the summit at Charlton, 4,356 lbs.

The engine had an 18 inch by 24 inch cylinder, and the track was in excellent condition. The maximum of the

Springfield grade is 60 feet to the mile, and the Charlton grade 51·47 feet. At the sharpest curve the grade is about 49 feet. Similar experiments were made on a freight train of 27 cars, drawn by the Adirondack, famous for her trials with the Mogul engine last summer, and showed that the tension on the draw-bar going up Springfield grade at a speed of 5·9 miles per hour, was about 16,000 lbs.; and the average strain going up Charlton grade at an average speed of about nine miles per hour, was 14,500 lbs.; the power required in the first instance being 84,840,000 foot pounds. Near the top of the grade the power of the engine was tested by applying the brakes, and it was found that, running at four miles per hour, the engine could exert a tension of 17,000 lbs. Beyond this point the drivers would slip and little progress was made.

Really, the most important experiments in which the association is just now engaged are in testing the quality of iron and steel used for bridges, rails, axles, and car wheels. Recent trials of the tenacity of iron used for various bridges and car axles indicate that much of the iron now in use will only stand about two thirds the strain which it is guaranteed to resist. For instance, some iron now being put into a new bridge at the East, which is supposed to stand a pressure of 60,000 lbs. to the square inch, breaks readily at 40,000 lbs., and a car axle, supposed to be equal to 110,000 lbs., snapped at 70,000 lbs.

When it is borne in mind that the calculations of bridge building engineers are based on the guaranteed strength of the iron, the reason for the fall of iron bridges becomes apparent at once, and instead of wondering at an Ashtabula horror, the wonder rather is that it is not repeated. The Eastern Railroad Association, which is making these experiments, represents all the railroads on the Atlantic coast north of Richmond, Va., and east of Pittsburgh and the Alleghenies, and was organized about ten years ago, having for its object the investigation of the validity of patents and claims to royalties for the use of the same. S. M. Whipple, of South Adams, is the general agent. The scope of the association has naturally broadened, and it has been for the past few years largely engaged in testing the merits of various railway equipments with the idea of getting the best in every department. The dynagraph car is a curiosity in itself, containing, besides the dynagraph, which is an ingenious instrument, registering exactly the amount of power required to pull a train, a chronograph, which records the speed of the train every 7½ seconds; an anemometer, which registers the velocity of the wind, whether natural or caused by the motion of the cars; and a complete set of instruments for testing the hardness, tenacity, ductility, density, and the amount of carbon in rails, axles, etc.

The Use of Glue and its Applications in Carriage Body Making.

The following suggestions are from the pen of Mr. John D. Gribbon, the veteran carriage body maker of this city: Glue is obtained by boiling the skins and hoofs, etc., of animals, also the skins and some other parts of fishes: but that from animals is considered the best, and that obtained from the skins of old animals is considered better for the purpose than that from young ones. The strongest glue of all—Russian isinglass—is made from the air bladders of a species of large fish found in the Russian seas, but its great price excludes it from use by the carriage trade, when other glues can be substituted. From experiment made it has been found that glue made from the sinews and skins of animals is superior to that made from their horny parts; but the latter, again, is found from actual observation in practice to be much superior to glue made from the skins, etc., of fishes, as it is not so subject, as the last named, to be affected by the atmosphere. Animal glue is, for the reason just named, unquestionably preferable to fish glue, although the latter is sometimes sold as first quality glue.

TESTING GLUE.—In the selection of glue, the testing of it, so as to form some estimate of its adhesive qualities, is a matter of first importance. All glue in the cake is subject to be influenced by the moistness or dryness of the atmosphere, becoming soft in damp weather and crisp in dry weather, but different kinds are differently affected, and hence it is better to purchase in dry weather, as that which is *then soft is not of as good quality* as that which is crisp; and it should be borne in mind also, when purchasing, that the *most transparent* is generally the best. It is always advisable, before purchasing, to submit to experiment a sample of the article offered. To do this, take a cake of glue, place it in a pan, and cover it with water; when, after some hours, if it be good glue, it will *swell but not dissolve*, while, if bad, it *will partly if not wholly dissolve in the water*. Another test is this: After being dissolved by means of heat, that glue is best which seems most cohesive, or which is capable of being drawn out into thin filaments or strings, and does not drop from the brush or glue stick as water or oil would, but rather extends itself in threads, as it falls from the brush or stick; and if the glue possesses the requisite properties, this will always be found to be the case.

PREPARING GLUE.—The preparation of glue is very simple. It is first broken up in small particles and put into a vessel, covered with cold water, and left to soak for a number of hours, the length of time required for soaking being generally governed by the strength of the glue, the strongest glue taking the longest time. After being soaked until it all swells and becomes soft and gelatinous (avoid oversoaking) it is then placed upon the fire to cook, being kept rtirred until it is thoroughly dissolved and appears stringy, as we stated above. It is then ready for use; but in factories where a large quantity is employed, it is then poured out in a large flat pan and left to cool; and the workman, when desiring it for use, cuts off the required quantity and heats it. I would remark here that it is a bad habit for workmen to allow the glue pot to remain on the stove after they are done using it, as a very prolonged heat will destroy the adhesive qualities of the glue.

In some of the large carriage factories of the United States, where steam is generally used, a steam jacket is provided to receive the glue when it requires to be warmed, and, in connection with this jacket, a pipe heated by steam is generally added, on which panels may be warped bent, which proves a very expeditious and convenient process for both the purposes named, and preferable in every way to the use of a stove.

As a novelty in the way of preparing glue, the pulverized article, which has recently been introduced to the trade, merits mention here. In passing along one of our thoroughfares my attention was attracted, not long ago, by a sign on which the words *pulverized glue* were prominently displayed, and being curious to see the article and learn its advantages, I went in and asked an explanation from the proprietor. It seems that the pulverized glue is recommended for its convenience, being more quickly prepared for use than that which is in cakes, the latter requiring several hours to soak, whereas the pulverized can be soaked just as thoroughly in a few minutes; and this is a great advantage, particularly in warm weather, when glue put to soak is often liable to spoil. Again, if a workman's cooked glue runs out, he can in a short time prepare more from the pulverized, and this is often a great convenience, as every workman knows, especially when quitting time is near at hand.

We would say further in regard to glue in the pulverized form that it avoids the serious injury by salt air that affects glue in the cake in crossing the ocean, and it is for this reason particularly adapted for exportation.

APPLICATION OF GLUE.—Referring to the letter of your London correspondent, it is worthy of note that, with very few exceptions, no stoves or heaters are used in the English body shops, and, when a panel is to be bent or the glue to be heated, recourse must be made to the smith-shop to accomplish the object, but good gluing cannot be done under these circumstances, and particularly in a climate like the English, that is almost continually moist. In the United States, on the contrary, every carriage maker, even if he is doing business on the smallest scale, will have a stove for heating his body-shop in cold or damp weather, and also for bending his panels, shavings and waste stuff usually constituting the fuel employed. The heat of the body room is generally kept at a temperature of from 55° to 65° Fah., which is a comfortable one for the workmen to labor in, without becoming exhausted from the heat, and such a temperature will render the workman more cheerful, and cause him to accomplish more work than is the case (particularly common in England) of cold winter weather with an unheated shop, when the workman feels as if he touched ice when he takes hold of his tools, which feeling certainly does not expedite his labors, and when he feels glad at the approach of quitting time, that he can warm up at the tap, and take a drink of something warm.

There is no reason why in England bodies could not be glued together as well as here, provided the room were properly warmed and proper precaution taken. Some may raise the objection that glue will not hold so well on the hard ash here employed, but some years ago I saw bodies glued here in Mr. Charles Parker's factory, very hard ash and mahogany being used, and they held together quite as long and as well as any others having whitewood panels. The only difference in the case of using very hard wood is that the surfaces to be glued together should first be roughed with a tooth plane, or other tool, as a file or saw.

The following additional suggestions may be of value in applying the glue:

In all American carriage factories the side, back, and front panels are glued on, no nails being used, excepting one small tack in each corner to keep the panel in place while the straps and hand screws are being put on. In putting on the neck and bottom arch panels, some builders use both nails and glue, while others use glue without any nails, mitering these panels along the edges without nails, and where properly fitted and put on, no trouble is experienced from their giving way.

In the case of panels glued on, there is of course no fear of nails showing, while the latter is frequently the case on English carriages, even when the top quarters and back have been covered with leather, the nails showing through all. French carriage builders, until quite recently, have always nailed on the neck panels of boots, but the nails would always, in spite of the greatest care, show through the paint and varnish, and latterly they have been covering the necks of their boots with enameled leather, to avoid this trouble. It was the knowledge of this weakness in French carriages, in connection with the perception of its absence in American carriages, that, at the time of our Centennial Exhibition, first led some of their celebrated builders to look into the advantages of using glue to hold the panels on without nails.

When panels are glued on—properly on—there is no occasion to cover the quarters with leather. In the matter of roofs, some American builders cover them with patent leather, neatly nailed in a rabbet in the side-top and end rails, while others prefer to cover them with duck and paint in the same manner as the panels. Still others put on the roof board in one piece (which is easily obtained since the new method has been introduced of cutting panels from around the log, whereby the width is limited only by the diameter of the tree), and closely block the same on the inside, no covering of cloth, leather, or other material being required, as was the case with the old method of putting the roofs on in narrow boards.

We will add two further suggestions in this connection, namely, in applying glue, where the part is end grain, first fill the pores of the wood with thin glue, and let dry; then clean off, and glue at the joint with strong glue. Many a job has been spoiled by reason of neglecting to fill the end grain in this manner. Next, in adding water to glue, it is best to give the glue a boil before using again, so that it may be evenly and thoroughly mixed.—*The Hub.*

NEW BOOKS AND PUBLICATIONS.

SANITARY ENGINEERING. By Baldwin Latham C.E. Published by George H. Frost, Chicago. Price $3.00.

This is a reproduction of the English work published by Mr. Latham in 1873 It is a series of excellent and valuable papers forming a guide to the construction of works of sewerage and house drainage. It has heretofore been printed as a supplement to the Chicago *Engineering News*, from the stereotype plates of which the present book is made. Illustrations are abundant and good, and the work is sold at one quarter the price of the original English edition.

THE ELEMENTS OF DESCRIPTIVE GEOMETRY. By S. Edward Warren, C.E. John Wiley & Sons, 15 Astor Place, New York city. Price 3.50.

Thisis a new work prepared weare informed to meet an evident demand for brief text books. The author explains clearly, arranges his topics logically and uses the fewest words possible, all excellent features, and in brief has compressed into comparatively small space as compared with other works on the subject, a very full view of the science. The plates accompanying the text are bound in a separate and handy volume, and thus rendered easier for reference.

BREAD AND CAKE BAKING. By Frederick D. Hauptmann. Price $1.00. Published by the Author. P. O. Box 94, New Waterford, Ohio.

A collection of recipes, differing from those ordinarily found in cook books in that they are the work of a practical baker of experience and are especially intended for the trade.

PERFUMERY AND KINDRED ARTS. By R. S. Christiani. Price $5.00. Henry Carey Baird, Publisher. 810 Walnut street, Philadelphia.

The climate of the United States, is so diversified says the author, and in many parts so well adapted to the cultivation of numerous plants which are useful to the perfumer, that the author hopes by this treatise to awaken attention to the practicability of establishing flower farms and orange groves. as well as to the utilization of many indigenous plants now neglected for perfumery purposes. The work he offers is a complete encyclopedia apparently covering all branches of the subject. Descriptions are given of all the materials used in perfumery, of the laboratory and its requirements, and then follow a very large number of recipes for extracts and bouquets, aromatic and toilet powders, hair oils, pomades, hair dyes, essences, soaps, etc. In an appendix are instructions for making sugars, jellies, candies, cordials, etc. All the recipes have been carefully revised and many are the result of the author's long experience. The work will doubtless prove exceedingly valuable to the perfumer.

HOW TO DRAW A STRAIGHT LINE. By A. B. Kempe, B.A. Macmillan & Co., 22 Bond street: New York. Price 50 cents.

This is a continuation of the set of technical volumes, known as the Nature Series. It is a lecture on linkages, fully treating the subject and copiously illustrated.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class WOOD ENGRAVINGS of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED COMBINED SPRING SHACKLE AND STEP.

Reuben Doty, Wellsville, N. Y.—This invention consists in the peculiar construction of a shackle for coupling the springs of platform wagons, and in the combination of a step with the shackle. Portions of the shackle are secured to the ends of the wagon springs by bolts. These parts are similar, and consist of a round bar, from the ends of which the arms project at right angles and parallel to each other. At the ends of these arms eyes are formed for receiving bolts. The bars of the other parts are arranged at right angles to each other, and between them a bearing piece is placed, which covers half of the surface of each of the bars. From upper part of bearing piece an arm projects, to which a step is secured by means of a rivet or screw. The advantages claimed for this improvement are that the shackle is cheaply and easily constructed and applied. Friction is distributed over a large surface, so that the wear is reduced to a minimum, and the step is always kept in a horizontal position.

IMPROVED GAS DROP-LIGHT.

William B. S. Taylor, Westfield Township, N. J.—The nature of this invention is such an arrangement and application of flexible tubing to such drop-lights or chandeliers as will protect the tubing from injury by unnecessary coiling or rubbing and the heat of the lights when the chandelier or drop-light is in use, and will carry it out of the way when it is not in use. In this improved method of constructing chandeliers and drop-lights the tubing is to be attached to the lower parts both of the suspending and of the stationary parts of the fixture, and is allowed to hang or is estooned in a manner agreeable to its nature.

IMPROVED FEED BAG.

Thomas R. Lowerre, Mott Haven (Morrisania Station), N. Y., assignor to himself and Richard U. Wright, of same place.—The object of this invention is to furnish an improved feed bag for horses, which shall be so constructed as to allow the oats to pass down to the horse's mouth as fast as he eats them, and no faster, which will allow the horse to have plenty of air while eating, which shall be evenly balanced, so that the horse can eat comfortably, and which will prevent the oats from being thrown out by the horse. The body of the feed bag is divided by two partitions into three compartments—a central compartment, into which the horse's nose is inserted, and two side compartments, in which the grain is placed. The lower edges of the partitions extend nearly to the bottom of the bag, space being left beneath said edges for the grain to pass slowly into the bottom of the central compartment as fast as the horse eats it.