Vibrations.

Prince Kropotkin gives an interesting article on electricity as a mode of motion, in a recent number of the *Nineteenth Century*. It summarizes the results of the latest researches as simply as their nature admits of, and the net result of seemingly conclusive experiments is that with vibrations or wave lengths in the ether:

0·000,012 to 0·000,016 in. long, we have.......... chemical energy.
0·000,016 to 0·000,030 " " " " .... light.
.... to 0·000,120 " " " " .... radiant heat.
.... to yds. or miles. " " " .... electricity.

If these results may be accepted, we have squarely before us the problem: Given, vibrations of any length in the "ether" (whatever that is), to modify their length at will. The problem of the transformation of energy reduces down to that. When some benefactor of mankind has solved that problem, if it ever is solved, a new era indeed in civilization will open. We may then have electricity from heat, light without heat from electricity or any other form of energy, and divers and sundry other things which we can now only dream of, or perhaps not that. When we consider that pretty much all that is now known of the real nature of electricity, heat and energy is the fruit of the last twenty years (Joule's equivalent and first series of experiments were not announced until 1849), it seems a pretty safe conclusion that science is yet young, and that all which has been yet achieved is but a trifle compared with what is yet to be achieved. Moreover, we know that in the living organism, heat and energy, energy and light, energy and electricity, are transformed into each other by some mysterious process with the greatest ease, and to a large extent according to the will or needs of the organism. It may be that this power is one of the properties of living "protoplasm," and that man will never be able to understand it or to imitate it until he has learned the secret of life itself; but all the recent tendency of science is to indicate that the secret of transforming one form of energy into any other may yet be discovered, and perhaps by very simple means, compared with which our steam engine will seem but a "relic of barbarism."

The fact that electricity, like heat, light, and radiant chemical energy, is a manifestation of energy, has long been known, but up to the last four or five years scientists have been uncertain as to the manner in which energy existed in the electric current. The old idea of an electric fluid, which is still prevalent outside of scientific circles, served to mislead investigators. At present, however, the researches of such scientists as Hertz, Lodge, Crookes, Sir William Thomson and Tesla seem to have established the fact that electricity, like heat and light, is merely a vibration in the so-called "ether" which is believed to permeate all space. It is notable that all the original theories as to what we now call forms of energy were materialistic. The Newtonian (corpuscular) theory of light, which was the generally accepted one for half a century, was that light was an effect produced by an incessant fire of infinitesimal but material cannon balls thrown off in all directions from the light-giving body. Heat was a material something stored in the pores of the visible body. Electricity was a "fluid." All these assumed material substances have been shown to be non-existent, and not necessary to explain the phenomena. But there still remains one grave difficulty with the later theories. The notion of a material ether itself is almost as contrary to what we know of the nature of other matter as the corpuscular theory of light, and almost as much a mere evolution of the scientific inner consciousness, to explain what is otherwise inexplicable. We have not a particle of direct evidence to prove that there is a substance with properties such as we assign to this ether. We have only to eliminate the notion of a material ether, as we have eliminated the notion of material light particles, and we shall be down to hard pan! "I believe because it is impossible," the old monk declared. The modern scientific man, possibly, would do well to reverse this logic and declare: I disbelieve because it is so very convenient a theory, with nothing but its convenience to support it.—*Engineering News.*

A New Metallic and Rubber Wire Mat.

A new style of woven wire mat, to which is attached a soft rubber cleaner, with edges and top roughened to fit every shape in the sides or edges of boots and shoes, has recently been patented and put upon the market by Messrs. Emerson & Midgley, of Beaver Falls, Pa. Another description of mat or rug coming from the same firm is made of variously colored galvanized wire and has a thin rubber strip held on its edges by polished metal loops, the construction being such that there is no point upon which the most delicate trail of a lady's garment is liable to catch. The mats lie loosely on the floor, without fastening, so that they can be readily lifted, rolled up, and washed or shaken, and are furnished lettered as desired, three inch brass letters being used for the purpose. A mat of this kind is now in use at the entrance of the SCIENTIFIC AMERICAN office. They are manufactured by the Trenton Iron Company.

POLYCHROME PROJECTIONS BY MEANS OF UNCOLORED PHOTOGRAPHS.

For the last two years there has been much talk in the United States on the subject of a remarkable application of photography to the reproduction of natural colors—an invention attributed to Mr. Ives, of Philadelphia.

In reality, Mr. Ives, who is a very ingenious scientist and a fortunate investigator, has, aside from a few variants, merely put in practice a process published in France in 1869 by Mr. Louis Ducos du Hauron and Mr. C. Cros.

These two inventors, without any connection existing between them (Mr. Cros living in Paris and Mr. Du Hauron in Agen), conceived the same idea at about the same time. It consisted in the use of photography in the decomposing of the essential colors of any polychrome object whatever. The method published by each of them is nearly the same, and leads to the obtaining of three negatives of the same object, prototypes that are identical with each other as regards lines and dimensions, but different as regards the manner in which the various colors are reproduced.

This result, obtained by means of photography, is analogous to that sought for by a chromolithographer when he is executing the various monochromes of a subject upon stone, and which correspond to distinct colors, the superposition of which, at the moment of printing, are to give a polychrome nearly like the original. The work of selection due to photography may be so nearly complete that three negatives, the positive impression of which will be done with the three colors, yellow, red, and blue, may suffice for the obtaining of a most satisfactory polychrome image.

As a proof of the exactitude of the method devised by them, Messrs. Du Hauron and Cros have published various methods of recognizing the value of their photographic analysis of the colors of an object. Among the number of the synthetic processes that they have described there is one to which it is well to call more especial attention, because it consists in the use of a projection, upon a screen, of a combination of three positive pictures, each illuminated through a medium of a different color. The recomposition of the true colors is to be effected upon the screen.

It is useless to dwell upon the error committed by the two inventors when they say that the colored media should be yellow, red, and blue. They recognized this error later on, and in March, 1879, Mr. Cros, who, moreover, had come to an agreement concerning it with Mr. Du Hauron, distinctly directed the use of violet, green, and red screens.

We desire to well establish this question of priority in favor of our two fellow countrymen, not only because there seems to be a disposition on the other side of the Atlantic to consider Mr. Ives as the inventor of the process that we are about to describe, but also because the experiments relative to this process, now being tried in France, are of a nature to cause its adoption with a view to substituting, in cases where the thing will be possible, polychrome for colorless projections, which are evidently less attractive.

There is reason to hope that many lecturers will soon have recourse to these kinds of projections of a truly fascinating effect, and we must then know who were the inventors of this so curious an application of photography, which is perhaps destined to render many services, as yet unforeseen, to science and the fine arts.

This act of justice accomplished, we shall try to explain, as clearly as possible, the principles that serve as a basis to these photographic projections, in order that the bringing of them into play may be more easily understood.

In the first place, it is necessary to produce the three negatives of which it has just been a question. Upon the good quality of these will depend the success of the final synthesis. They should, as we have said, be identical with each other as regards dimensions, but differ as to the rendering of the distinct colors of the original.

An example will make the result that it is a question of obtaining better understood. Let us suppose that we have to analyze the colors of a polychrome object composed of three colors, yellow, red, and blue. We shall have to obtain a first negative containing the yellows and the combinations thereof, a second containing the reds and their combinations, and, finally, a third negative corresponding to the blues and their combinations. It is evident that if this result can be obtained, we shall have effected a decomposition such that the mixture of the radiations corresponding to each of these three colors, and assorted by the positives and in the desired proportions, will necessarily recompose the total coloration of the object reproduced.

Owing to the property that certain coloring substances possess of modifying the nature of films sensitive to light, it is possible to use sensitized plates adapted to the printing of blue and violet radiations to the exclusion of green, yellow, and red, or of yellow and green radiations to the exclusion of blue and red, or, finally, of yellow and red to the exclusion of blue.

The three prototypes of the same object will have to be reproduced in a camera of the same focus, the first upon the sensitized film most susceptible of receiving the impression of the blue radiations. A plate called "ordinary" is the one most suitable, since such plates, as well known, are not very sensitive to green, yellow, and red radiations. The second negative will be taken upon a sensitized film capable of receiving the yellow and green radiations, but not the red. These kinds of plates are easily obtained by incorporating with the sensitized film a dye that possesses the property of absorbing the yellow and green rays.

At the same time there should be interposed between the plate and the objective a translucent yellow screen for the purpose of retarding the action of the blue rays.

In order to obtain the third prototype, we use a plate treated like the preceding, but with a dye that gives it sensitiveness to the red rays as well as to the yellow. As for the blue, they must have no action upon this plate, such action being prevented by means of an orange-yellow screen.

As soon as a few experiments on the analysis or decomposition of colors have been made in this way, which is absolute only as regards the result to be obtained, but which is susceptible of modifications as regards the means to be employed, we shall have sufficiently mastered the process to succeed every time. After the negatives have been obtained, two methods of employing them are at our disposal. They may be used for pigmentary impressions of polychrome images analogous to those of chromolithography, and in this case it will be necessary to superpose the three monochromes, yellow, blue, and red, furnished by each negative corresponding to each of these three colors.

We have not to occupy ourselves at this moment with such application, as interesting as it is. The other application, which forms the main object of this article, relates to polychrome projections. It is well to remark, only, that when it is a question of projections, the colored media are not the same as in the case of pigmentary impressions, although the negatives are the same. For such impressions it would be absolutely impossible to attain the object if we employed ternary yellow, red, and blue, while the use of the same ternary in the recomposition of the colors by means of radiations would give improbable effects of color. Such recomposition can be effected only by the aid of the three primary colors indicated by Young and Helmholtz, viz., violet, green, and red.

We remark, in fact, that if we mix these three radiations by projecting them separately upon the same point of a white screen, we obtain pure white—a result that is not produced with the mixture of the blue, yellow, and red radiations made under the same conditions.

Now it is found that the color of each of the media to be employed is precisely the complementary of the color adapted to the pigmentary impression. Thus the negative which would furnish the pigmentary yellow will give, in view of the projection, a diapositive that it will be necessary to cause violet radiations to traverse—violet being the complementary color of yellow.

The negative of the pigmentary red is that which produces the diapositive to be illuminated in green, the latter being the complementary of red.

Finally, the negative of the pigmentary blue is that which, for the projection, will give the diapositive of orange yellow, the complementary of blue. Thanks to these preliminary explanations, the facts that are to follow and that we are going to explain will be better understood.

The putting in practice of the recomposition of colors requires the use of a lantern in three parts, or, at least, of a special apparatus constituting a single lantern provided with three projection objectives. To simplify things, let us be content for the time being with the ordinary three-bodied apparatus constructed by Mr. Moltine, which has been used by us for our own experiments. This apparatus is represented in perspective and in action in Fig. 1, and the arrangement of it is shown by the diagram in Fig. 2. Three distinct luminous sources, F, F, F, illuminate the lanterns, 1, 2, and 3. Such illumination may be furnished by an oxyhydrogen light or by electricity, or else by kerosene lamps or illuminating gas with Auer burners. The three black diapositives are placed at D, D, D, and behind each of them is located the colored medium corresponding to the analytical value of the diapositive appropriate to its special radiations. Behind D, therefore, is placed a violet glass, behind D No. 2 a green glass, and behind D No. 3 an orange yellow one.

The projections of the three uncolored (black) monochromes, D, D, D, are exactly blended into a single image perfectly registered upon the screen, I, I', I'', on which the three objectives, o, o', o'', project the image.

Each of these three radiations, as shown in the diagram, reaches all the parts of the composite image projected; and from the combinations with each other of these three sorts of radiations, violet, green, and red, result all the possible colors that can be obtained with the seven colors of the spectrum. We have a proof of this, moreover, when we witness the truly wonderful spectacle of the immediate recomposition upon the screen of the infinite shades of color of the original, and this synthesis is indeed one of the most curious experiments in optics that can be made for demonstrating the relations that exist between the colors called primary and the unlimited variety of the various tones that they are capable of producing on combining with each other.

It will be understood that, since the violet, green, and orange-yellow radiations produce white through their admixture, white will be produced in the composite image in colors at every point where the parts of such image correspond to points of the negatives likewise traversed by the three sorts of radiations. On the contrary, where the diapositives present spaces likewise opaque, black will be produced upon the screen, and, for all the intermediate values, going from white to black, we shall have combinations in variable proportions according to the respective opacities of the diapositives, and, consequently, colors or shades varying by reason of such proportions.

If the green and red radiations are absolutely arrested in two symmetrically corresponding points, the blue radiations alone traversing the diapositive of such radiations, the screen will receive the blue color all by itself. If the green radiations are alone suppressed, while blue and red radiations pass over two symmetrical points, there will be a resultant of a more or less reddish or of a more or less bluish violet upon the screen, according as the dominant resultant is found in the greater translucency of the diapositive of the red or of the blue radiations, and so on *ad infinitum*.

At first sight, it may seem difficult to reach the desired result when we reflect that we are in presence of twelve variables which it is necessary to bring into a state of perfect accordance in order that the composite image sought shall effect the exact reproduction of a given polychrome object. These twelve variables are the three negatives, the three diapositives, the three colored media, and the three sources of light. If a single one of these twelve unities be modified, there may result therefrom a modification of the polychrome projected, to the detriment of the accuracy of the rendering. This is true, but we must not get scared in the presence of such a difficulty, for it is easily surmounted.

The obtaining of the three negatives, in suitable conditions, can be quite regularly effected. As for the diapositives, they are easily printed upon plates sensitized with gelatino-chloride of silver, and, with a little familiarity with the method, one may know when to stop at the most apposite point. One is always free, moreover, after a trial, to make the necessary correction if it is indicated by an inexact result.

The colored media should present, in the first place, the essential condition of furnishing pure white through the mixture of their three radiations. After a few tentatives, we shall quickly find those that best lead to the effect sought, and thereafter it will be useless to modify the three colors adopted. They will then pass to the state of constant.

As for the illumination, it is not indispensable that they shall be absolutely identical in the three lanterns. There is even a certain advantage in being able to modify the intensity according as it is desired to bring out a dominant in the three radiations. With gas or the oxyhydrogen light, it is merely a question of cocks, and the operator can thus regulate the effect of the projection at will by graduating the intensity of the luminous sources corresponding to each of the diapositives.

To tell the truth, these twelve variables are reduced to three, say to the prototypes, of the value upon which depends all the rest, nothing being easier, if one or more of the diapositives are too strong or too weak, than to make others of the desired intensity.

Upon the whole, the three diapositives represent the colors collectively of any polychrome object whatever, provided that they be projected, as has just been said, by means of three objectives, and traversed by the three distinct radiations that have been indicated.

This process of synthesis offers the great advantage of permitting of obtaining the representation of the colors of nature and of works of art without the intervention of the brush, and without the interpretation, however able it be, of any translator whatever. Our first tentatives in this direction, susceptible of leading to numerous applications of great interest, permit us to believe that it is possible to reach perfection in the rendering of colors. The images thus projected are fugitive, it is true, yet we can succeed in fixing them in a less striking but also less exact manner, through pigmentary impression by means of the same negatives. In that way, the method of the photographic decomposition of colors, combined with certain easily employed correctives, leads to results that are remarkable and much superior to anything that can be obtained thus by the use of the ordinary processes of chromolithography or chromotypography.

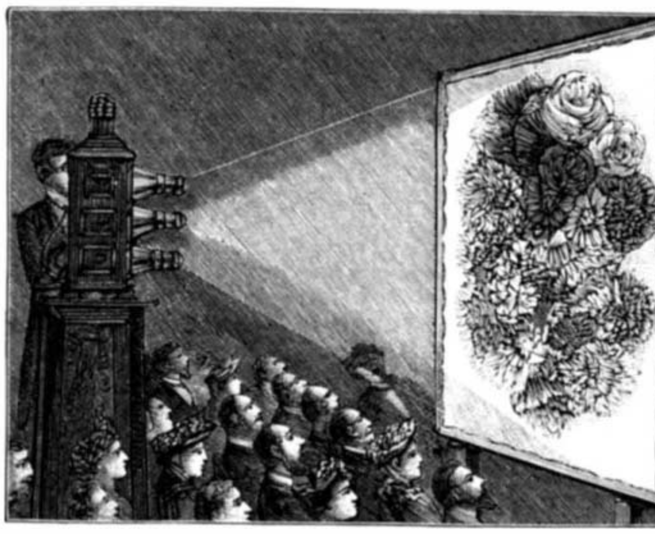

Fig. 1.—PROJECTION BY MEANS OF A TRIPLE-BODIED LANTERN.

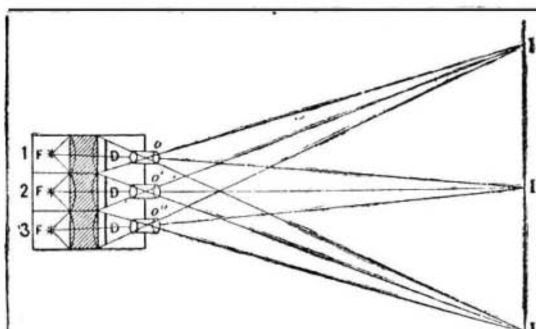

Fig. 2.—DIAGRAM OF THE APPARATUS.

The first public experiments in France on this method of recomposing colors by way of projection took place at the Conservatoire National des Arts et Metiers in our lecture of February 7, 1892. Since then they have been repeated, with completer elements, at the session of the French Society of Photography of the 4th of March, and before the Photo. Club, of Paris, on the 9th of March.

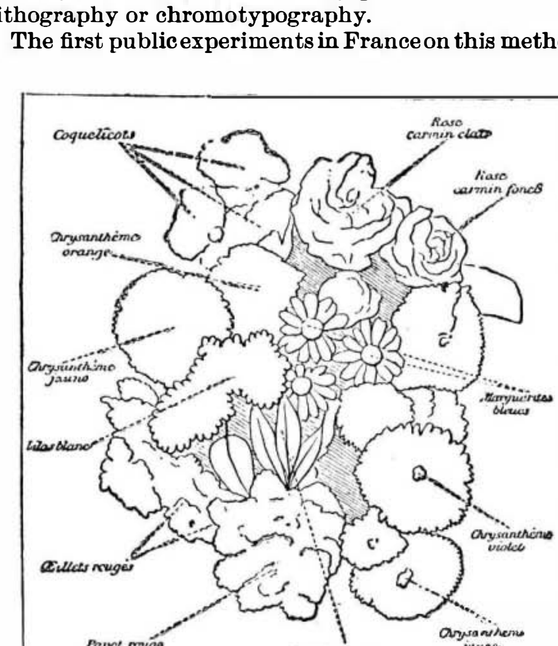

Fig. 6.—DIAGRAM SHOWING THE COLORS OF THE FLOWERS REPRESENTED IN THE FIGURES.

The three engravings (Figs. 3, 4, and 5) represent, in its three states, one of the subjects projected, the diagram of which in Fig. 6 indicates the colors. These three images are a reproduction of the same bouquet of artificial flowers under the special conditions detailed above. If we compare with each other the corn poppies at the top and at the left, we find that they nearly resemble one another in Figs. 4 and 5, where they are rendered by a color almost black, while they are white in Fig. 3. The yellow flower situated beneath and to the right of the bouquet is of a dark shade in Fig. 5, and, on the contrary, nearly white in Figs. 3 and 4. The yellow centers of the daisies are black in Fig. 5, and of a light tint in Fig. 4, and still lighter in Fig. 3.

Two of the daisies were purposely colored with ultramarine. In the last two images, 4 and 5, these are nearly white, like the white daisy, while in the first (3), from which the action of the blue rays was excluded, they have a vigor comparable to that of the green of the leaves.

It seems to us useless to carry the comparison farther; it suffices to show the dissimilitude that exists between these three diapositives, as regards the rendering of the colors, although identical in their lines and dimensions. It will be remarked that the white lilac is everywhere found reproduced with an equal value, the white having acted in the same manner upon the three sensitized films, possessing solely different properties as regards the simple colors.

The favorable reception accorded by the numerous spectators present at these experiments is a sure guarantee of the future in store in France for the use of this method of polychrome projection. It has been almost unknown there up to the present, although its inventors are Frenchmen. The proof of a possible perfect realization has now been given, and there is nothing more to do but construct apparatus adapted to this special object—cameras and lanterns designed for obtaining negatives and the projection of their diapositives. We know that skillful constructors have already taken the work in hand.

What a splendid application for our intelligent and artistic amateurs is that which is to permit them to bring back from their excursions photographic images that it will be only necessary for them to project in a composite state upon a screen in order to show their friends or others the places visited, and cause them to admire not only the picturesque character but also the beautiful colors thereof.—*La Nature.*

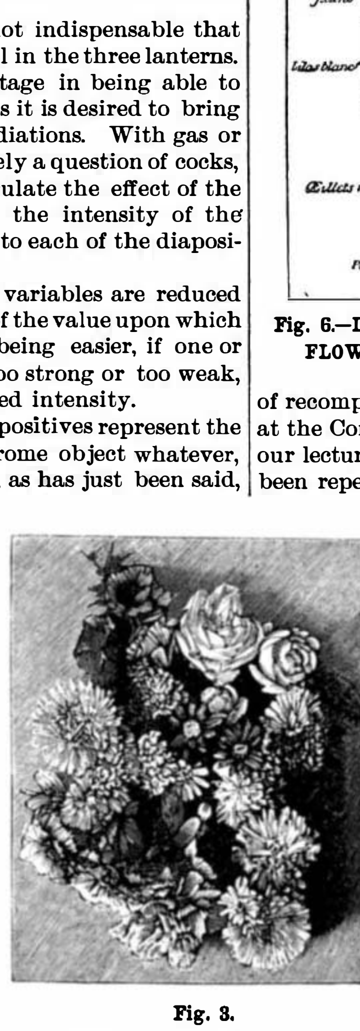

Fig. 3.

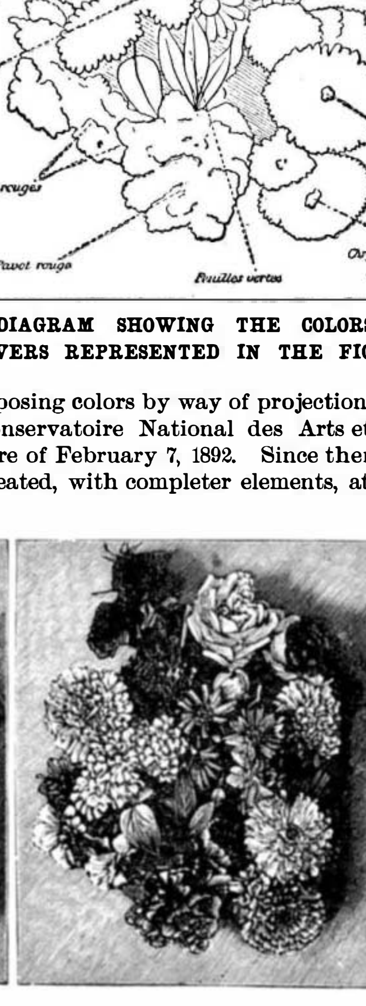

Fig. 4.

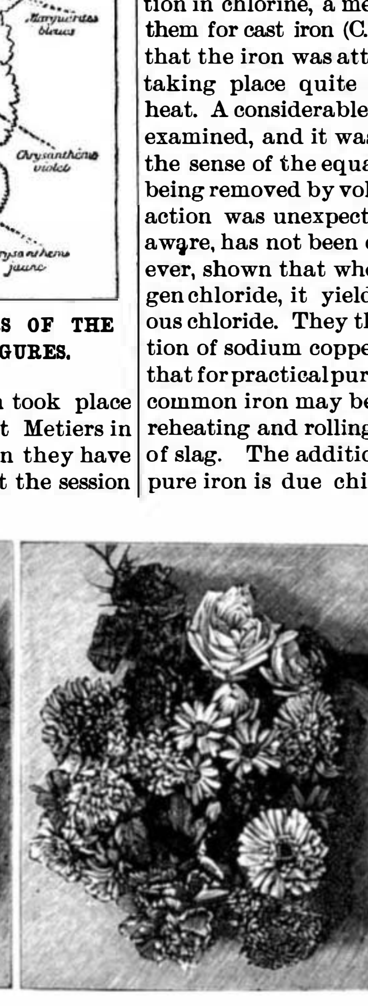

Fig. 5.

Fig. 3.—Monochrome designed for giving red, in the state of diapositive; monochrome of blue for the printing of pigmentary colors. Fig. 4.—Diapositive that gives green radiations; monochrome of red for the printing of pigmentary colors. Fig. 5.—Diapositive that gives blue radiations; monochrome of yellow for printing with pigmentary colors.

Analysis of Iron.

In a paper read before the Chemical Society, Messrs. A. E. Barrow and Thomas Turner gave results of analyses of best bar and sheet iron and common bar and sheet iron. They attempted to estimate the slag by combustion in chlorine, a method already employed by one of them for cast iron (C. S. Trans. 45, 263), but they found that the iron was attacked by the chlorine, the action taking place quite sharply at a scarcely visible red heat. A considerable number of iron ores and slags were examined, and it was found that action takes place in the sense of the equation $3FeO = Fe_2O_3 + Fe$, the iron being removed by volatilization as ferric chloride. This action was unexpected, and so far as the authors are aware, has not been observed before. Deville has, however, shown that when ferrous oxide is heated in hydrogen chloride, it yields magnetic oxide of iron and ferrous chloride. They then dissolved the iron in cold solution of sodium copper chloride. The authors conclude that for practical purposes the weight of slag in best and common iron may be taken as identical, and that on reheating and rolling each loses about the same weight of slag. The additional loss noticed on reheating impure iron is due chiefly to the elimination of phosphorus, probably in the form of ferrous phosphate.

Length of Street Railway Cables.

Among the longest cables made by the Washburn & Moen Manufacturing Company were one manufactured for the Denver Tramway Company, of Denver, which was 32,145 feet in length, weighing 86,867 pounds; one manufactured for the Portland Cable Railway Company, which was 33,000 feet in length, weighing 76,350 pounds; and another manufactured for the Metropolitan Street Railway Company, of Kansas City, 32,300 feet in length, and weighing 95,200 pounds.

Conscience in Work.

The policy of right doing cannot be doubted. Every intelligent man and woman must see that in nearly every instance it pays richly and fully for whatever labor or self-sacrifice it may involve, and in the few cases where they cannot see this result most of them have sufficient faith in the law to trust it. Yet, if this be the only motive in action, it cannot be called right doing in the best sense. That which is done solely from the hope of gain or advantage cannot be of the highest type.

The habit of doing what we have to do as well, as thoroughly and as speedily as possible, without immediate reference to its probable or possible effects upon ourselves, is one which would of itself secure at once the best success for ourselves and the greatest good of the community. It would settle many vexed questions and solve many knotty problems. Instead of this, the common course is to consider closely the comparative benefit that is likely to accrue to us in return. There are all degrees of this calculation, from the strictly just to the grossly selfish. One man tries to estimate the true worth of his labor and performs it accordingly, another gives as little work and secures as large returns as possible, and between these there is every shade. But in all such reckonings there is one important element left out. No one can count up the value of the labor which is both generous and conscientious. Even its money value can never be calculated.

The youth who enters business determined to do all that comes to his hands as well and as quickly as he can, who is anxious to learn and anxious to please, who never measures his labor by his wages, but freely gives all the work and the best work in his power, is vastly more valuable than the one who is always bearing in mind the small pay he is receiving and fearing that he should give too much in return. So the mechanic or the clerk who, beyond his stated salary, beyond even his obligations to his employer or the demands which public opinion could make upon him, exerts himself to make his work as perfect as he can, and delights in its thoroughness and excellence, apart from any private benefit it can render him, has a value which can never be computed. It matters not what the work be, whether it be done with the spade of the laborer, the pen of the clerk, the brush of the artist, or the voice of the statesman. Such people are sought far and wide, there are places always open to them, and their services are always at a premium. Talents and skill tell for much, but conscience in work tells for more. He whose integrity is unquestionable, who can be trusted far and wide, who will work equally well alone as when every eye is upon him, and will do his best at all times, is an invaluable member of society. And he cannot do this simply from the motive of self-interest. It is the result of something more than intelligence and foresight, it is conscience, vitalizing every detail of labor, and raising it to its highest pitch of excellence.—Condensed from a lengthy editorial in the *Confectioners' Journal.*

An Observatory for Mont Blanc.

A second attempt is to be made to build an observatory at the top of Mont Blanc. As the workmen who tunneled last year through the snow just below the summit did not come upon rock, M. Janssen has decided that the building shall be erected on the frozen snow. A wooden cabin was put up, as an experiment, at the end of last summer, and in January and early in the spring it was found that no movement had occurred. According to the Lucerne correspondent of the *Times*, the observatory is to be a wooden building 8 meters long and 4 meters wide, and consisting of two floors, each with two rooms. The lower floor, which is to be embedded in the snow, will be placed at the disposition of climbers and guides, and the upper floor reserved for the purposes of the observatory. The roof, which is to be almost flat, will be furnished with a balustrade, running round it, together with a cupola for observations. The whole building will rest upon six powerful screw jacks, so that the equilibrium may be restored if there be any displacement of the snow foundations. The building is now being made in Paris, and will shortly be brought in sections to Chamounix. The transport of the building from Chamounix to the summit of Mont Blanc and its erection there have been intrusted to the charge of two capable guides—Frederick Payot and Jules Bossonay.

CORNELL UNIVERSITY had, in 1891-92, a larger number of students in her technical departments than any of the nine technical colleges of Germany, with the single exception of Berlin (Charlottenburg). Sibley College, in its courses in mechanical engineering alone, has a larger number of students than the total in any German technical college except Berlin, Munich and Carlsruhe. The following are the figures: Berlin. 1,756; Cornell, 1,090; Munich, 642; Carlsruhe, 586; Sibley, 525; Hanover, 514; Stuttgart, 363; Darmstadt, 334; Dresden, 251; Brunswick, 237; Aachen, 110.

When it is considered that the German colleges are the wards of the state, and are fully supported by their guardians, while Cornell University and its technical colleges are the wards of New York State, and left to be supported by private liberality, the contrast is something remarkably creditable to the latter, and not at all to the State so greatly benefited.

New Pacific Mail Steamer.

A new steamship, the Peru, for the Pacific Mail Steamship Company, was launched on the 11th from the yards of the Union Iron Works at San Francisco. The Peru is a steel steamer, 350 feet long, with triple expansion engines of 2,800 horse power, and is expected to attain a speed of 15 knots per hour.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING. — Robert S. Russell, Brownsville, Tenn. This is an improvement in that class of devices known as "twin-jaw" couplers, a coupling jaw of novel form being pivoted within each drawhead, the jaw having a horizontal hook at its forward end and a shoulder on the lower face of its weighted rear end, while a rock shaft jonrnaled beneath the drawhead carries an arm adapted to contact with the jaw and the shoulder. The beveled forward ends of the coupling jaws pass each other as the cars come together, their hooks becoming automatically engaged, means being provided for locking the parts in coupled or nncoupled position. This coupling is inexpensive and always safe, and the device is readily operated from the side of the car.

MAIL BAG CATCHER.—James W. Horton, Madison, Ind. Catching and holding arms, normally pendent, are secured to a main or supporting bar hung in bearings npon the outer faces of the car door posts, these arms being swung out into operative or horizontal position by a lever arm. The catcher arms are adapted to be readily reversed to operate in either direction of movement of the car, the arms positively grasping the bag, while the holding devices yield to its inertia to overcome the shock. The device is simple in construction and easy to manipulate.

BAGGAGE STAMP OR CHECK.—Thomas M. Cunningham, Nashville, Tenn. This invention consists of a railroad ticket having separate and independent stamps or checks secured to it indicating the amount collected by the initial road on the route for the baggage of the passenger, with other particulars, such as the excess in value and excess weight of the baggage. The improvement has for its object the more certain division pro rata of charges for excess of baggage on connecting railroads using coupon tickets, although it is likewise applicable to local tickets.

Mechanical.

GRINDING WHEEL ATTACHMENT. — John H. Goetsche, San Francisco, Cal. Emery and other grinding wheels are, by this improvement, provided with a casing formed with an annular recess to retain the oil, the inner wall of the casing resting on the face of the wheel and being held in place by a washer. The arrangement is such that all the lubricant passing out of the bearing is readily gathered by the casing and retained therein, from which it can be readily removed by a sponge or other means, the work being protected from the oil or other lubricant ordinarily liable to be scattered over the surface of the wheel.

CLAW BAR. — James W. Gray, Brooklyn, N. Y. An implement especially adapted for drawing spikes from railroad ties, and capable of speedy and convenient adjustment to any size of spike-head, is afforded by this invention. The jaw is curved on its under side to rock, and its forward end is curved downward and inward to form a beak, in the rear of which is a vertical slot in which a bar has a sliding and pivoted movement. The construction is such that one of the clamping jaws may be utilized as a fulcrum for the bar in drawing the spike, the implement being also light, durable, and inexpensive.

Agricultural.

PLOW.— Henry M. McCafferty, Montrose, Col. A combination sulky plow and roller has been devised by this inventor, an implement designed to thoroughly plow the soil and roll it nicely at the same time, the roller forming one of the main wheels of the machine. The frame is supported by an ordinary wheel at the landside, and the land roller is hinged centrally between its ends at its forward side to the opposite side of the frame. so that it will have a free lateral swinging movement. This improvement is designed to afford especial advantages from the fact that the soil rolls better and the clods break up more easily just at the time they are turned up by the plow, and the weeds and vegetable matter are thus so effectually covered up that they rot more quickly.

FOWL CRATE.— Friedrich W. Ewert, Wood Lawn, Ill. A transverse partition divides this crate into upper and lower compartments, and transverse and longitudinal bars in each upper and lower division are made to form single compartments, one for each fowl, there being a door on the front end of each compartment formed of a bar sliding on vertical rods, guide rods held on the bar sliding in bearings on the crate. The crates are more especially designed for shipping fowls to a distance without injury, perfect ventilation being afforded, and the construction being simple and durable.

EGG CARRYING PACKAGE.—Robert G. Dale and Walter S. Weightman, Durango, Col. The outer body of this package or case is made of pasteboard or thick paper bent or folded to form two tubular sections lying side by side, with their inner walls dividing them but left free to open, inner thin paper or flexible strips being looped to form a series of separate egg chambers in each tubular section. The improvement is more especially designed to facilitate the safe delivery of eggs in small lots to consumers, and is also applicable to egg cases of larger size, or packages containing any number of such divided lots.

CHEESE VAT.—Leopold Meyer, Ahnapee, Wis. This is an improvement upon vats having a water tank and heater, the milk being heated in a removable vat suspended upon the water tank. The milk vat has a sliding and detachable connection with the water tank, and a longitudinal discharge pipe extends along the under side of its bottom, the projecting end of the pipe entering an aperture in one end of the water tank when the vat is secured to the tank, the latter having a heating pocket in its bottom. The bottom of the sheet metal milk vat is strengthened, and a simple and convenient means provided for drawing off the whey from the curds, the tank and vat being easily separated and operated, and easily kept clean.

MUZZLE FOR HORSES AND STOCK. — Marcus S. Moremen, Switzerland, Fla. This is a simple and practical device, attachable to the head of the animal to prevent injury being done to other cattle or to trees and shrubbery, while allowing freedom to graze. The skeleton muzzle is secured upon the jowls of the beast, and its open bottom is normally closed by a pivoted and spring-pressed guard plate, a projection from the latter engaging the ground to swing the plate upward within the muzzle when the animal lowers its head.

POWDER DUSTER.—John P. Wright, Thomaston, Texas. This is an inexpensive device adapted to be carried on a farm cart or wagon, and be easily operated by the driver to distribute poison upon plants. A bed or platform carries uprights supporting a hand shaft with crank handle, this shaft being connected by a belt and pulley with a distributer shaft on the outer ends of which are poison-distributing cylinders, which may be held at different heights, as desired, for dusting the plants. The distributer shaft is operated by the turning of the crank handle by the driver, and not by the moving part of the machine, so that the powder may be applied only where needed and none of it will be wasted.

Miscellaneous.

TOY.—William H. Gregg, New York City. The evolutions of a body of soldiery can be imitated and different positions of a company of infantry may be accurately represented by this novel and amusing toy, instruction in the order of marching bodies of men being illustrated thereby. In connection with a base board, a series of figures is supported on transverse strips secured pivotally at both ends on parallel bars, and thus adapted for changing the position of the figures by ranks.

PUZZLE.—Antenor Assorati and Arturo Cuyas, New York City. A puzzle in egg form. simulating the mythical egg of Columbus, is provided by this invention, the egg being so constructed that when handled in a certain manner it may be made to stand upon its end. Although the toy is inexpensive, the interior mechanism is so arranged that it requires considerable expertness to solve the puzzle.

DESIGN FOR THE ORNAMENTATION OF SHEET METAL.—Leopold Kahn, New York City. The leading feature of this design consists of alternating strips of ribbon-like and lace-like metal, the latter figures simulating different varieties of lace, and having preferably scalloped edges overlapping the ribbon-like figures.

DESIGN FOR A SHOE SHAPER PLATE.—Joseph W. Skinner, La Crosse, Wis. The edge lines of the flat main plate converge slightly toward both ends, which are turned up at right angle, one upturned end being bent over in a curve, while in the other is inserted a screw eye.

PRESSURE REGULATING VALVE.—Walfrid Gustafsson, Brooklyn, N. Y. This invention provides a valve of simple, durable, and inexpensive construction, with which, no matter what the pressure may be upon the inlet, the pressure at the outlet may be diminished as desired. The invention also provides a means whereby the regulating mechanism of the valve may be manipulated in a convenient and expeditious manner, the improvement embracing various novel details of construction and combinations of parts.

FEED PIPE FOR VACUUM PANS. — Henry Basanta, Ponce, Porto Rico. The feed pipe is preferably ring-shaped, provided with a series of perforations, and located directly above the heating coil of the vacuum pan. One end of the pipe is closed and the other registers with a short pipe leading to a chamber into which discharges the supply pipe, valved steam and chemical supply pipes being also connected with this chamber, the valves in the latter pipes being ordinarily closed. The regular perforations in the feed pipe cause a uniform discharge of the sirup under an equally distributed pressure, any crystals in the sirup not being liable to break, and facilitating the production of well-grained sugar in the boiling.

TRANSFER PAPER.—William Schwartz, New York City. This invention relates to an improvement in the paper and in a composition for coating it, providing at a low cost a paper by means of which a number of copies of a mannscript or design may be quickly and conveniently taken on single sheets or on the leaves of books. The coating is composed of glycerine, carpenter's glue, agar-agar, and other components, in specified proportions, and is applied while hot. The compound never thoroughly dries, but always retains its absorbent qualities, and with the paper thus treated a distinct and perfect impression is made of the matter to be copied.

HARNESS. — Thomas J. Magruder, Marion, Ohio. This is a strap-attaching device for harness, of simple and durable character, especially adapted for connecting the inner and outer belly-bands, or for connecting any two straps crossing one another. The device has side bars with upwardly curved extremities from which tongnes extend inwardly, a bridge bar connecting the side bars, the bridge bar having studs and a central aperture.

SACK HOLDER. — James C. Bratney, Sparta, Ill. This is a device for holding any kind of sack in a position to be easily filled, and is readily adjustable to suit and support sacks of different lengths. The holder has a funnel top, with depending neck to enter the sack, and on opposite sides of the funnel are downwardly-depending sockets to receive supporting legs. The funnel has projections or teeth and hooks to engage the sack, which may be fastened in place by one motion of the hand, and thus held without injury, the hooks not extending through the fabric, but simply forcing it into aligning perforations.

EMBROIDERING.—Hermann Gehnrich, New York City. Thie invention relates to a fabric-holding frame for embroidering machines, and especially adapted for use with the Heilmann or Swiss machines. The frame may be secured to the machine in any well known manner, is of simple and inexpensive construction, occupies but little space, and the fabric can be readily and securely attached to it and stretched without injury. It is provided with an automatically-working lock, so that when the fabric is stretched it will be held under the desired tension.

SHOW CASE. — James C. Loughry, Greensburg, Pa. This case is especially adapted to exhibit cigars and permit them to be easily reached. It has a vertically-sliding glazed front, operated in ways by chains or cords extended over guide pulleys to the rear of the case and there weighted for operation by the salesman, there being a shield or mirror in front of the upper ends of the ways. The salesman pulls on the chain to raise the glass front when a customer desires to select a cigar.

COMBINATION LOCK. — William H. Thompson, Winnipeg, Canada. This lock has a rotary bolt with a locking notch in which rests a tumbler on a spring bar, at right angles to and operating on which is a grooved pull-shaft, in the grooves of which play one or more adjustable slides. The lock can be opened only by one knowing the proper combination, and is adapted for use on cupboard doors, drawers, valises, and in connection with the ordinary bolts of safe locks.

STOVEPIPE FASTENING. — John H. Johnston, Little Rock, Ark. Metal loops are, according to this invention, riveted to the pipe sections on the inside near their ends, a separate connecting strap or tie being bent around the loops and connecting the opposite pipe sections, thus forming a firm and secure union of the sections to prevent them from becoming loose and falling apart, without producing any visible or unsightly effect.

FURNITURE CONSTRUCTION. — Frank M. Haiman and Andrew L. Eaton, of Ottumwa, Iowa. This invention provides a convenient means of securing the legs to tables, stands, desks, and similar articles, temporarily for shipment. A diagonal right and left screw bolt is made to connect the rails in the rear of their spaced ends, the leg being clamped between the rail ends beyond the screw, which serves to connect and brace the rails when the leg is removed.

FISH HOOK.—William H. Hunter, Farnhamville, Iowa. A bowl and two hooks are combined in this improvement, the shank of one hook being fixed in the bowl while the shank of the other hook engages a pin or lug on the bowl to hold the two hooks in a closed position. While trolling the hooks are thus held closed to prevent them from getting caught in weeds, grasses, etc., but they are adapted to open instantly when the fish takes the bait.