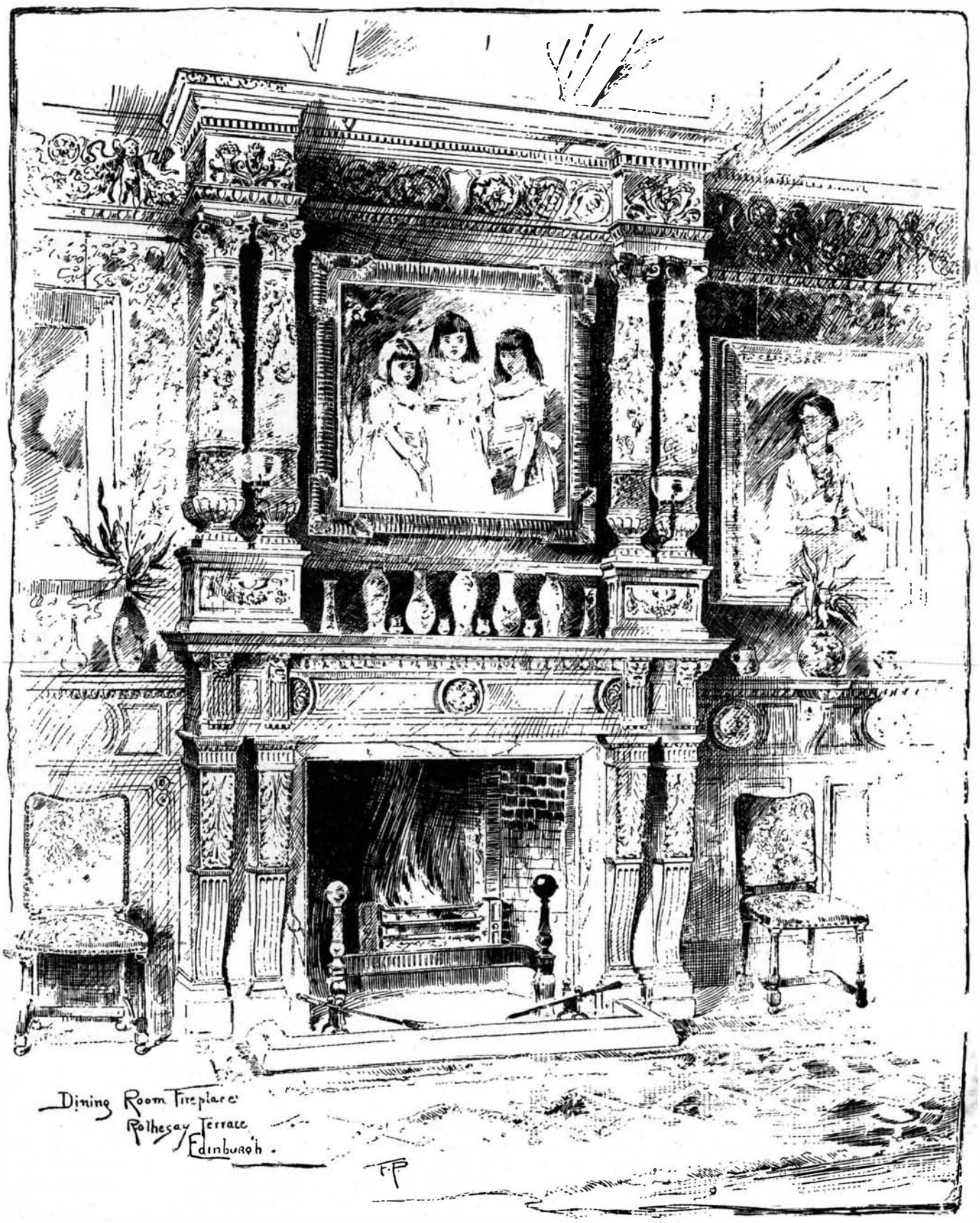
A BEAUTIFUL FIREPLACE.

The accompanying illustration of a dining-room fireplace is taken from a celebrated Scotch residence located in Edinburgh. The engraving first appeared in the *Furnisher and Decorator* and subsequently in the Architects and Builders Edition of the SCIENTIFIC AMERICAN. It is a tasteful and harmonious design; a good example of the class of large fireplaces now in vogue.



A DINING-ROOM FIREPLACE IN A SCOTCH RESIDENCE.

The Railways of the United States.

The Inter-State Commerce Commission has lately made its sixth statistical report.

The total mileage of railways in the United States on June 30, 1893, was 176,461·07, being an increase during the year of 4,897·55 miles. The corresponding increase during the previous year was 3,160·78, from which it appears that there was some revival in railway construction during the year covered by the report. The number of roads abandoned during the year was nineteen. The total length of line, including all tracks, was 230,137·27, which includes 10,051·36 miles of second track and 42,043·40 miles of yard track and sidings.

The total number of locomotives on June 30, 1893 was 34,788, being an increase of 1,652 during the year. Of these, 8,957 were passenger locomotives, 18,599 freight locomotives, and 4,802 switching locomotives, the remainder being unclassified. The total number of cars owned by the carriers making report was 1,119,878, to which should be added 154,068 leased cars, making a total of 1,273,946 cars operated directly by the carriers. This shows an increase in the number of cars directly controlled of 58,854 during the year. Of the total number of cars, 31,384 were in the passenger service and 1,047,577 in the freight service. The number of passengers carried per passenger locomotive was 66,268, and the number of passenger miles per passenger locomotive was 1,588,601. These figures show an increase in the efficiency of passenger locomotives. The number of tons of freight carried per freight locomotive was 40,062, and the number of ton miles accomplished per freight locomotive was 5,031,889. These figures show no change in the efficiency of freight locomotives as compared with previous years.

The total number of employes in the service of railways on June 30, 1893, was 873,602, being an increase of 52,187. Of this total of employes, 35,384 are assigned to the work of general administration, 256,212 to maintenance of way and structures, 175,464 to maintenance of equipment, and 397,915 to conducting transportation, the remainder, 8,627, being unclassified.

The aggregate of property properly classified as railway capital was on June 30, 1893, $10,506,235,410, which shows railway capital equal to $63,421 per mile of line. The amount of stock outstanding was $4,668,935,418, of which $3,982,009,602 was common stock, the remainder, $686,925,816, being preferred stock. The funded debt outstanding was $5,225,689,821, classified as follows: Mortgage bonds, $4,504,383,162; miscellaneous obligations, $410,474,647; income bonds, $248,132,730; and equipment trust obligations, $62,699,282. The amount of investment in the railway securities has increased during the year from $1,391,457,053 to $1,563,022,233, being an increase of $171,565,180.

The amount of stock paying no dividends during the year was $2,859,334,572, being 61·24 per cent of the total stock outstanding.

The total dividends paid was $100,929,885. The amount of mortgage bonds paying no interest was $492,276,999, or 10·93 per cent of the total of mortgage bonds, and the amount of income bonds paying no interest was $204,864,269, or 82·56 per cent of the total of income bonds.

The total number of passengers carried during the year ending June 30, 1893, was 593,560,612.

The number of tons of freight reported by the railways for the year was 745,119,482. Ton mileage was 93,588,111,833.

The gross earnings from operations on the railways of the United States for the year ending June 30, 1893, was $1,220,751,874, being an increase of $49,344,531 over gross earnings reported in the previous year. Operating expenses during the year were $827,921,299, being an increase of $46,923,303 over the previous year.

The final net income available for dividends was $111,058,034, being a sum less than the corresponding amount for the previous year of $4,907,157. After deducting from this amount the dividends paid, the income account of railways in the United States for the year 1893 shows a surplus of $8,116,745, which is less than the surplus of the previous year by $5,919,311.

The number of railway employes killed during the year was 2,727, being greater by 173 than those killed during the previous year. The number of employes injured was 31,729, being greater by 3,462 than the number injured the previous year. The number of passengers killed during the year was 299, being less by 77 than the number killed the previous year, and the number injured was 3,229, being two in excess of the number injured the previous year. Of the total number of deaths to employes on account of railway accidents, 433 were due to coupling and uncoupling cars, 644 to falling from trains and engines, 73 to overhead obstructions, 247 to collisions, and 153 to derailments, the remainder being due to causes not so clearly defined. An assignment of casualties to the opportunity offered for accidents shows one employe to have been killed for every 320 men employed, and one to have been injured for every 28 men employed. The most dangerous service is that of trainmen, and for these the statistics show one employe to have been killed for every 115 trainmen, and one employe to have been injured for every 10 engaged in this service. A similar comparison shows one passenger to have been killed for each 1,985,153 passengers carried, or for each 47,588,966 passenger miles accomplished, and one passenger injured for each 183,822 passengers carried, or for each 4,406,659 passenger miles accomplished.

Wood Pulp Pipes.

Wood pulp is agitated with water and rolled on a tube. After the pulp is wound to a sufficient thickness around the tube, and the extra amount of water drains away, it is placed on end and the interior mould is withdrawn, leaving the wood pulp tube, which is held on suitable supports and dried until the water is evaporated. The further process consists of dipping it into a very hot solution of asphaltum and other materials, which penetrate the whole substance. The ends are then squared up, and the threads cut, or taper finish is made in the usual manner of wrought iron pipe.

This material, when finished, possesses high electrical resistance, rendering it suitable for underground conduits for electric wires. As a non-conductor it is free from being impaired by electrolytic action from earth return currents, which have become such a serious factor in impairing the water and gas pipes in cities where the street tramcars are propelled by electric motors using earth return circuits. Its resistance to acids and alkalies fits it for use in chemical works. As a non-absorbent of water it is free from any difficulties due to expansion and contraction. The bursting strength of the tube is said to be from 150 pounds to 250 pounds per square inch, according to the size. It can stand a temperature of 150 degrees.

Notes on Science and Industry.

Composition of Amethysts and Turquoises.—That the structure of some minerals often presents a certain indeterminateness is well known. Mr. A. Carnot, whose researches upon the presence of fluorine in fossil bones will be recalled, having devoted himself to the study of the chemical composition of amethysts and turquoises, has ascertained that all amethysts contain fluorine. As for turquoises, there is reason to make a distinction between those of Oriental and western origin. The former are true minerals and contain no trace of fluorine; as for the latter, they contain fluorine in the same proportions as the bones of the tertiary epoch. This conclusion is a confirmation of the hypothesis emitted as to the origin of such turquoises, that is, that they are nothing more, in fact, than the product of the fossilization of the teeth of animals.

Analysis of Steel.—One of the great difficulties met with in the analysis of iron and steel is due to the enormous excess of oxide of iron amid which it is necessary to operate, and which, when it is obtained in a gelatinous state by humid way, carries along all or a portion of the other elements and often completely masks the presence of them. Mr. H. K. Bamber, at the recent meeting of the Iron and Steel Institute, recommended a method that has given him excellent results, and surmounts the above mentioned difficulty. He attacks 13 grammes of the metal with nitric acid; saturates incompletely with pure carbonate of soda, and then evaporates to dryness. The oxide of iron resulting from the decomposition of the nitrate remains in a pulverulent state, all the other bodies remaining in combination with the soda. He places the product in distilled water containing a small quantity of carbonate in solution and passes the whole through a double filter, which retains the oxide of iron. All the other elements are contained in the soda solution, which is analyzed by the ordinary methods.

Mr. Bamber claims that he has thus detected in the majority of steels small quantities of chromium, arsenic, and molybdenum, the presence of which was unsuspected.

The Browning of Oakwood.—According to the *Moniteur Industriel*, the dark oak employed in decorative woodwork is prepared by submitting the wood to the action of ammoniacal vapors, which rapidly give the dark tint that is in so much request. The method consists simply in arranging the material to be rendered of a dark color in a tight room into which no light penetrates. For small pieces, a large box whose joints are closed with strips of paper glued to the places whence the vapor might escape fully suffices. For larger pieces there should be a hermetically closed room. Into the box or room are put several flat glass vessels containing liquid ammonia, and placed upon the floor so that the vapor may fill the space and give the tannin of the oak a very dark brown color, which will not be altered if a little of the wood be removed from the surface. The liquid should not touch the wood, and the depth of the color will depend upon the quality of the ammonia employed and the length of time of the exposure to its fumes.

Concentration of Sulphuric Acid by Electricity.—The industrial concentration of sulphuric acid presents certain difficulties that are due to the fact that only platinum, glass or porcelain vessels can be employed. The use of platinum has prevailed in practice by reason of the fragility of glass and porcelain apparatus, but the employment of it is costly, although the researches of Messrs. Faure and Kessler have reduced to a minimum the quantity of this metal brought into play. Moreover, it is found that the sulphuric acid always dissolves a small quantity of the metal, so that the apparatus have but a limited duration.

The *Electrician* announces that Mr. Bertram Blount, in order to obviate this inconvenience, proposes to heat the acid to be concentrated by means of a platinum conductor entering the liquid and traversed by an electric current sufficient to raise its temperature to 150° above that of the acid. The latter may therefore be placed in non-metallic vessels, which are no longer subject to breakage, since they do not transmit heat. In order to be concentrated from 60° to 66° B., 117 kilogrammes of acid require 32,679 heat units, say 44·2 horse hour. It results from these figures that electric concentration requires an output of fuel five times greater than direct condensation; but by reason of the advantages enumerated above, it is possible that the final cost of the operation may, notwithstanding, be less than by direct heating, especially in the case of a motive power produced by waterfalls.

Mr. Blount recommends the use of a platinum wire 5 millimeters in diameter and 77 centimeters in length heated to 480° C. by a 364 ampere current. Such a wire would be able to concentrate 24 kilogrammes of acid in five hours. The maximum difference of potential would be 5 volts. It seems insufficient to cause a sensible loss of platinum through electrolysis, and any such loss might be completely eliminated by the use of alternating currents.

Preservation of Fruit with Lime.—More or less attention has been paid for some time past to the subject of the preservation of fruits and roots by means of powdered quicklime. An interesting communication, says *Le Genie Civil*, has recently been made by Mr. Monclar to the Agricultural Society of Albi on the subject of the results of his experiments in this direction. He exhibited in support of his assertions some chasselas grapes which were perfectly preserved, and which were as round and plump as they were on the day that they were gathered. The taste also was the same, except perhaps that it was a little more saccharine. Unfortunately, despite the fact that they had been washed, some traces of lime remained upon a few of the berries. They had remained embedded in the lime for seven months. Mr. Monclar stated that, after they had remained only four or five months therein, a washing caused the whole of the lime to disappear. He added that his grapes had been perfectly preserved during the entire winter for two years. About the middle of March only a tenth were spoiled, and a month later about half of them. In order to have perfect success, it would be prudent not to put off the consumption of the fruit beyond the beginning of March. Mr. Monclar also exhibited some apples that had been preserved in the same way for a long time and that were found to be in a perfect state.

Volatility of Iron.—Some experiments made by Mr. Fleitmann upon the welding of iron with nickel have brought to light some very curious facts as to the volatility of iron and its atomic penetration. In these experiments, the adhesion of the two metals was such that it became impossible to separate them by mechanical action, and a chemical examination demonstrated a true alloyage—an intimate composition, although the welding had been done at a temperature lower by 500° or 600° than the point of fusion.

Other experiments have established the volatility of iron at a cherry-red temperature. Two superposed plates of iron and nickel having been submitted to the same heat, the iron passed over to the nickel in notable quantity without there resulting either welding or adhesion of the surfaces. There formed over the entire plate of nickel an alloy with the iron which, in plates of one millimeter, penetrated to a depth of 0·05 of their thickness and contained on an average 24 per cent of this metal, the proportion being naturally greater at the surface.

An important fact to be noted is that the passage of the iron to the nickel is not reciprocated. While the combination is shown at the surface of the nickel plate by the silvery luster of an iron alloy of 50 per cent of nickel, the iron plate remains intact and preserves the dead appearance that it received from scouring. This penetration of the iron can also be ascertained by the scales.

The volatility of the iron in this particular case still awaits an explanation. It is not known whether it must be attributed to traces of ferric cyanide, chloride or carbide. At all events, the very exceptional weldableness that it shows, as compared with other metals, must depend upon a volatilization partial to a temperature much lower than the point of fusion.

The Natural Varnish of Japan.—The famous varnish so extensively employed by the Japanese for lacquering various articles of furniture and small ware is obtained from a tree known to science as *Rhus vernicifera*. This varnish tree, which is called *urushi-naki* by the Japanese, grows to a height of about thirty feet, and, at the age of forty years, its trunk is forty inches in diameter. It reaches its greatest perfection at its eighteenth year, and then produces its largest yield of lac or varnish. This is obtained by making incisions in the bark in a horizontal direction, an operation that may be performed at any time between April and October. Later in the year the lac is very thick and viscid, so that the collecting of it is attended with much greater difficulty. The lac tapper carries his own peculiar bow-shaped knife, made for this purpose, with which he cuts a 2 millimeter gash in the trunk of the tree and then draws the point of the knife through the cut again in order to remove any chips formed by the first incision. This cut is made low down. On the opposite side of the trunk, a little further up, he makes a second cut, and then on this side again, and so on, until he has made from six to ten such incisions. After he has operated thus upon about a dozen trees, the tapper returns to the first tree and collects the fluid that has oozed from the cuts, and which, at first milky white and thick, becomes, through exposure to the air, first dark brown and finally quite black. This crude lac is called *ki-urushi*. The tree is hacked in this way for from sixty to eighty days, until it dies. It is then cut down, and the wood chopped up and put into hot water, which extracts the last remnant of the liquid, amounting to not more than half a pint. This forms the poorest quality of lac. The lac is purified by filtering it through cotton stuff, grinding on a paint slab, mixing with water, and then evaporating the latter by heat. The finer sorts are bleached in shallow dishes in the sun. The best kind is called *nashyi-urushi*, the poorer kind *henki-urushi*, and the unbleached *jeshime-urushi*. The black varnish, *roiro-urushi*, is made from the crude lac. There are about twenty different kinds in the market, of which the above named are the most used. The operation of varnishing is conducted in a very different manner from what it is with us. The Japanese apply their varnish mostly to woodwork; less frequently to copper and unglazed stoneware and porcelain. When applied directly to tinware, the lacquer does not stick. When applied, the varnishes are generally brilliant black, dark colored, impure vermilion, or impure dark green or dark gray. Pure light colors and white cannot be produced with Japan varnish. The Japanese varnishers prepare their woodwork with the utmost care. The surfaces are smoothed and the chinks filled in with cement. The ground coat is a mixture of the unbleached lac with paste, upon which is laid Japanese paper rubbed smooth with a brush and dried. Afterward, several very thin coats of the same varnish are applied, and each coat, after being well dried, is polished with Japanese carbon. The drying is done in a moist atmosphere, the apparatus used being a tight box whose sides are wet with water. After twenty-four hours one coat is dried, and if the article is to be black, a coat of black varnish (*roiro-urushi*) is applied, but if it is to be gray or gray brown, *jeshime-urushi* is used instead, and if it is to be red, the latter varnish is mixed with vermilion. The appearances of gold and pearl are obtained by mixing real gold dust, or mother-of-pearl dust, with the varnish, whereby a beautiful effect is produced. The article is then dried, rubbed down and polished; and if there are gold, tortoise shell or mother-of-pearl decorations, a coat of azure varnish (*nashyi-urushi*) is applied. In applying their varnishes, the Japanese use broad brushes, the bristles of which are very stiff and inserted in wood, just as the graphite is in our lead pencils. After long use, the bristles get worn short, and the wood is then cut away just as in sharpening a pencil, thus exposing more of the bristles. A very fine piece of work receives eighteen coats. These never fade with time, but rather improve, bear a high temperature, and are totally unaffected by acids, spirits, and the like. The Japanese method is not likely to be introduced into Europe or this country, because of the want of the natural material, which when imported becomes extremely costly, and because the process is indirect and tedious, and, with the high price of labor, would be impracticable.

Antique Bronzing.—The repeated applications to copper or brass of alternate washes of dilute acetic acid and exposure to the fumes of ammonia will give a very antique looking bronze; but a quick method of producing a similar appearance is often desirable. To this effect the articles may be immersed in a solution of one part of perchloride of iron in two parts of water. The tone assumed darkens with the length of the immersion. On another hand, the articles may be boiled in a strong solution of nitrate of copper; or, lastly, they may be immersed in a solution of two ounces of hyposulphite of soda in one pint of water. Washing, drying, and burnishing complete the process.

Mirror Experiments.

Some interesting experiments with a rectangular glass prism are described, says *Nature*, by W. C. Rontgen in *Wiedemann's Annalen*. Those who have tried looking at themselves as reflected by two mirrors, placed at right angles to each other, will remember the amusing effect created by the image, contrary to the usual reflection in a mirror, not being reversed right and left. We can see ourselves "as others see us," also, by looking straight at the surface subtending the right angle of a rectangular prism. Herr Rontgen observes that in no case is the pupil divided into two equal parts by the faintly visible edge of the prism. This is an illustration of the angle between the line of vision and the axis of the eye, which is different in different people. Rectangular prisms can be easily tested for correctness of the angle by observing whether the two images of the cross wires in a telescope, as seen in the two surfaces, coincide. The same test would tell us whether two mirrors are exactly at right angles—a fact which might be usefully applied for testing instruments like Gauss' heliotrope. Such a pair of mirrors, or a rectangular glass prism, give rise to another peculiar phenomenon. If they are rotated about the axis of vision, the image rotates in the same direction with twice the speed. If, therefore, the object, say a cardboard disk with writing on it, rotates twice as quickly as the mirrors or prism, it will appear to stand still. This might be applied to investigate the effects produced upon bodies by rapid rotation. Another peculiarity is that such an instrument will reflect rays falling upon the hypotenuse at any angle up to 45° to the same spot. By rotating such a prism about a line at right angles to its edge and to its hypotenuse the author was enabled to reflect the light from an electric lamp through a distance of 1 km. with ease and certainty.

Sulphonal in the Treatment of Whooping Cough.

The June number of the *Practitioner* contains the following prescription: Sulphonal, one grain; creosote, two minims; sirup of tolu, water, each, two ounces. Two teaspoonfuls of this mixture are to be given every two hours.—*N. Y. Med. Jour.*