a *barrique* of wine holds 227 liters. You buy cloth by the meter, half-meter, and quarter-meter, and the salesman would lift his eyebrows if you asked for 60 or 70 centimeters of ribbon.

The centime is to the American cent as the millimeter is to the inch. It is too small, and everything therefore goes by five centimes, commonly known as a *sou*. The centime does not harmonize with the coins in use.

The millimeter for engineering purposes is very inconvenient. I speak from experience. The natural divisions of the inch into halves, quarters, and eighths do not give us over three decimals; and if into sixteenths—which is a better working size than the millimeter and not very much longer—four decimals, the last being in all cases a 5. With the French system an 18-inch lathe becomes a 225-millimeter H.D.P. lathe; and to form a mental image of the swing a man is compelled to think of a height of 2¼ decimeters from the ways to the center. For very fine measurements the one-thousandth of an inch is in every way as satisfactory as the one-hundredth of a millimeter—I have found it more so—and all natural divisions down to thirty-seconds can be read in thousandths and halves or quarters of thousandths. We are, therefore, getting the benefits of both the natural and decimal divisions, and there seems to be no reason whatever for adopting a different standard unit which is as arbitrary as ours, when we, Anglo-Saxons, hold the controlling interest in the markets of the world.

When it comes to the laboratory, matters are very different, and I will agree that the interrelations of the gramme, the cubic centimeter, and the centiliter are of the greatest utility. For analysis, the milligramme and the centiliter are vastly superior to the English measures; but the quantitative work done in the laboratory in no way influences the weights and measures of the works to which these laboratories are attached.

Let us have the metric system by all means for laboratory work, but not for the vastly greater amount of work which does not require delicate instruments and intricate calculations. We cannot use a microscope on the stars or a telescope on bacteria, nor can we use a reading glass for either. A system which will suit both science and industry has not yet been devised.

If you will expend your spare energy on introducing the centigrade thermometer, killing off antiquated wire gages and the like, you will be working with a better chance of success than by backing a change which is not warranted by necessity, and not demanded by the majority of those who would be affected by the change. It is even opposed by the manufacturers of gages, whom you might expect to find in the forefront of its champions. ALFRED SANG.

Pittsburg, Pa., April 14, 1906.

Wood and Concrete Construction.

To the Editor of the SCIENTIFIC AMERICAN:

When your expert on concrete construction next discusses his specialty, please let him take up the practicability of using concrete or armored concrete in wooden framework. In brief, could it be used in walls between laths and weather boarding? If so used, would it do away with the necessity of rough-boarding? Could it do away with the laths, too? Would the steel bands, screwed or nailed to and between the joists, hold the joists and concrete sufficiently tight to prevent the joists from falling away as they dried out? If practical in walls, would it also do for use in floors, and if so, would it be of enough advantage from a fireproof and noise-deadening standpoint to warrant its use?

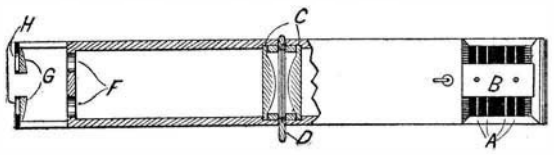
All these questions are asked by a decidedly amateurish delver into the mysteries of how to build the best home at the least expense consistent with good work. MORTON WATKINS.

No. 223 West 106th Street, New York city.

[It would hardly seem desirable to combine concrete construction with wooden framework, notwithstanding that there are apparently no technical difficulties to prevent this. The impracticability of the construction would lie in the fact that while the concrete would, of course, be fireproof and moisture-proof, the woodwork could not be considered to answer these requirements, and, therefore, the resulting structure would correspondingly be only semi-fireproof or semi-impervious to moisture. The woodwork would probably pull away from the concrete as the latter dried out, for not only would the concrete contract, but the wood itself would shrink when the moisture which it had absorbed from the water in the cement had evaporated. This shrinkage both of the wood and of the concrete would probably not be sufficient to cause much damage, and the steel bonds imbedded in the concrete secured to the wood would doubtless hold the structure rigid. If such a construction were used, the builder would probably be able to dispense with rough-boarding, and the resulting partitions and floors would undoubtedly be more nearly soundproof than an ordinary frame construction. It would be far better to build directly of concrete, and probably the expense would be no greater in that case.—ED.]

APPARATUS FOR VIEWING DIFFRACTION COLOR PHOTOGRAPHS.

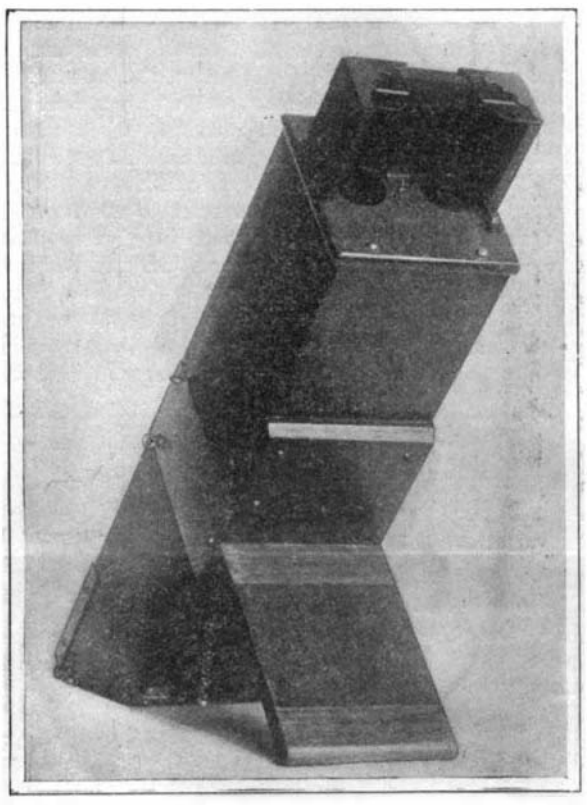
Some seven years ago Prof. R. N. Woods, now of Johns Hopkins University, Baltimore, described his new diffraction process of color photography, which was a novelty on account of its simplicity. The process is fully described in the SCIENTIFIC AMERICAN SUPPLEMENT No. 1227. Until recently no satisfactory instrument was invented for viewing the diffraction color photographs. The improvements in this line



INTERIOR OF THE DIFFRACTION CHROMOSCOPE.

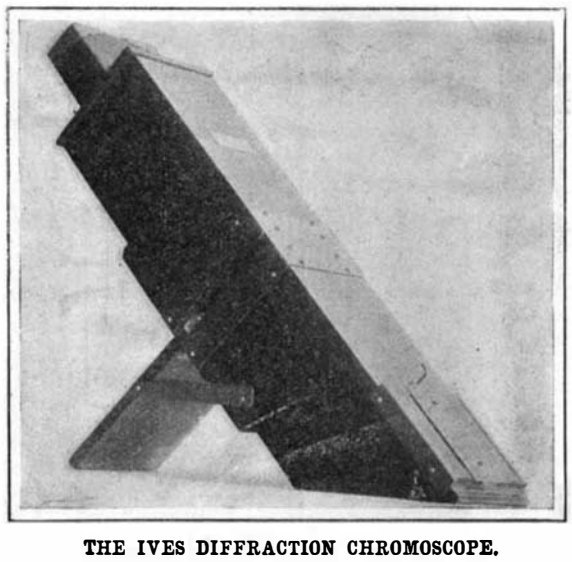
have been made by Mr. Herbert Ives, B.Sc., and Mr. Fred. E. Ives, the inventor of the kromoscop, which greatly simplify the necessary apparatus and considerably reduce its cost. It is called a multiple-slit diffraction chromoscope.

The diffraction color photograph is preferably made on a small plate of glass about the size of a lantern slide for convenience of handling and viewing, although there is no reason why it may not be made larger. The diffraction photograph is a mosaic com-



VIEWING END OF THE DIFFRACTION CHROMOSCOPE.

posite image in regularly spaced microscopic indented lines of three photographic color records, representing the primary colors, red, green, and blue. The red element of the composite color record is made up of 2,406 lines to the inch, the green of 3,000 lines, and the blue of 3,606 lines. The method of manufacture is to print on a bichromatized film respectively one after the other and over each from negatives originally taken in the camera, through screens of red, green, and blue with gratings of lines as above mentioned;



THE IVES DIFFRACTION CHROMOSCOPE.

then developing the composite print in the usual way by hot water. From this plate duplicate impressions can be made by a special method. This duplicate, exactly a counterpart of the original, is bound between two plates of glass, and becomes the medium for producing the colors when viewed in the instrument. If the glass plate is held up to the light behind a sheet of white paper, it appears to be perfectly clear. When put in the instrument the light is dispersed evenly as it passes through the plate, and the colors are reproduced exactly as in nature.

The diffraction chromoscope is essentially a dark box with a slit at each end and lenses in the middle to pick up light from one slit and concentrate it upon the eye at the other slit. If both slits are placed in the axis of the box, and the photograph inserted, it shows no color whatever; but if either slit is displaced in a direction parallel to itself, the direct light is no longer brought to the eye, but at the correct position light bent and dispersed by the microscopic diffraction lines takes its place, and owing to their disposition and distribution the colors seen correspond exactly to the colors of the object photographed. Mr. Ives's diffraction chromoscope has four primary slits instead of one, utilizing first and second order spectra on both sides of the axis, and thereby securing sufficient illumination to permit of use in diffused daylight, which would otherwise be impossible.

In the diagram *A* represents the four slits, with a central plate, *B*. Directly under *B* is a mirror which reflects the light upward through the plano-convex lenses, *C*, about three inches in diameter, also through the photograph, *D*, and openings, *F*, through the eye lenses, *G*, cemented to the inner side of the glass slits, *H*.

The hook shown just above the plate *B* is to hold an incandescent light for artificial illumination.

The upper illustration shows clearly the viewing slits, the hinged brace for supporting the box, and on the side is a pivoted plate which can be swung around by removing the screw eyes, for the purpose of taking out the lenses for cleaning.

The lower illustration shows the slot opening on the side of the box for inserting the picture, the latch for locking the supporting brace, the plate and slits at the bottom, and the hook for locking the hinged mirror. By releasing the hook the mirror can be folded back on the box to be cleaned.

By using four primary slits in the bottom, a greater quantity of light is admitted, giving correspondingly a more brilliant illumination of the image than would be the case if but one slit was used.

Altogether, it is about the simplest natural color reproducing apparatus yet devised, not liable to get out of order. It is calculated to excite wonder and astonishment to those unfamiliar with the optical principles involved, for from an apparently invisible picture without color is reproduced one perfect in color. Mr. Ives has devised special cameras for producing the original negatives.

The Current Supplement.

The current SUPPLEMENT, No. 1587, has for its first-page article two views of the Brunnen-Morschach Alpine railway. "Some Practical Experiences with Steam Turbines" is by C. E. Stanton, and will be welcomed by all engineers. "Reservoir, Fountain, and Stylographic Pens" is a continuation of a valuable series. "Cement Materials and Industry of the United States" is by Edwin C. Eckel. "Electricity in the Home" is a finely illustrated article showing novel electrical contrivances. "Surveying on the Farm" is a valuable article. The Science, Electrical, and Engineering Notes will be found in their accustomed places.

Lower Foreign Postal Rates.

The Congress of the International Postal Union, which has been in session at Rome, practically completed its labors on May 22. The Congress has inaugurated several changes which directly affect the public, and the most important of these is the reduction of the rates of foreign postage for heavy letters. Not only has the unit of weight been raised from 15 to 20 grammes, but the postage has been decreased as well from 5 cents to 3 cents for each unit of weight in addition to that constituting the first charge.

As the Anglo-Saxon countries do not use the decimal system, these changes will be even more favorable to them than to those which use the system, for the British delegates succeeded in obtaining the ounce as the unit equivalent to 20 grammes, while as a matter of fact an ounce is in excess of 28 grammes. Unfortunately, the British and Japanese proposals for a reduction of the initial rate to 4 cents failed. Universal penny postage advocated by New Zealand was not considered practicable. Other important changes were instituted relative to the internationalization of the right to use the left-hand portion of the address side of picture post cards for writing other than the address, and the use of post cards having an attached reply coupon.

The manufacture of cement in the United States continues to make remarkable progress. Whereas in 1890 there were sixteen factories, producing annually 335,000 barrels of Portland cement, there were, in 1905, eighty-two plants, with an estimated annual output of 31,000,000 barrels. The manufacture has increased about a hundredfold in sixteen years, for in 1889 the total production was 300,000 barrels. Since the great extension of the use of this material, the amount of natural cement produced in America has rapidly declined.