on the screen, a stronger light is required for the reflecting lantern than for the ordinary instrument. In the present case the illumination of the writing was effected by means of two powerful calcium lights contained within the lantern.

A watch placed in the instrument and reflected on a finely ground glass screen leads the spectator to believe that he has suddenly come in contact with the city hall clock. The pores of the skin on the cheek or hand are shown with an unpleasantly magnified faithfulness, and to see the face of your dearest friend through the megascope almost moves you to tears, under the false impression that he has been riddled with bullets. A piece of writing which to the naked eye, or even under a strong magnifying glass, appeared as if each letter was made with simply one stroke of the pen, on being placed in the lantern was easily dissected. The work of the skilled penman in "painting" the letters was laid bare. The ragged edges where the heavy shading began and ended were as plain as were the letters themselves. Defects in the paper, though never so invented a form of spectroscope which enables the experi- ing Heidelberg a very attractive place to spend the summer. slight, by erasure or otherwise, and even the texture of the menter to study not only the rays of luminous gases, but paper itself, were presented as clear as sunlight.

----PROGRESS IN SPECTROSCOPY.

It is now seven or eight years since Professor J. W. Draper demonstrated the fallacy of the popular notion that the heating power of the sun's rays varied with their color, by showing the relatively high temperature of the red end of the spectrum to be wholly due to the unequal distribution of the ether waves by the prism. In other words, the "Matterhorn of Heat" (as Professor Tyndall styled it), which culminates just below the red of the spectrum, is an accident of the prism, and not due to any superior heating power of the rays of low refrangibility-a lesson, by the way, which too many of our text book writers have failed to learn.

In the July number of the American Journal of Science and Arts, Professor Draper similarly disproves the notion that the yellow portion of the spectrum surpasses the rest in lumi- studies in older or better endowed institutions. Some of our ing German (in Hanover) if the student is not already quite nous power. As he had already shown that the supposed wealthy colleges furnish their brightest and most promising superior actinic power of the violet end of the spectrum is due not to any preponderance of chemical power in rays of years longer. The advantages of taking a post graduate, tour select, if possible, a German who does not speak Enghigh refrangibility, but to a peculiar susceptibility of the course abroad are quite numerous, but we can only briefly lish. salts of silver to them, these experiments complete the refer to them, without enlarging upon details. The benefits demonstration of his opinion that there is no inherent differ- of travel, the change of air and scene, the opportunity of per- in most of the German laboratories, especially Heidelberg ence in the light, heat, and chemical power of the different fecting one's knowledge of a foreign tongue, are incidental rays. The different colors are equally warm and equally but not unworthy incentives. To learn the methods of teachluminous, and though acting on different substances, are of ing in vogue there, to be raised out of the old ruts into which equal chemical power.

with a new form of spectrometer invented by himself, the who have built up the science, and to feel the inspiration of function of which is the measurement of the intensity or their presence, to work side by side with these men, and brilliancy of light waves of different lengths.

becomes invisible in the presence of another light about side of the world renowned Bunsen, each step brightened by sixty-four times more brilliant, and is constructed as follows: his genial smile, or to be directed in one's investigations by Remove from the common three-tubed spectroscope its scale the celebrated Hofmann or Kolbe, to enjoy the acquaintance tube, and place against the aperture into which it was screwed a piece of ordinary glass ground on both sides. In front of this arrange an ordinary gas-light, attached to study chemistry and its allied sciences, mineralogy and phya flexible tube, so that its distance from the ground glass may be varied at pleasure. This extraneous light is called, his time. To such we would offer a few words of advice. from the function it has to discharge, the extinguishing light. The science of chemistry as studied there may be divided On looking through the telescope tube the field of view will be uniformly illuminated, this being the use of the ground glass. The brilliancy of the field depends on the distance of the gaslight, according to the ordinary photometric law.

extinguishing flame be at a suitable distance, the whole thoroughly his methods of analysis; at the latter place Bunspectrum is visible on the illuminated field. As that distance is shortened, first the violet and then the other more refrangible colors in their descending order disappear, and at reactions, as well as the methods of separating and purifying length in the steadily increasing effulgence the red alone the rarer metals, cerium, lanthanum, didymum, the metals remains. The yellow never stands out conspicuously, as of the platinum group, selenium, thallium, and other interit should were it the brightest of the rays, or even the brightest portion of the prismatic spectrum. The red is plainly perceptible long after the yellow has been extinguished.

It is proper to note that these results were obtained, first, with the apparatus above described, using the spectrum of the luminous flame of a Bunsen burner and an extinguishing | teacher. From experience the writer can say that no man's gas flame, and afterward were verified by ingenious contrivances employing sunlight both for the spectrum and the ex- sen in his quaint old laboratory in picturesque little Heideltinguishing light. Prisms of different kinds of glass and berg. other transparent substances were also tried, and in all cases the extinction began in the violet and ended in the red. The ber of laboratories from which to select. The beginner, who sons, irrespective of age or the condition of their sight, the compounds, will find what he requires in nearly any of the capacity to see color being normal. No opportunity offered larger universities. Berlin and Strassburg are both highly for testing in a case of color blindness. Thus it appears that, in the prismatic spectrum, the yellow is not the brightest color, brilliancy as well as by other causes. Neither Berlin nor Strassburg is a healthy temperature increasing continuously toward the red. The question at once arises: Is the observed effect due to any to hear Prof. A. W. Hofmann's excellent lectures upon or- 2. The possession by the applicant of a foreign patent superior light power in the red rays, or, as in the case of ganic chemistry it is necessary to spend the summer in prior in date to the unexpired American patent does not heat, to the circumstance that the prism throws a relatively Berlin. larger portion of the ether-waves upon a given space in that part of the spectrum? Observation with the grating or diffraction spectrum supplies the answer. In this spectrum tensity they must obviously appear and disappeartogether.

object itself, and as the reflected rays from the object appear | tube could be set in any required angular position, Proplane side of the grating reflected its light down the tele- but little attention from the professors. scope tube. In this, as in the former case, the spectrum was seen in the midst of a field of light, the intensity of fessor Draper was naturally delighted to find that, as the disappeared at the same moment; and on diminishing the enjoy the advantages of both at the same time. illumination, all the colors came into view apparently at gas-light. Hence the conclusion that, other things equal, all light rays of whatever color are equally luminous.

> For another important advance in spectroscopy we are also those emitted by incandescent solids and liquids, and to measure the relative intensities of the different physical rays. By a long series of measurements with this instrument, employing substances differing widely in physical and chemical properties, Dr. Jacques has determined their molecular weight and arrived at important conclusions as evidences of the correctness of the English astronomer's opinion that all matter is essentially one, the observed differences arising from differences in molecular structure.

WHERE TO STUDY CHEMISTRY IN GERMANY.

uated in the chemical department of any of our scientific ingraduates with the means to continue their studies for three a student is too liable to sink, to make the acquaintance of The later researches of Professor Draper have been made, other rising scientists, to come into contact with the men seek to learn by daily observation the secret of their success, It depends on the well known optical fact that a light are advantages not easily over-estimated. To work by the of Hübner and Fittig, are no small favors.

When a student has made up his mind to go abroad to sics, he is often at a loss where to go, or how best to employ into three divisions, inorganic, organic, and technical or applied chemistry. As the student ought to perfect himself in the first named before taking up the two other branches, he will do well to first direct his footsteps to Wiesbaden or to If, when studying a prismatic or dispersion spectrum, the Heidelberg. At the former place Fresenius teaches most sen teaches his methods of analysis, including the analysis of water and gas, the use of the spectroscope and his flame esting bodies, by methods peculiarly his own. The wellknown perfection of all Bunsen's methods, his great skill and dexterity of manipulation, his ingenious devices, and the great simplicity of the man as well as of his methods, recommend him especially to any one who is fitting himself for a education is complete without spending one term with Bun-

The student of organic chemistry has a much larger num-

tion to the fatty bodies. Thus a man who has already sefessor Draper put in the place of its prism a glass grating | lected his subject will select his professor accordingly. A inclined at forty-five degrees to rays coming through the slit, man in search of a subject, and wishing to receive a large the ruled side next the slit. Now, when the extinguishing amount of personal attention, will not regret having begun flame was properly placed before the ground glass, the his studies at Berlin. At Leipsic and Bonn the student gets

For technical chemistry there are a large number of polytechnic schools in all parts of Europe. One of the best of which could be varied at will. With this apparatus Pro- these is at Würzburg, where Rudolph von Wagner is professor; another is at Zurich; a third at Berlin. This does not force of the extinguishing illumination increased, all the exhaust our list, but we mention these because at each of the colored spaces yielded apparently in an equal manner and above cities there are excellent universities, and a student may

As most students of chemistry will wish to hear a few lecthe same instant. This with sunlight the same as with tures on mineralogy we may state that no better professor can be found than Rosenbusch at Heidelberg. During the summer crystallography is very carefully taught at the same place by Prof. H. Kopp, while Prof. Quincke lectures on indebted to Dr. Wm. N. Jacques, of Baltimore, who has electricity and magnetism, and Prof. Fitzer on botany, mak-Prof. Groth at Strassburg and Klein at Göttingen are also distinguished mineralogists.

Each of the above mentioned universities, of course, has its own professor of physics, the most celebrated being Helmholz and Kirchhoff at Berlin. The chemist, however, finds better facilities for the study of physics in Paris than elsewhere. The laboratory of Prof. Desains in the Sorbonne to the structure of their molecules. By processes totally dif- is fitted up with the best apparatus, and students may spend ferent from those of Mr. Lockyer, Dr. Jacques finds strong from four to eight hours per week there at the nominal charge of \$4 per year.

In the German universities the division of time is quite unlike that in our colleges. The year is divided into two terms, called "semesters," one extending from November 1st to March 1st, the other from May 1st to August 10th, separated by long vacations. The student who leaves home It has become customary for young men who have grad- in June may arrange to hear a few lectures in the summer semester at Heidelberg, in order to accustom the ear to the stitutions to turn their steps Eastward, so as to continue their language. The long autumn vacation can be used for studyproficient therein, or for foot tours through Switzerland, the Black Forests, Tyrol, or Thuringia. As companion on a foot

> Owing to the large number of English speaking students and Bonn, an American has but little opportunity to practice speaking German. For this reason some prefer to spend a term at some less noted university, like Breslau or Tübingen.

> An American can enter any German university upon showing his passport and paying a small fee. At Berlin men over 30 years of age cannot be matriculated, but can readily obtain a permit to attend lectures and enjoy other privileges of the university. The fees for the laboratory vary from \$20 to \$25 per term. Lectures cost from \$5 to \$10 each per term. The student may select such lectures as best suit his purpose, and pays only for those which he hears. In every respect perfect freedom is allowed the student, in striking contrast to the restrictions imposed in this country.

> > E. J. H.

Recent Decisions Relating to Patents. BY THE COMMISSIONER OF PATENTS.

Mallett v. Cogger.-1. The question whether the embodiment of an invention in a construction capable of use, with out actual practical use, will, of itself, secure to the inventor an indefeasible title, as against other applicants who subsequently invent and properly reduce to practice the same device, is still an unsettled question.

2. If upon the completion and actual use, either in public or in private, of a machine or article of manufacture the in vention embodied therein becomes a successful experiment. so as to entitle the inventor to a patent and to defeat the claim of a subsequent inventor, without further action or diligence on the part of the first inventor, still the invention does not pass absolutely from the domain of experiment until it has been actually used in public. If forgotten before or after such public use, it may be reinvented and patented by a subsequent inventor. If abandoned before such public use, it is an abandoned experiment and may be patented by a subsequent inventor. If abandoned after such public use, it cannot be patented by a subsequent inventor, but becomes

same was true when the effect was viewed by different per- has to learn organic analysis and the preparation of organic keyed to the frames with square keys is not a reduction to Ex parte Bland -1. The present practice of the Patent

recommended for this purpose, nor is Bonn far behind them, so that the student may now allow himself to be influenced with an unexpired patent which shows, but does not claim, and agreeable place of residence in summer, yet in order the subject matter claimed in the application.

3. An applicant's invention must be decided to be patent-The advanced student who wishes to begin a research on a able before his application will be placed in interference with some organic body may choose between Hofmann or Lieberan unexpired patent; but this proceeding is ex parte, and mann in Berlin, Kolbe in Leipsic, Hübner at Göttingen, the colored spaces are arranged uniformly and equably in the Fittig at Strassburg, Bayer at Munich, Meyer in Zurich, does not bind the grantee of the unexpired patent. order of their wave lengths, and if they are of equal in- Kekule at Bonn, or Wiselcenius at Würzburg. The first 4. Priority of date of an English patent raises no prementioned is to be preferred for a research upon the so-called sumption of priority of invention in favor of an application Having modified the common spectroscope by taking aromatic group; the second for colors and dyes; the last by the patentee, claiming the same device, as against an unaway its dark box, so that the slit tube and the telescope | named, as well as Prof. Ad. Wurz in Paris, devote their atten- | expired American patent.

exempt his application from such an interference.

Office permits an application to be placed in interference