Cloth on the Execution of Matthew Henderson,"—Henderson being a footman executed the preceding month for the murder of his mistress under peculiarly aggravating circumstances. In all of Fielding's writings, hardly a finer specimen can be found of the irony in which he excelled than in this essay, which will be sought for in vain in editions of his so-called complete works. This meagerness of selection is even worse in the case of "The Jacobite Journal," which was published weekly from December 5, 1747, to November 5, 1748. Of the fifty numbers belonging to it, two only can be found in any of the editions of Fielding's works.

It is certainly full time that everything produced by the first great English novelist should be gathered together and put where every man who wishes it can find it. A critical edition of Fielding's writings, in which every change of text made by the author during his life-time should be noted, would be nothing more than a just recognition of his claims as a classic. This may be too much to expect. But there is surely no reason, either literary or pecuniary, why we should be deprived of the possession of his complete works.

T. R. Lounsbury.

Trades-Unions.

I HAVE read with much interest the several chapters of "The Bread-Winners," as also the correspondence in "Open Letters" of the October magazine.

While I make no pretensions to an intimate knowledge of the methods advocated and pursued by trades-unions, yet I cannot help feeling that the trades-unionists have been misrepresented by the author of "The Bread-Winners."

The late unsuccessful strike of the telegraph operators was an ineffectual protest of underpaid labor against a gigantic and heartless corporation. So far from its being started by a "few conspirators whose vanity and arrogance blinded them to the plainest considerations of common sense," it was a national movement, advocated by nine-tenths of the operators, and had the sympathy of the vast majority of the American people, and which was deplorable only in its fruitlessness.

The members of trades-unions do not surrender their individuality, nor do they follow blindly the dictates of their leaders. They are principally intelligent and honorable citizens. Of course, it will be admitted by all that there is more or less destruction of property, etc., in most strikes. But the respectable should not be held accountable for the ill deeds of the rascals; the many should not be judged by the few. Labor, of course, has a perfect right to demand the highest price it can get, and so long as it leaves unmolested the property of others, it is entitled to the respect of the people.

Railroads, telegraph companies, and the like, as a general thing, pay immense dividends, the funds for which come out of the pockets of the people. The corporations force labor down to the barest minimum on which it can subsist, and when the laborers, like Oliver Twist, ask for more, the cry is raised that the security of society is threatened; and as in the novel, the request for more is denied, and the workingmen are put upon a bread-and-water diet for their impudence. There is, I am happy to say, a growing sentiment in favor of the Government's taking control of the railroads and telegraph wires. This done, transportation and telegraphing will be immeasurably cheapened, and labor in these departments will receive its full and natural reward.

The author of "The Bread-Winners" should bear in mind that "In union is strength" is as good a motto for laborers as for legislators. Men linked together for a common object, advising and counseling among themselves and accepting the views of a majority of their number, can always be more certain of success than if every one followed a policy of his own. Collectively, the workingmen can accomplish wonders; individually, they can do nothing.

J. H. Loomis.

Petrography and the Microscope.

I TAKE pleasure in responding to your request for a brief description of one of the youngest of the sciences —petrography, or lithology, a science the delicacy and elegance of which, as well as its great economic importance, entitle it to rank with its sister science, spectroscopy, as one of the marvels of the age. The study is still in its infancy, being little more than twenty years old, and but few popular accounts of it have yet been written. The tool of the petrographer is the polarizing microscope, and his field of work the investigation of the intimate interior structure of rocks. The folk-lore tales have become true: we have magicians now who can look through the solid rock and tell you what lies hidden in its heart. Extremes meet in the new science; the rich pencilings of the spectroscope tell the atomic story of a star millions of miles away, and the translucence of the rock-shaving, as seen under the microscope, invites the eye to witness the solidifications and crystallizations that befell a million years ago.

To see what a vast new field of investigation is opened up, consider the old methods of identifying the mineral components of fine-grained and minutely crystalline rocks. These methods were two, the hand lens and chemical analysis, both rude and imperfect in the case of most rocks. To offer a chemical analysis of certain aggregations of minute minerals, and call it a complete account of the specimen, would be very much like trying to get an idea of St. Mark's in Venice from its ruins — reconstructing in the mind the infinite complexity of its patterns of colored marbles out of the heaps of dust and *débris* into which they had been shattered. For many rocks, differing widely in minute structure and mineral composition, yield identical results under mere chemical analysis, and there are numerous little interchanges in the composition and molecular arrangement of rock-aggregates which chemistry could never discover. There are building-stones which undergo disintegration when they should not, and there are rocks which ought to contain metalliferous lodes, but do not. Micro-lithology ought in time to solve these puzzles, and undoubtedly will do so. An instance of its practical application has come under my notice, *i. e.*, a microscopical study, by Dr. M. E. Wadsworth of Harvard College, of the iron ore, or peridotite, of Iron Mine Hill, Cumberland, Rhode Island, in which the metallurgical problems presented to the iron-master by that ore are for the first time practically solved.

It is difficult to give an untechnical explanation of the methods of the science; but a general idea may be given of the working of the instrument and of the preparation of the rock-slices.

A polarizing microscope consists of an ordinary compound microscope, in which two Nicol's prisms of Iceland spar are placed at a certain distance apart. One of these prisms polarizes the light, and the other shows you that it is polarized. Theoretically, common light is looked upon as vibrations of the particles of attenuated matter, called ether, with which all space is supposed to be filled. While the motion is propagated directly forward in straight lines, the particles of the ether are supposed to vibrate in every direction at right angles to the propagated motion. Now, if in any way these vibrations can be forced to confine themselves to one direction only, the light thus modified is said to be polarized. To make the meaning clearer, let the reader imagine a cord tightly drawn between two points, one of which shall represent the source of light and the other the eye. Let that cord be struck at the first end, the motion will be carried forward to the other, but the particles of the cord will of themselves only vibrate from side to side. Now imagine that the cord has been so struck that it shall oscillate outward in every direction about its former place of rest, as water does about the point where a stone falls on it, and it will yield us an imperfect idea of the vibrations of common light. Now imagine this cord struck so that it will vibrate from side to side only, and we have the vibrations as in polarized light.

When a ray of common light enters, in certain directions, a crystal of carbonate of lime (Iceland spar), it is separated into two parts, and in both of these parts the light is polarized; but when they leave the crystal they unite again, forming common light. If, then, by any means, we can get rid of one of the portions into which the light-ray has been divided during the passage through the crystal, the other portion on its exit will remain polarized.

Nicol found that by cleaving a crystal of Iceland spar into proper shape, then sawing it diagonally through its longest direction and cementing the parts together again by Canada (fir) balsam, the balsam prevented one of the two portions of the light from passing through the crystal, but did not interfere with the other portion. These calcite prisms, known from their inventor as Nicols, usually have at the end a rhombic outline; and when the shorter diagonals of the two prisms are parallel, the field of the microscope is illumined; but when the diagonals are *crossed* at right angles, the field is dark. When minerals or glassy substances are placed between the crossed Nicols, they act differently upon it, according to the system in which they crystallize. Glasses and minerals belonging to the cubic (isometric) systems, like common salt, do not affect the light at all; but those belonging to the other crystallographic systems present more or less beautiful and brilliant colors, showing oftentimes the most surprising contrasts and effects, such as no art can imitate.

Interpose a strip of porphyritic pitchstone between the Nicols: the matrix, or mass, of the pitchstone itself is glassy, and therefore remains dark, but the feldspar or mica crystals imbedded in it instantly gleam out in the most brilliant colors in the polarized light.

In practical work, the lithologist uses his microscope, sometimes without any Nicol, sometimes with one only, and then again with both, according to the problem he has before him.

Besides the Nicols, there are other appliances used, like quartz, calcite, gypsum, and mica plates, specially constructed thermometers for measuring the expansion by heat of the liquids and gases inclosed in the crystals, etc., which the limits of this article prevent our describing. Petrography, as at present studied, enables one to ascertain the origin of a rock, the various vicissitudes its component parts have undergone, their relations to one another,—in short, it gives a more or less complete history of the rock, while it throws a flood of light upon points previously obscure. It gives information regarding the decay of building-stones, and points out the injurious materials therein. It determines the minerals in the rocks, and, however minute they may be, yields them up to chemical analysis. It enables one to read the history of those celestial visitants, the meteorites, as plainly as the spectroscope does the stars.

The rock-sections are prepared by first striking off a thin flake of the rock as big as the thumb-nail, and then grinding this flake down on a wheel with crushed corundum and emery till it is so thin as to be transparent, or at least translucent,—so thin, in fact, that a couple of turns more would entirely remove it from the little glass slide to which it is attached. When necessary, the slices are cut on the treadle machine by means of a soft iron disk charged with diamond dust. After being attached by its smooth side to the glass slide (Canada balsam being used to cement it), the section is then made still thinner by grinding down the other side; next, another glass is cemented to that other side, and a number is scratched on the glass with a diamond, a paper label being usually added for convenience of reference. All the processes are extremely delicate and elaborate.

The most eminent students of petrography are found in Germany. Rosenbusch, Zirkel, Cohen, and Von Lasaulx are among the great names there. The first-named seems just now to stand forth most prominent. Zirkel came over to this country in 1876 by invitation of the United States Geological Survey, and accomplished the first extensive micro-lithological work done in America. He examined twenty-five hundred thin sections, and the results of his labors are embodied in his report on "Microscopic Petrography," containing twelve beautiful colored plates. The late Dr. George W. Hawes of the National Museum, and Dr. M. E. Wadsworth, now professor of petrography in the Agassiz Museum at Harvard, were among the first American workers in the new science—the latter having taught the first advanced course in modern petrography ever given in this country. Harvard is the only American college employing a professor of petrography exclusively, and the present chair is maintained by the generosity of Professor J. D. Whitney, the geologist. There are already over two thousand mounted rock-sections in the lithological collection at Harvard. The only text-book of lithology in English written in the modern system is the inaccurate one of Frank Rutley.

Wm. Sloane Kennedy.