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JOSEPH HENRY AND THE ELECTRIC TELEGRAPH.

It is not often that the discoverer of great scientific truths obtains in his lifetime the full measure of credit that properly belongs to him; and the reason for this injustice is to be found in the abstruse and unintelligible nature of the researches which early explorers have to make, often carrying them beyond the reach of the popular mind; but the practical man who applies the discoveries, and "out of the nettle danger plucks the flower safety," generally runs away with all the honor, and, surrounded by a halo of glory, amid the roar of cannon and the applause of the multitude, is pronounced to be the real benefactor of his race. The present moment is perhaps an opportune one for us to consider the claims of a man still living to a large share in whatever of value and honor there may be attached to the invention of the magnetic telegraph.

If the telegraph were an estate, subject to partition by order of the Court, the number of heirs whose claims would have to be considered would be found to be very great.

The Court would have to go back to the ancient Greeks, who, 600 years before the Christian era, discovered the peculiar property of amber, elektron, from which the whole science of electricity derives its name. Then the claims of the heirs of Gilbert, who in 1600, in England, added a long list of electrical bodies to those previously known, and was one of the greatest philosophers of his own or of any age, would have to receive due attention. And thus by degrees we should pass by Franklin, Galvani, Volta, Davy, Oersted, Seebeck, Ampère, Arago, Ohm, Schweiggers, Sturgeon, Wheatstone, Gauss, Weber, Steinheil, Faraday, Daniell, Grove, Jacobi, Nobili, Page, and a good many others, whose claims in a court of justice would have to receive due consideration, and finally we should reach the names of the truly illustrious Americans, Professor Joseph Henry and Professor Samuel F. B. Morse.

We do not propose to trace the history of the telegraph down through all the ages indicated in the imperfect list given above. The story has been repeatedly told, sometimes in a popular way, sometimes in scientific language, and each author has contrived to add something new to the general stock of our knowledge of the subject. In this embarrassment of riches it is not surprising that the popular mind should be a little confused, and that a multitude can always be found to shout for every new pretender, "the king is dead; long live the king!" The whole history of the telegraph could only be written by a scientific man of unusual acquirements. It would involve immense research, profound knowledge of physics, and rare linguistic attainments; and, after the work was done, none but scientific men could understand or appreciate it. A popular story is quite another affair, and narrations of this character are as abundant as the number of advocates who for money, from friendship, or from enthusiasm, have been found to present the claims of their favorites to the consideration of the public. We shall not attempt to write a scientific or a popular history, but confine ourselves to a statement of what Professor Henry has done, without intending to detract from the praise due to anybody else. We feel that justice has never been rendered to Professor Henry, and it is time that the great omission should be supplied. The first essential fact which rendered the electromagnetic telegraph possible was discovered by Oersted, in the winter of 1819-20. Then followed the important contributions of Arago and Ampère in 1820. In 1825 Sturgeon first produced what is properly known as the electromagnet, in the form of a horse-shoe, but the power of this magnet was very slight in consequence of the manner in which he wound the wires, and its chief value was in suggesting a new path for future research.

The next improvement was made by Professor Henry, and this consisted in insulating the conducting wire itself, instead of the rod to be magnetized, and covering the whole surface of the iron with a series of coils in close contact. Henry's magnet was described in Silliman's Journal in 1831; and, in 1832, a mechanical arrangement was put up in the Albany Academy for making signals and sounding a bell through a wire more than a mile in length. Previous to Professor Henry's investigations, the means of developing magnetism in soft iron were imperfectly understood, and no electromagnet, applicable to the telegraph, was known. The particular form of battery adapted to project the current through a long conductor was first pointed out by Henry, and he was the first to magnetize a piece of iron at a distance and to call attention to the fact of the applicability of the experiment to the telegraph. The principles developed by him were applied to render the various machines invented by Gauss, Weber, Steinheil, Wheatstone, and Morse effective at a distance. The galvanometer now employed for transmitting messages by the Atlantic Cable, is about as close an imitation of the apparatus devised by Henry for ringing a bell, in the Albany Academy in 1832, as the different circumstances of the cases require. And the electromagnet, now used for the telegraph all over the world, is the one invented and described by Henry in 1831. Whether the instrument used be a semaphore, that is, carrying evanescent signals, or a telegraph making a permanent record, the engine for driving the works by aid of the battery is the electromagnet invented by Professor Henry.

The magnet is the power behind the throne; it drives the electric clock and the magneto-electric machine; it frightens away burglars, gives the alarm of fire, warns of danger, explodes the mine, transmits signals, sends messages by the needle, and makes permanent record by the telegraph.

The philosopher who discovered the scientific principles upon which the electromagnet is founded, and who invented the form of apparatus best adapted to demonstrate these principles, must be regarded by the whole world as having made the chief contribution towards the application of electromagnetism to the various wants of man. This philosopher was Joseph Henry, and to him was accorded the homage of the whole scientific world for his magnificent researches.

While we very properly render great credit to the inventors of the various forms of apparatus now commonly called telegraphs, let us not forget the man who disclosed to us the power with which to drive not only this but every other magneto-electric machine. All honor to the great American philosopher, Joseph Henry!

EXTRACTING GOLD FROM WASHINGS AND POOR ORES.

Our Australian advices of the latest date report the discovery of an agent for extracting the ultimate residue of gold from ores and water, after the ordinary means of search and smelting have done their best. The new process is so important to the miner, and so simple in preparation and application that we look eagerly for the result of a trial of it in some of the rich gold fields with which our country abounds. The matter is deserving serious consideration, the more so that we recently read a statement from California that in the earlier years of gold mining in that State, not less than fifty per cent of the gold was left unresolved in the refuse earth.

The new process is one of amalgamation, and consists in treating the ore or refuse with a new compound, which has been patented in Australia by two gentlemen from Ballarat, and is called by them saccharate of mercury. This preparation consists of mercury triturated with sugar, until an impalpable powder is formed, and the metal cannot be discerned in it except by using a powerful magnifying glass. The powder is dry, and is to be mixed with the so called exhausted earth, the water, or the washings of the quartz-crushing machines. Our informants tell us that it will attract and attach to itself all the gold disseminated in the earth or held in suspension in the liquid. The usual system of amalgamation can be carried on simultaneously with the use of the new preparation as an accelerator. The ease with which the saccharate can be prepared, and its comparative cheapness render it unnecessary for us to say more under this head, and we proceed to give the results of a few experiments with it in Australia.

The inventors tested, on Sept. 13, 1870, 6 pounds of tailings which contained gold equal to 25 ounces 16 pennyweights, and on October 10, of the same year, 6 pounds of tailings yielded gold at the rate of 9 ounces 4 pennyweights, to the ton. One pound of gem sand, from New South Wales, contained gold equivalent to 49 ounces 15 pennyweights to the ton; and the banks, for which the test was made, have certified to the accuracy of the figures. A sample of pannings showed a proportion of 515 ounces 14 pennyweights to the ton; but we think the large figure shows that the case was an exceptional one.

A valuable part of the new discoveries is the production of a rotatory machine, to be used for new ores wherein the gold exists in the proportion of at least one ounce to the ton. Half a pound of the saccharate, costing fifty cents, is sufficient for the treatment of a ton of ore. The Melbourne Leader rightly says that, if these experiences be indications of the average conditions of ores and washings when thrown aside after treatment by ordinary methods, gold mining is about "to commence a second infancy."

Our miners in the West will, no doubt, soon give their experiences with saccharate of mercury, and a new impulse to a most important industry will be the result.

EFFECT OF CORPORATION EMPLOYMENT ON WORKMEN.

In passing various points in our city where gangs of work men are employed upon public works, and witnessing the indolent, timeserving manner in which their labor is performed, we have been led to consider the effect of this kind of employment upon the workmen themselves. There is no doubt that its influence is hurtful to the moral character of the men, and that as "a little leaven leaveneth the whole lump," the demoralizing effect extends more or less through the entire class of those who get their living by the labor of their hands.

In the first place these city employes are obliged to serve a set of political masters, who, so long as the men vote right (that is, in support of the party in power), will not scrutinize too closely the quality or quantity of their work. The men, knowing this, not only slight their work, but "soldier" as much as possible. The proportion of citizens in any community whose standard of honesty is high enough to impel them faithfully to labor the entire time they are paid for, without watching, is not large. Time is so indefinite a thing to the majority of mankind, that its waste has always been a source of regret to thinking minds. Many a man who would shrink from purloining a dollar, will yet rob his employer of hours of service, and take his weekly wages without a qualm of conscience.

We believe that a total change, wherever practicable, from the system of employment by the day, week, month, or year, to that of payment for the amount of work accomplished, commonly called "piecework," would result in a marked elevation in the moral tone of the community at large; and that while those who labor would ultimately earn more than they do at present, employers could in many cases conduct their business with greater profit.

We have in mind an instance in which a business was changed from a barely living concern into a money-making enterprise by the adoption of this system under a carefully considered scale of prices; and though the workmen at first loudly protested against the change, and were with difficulty prevailed upon to accept it, they have earned so much more by piecework than they did previously, that none of them would now return from choice to the old system.

There is another effect produced by this system of "piecework" worthy of notice. There is less of the feeling of abjectness on the part of the employed. They are not so strictly confined to hours, in coming to and going from work. If a man chances, from unavoidable circumstances, to be a trifle late in the morning, he, if disposed, may apply himself more vigorously, or stay a little later at night and recover the loss. If he does not feel well, he can favor himself a little without fear that the "boss" will be at his heels with a reprimand. He feels more manly and independent, and holds his head higher.

In city employment we find the extreme reverse of all this. The men, feeling themselves the slaves of a political ring, avail themselves of every opportunity to rob the taxpayers of service. They get into a morally unhealthy state—so much so that they will not tolerate among them a man who tries to do a fair day's work. There have been instances of men being assailed by vituperative language, for honest service, and even of personal assault upon such as felt impelled to disregard warnings of this kind.

The only remedy for this state of things we can at present suggest, is the performance of all city work by contract, so far as is practicable. This in connection with the principle of paying men by the contractor according to the amount of work accomplished whenever it is possible to do so, would in a great measure put an end to timeserving, and at once elevate the character of the employes.

LIGHTNING RODS.

The hypothesis that the phenomena of electricity depend upon the existence of positive and negative imponderable fluids has served a purpose in speaking and writing upon the subject. In the absence of positive knowledge, it is perhaps as well to speak of this mysterious force as a fluid, and as such we shall deal with it in the present article. In this view, a conducting rod may be compared to a viaduct over or through which the current passes. Whether over or through has been a question upon which theorists have widely differed, and the question is of no practical importance whatever as bearing upon the construction of lightning rods. The law that the resistances of conductors vary as the areas of their cross sections is, however, well established, and it follows that the capacities of rods to harmlessly conduct away lightning discharges are—if made of the same materials—as their cross sections. The shape of a rod, if of uniform size throughout its length, does not affect its conducting power.

The question as to how large the rods ought to be, and at what distance apart they ought to be placed, involves a definite knowledge of the maximum amount of electricity that is ever discharged to or from the earth at any one point, an amount obviously indeterminate. To guide us, therefore, upon this point, we have only the results of accumulated experience. This has shown that comparative safety can be secured by rods one inch in diameter, having a metallic connection with the moist earth equal in area to that of the surface protected, and that rods having the above dimensions and the above metallic connections with the earth, may be relied upon to shield, from disruptive discharges, circular areas of roof having radii equal to twice the height the conductors are elevated above the structures to which they are attached.

It must also be borne in mind that the metal work upon the surfaces of buildings should be connected with the principal conductor, by rods of ample size, and further, that the

power of any conductor is only the power of its smallest part. Perfect safety demands that the capacity should be maintained at its maximum throughout the system.

Leaving to individual judgment the best method of fulfilling these conditions, we may say that they are seldom complied with, and that they are found lacking in every instance where damage is occasioned by the lightning stroke. Such a system as we have described entails so much expense, that remote though possible contingencies are accepted rather than to incur the outlay. If connection of a rod with the earth be broken it is useless, and in many cases is indirectly a source of danger.

Rods do not attract lightning from the clouds; they only dispose of it when it comes within the sphere of their influence.

#### MASSACHUSETTS SHOEMAKERS ON THE TAXES.

A protest has been issued, signed by a large number of the leading shoe manufacturers of Massachusetts, including Lynn, Boston, Haverhill, Marblehead, Worcester, and Beverly, against the tariff and other taxes upon leather and shoe findings.

The protestants state that of late years there has been an increase of twenty-five per cent in the productive power of a given amount of capital and labor, due to the good effects of improved machinery and processes; but this gain is completely nullified by the taxes, so that they are unable to furnish boots and shoes any cheaper than formerly.

They further allege that, while the revenue, received by the government from all the taxes on leather and products used in their business, amounts to only three millions five hundred thousand dollars, the actual tax imposed upon the manufacturers of boots and shoes is eighteen millions of dollars per annum.

"The legislation of our own country has driven our products from the markets of Canada, Mexico, the West Indies, and South America, which we had enjoyed for more than a century. It has transferred the manufacture of our products to a great degree to Canada, where it enjoys greater advantages, and is subject to fewer impediments, in the prosecution of business. Thus, our country has, to this extent, lost the benefits of this industry, and given her wealth to others, though a system of tariff taxation, professedly framed to foster and encourage American industry, but which expels it from America and increases the wealth of other nations.

"In addition to the direct influences of the tariff upon our production, the system of protective duties indirectly imposes grievous burdens upon it by increasing the cost of our buildings, engines, machinery, tools, and supplies, as well as railroad transportation. It raises the prices of house rent, fuel, food, clothing, and all supplies, so as to render extravagant wages a necessity to our workmen. This apparent increase of wages, however, yields no substantial benefit to our workmen, because it is all consumed in the enhanced cost of living.

"We believe that a entire removal of all protective duties would greatly advance our industry, as we should then have the markets of the world in which to sell our products, thus largely increasing the labor employed and the profits of manufacturing. We, moreover, believe that the enhanced wealth and comfort of our own people, consequent upon a change of system, would be evidenced in an increased consumption of our goods. A reduction in the duties levied upon the articles used in our manufacturing, is demanded by the interests of all capitalists and laborers engaged in the boot and shoe industry.

It is but just and reasonable that the views of representative men in the business should be carefully considered by the next Congress, and proper relief granted. In the value of its product, and the number of hands employed, the boot and shoe interest is larger than any other single industry in the country.

#### COLOSSAL BRONZE BUST OF WASHINGTON IRVING.

It will be gratifying to many of our readers to know that a bust is to be erected to the memory of the great author, in Prospect Park, Brooklyn, and still more, to learn that the work has all been done in this country. Heretofore, nearly all the bronze work erected in the United States has been done in Germany or France. The founderies which we have established within the past few years, render it no longer necessary for our sculptors to send their works abroad; we have skilled artisans equal to any in the world in nearly every department of mechanics.

This colossal bust of Irving was modeled by the well known sculptor, J. Wilson Mac Donald, 161 Fifth Avenue. It is the head and shoulders only, and is many times larger than life. The pedestal, which is of granite, and the head render the whole work fourteen feet high. It is pronounced by the friends and relatives of the great story writer to be an admirable likeness. The bust was cast at the foundry of Maurice J. Power, in East 25th street, in this city, and reflects great credit upon his establishment. The metal is very rich, and the finish quite artistic.

The work is to be unveiled in Prospect Park, the day we go to press, June 24th, with appropriate ceremonies. Henry Ward Beecher is to deliver the oration, and the sculptor is to unveil the bust.

The bronze is erected at the expense of Hon. Demas Barnes, one of Brooklyn's most prominent citizens.

THE writer of the "Card," signed "Fides," in another column, page 14, is known to us to be a responsible person, and the gentleman for whom the situation is wanted has been long and favorably known at this office.

#### SCIENTIFIC INTELLIGENCE.

##### WATERPROOF GLUE.

Ordinary glue can be rendered insoluble in water by adding to the water, with which it is mixed when required for use, a small quantity of bichromate of potash, and exposing the articles to which it is applied to the light. Chromic acid has the property of rendering glue and gelatin insoluble, and, as the operation of heating the glue pot is usually conducted in the light, no special exposure of the articles to which it is attached need be made. It is probable that paper could be rendered impervious to water by pasting the sheets with this prepared glue. The bichromate is said to render rubber particularly hard and unattackable by hot water. The chromated gelatin ought also to be tried on parchment paper, wood, leather, and cloth fabrics. The proportion of bichromate to be taken must be ascertained by experiment; for most purposes one fiftieth of the amount of glue employed will be found to suffice—that is, one pound of dry bichromate of potash to fifty pounds of dry glue.

Many applications of waterproof glue will readily suggest themselves to our readers. The Albert photographic process is founded upon this property of gelatin, and billiard balls, buttons, and ornaments are now largely made of the chromated glue.

##### HOP REFUSE FOR PAPER.

A large paper manufacturer near Marseilles, France, has sent agents to the various hop merchants of the Continent to purchase the waste of hop vines for the purpose of mixing it with other stock as a substitute for wood and straw. The fiber is said to be strong, and well adapted for paper. The process by which the raw material is worked up is kept as a trade secret, but it cannot materially vary from the treatment to which wood and straw are now subjected. As hop raising has now become an important branch of agriculture in Northern New York and Canada, it would be well to take note of the French example and save the refuse for the paper manufacturer. Paper can only be made from waste with profit, and such material as wood, straw, seaweed, grass, cornstalks, hop vines, and the like, naturally fall into the same mill with the rags so long used for this purpose. Cheap paper is associated with cheap books, and the latter with higher civilization and intelligence; therefore we hail with pleasure the introduction of any new material for its manufacture.

[Special Correspondence of the Scientific American.]

#### THE KELLY PATENT EXTENSION CASE.—ADDRESS OF HON. S. S. FISHER.—COMPETITIVE EXAMINATIONS.—FEMALE APPLICANTS FOR CLERKSHIPS IN THE PATENT OFFICE.

Washington, D. C., June 20, 1871.

The application of William Kelly for an extension of his patent for an "Improvement in the Manufacture of Iron," the same expiring by limitation on the 23d inst., has excited great interest, from the magnitude of the manufacturing establishments in which the process is used, and the capital represented by the parties applying for and those opposing the extension.

The case was argued before Commissioner Leggett on the 15th instant, Mr. George Harding appearing for applicant, and Mr. Franklin E. Felton for the opposition. Among the sixty-four remonstrants are the names of the most prominent financial and business men of the country—e.g., J. E. Thompson, President of the Pennsylvania Railroad, Jay Gould, President of the Erie Railroad, Thomas A. Scott, President of the Union Pacific Railroad, H. J. Lombaert, President of the American Steamship Company, John W. Brooks, President of the Burlington and Missouri River Railroad, Nathaniel Thayer, of Boston, Jay Cooke, Samuel Sloan, James F. Joy, President of the Michigan Central Railroad, and Samuel M. Felton, President of the Pennsylvania Steel Co. On the same day with the hearing, the Commissioner decided in favor of the extension, the Examiner, Professor B. S. Hedrick, having also reported favorably.

Mr. Kelly's invention consists in "decarbonizing molten crude cast iron by running it into a vessel separate from that in which it is melted, and blowing through it blasts of air so as to burn out the excess of carbon." For the benefit of some of your readers, it may be well to state in a general way, without entering on more scientific and accurate details, that cast iron is the first product of smelting the ore, and that this contains about four per cent of carbon; by reducing this proportion of carbon to 1 or 1.5 per cent the product is steel; and by still further reduction, so as approximately to remove all the carbon, we have pure or malleable iron. Steel may therefore be made by either eliminating the carbon from crude iron, or by adding carbon to malleable or bar iron, and both modes involve some form of chemical action. Among the different processes for reducing the amount of carbon is the so-called pneumatic, which, in a broad sense, is simply injecting, into and through the body of the molten iron, currents of air, the oxygen of which unites with the carbon and escapes. To whose inventive mind this valuable thought first occurred it is not easy to decide, and it was probably original with more than one individual. In Europe, Mr. Henry Bessemer, of England, appears to have been the first who successfully applied the pneumatic process, and his original patent was issued, both in England and this country, in 1856. The claim reads as follows: "The conversion of molten crude iron, or of remelted pig or finery iron, into steel or into malleable iron, without the use of fuel for reheating or continuing to heat the crude molten metal—such conversion being effected by forcing into and among the particles of a mass of molten iron, currents of air or gaseous matter, containing or capable of evolving sufficient

oxygen to keep up the combustion of the carbon till the conversion is accomplished."

Mr. Kelly's invention was considered by the Patent Office as similar to Bessemer's, and when his application was filed, in Nov., 1856, the parties were put in interference, Mr. Bessemer having just received his patent. The latter did not appear as contestant, and the interference was decided for Kelly. In 1854, Mr. Christian Shank filed an application for an air blast process, and in 1856 received a patent here; and in England, in 1855, Mr. Martien was granted a patent for a similar improvement in the manufacture, but it is evident from its action that the Office did not consider any of these as equivalents of Kelly's invention. And here it should be stated that Kelly in his patent disclaimed a broad application for blowing air into molten iron, but claimed only his method of doing it.

The opposition, however, contended that the above patent to Shank and also the patent to Martien fully covered Kelly's original claim, and that it should not have been allowed. The other grounds taken by those opposing the extension were that Kelly had not used due diligence in introducing his invention into general use; that the prolonged existence of the patent would be prejudicial to the public interests by reason of the onerous burdens imposed thereby on American manufacturers, and that the invention was practically useless and a failure. In proof of the last named argument, witnesses were brought forward to show that Kelly's process required the supplementary use of Robert Mushet's patent, which consists in introducing into the molten iron, at the proper moment, a triple compound of iron, manganese, and carbon. It was also argued that the British iron masters, being relieved from royalties by the expiration of the Bessemer and Mushet patents, would secure a monopoly of the American market.

Mr. Bessemer's and Mr. Shank's patent expired last year, and their applications for extension were refused, so that the Bessemer process of manufacture in this country is now covered only by the extended patent of Kelly. Five Bessemer steel works are at present in operation in this country, viz., at Troy, Harrisburgh, Johnstown, Penn., Cleveland, and Detroit, and a sixth is erecting at Chicago.

Mr. Bessemer is one of the financially successful inventors. Since the original patent of 1856, others have been granted him, and he is said to live in luxurious and princely style.

The Bessemer works in this country are all in the hands, directly or indirectly, of a company styled "The Trustees of the Pneumatic or Bessemer Process of making Iron and Steel," these parties having purchased the numerous patents of Bessemer, Mushet, and Kelly, and "consolidated their several interests for the purpose of avoiding all conflict of claims thereunder." These trustees are John F. Winslow, John A. Griswold, of Troy, N. Y., and Daniel J. Morrell, of Johnstown, Pa.

The late Commissioner of Patents, Hon. S. S. Fisher, has recently delivered an address in Cincinnati, before the Young Men's Christian Association, on his experiences as a bureau officer. It is an interesting and amusing "tale out of school," and gives one an agreeable peep behind the curtain, with a moral or two of practical moment to the country. Mr. Fisher gives a sorry picture of the working of the American mode of appointment and promotion in the civil service, and of the trials to which the heads of departments and bureaux are subjected. He strongly favors a system of competitive examinations, and a long tenure of office, and refers with satisfaction to the working of the plan which he himself adopted when Commissioner. Ample authority for the introduction of thorough pass and competitive examination was found in an Act of Congress, passed in 1853, and Mr. Cox, the Secretary of the Interior, was in favor of a reform. In referring to the retirement of Mr. Cox from the Secretaryship, Mr. Fisher says that it was unquestionably "due to the determined resistance of certain men to this work of reform."

Most of the present corps of Assistant Examiners passed one of the competitive examinations, and Mr. Fisher gives it as his opinion "that so intelligent and efficient a body of men has never before been seen in the Patent Office;" and that if a similar system were introduced into the other Departments, and rigidly adhered to, the number of employes might be reduced one third. The inaugurations of the examinations, when applied to those already holding places, caused a great flutter and commotion, and several resigned rather than face the ordeal. One man, to heap coals of fire on the Commissioner's head, accompanied his resignation with the present of a small Bible, enclosing in it, on a slip of paper, the "Beatitudes" in Latin.

The number of female applicants for clerkships, even in the Patent Office, where only about sixty-five are employed, is greatly in excess of the males. As employes he highly recommends them. "Some of the lady clerks," he says, "had no equals among the gentlemen, and they and many of the men should have changed salaries."

Mr. Fisher's opinions on the subject of test examinations are worthy of all consideration, but it must be allowed that everything depends on the character of these examinations. To merely sift out the fools and ignoramuses by a few school-boy questions, is a simple and eminently desirable operation; but to test the fitness of an applicant for a responsible position is quite another transaction, and the crucible is not so easily manufactured. Knowledge is needed of his character, and ability as displayed in positions already held, and other witnesses than himself must be consulted. Qualities and habits of mind and life need to be considered as of more value than scholastic attainments; but how is an examination of a few hours, as ordinarily conducted, to secure answers to such inquiries? For example, in applying a test for fitness to hold