PROFESSOR CHARLES VALENTINE RILEY.

The name of Professor C. V. Riley is a familiar one to our reader. He appeals to them as the author of some of the most interesting papers which we have published in the SCIENTIFIC AMERICAN and SUPPLEMENT, and many of our readers are under special obligations to him for the work he has done in solving problems of entomology. In the scientific world it may be said that no entomologist stands higher than he. His career is of special interest as showing the typical self-made man whose life is identified with America, and whose first steps after his school and college days, were taken on the farm and in the service of the press.

Charles Valentine Riley was born in London, September 18, 1843. His early life was spent in rural England, much of it in the pretty village of Walton-on-the-Thames, between Hampton Court and Windsor. At the age of 11, he entered the College of St. Paul, Dieppe, France. After three years' attendance there he spent three years more in a private school in Bonn, Prussia.

Even in these early days his talent for drawing was noticeable, and curiously enough, as an indication of the future, he had a great fancy for producing exquisite delineations of butterflies, moths, and other insects. While his drawing teacher, Professor A. Hoe, was urging him to repair to Paris and devote himself to art, he was by family circumstances thrown upon his own resources,and at the early age of 17 he sailed for America, went West and settled with Mr. G. H. Edwards, Kankakee County, Illinois, on a stock farm.

Three years were spent here, years during which the boy was distinguished by his love of work and by a most marked tendency for original research, which took the direction of the improvement of farm processes and of farm stock. Those who know him say that there is but little doubt that he would have made a mark as an advanced agriculturist, had not his health failed him under the great strain, so that at the age of 20 years he went to Chicago. Here he had his early trials. He actually worked in a pork packing establishment, made portraits of his fellow boarders, and made sketches which he personally sold to appreciative purchasers. At last he obtained an engagement as a reporter on the Evening Journal, and next changed to the Prairie Farmer, at that time the leading agricultural paper of the West. His especial department was botany and entomology, and in the interest of that department he traveled extensively. His enthusiasm, industry, and versatility soon made his services invaluable. A curious illustration of the bent of his mind is shown in the fact that he here learned typesetting, simply because he was determined to have some trade at his command. The development of insects was one of his main studies, and the results of many original investigations and the answers to many inquiries were published by him in this paper.

In May, 1864, he enlisted in the army, serving for six months with the 134th Illinois Volunteers. The regiment disbanding six months later, he returned to his paper, severing his connection with it in the spring of 1868 to accept the office of State Entomologist for Missouri. At last we find him fully launched upon his career, and from 1868 to 1877 he did the work which firmly established his international fame.

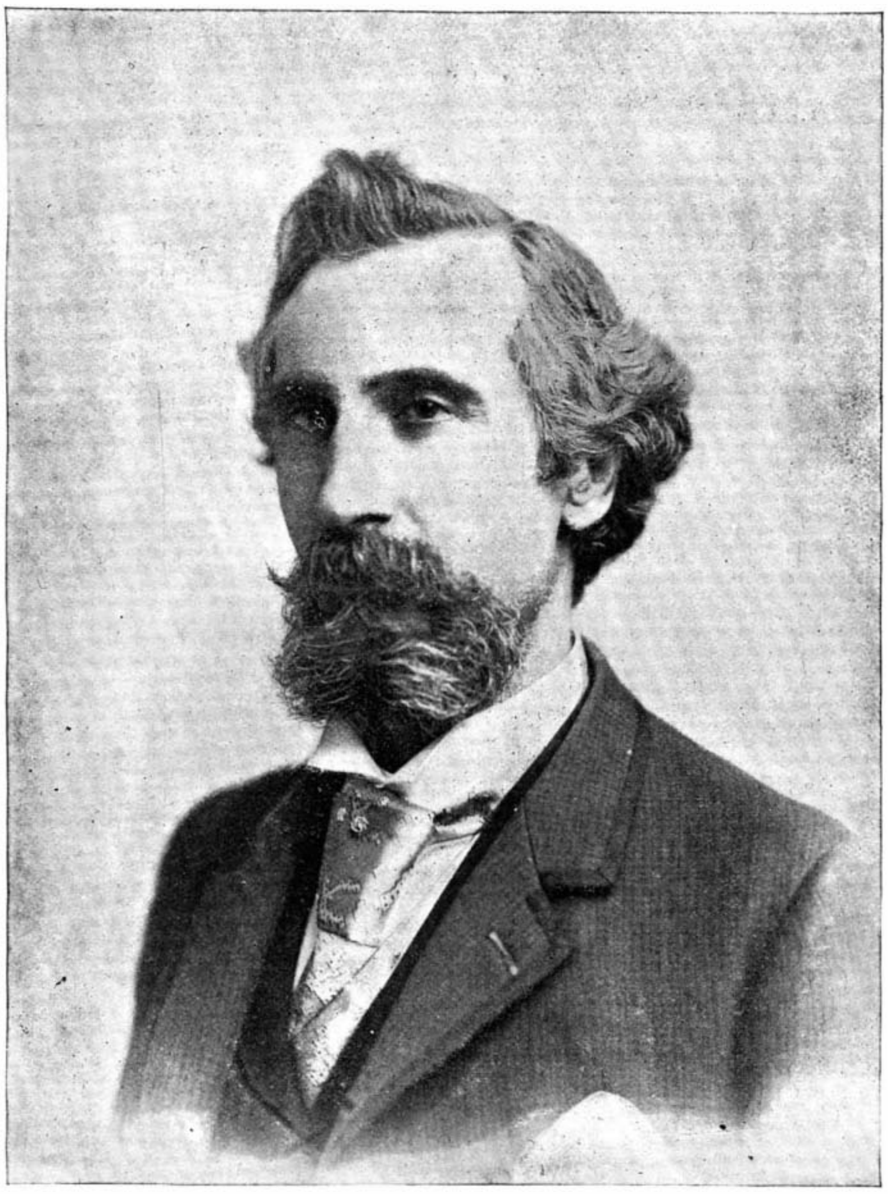
His salary was but $3,000 per annum and there was no allowance for expenses, yet out of this amount Prof. Riley paid his assistant and large traveling expenses. He also paid for the beautiful illustrations of the reports, which illustrations were drawn by himself. The original edition of the reports have been long exhausted, and any copies now bring very high prices. Charles Darwin, the famous naturalist, gave them the highest encomiums. In connection with Mr. B. B. Walsh, Acting State Entomologist of Illinois, Prof. Riley established the American Entomologist about this time.

In 1873 a bill was passed creating the United States Entomologic Commission, with Prof. Riley as chief, and Dr. A. S. Packard, Jr., and Cyrus Thomas as his associates. This commission was designed to cope with the Rocky Mountain locust, then doing great damage, and in the five years of its existence published five large, fully illustrated reports, besides seven bulletins, all the work being done by the three members.

Since this period, with an intermission of two years, Prof. Riley has held the position of United States Entomologist, which he resigned a few weeks ago. His work at Washington has fully upheld the promise of his early years. In carrying on the operations of his department, working night and day, year after year, without rest, he nearly ruined his constitution. To the National Museum he presented his magnificent private collection of insects, representing the labor of twenty-five years. With it as a nucleus he built up a collection unsurpassed in America.

Applied entomology or economic entomology, as it is sometimes called, has been his specialty, and he in some sense is the founder of that science. Space is not at command to even summarize his work. After his studies on the Western locust problem, he took up the animals affecting stock in the lower Mississippi, those affecting the hop industry and cranberry growers, and in all those lines he did useful and practical work, ameliorating greatly the troubles of the farmer.

In the past few years, two of his studies have produced epoch-making results. One is his famous emulsion of kerosene oil, milk or soap solution being the emulsifying agent. Having found that this was an infallible insecticide, he had to devise means for applying it, and invented the "cyclone," "eddy chamber," or "Riley system" of nozzle for spraying it upon trees.



PROFESSOR CHARLES VALENTINE RILEY.

Another of his achievements was the introduction of the Australian ladybird, Vedalia cardinalis, into California, to destroy the white scale, which was then ruining the orange groves. The result was simply magical. Since then the insect has been introduced elsewhere. It is interesting to note that other attempts of the same sort that have been made in California, against other insects, either against his advice or without his indorsement, have not had the same success. His discoveries in relation to the phylloxera alone were enough to give him international renown, and his recommendations have been followed by grape growers in all parts of the world. He has been a most voluminous writer; a bibliography of his writings, published by the Department of Agriculture, five years ago, showing over 15,000 titles.

It would take much space to give the simple list of the honors in the way of medals and diplomas, honorary memberships of societies and the like which have been showered upon him. One of his greatest honors was the gold medal presented him by France in 1873, in appreciation of his services in the study of the phylloxera. His work will live. His organization of the Entomological Department of the United States government will be responsible for much of its value and utility in the future, and lands as far apart as Egypt, the Sandwich Islands, California and France are to-day reaping the benefits of his work. His resignation from the Department of Agriculture is to be lamented as a national loss, brought about by his absolute need for rest and by other causes affecting his professional work. It is believed that the vacation which he has at last given himself may be productive of the most important results to humanity in the direction of his favorite science.

As a lecturer his reputation is extended. He has held appointments as lecturer on entomology at Cornell University, Kansas State Agricultural College, Missouri State University, and the St. Louis Washington University. He has also lectured before the Boston Lowell Institute and the Brooklyn Institute. He edited the 5th volume of the Reports on the Paris Exposition of 1889, a work of nearly a thousand pages, with text, figures, and plates, a work containing a mine of valuable information on agriculture and agricultural education, not only of foreign countries, but of our own. So much of his writing has taken the form of monographs and addresses, and it embraces so many titles, that it cannot be summarized here.

Not a Deadly Current.

The Electrical Review says: "The well authenticated report of an instructive electric accident comes from Paris. A workman was caught between two bare wires, which conducted the current from the electric plant to the railroad station on the Seine. It was at first not known what caused the disturbance noticed in the current, and when it had lasted five minutes the current was cut off and an inspection of the conducting wires made. After ten minutes' search it was found that a workman had been caught between the two wires and had received the discharge of 5,000 volts for the time of five minutes, while ten minutes later he was found apparently dead. At once attempts were made to restore him, first by artificial respiration after the usual methods, but this being of no avail, the rhythmical pulling of the tongue was resorted to, and this was successful in very gradually restoring respiration, after which the man made a quick recovery and was none the worse for his bitter experience, except that he suffered much from the burns where the wires had touched his skin.

"Dr. D'Arsonval, who reported the case to the Biological Society, of Paris, concludes from this that death from electricity is not immediate, but that the first effects of the electric current are asphyxia and syncope, the result of arrested respiration, and that when this is re-established by proper treatment, the apparently suspended vitality may be revived.

"Dr. D'Arsonval adds that 'if this is so it becomes doubtful if the criminals who are executed in the State of New York are killed by electricity or are killed by the autopsy.'

"It appears from the above case that if treatment for asphyxia was substituted for the autopsy, some of the condemned criminals might be revived even when they have been submitted for five minutes to a current of 5,000 volts and had been lying apparently lifeless for ten minutes."

We would remind our excellent contemporary that in every case of execution by electricity in this State, the body of the victim is carefully examined by medical experts and pronounced dead before the autopsy.

Chromium.

A communication made to the Academie des Sciences, by M. Henri Moissan, contains some new and interesting researches respecting the metal chromium. By availing himself of the intense heat produced by the electrical current, he succeeded in preparing cast chrome in a very small quantity, which may be fairly represented by the formula C Cr. When treated with lime or the double oxide of calcium and chrome, the metal produced under these conditions is more infusible than platinum, and takes a very fine polish. It is, moreover, not attacked by atmospheric agents, not to any great extent by acids, and resists the action of aqua regia and of alkalies in fusion. This preparation of chrome leads to some important results in connection with the alloys of the metal. Alloyed either with aluminum or copper, it possesses some remarkable qualities. When pure copper, for instance, is alloyed with 0·5 of chrome, it becomes endowed with a double power of resistance, is susceptible of a high polish, and undergoes less change when exposed to atmospheric influences than when in a condition of purity.

Submarine Navigation.

The Electrical Review, London, says: "All the maritime nations are concerned with, and we believe are studying, through the media of their Admiralty officials, the problem of submarine navigation. It is considered that a navy equipped with vessels which can be propelled at any depth beneath the surface of the water will possess enormous powers of offense. France, Germany, Italy, Spain, Great Britain (of course), and even Turkey, are at present engaged with the greatest secrecy in endeavoring to produce a practicable form of submarine topedo boat; but the problem has hitherto baffled them. It is true that some success attended the famous trials of the Gymnote in Toulon Harbor about two years ago, and it is claimed that the French have a boat, the Gustave Zede, which is capable of keeping up a speed of 14 knots for several hours below the surface of the sea; but these boats can hardly be said to have realized all the necessary conditions. From what we can gather, the key to the whole problem is in the hands of electrical engineers. Steam cannot be employed as a motive agent on account of the absolute impossibility of disposing of the products of combustion. Compressed air gives no better results, the weight of the chambers in which it must be stored proving too great; moreover, to dry the air thoroughly and the expansion of the necessarily enormous amount so lowers the temperature that ice forms in the pipes and renders them useless. Undoubtedly the direction in which progress and indeed success must be looked for is in electricity, more especially in the use of storage batteries. As yet, however, no system of accumulators has been discovered that is perfectly adapted to the needs of submarine navigation. Here, then, is a problem which those who are interested in secondary batteries may study, possibly with profit to themselves. The absolutely essential points are extreme lightness, considerable storage capacity and the absence of noxious gases at the moment of discharge. These must be borne in mind when entering upon a line of investigation. They are difficult points to reconcile among themselves to say nothing of the conditions: but we venture to think that difficulty need not deter. If discouragement followed upon the recognition of the arduous nature of a problem, how few would ever have been solved by electrical engineers.

Power and Speed in Cotton Mills.

BY FRANK P. SHELDON.

Taking a general view of the entire mill, a comparison between the old and modern mills is striking. Going back to the time when both warp and filling were spun on mules (1869), my data show that what was then a good average mill of 44,000 spindles, all mules, was producing 37,700 pounds per week, and required 677 horse power to drive it, a product of 0·85 pound per spindle per week and of 55 pounds per horse power per week.

Another, with 28,000 spindles, all mules, produced 24,300 pounds per week, with 430 horse power, or 0·87 pound per spindle per week and 56 pounds per horse power.

Another mill (1874), with old ring warp and mule filling, with 90,000 spindles, produced 78,000 pounds per week, and required 1583 horse power to drive it—a product of 0·87 pound per spindle per week and 49 pounds per horse power per week. These were all on print-cloth numbers.

A mill with Sawyer warp spinning and fairly high-speed mules produced 0·93 pound of cloth per spindle per week, and 1 horse power produced 46·5 pounds of cloth.

And to-day a modern mill with all frames at high speed produces 1·17 pounds per spindle per week, and 1 horse power produces 46·75 pounds. In round numbers the product of a 30,000 spindle modern mill is equal to that of a 40,000 spindle mill of 20 years ago.

From these figures we find that the Swayer warp mill required 19 per cent more power to turn off a pound of cloth than the old all-mule mills. But this fact did not weigh a feather against the adoption of Sawyer spindles.

Since that period the product per horse power has not changed materially. But the improvements made in steam plants meantime have reduced the actual cost of the power per pound of cloth, so that it is less than it was in the old slow-speed "all-mule" mill, the total cost for fuel for power alone being now about 0·41 cent per pound of cloth, while then it was 0·66 cent (taking the same price for coal in both).

The deduction to be made from the above table is that in regard to cost of production alone, any increase of speed and product will be in the line of economy, so far as cost of power is concerned, even if the latter should increase four times as fast as the production; and this is so unlikely a supposition that practically the question of power is not to be considered for a moment as against speed.

One of the items of power in a cotton mill, and not a small one, is the friction load of the shafting. Power expended for this is in a sense wasted. It produces nothing and costs a great deal. In the best mills it will be not less than 22 per cent and often 25 per cent of the total power. (This includes the friction due to the belts on the loose pulleys of all the machines, as this is the usual method of weighing this load, so that it does not of course represent the mere friction due to weight of the shafting.) In a mill requiring 1,000 horse power, therefore, 220 to 250 horse power will be expended in this manner, costing, at $19 per horse power per year, about $4,200. Various methods have been tried from time to time to reduce this loss. One way has been by reducing the diameter of shafting, sometimes to extremes, and increasing the speed, but not much has been accomplished in results. The percentage remains about the same. In the course of my work I have had occasion to test the power of a large number of mills of all descriptions, old and new, large and small, with excessively heavy and excessively light shafting, at extreme slow and high speeds, and medium heavy at medium speeds, and with all sorts of bearings and in all sorts of conditions. I have found the friction load to run from 22 up to 39 per cent. The lowest I have ever found was 21·24 per cent, and this was in a very old mill, requiring 1,055 horse power, with rather heavy shafting, but all at low speeds, from 210 to 250 revolutions. The friction load was 224 horse power. I have never found this result equaled in a modern mill. Several years ago I tested two mills in the same yard, one a very old one, with extremely, even ridiculously, heavy shafting, but at very slow speeds, and the other a new mill just completed at that time, with very light shafting at high speeds, and with bearings about 5 feet apart. I remember that I expected to find the friction of the older mill so much more than the new one that it would pay to change the shafting. The test showed so little difference between the two that it was not worth considering. This result was a surprise to me at that time, but would not be so now.

So far as the theory of friction is concerned, the laws that govern the driving capacity of a shaft and its friction are so related to each other that it makes no difference in theory whether a large shaft at a slow speed or a small one at a higher speed is used to convey a given amount of power, if the speed in both cases is in inverse ratio to the cubes of their diameters. But in a cotton mill this theory will not hold in practice. Increasing speed of the shafting is liable to increase the friction, and for obvious reasons. The friction of shafting in cotton mills is not due entirely to its dead weight, but more to the lateral stress of the multitude of belts on machines and counters. This stress is independent of the weight of the shaft and has no relation to it, and reducing its diameter will not affect it. On the other hand, when we reduce the diameter and increase the speed to give the same power, we decrease its circumference or rubbing surface only as the diameter, while we increase its speed inversely as its cube. Therefore, we have increased the surface velocity in the bearings inversely as the square of the diameter. And although the weight of the shaft is also reduced in the same ratio, yet the lateral stress of the belts is put upon the rubbing surfaces at the above greatly increased velocity. The friction, therefore, ought to be more, and I am satisfied that it is, other things being equal. Then, when in addition to this the number of bearings is increased, in order to properly support the reduced shaft, we magnify this evil, for in a cotton mill with bearings suspended from wooden beams and floors, the conditions are far from that perfection which admits of the strict application of any mechanical formulas. Every unnecessary bearing increases the chances for greater friction. In lines which are merely carriers of power, with no pulleys or belts upon them, the above objections to high speed do not apply so forcibly up to a certain point. The fact is, in this as in all other mechanical constructions, it is impossible to apply any strict formulas. They must be materially modified by the carefully noted results of experience.

In the mill where I found the friction 39 per cent the shafting was rather heavy, but not extremely so. I attributed the excessive friction here to the multiplicity of bearings, and all of a very bad construction, the boxes being absolutely rigid. Of course, the difference between 39 per cent and 22 per cent is worth saving. It would represent 170 horse power on a mill requiring 1,000 horse power, and this would represent a needless loss of $1,700 a year for fuel alone in the best steam mill. And, more than this, in some cases of partly water and partly steam power mills, it may mean the still larger losses from stoppage of machinery or loss of speed, which might be overcome merely by reducing the friction down to a reasonable point. This was, in fact, exactly the case in the mill in question, which I tested recently on account of this condition of things.

High speed of shafting in carding and weaving rooms is especially to be avoided. I have in mind a large mill in which the shafting in these rooms runs over 320 revolutions. The loom pulleys are 5 to 6 inches diameter, the belts very tight. Of course, the shafting is very small, with bearings every 5 feet, and in one room with 384 looms there are over 500 bearings, whereas half that number, with a proper arrangement, would have sufficed. Every one of these 250 unnecessary bearings means more or less unnecessary friction. In yarn mills the friction is, of course, less than in weaving mills. I have found it about 18 to 19 per cent.

Carrying steam to a number of small engines distributed about the mill was once suggested, I believe, in a certain mill, but, of course, is not to be thought of. At present the only thing to do is to avoid extreme speed, use bearings of good construction and in as small number as possible, and by a good arrangement keep the friction down to as low a point as possible.

Although I have emphasized the supreme importance of high speed of spindles and the reliability of the motive power, rather than a fine economy of fuel, yet it, of course, goes without saying that this economy is to be sought also by every practicable method; and all improvements in steam engineering to this end are to be welcomed, so long as they do not raise any question as to the more vital point in cotton manufacturing—certainty of continuous operation.—Manufacturers' Gazette.

The Campania.

The new Cunard steamer Campania has just broken both the eastward and westward records by crossing the Atlantic in 5 days, 9 hours and 29 minutes. This was on her westward trip, ending in New York August 17. The previous record was held by the same vessel for her eastward trip, last November, which she accomplished in 5 days, 12 hours and 7 minutes.

The days' runs were as follows:

August 12	516 knots.
" 13	528 "
" 14	543 "
" 15	525 "
" 16	515 "
" 17	126 "
Total	2.783 "

The average distance traveled a day was 515·8 knots, and the average speed per hour was 21·49 knots.

It is very doubtful if any ship now in commission in the United States navy, or building, could maintain an average speed of 21·49 knots per hour for days at a time. When the new vessels of the American line, now building, shall be put into direct competition with the Campania, Lucania, Teutonic, and Majestic, we may expect some extremely interesting voyages.

An Electrical Fire-damp Detector.

It is a well known fact that a spiral of platinum wire that has been heated to redness glows more brightly when it is plunged into a vessel containing air mixed with inflammable gas. This forms the basis of a method of detecting fire damp in coal mines, which has been worked out by G. Fletcher. The method involves the use of an instrument, which consists of two identically similar spirals of fine platinum wire, one of which is inclosed in an air tight tube containing air, and having the upper end glazed, while the other is contained in a similar tube of wire gauze, which is also glazed at its upper end, both tubes being arranged vertically. When a current of electricity is passed through both spirals in air, they glow with equal brilliance; but when the instrument is introduced into an atmosphere containing inflammable gas, the spiral in the wire gauze tube glows the more brilliantly, the brilliancy being proportional to the amount of inflammable gas present. By an ingenious arrangement it is possible to calculate very easily the actual percentage of dangerous gas that happens to be present. This arrangement is based on the principle used in common photometers. Any small storage battery, such as those in use for miners' lamps, may be used as the source of electricity.

A Church Rich in Silver.

The St. Louis Globe-Democrat says: The erection of the magnificent canopy over the high altar of Our Lady in the shrine of Guadalupe, Mexico, has been completed. The pillars to support it are each of a solid block of polished Scotch granite weighing seven tons. The diameter of each pillar is 3 feet, and the height 20 feet. The altar will be ready for dedication December 12 (Guadalupe day), and will be the most elaborate and costly one in America. The additions to the church edifice will not be completed for nearly two years at the present rate of progress. When finished, the shrine of the Lady of Guadalupe will be one of the notable Catholic church edifices of the world. The solid silver altar railing weighs twenty-six tons, and many millions of dollars are in other ways represented in the palatial place of worship.

Glycerine in the Treatment of Coughs.

The Medical Reporter, of Calcutta, says that in severe paroxysms of coughing, from whatever cause, a tablespoonful of glycerine in hot milk or cream will give speedy relief. If any of our readers are disposed to try it, we would caution them that the dose of glycerine seems rather large, especially as nothing is said about the patient's age or the frequency of its repetition.—N. Y. Medical Journal.