as he falls, his sword flies from his hand with nothing to show the presence of any electrical connection.

Every one familiar with the charming music drama of Wagner's, the "Ring of the Nibelung," will recall that impressive scene in the first act of Siegfried where the stout lad Siegfried welds together the broken pieces of his dead father's sword which have been left him by his mother Sieglinda (see Fig. 6). The scene represents a cave in the rocks with openings into the forest. It is a smithy's forge, with fire, chimney, and bellows. The point of this scene lies in the prodigious strength of the lad Siegfried, who, because of it, succeeds where Mime, the smithy, has failed, and welds the terrible sword that is to kill the dragon who guards the treasure. The anvil upon which the lad strikes is connected by concealed wires with the storage battery, the positive plate being a corrugated piece of cast iron 6½ inches by 12, the negative pieces of iron wire three-sixteenths inch diameter and 12 long, bowed upward at their center and placed above and free of the corrugations below them. The current required being of 15 amperes, if the negative wires should rest upon the positive plate, a dead short circuit would be formed and all metal connection with the battery would be fused; but bowed as they are, there is but a momentary short circuit at each stroke of the hammer, when the springy wires are forced down upon the under plate, producing only a shower of sparks, as if from the great force of the blows struck. At last, when the sword is completed and a firm handle upon the hilt, he determines to test its temper, and raising it aloft brings it down with what seems a tremendous blow upon the anvil, which falls into two parts (see Fig. 7), as if cleft in twain, the sparks following the sword down to the ground. In reality, he strikes a spring which lets one-half the anvil fall, its under and outer side, as will be seen, having the corner cut off for the purpose and causing momentary short-circuiting.

A very pretty electrical effect is had in the garden scene in "Faust," act III., scene 6. Siebel, the would-be lover of Marguerite, advances to a bed of tulips (see Fig. 3), some red, some white, and some gold, to pluck a nosegay that he would leave upon her window to speak for him. Concealed in the corolla of each flower, or, rather, disguised as stamens and anthers, are two tiny incandescence lamps (15 volts each), the whorl of petals fresh and sparkling as when we see them fed with sunlight. Now, the demon Mephistopheles had long before warned Siebel:

> "Every flower that you touch
> Shall rot and shall wither."

Unheeding, Siebel picks a golden tulip which shines yet as he lifts it up to him (the fine wire carrying the electrical current that keeps the bulbs in the flower aglow, trailing after it, unseen amid the foliage). No sooner does he examine it, when, lo! Mephistopheles, partly concealed, raises his hand, the current from that single flame is cut off, and it grows dull and withers perceptibly. Siebel says:

> "What, faded! Ah me!
> Thus the Sorcerer foretold at the fair:
> That, should I touch a blooming flower,
> It shall wither.
> But my hand in holy water I'll bathe—
> See, now, will they wither?"

Here he plucks a red tulip, a white and a golden one, holding them up triumphantly, a rich, mellow glow in each (the electrical current following upward along the fine wire and the little bulbs yet lighted), for Mephistopheles may not raise his hand against the power of what's been blessed. Then he changes hands, and, like a flash, they fade; beaming with light again when he, remembering it was the other hand that touched the holy water, hands them back. (The operator, watching the scene, turning the electrical switch on or off as required.)

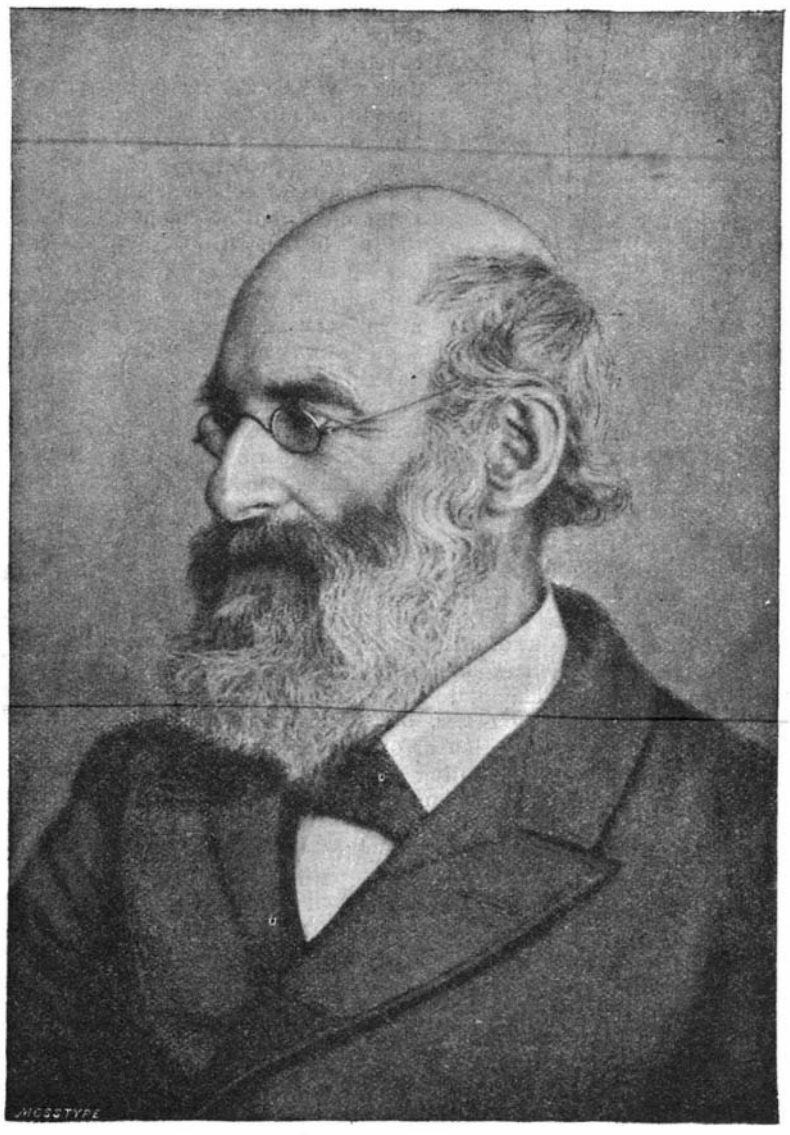
In the last act of Siegfried, the wanderer (Wotan) is standing at the foot of a high cliff, with a deal of thunder and lightning overhead. He is armed with a great spear, steel-tipped and pronged, with the wood of it studded with steel. It is supposed to contain the sacred though unseen fire, and heretofore, until the present application of electricity, there was no evidence of it, save Wotan's word. He, as guardian of the rocks, is pacing up and down, with the spear in his hand. Siegfried comes seeking Brynhilda's rock. As Siegfried approaches he draws his sword, dealing a heavy blow against the spear of Wotan, while, at the same moment, a man in the wings turns an electric switch. The spear parts, and from its shattered ends flames, like forked tongues, leap out. A lamp of 30 volts intensity is hidden in the spear; the core wrapped with heavy brown paper for insulation, with a mass of secondary cotton stuffed about the carbons at the point where the spear is to part. Then come thunder and lightning and black, rolling clouds, the last two projected upon the mimic sky by a stereopticon in the wings. The lightning and the clouds are scratched and painted on small bits of glass; before projection being greatly magnified by lensing, with a powerful voltaic arc electric light behind the condenser throwing them with wonderful precision and naturalness: the clouds rolling across an apparently immense expanse of sky, as the operator revolves the disks one over the other (see Fig. 8), and the forked lightning seeming to shoot across the heavens.

The realistic fire clouds and flames in the last act of the Prophet, where the latter, learning he is betrayed, orders the firing of the Palace of Munster, are done by concentrating the arc light upon colored gelatine; using first yellow for fumes, then yellow and white, then yellow and red, red and white, red and black. The snowstorm in the Prophet is made by forcing the light through white scratches on black glass. The sandstorm in last act of the Queen of Sheba is done with yellow and black and pink gelatine before the light, and the rain by parallel scratches on a black surface; the arc light being dimmed and set aglow alternately, and the glass turned this way and that, so that the parallelism of the drops shall follow a supposititious changing of the direction of the wind.

The firefly (Fig. 10) is another fine effect, devised by the same hand as the others, and recently used at the Broadway Theater, in the play of the Kaffir Diamond. Tiny 15-volt incandescence bulbs were affixed to the weeds and rushes in a swamp, each bulb getting its life from a fine wire connected to an electrical accumulator in the wings. The operator in his hiding place, by pressing upon the knobs of his key board alternately, lighting up one and then another, could make a single firefly appear to be darting hither and thither, then there would be two of them, a half dozen, a score, or, pressing upon all, twenty-eight.

The artificial rainbow (Fig. 9) is made by the interposition of two triangular glass prisms, one elevated slightly over the other, before an electrical reflector, the bases and faces and lateral edges carefully adjusted with regard, the one prism to the other. The electrical sun, set opposite to the point where the rainbow is to appear, is made, the better to aid the illusion, to shine into a mass of cloud, the rainbow being seemingly only the reflection, refraction, and disintegration of sun rays into the various colors of the prismatic spectrum, the influence of the rain drops. So ingenious is the work, that there is made to appear, as in nature, two arches, the primary with its inter circle of red, and the secondary with red along the inner.

In the Valkyr, an incandescence light is thrust into a knot in the tree and, shining upon the hilt of the sword, discovers it to Siegmund.



ROYAL E. HOUSE, THE ELECTRICIAN.

ROYAL E. HOUSE, THE ELECTRICIAN.

BY H. C. HOVEY.

In a pleasant home in the city of Bridgeport lives a veteran inventor, whose name has long been associated with the honored names of Henry, Morse, Vail, and other pioneers of telegraphy, and which has lately gained new publicity from the fact that he contests with Professor Bell the priority as inventor of the telephone. Keenly watchful of passing events, he has hitherto been unwilling to allow any sketch of his life and services or any portrait of himself to be published; and it is only at the urgent request of his friends that he permits the printing of this communication.

Royal Earle House was born in Rockingham, Vt., September 9, 1814. In 1840, he invented and put in operation a water wheel that would work under water, and not freeze in winter, and yet do the work of a gravity wheel with its gearing. This he accomplished by using a spiral conduit, with cover, inclosing a vertical wheel with two sets of buckets; one set arranged around its side, to have motion from the inflowing water, the other arranged to cover the bottom, each bucket having a suitable angle to utilize the centrifugal force of the whirling water, and its weight, by causing the water between the vertical buckets to move backward and be discharged in a direction nearly opposite to that of the water in the spiral conduit, when, relatively, the outflowing water is in a state of rest. The principle of the turbine wheel had long been known abroad; but House's invention lay in such a combination of the impulse and discharge as should make the wheel of practical value, and his ingenious contrivance is now extensively used in various forms and known by different names.

In 1842 he resolved to devote his life to the study of electricity, and to give popular lectures, with accompanying experiments. After a brief career in the lecture field, he decided, however, to limit his attention to the more promising arena of invention. A brilliant galaxy had already preceded him. Morse had taken out his earlier patents, but had not yet built the first electro-magnetic line—from Washington to Baltimore—when House conceived the idea of his printing-telegraph. He made his first instrument of the kind in 1844, and exhibited it before the Mechanics' Institute, in New York City. It received a gold medal from the American Institute in 1848, with a special compliment on its being "an invention of great ingenuity." The committee of award were Professors Agassiz, Chilton, and Renwick. Morse's telegraph conveyed intelligence by preconcerted signals, dots and lines made by breaking and closing the circuit. House's telegraph printed its messages in Roman letters. The component parts were type wheels, platens, a keyboard like that of a piano, and a single line of telegraph. The type wheels moved synchronously by a step-by-step motion, arrested at will by pressure on a key, causing its representative letter to be printed. The actual speed attained was at the rate of fifty words a minute, or equal to the average speed of the modern typewriter. This was more rapidly than work could be done by the Morse instrument; but the printing-telegraph required more power to move the type wheels, etc., which became an objectionable feature when stations came to be multiplied.

Professor House removed with his family to New York City, in 1844, and sold a half interest in his invention to Mr. William Ballard, who was financially associated with him in making instruments and laying lines. Hon. Samuel Selden and Mr. Hiram Sibley, of Rochester, were also interested. Mr. Henry O'Reilly made an agreement for the use of the printing-telegraph throughout the West. He located the first telegraph line of any sort between Pittsburg and Cincinnati. Afterward he located an instrument at New Albany, Ind.

Capital was subscribed for building a line from New York to Philadelphia. This line crossed the North River at Fort Lee. On the east side was a mast 300 feet high, and on the Palisades, on the west side, one 200 feet high, making an eminence 400 feet in height. The contractors had faith in a small wire cable of seven twisted strands. But in practice this gave much trouble, and a solid wire had to be substituted. The right to use the printing-telegraph between New York and Philadelphia was sold for $25,000 in stock, and for $30,000 the right from New York to Boston.

An arrangement was next made with Judge Selden and Mr. Edson to extend the invention to all the principal cities of the United States, and to build 600 miles each year, or to forfeit $10,000 to liquidate annual damages. Under that contract a line was built from New York to Buffalo, with an iron wire having 600 pounds to the mile, for which the patentees received $100,000 in stock. About that time the Morse company filed a bill for an injunction to stop the House line from New York to Boston. Up to that date all suits had gone in Morse's favor, and it was confidently expected that the injunction would be granted. The counsel employed on the House side were George Gifford, Rufus Choate, and Charles L. Woodbury. After hearing very exhaustive testimony, the judge decided that the House telegraph was no infringement. The favorable termination of that suit (which was never appealed) gave value to the invention.

A new era was introduced in telegraphy when the messages came to be received by *sound only*, the operator writing them off rapidly in a suitable form for delivery. Professor House saw the need of more sensitive apparatus for the transmission of sound waves. Taking up the subject where Boursal and Reiss had discontinued their researches, he made and had patented an "electro-phonetic telegraph," June 27, 1865, and in order to improve the workings of certain parts took out another patent, May 12, 1868. The invention consisted in placing at each station of the line a hollow ear piece for receiving sound waves, this being closed at one end by a thin flat plate, or diaphragm, having a spring force to counterbalance the magnetic force of the armature, and thus hold the sounding head in a state of magnetic equilibrium when the circuit is closed. There was also a device for adjusting the loudness of sounds.

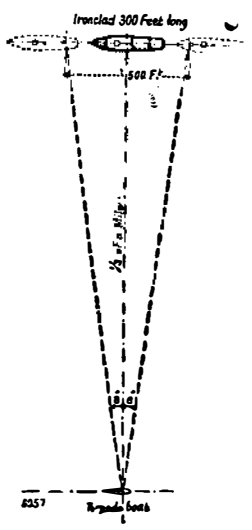
The inventor's idea was simply that of making an instrument of great sensitiveness for receiving the sound signals of letters used in telegraphing. But the instrument is really a *telephone*, doing as good work as can be done by the more recent Bell telephone. The Supreme Court has decided that "a patentee is entitled to all the benefits which result from his invention, whether he has specified all the benefits in his patent or not." Hence Professor House justly regards the Bell telephone as an infringement on his patent, and has called the attention of the American Bell Telephone Company to his claims. It is not my intention here to argue the case, but merely to state the facts as given to me. I may add that, in company with others, I have experimented with the original "electro-phonetic telegraph," made exactly according to the patent drawings, and with the modern House telephone, and also with the Bell telephone put in connection with the House, and found no difficulty in transmitting and receiving vocal messages with entire and uniform clearness. The inventor specified in his patent of 1868 that diaphragms as large as eight inches might be used. To test this Professor House produced a pair, of the size stated, made of pine wood, and the result was most remarkable. The messages were distinctly audible when the speaker and hearer each stood five feet away from the instrument; and when several persons carried on a conversation in the room, it was all transmitted perfectly to the other end of the line. Let the reader note the fact that every detail of the mechanism of these extraordinary telephones was covered by the House patent of 1868, granted eight years prior to the Bell patent of 1876, and observe the remarkable fact also that neither House nor Bell specially claimed that their instruments could "talk."

The "automatic telegraph" remains to be described in recounting the services of this eminent inventor. When business increased so that many million messages went over the wires every year, it became evident that there must be a wasteful multiplication of poles, wires, instruments, and operators, or else that in some other way the cost of sending a telegraphic message must be reduced to a minimum. House undertook to meet this demand by a system of his own. He invented a new, time-saving alphabet, in which a message may be prepared for transmission. When thus prepared it is sent over the wire with greatly augmented rapidity, and is transferred from line to line without having to be repeated. "Untouched by an operator, the message is automatically received and translated into ordinary printed typography ready for delivery, while automatic machinery, without the aid of an operator, takes care of and files away the paper of the transmitted message." So ingenious is this device that a series of messages on a single line may be sent as one message, and each be automatically dropped at its destination, and the capacity of a single wire will exceed the ability of six operators to prepare messages, each of which in its turn may be started by a slight movement of the hand. And this system does not interfere with the use of the wires, on occasion, in the ordinary way. This improved system, so far as it may be adopted, must give us one of the great demands of the age—rapid and cheap telegraphing.

In 1884 Professor House and his wife removed to Bridgeport, Conn., where two of his nephews reside, who are also known as successful inventors. The fact that he was brought up amid the rugged fields of a mountain farm, while having some disadvantages, enabled him to start in life with strong physical powers, as well as a healthy and vigorous mind. The result is that now, at the age of seventy-four years, Professor House enjoys uniform health, and his memory holds tenaciously the diversified facts of his eventful career.

DIVERGING TORPEDO GUNS.

We give a perspective view of a pair of torpedo tubes which are arranged in a manner introduced by Messrs. Yarrow & Co., of Poplar. It will be seen that the two tubes, or guns as they are generally called, are set at an angle to each other, so that if a torpedo be ejected from each one simultaneously, the two missiles will travel in diverging courses. The object of this is to afford a better chance of the enemy's vessel being struck. Below we give a diagram of a 3-gun arrangement which is an extension of the same principle. In illustration of the effect of this arrangement, we will suppose the ship attacked to be 300 ft. long. At about one-third of a mile, which is approximately the effective range of the torpedo, the line of attack covered by the three torpedoes would be 900 ft., as opposed to 300 ft. to only one of these weapons discharged; that is to say, the ship would not escape were she at any point on a line of steaming 900 ft. in length measured normal to the axis of the center gun or parallel to the attacking vessel's keel. There would also be a chance of two of the weapons striking the ship simultaneously.



It may be objected that this arrangement entails an extra expenditure of torpedoes for each discharge. No doubt this is true, but after all the question to be settled is whether in an engagement more torpedoes would be effective with a given force of torpedo-firing vessels than if the old system of single discharge were adhered to. The recent naval maneuvers have shown the value of torpedo attack—in spite of a popular belief to the contrary—but still there were not many hits scored out of a comparatively large number of tries. Mr. Yarrow claims that with his system there is an additional chance to strike an effective blow when the opportunity arises, but in any case the officer would have the option of only firing one torpedo, and so be on the same footing as if his ejecting tubes were arranged on the old plan. But three torpedoes are a small price to pay for the destruction of almost any vessel, and the diverging fire gives so immeasurably a greater chance of success, that it would be seldom that the risk of extra expenditure would not be warranted.

It is of the essence of successful torpedo attack that it should be sudden, and that the blow, when struck, should be overwhelming. In times of excitement and danger an officer, be he ever so brave, is not likely to make very good practice with so uncertain a weapon as the fish torpedo. It is a difficult thing to aim even under favorable conditions, but here a fair approximation to accuracy may afford success.

The torpedo is ejected by a small charge of gunpowder in the way that is now usual. The officer in command settles the angle at which his tubes are to be set before going into action, and the pointing is then done by maneuvering the boat. The elevation is also decided beforehand, and the guns pivoted on their trunnions by the horizontal wheels shown. For instance, it is determined beforehand whether the torpedoes shall be fired while the attacking vessel is approaching or leaving the enemy, and the guns are then trained before or abaft the beam, or of course a beam attack may be made, as shown in the diagram. The officer has, therefore, nothing to attend to but the steering of his vessel, and fires his weapons when the propitious moment arrives.

The arrangement is intended both for torpedo boats proper and for any larger vessels. Applied to the former, it has an additional advantage over the old plan adopted with the first-class English boat. By reference to our engraving of one of these vessels, shown in our issue of April 29, 1887, it will be seen that the two guns are placed one on each side of the conning tower. This has been found in practice very inconvenient, as the deck room is obstructed in a serious manner. With the diverging guns this difficulty is got over.

In our illustration the mechanism by which the necessary operations are performed is partly shown. The torpedoes are fired electrically by a "make-and-break" contact. The magnet is contained in a box, and this withdraws the bolt which allows the weight to fall, thus making electrical communication with the fuse in the discharging cartridge. The switch by which these operations are set in motion is placed in the conning tower. The tubes are traversed by hand, but steam gear can be fitted if required.

The arrangement has been adopted by the Admiralty for the new Sharpshooter torpedo gunboats. A number of sets have also been supplied to the Italian government, while there appears a probability that it will be fitted in other directions.—*Engineering.*

Mr. James S. T. Stranahan.

A dinner was given by the Hamilton Club of Brooklyn, N. Y., on December 13, in honor of one of her oldest and most distinguished citizens, Mr. James S. T. Stranahan. He has long been a representative of all that was best in the advancement of his city and time, and now at the age of eighty looks back upon a residence of nearly fifty years in the city of his choice. Some of his remarks made at the banquet have a peculiar interest. In the course of his address he said:

"I came to this city in 1844 and have since continued to reside here. There is no spot on earth to which I am so strongly attached as to the city of Brooklyn. The first enterprise in which I engaged on coming to Brooklyn was the Atlantic dock. In 1870 the first dividend was paid, twenty-six years after I engaged in the work. The second enterprise in which I was interested was Prospect Park. All the members of the original park commission, with the exception of myself, are sleeping in Greenwood.

"The third project that interested me in Brooklyn was the Brooklyn bridge. No one can but acknowledge what the great structure owes to Henry C. Murphy and William C. Kingsley, both of whom sleep in their graves. There are two others, the Roeblings, father and son. The first lost his life, the second his health, in the building of the structure.

"Brooklyn and New York are two municipalities. Is this an advantage? I think not. Would the consolidation involve any harm to either? I think not. The people in both cities are alike in sentiment and feeling and have about the same interests. One municipal government could be carried on at less cost to taxpayers. I may be mistaken, but I think that the people of both cities should consolidate under the name of New York. (Applause.) London is London on both sides of the Thames, and Paris is Paris on both sides of the Seine. The East River bridge, added to the ferry system, will so affiliate the two cities that both will alike ask the legislature of the State to enact a municipal marriage."

The dinner was attended by a company of 167 leading citizens, representing the bar, the pulpit, and other professions, as well as the business side of life.

Anthrarobin.

At the recent meeting of the American Dermatological Association, Washington, Dr. Bronson read a paper on a new remedy which he said was manufactured by Liebermann, a Berlin chemist, and was first employed on theoretical grounds, on account of its resemblance to other remedies of known value. Alizarine belonged to the same class, and from this anthrarobin was formed by a simple process of reduction. It was a powerful oxidizing agent, one gramme taking up 120 c. c. of oxygen. It was a yellowish white, granular powder, sparingly soluble in chloroform and ether, readily soluble in alcohol and weak alkaline solutions. It mixed readily with fats in the formation of salves. The presence of an alkali increased the reducing effect. The author had treated cases of psoriasis at the Charity Hospital, applying anthrarobin on the right side of the body and chrysarobin on the left side. It was used in a ten per cent mixture with vaseline, and once a day an alkaline bath was given before the application. Out of the eight cases treated, the first five had been somewhat surprising. Improvement had begun sooner and gone on more rapidly on the right side, but after the applications had been stopped there had been more recurrences on the right side.

In the three other cases the alkaline baths had been omitted, and the improvement had been more marked on the left side; but as soon as the baths had been commenced, the right side had begun to improve more rapidly. The staining was of a dark brown and deeper than with chrysarobin, but it was limited to the area to which it was applied. In only one case, and when a twenty per cent application had been made, had it been irritating. In a very marked case of eczema seborrhœicum the effect had been very marked. It had no antipruritic effect. In diseases in which the indication was for a purely keratoplastic agent, or in such conditions as obtained in the old stages of eczema, there was reason to hope that the new remedy might render considerable service.

Railway People Must Carry Good Watches.

The Rock Island road has notified its employes that, commencing December 1, 1888, each conductor, engineer, yard master, train dispatcher, section or bridge foreman, and officer connected with the operating department, and all employes in responsible positions as to the running of trains, will be required to carry a watch of a certain standard excellence, and shall have their watches examined by the company's examiner for certificate as to condition and quality, and once every three months thereafter.