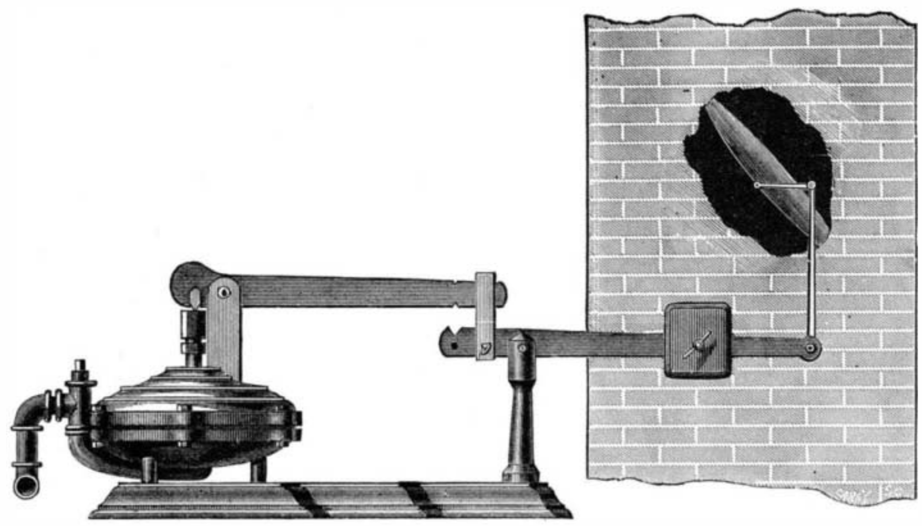
NEW DAMPER REGULATOR.

We give herewith an engraving of a recently patented automatic damper regulator, embracing several novel and valuable features. The mechanism of this regulator insures a large increase of leverage, movement, and sensitiveness, by the use of a compound lever, having adjustable fulcra, by means of which the same machine is adapted to the use of either high or low pressure; each regulator is provided with a siphon attachment, to prevent the contact of steam with the diaphragm. The diaphragm is perfectly supported, and is arranged so as to roll instead of stretching or wearing it, thus making it more durable than other forms of diaphragm.

This regulator will be readily understood by reference to the engraving, and will be appreciated by practical engineers. The great saving in fuel, the steady power, the regularity of speed, and the guaranty of safety from explosion by excessive steam pressure, are features which must recommend it to all steam users. It is claimed by the manufacturers that it will control the pressure of steam within one pound, and *fully* open or close the damper on a variation of two pounds.

The American Steam Appliance Company, of 13 and 15 Park Row, New York, and 28 School street, Boston, Mass., are sole manufacturers of the regulator.



PEERLESS DAMPER REGULATOR.

The Lick Observatory.

The recent decision of the courts with regard to the Lick estate in California gives the trustees of the estate $700,000 for carrying out the observatory project, which will be pushed forward as rapidly as possible. The question as to the kind of telescope to be adopted has not yet been settled, and the respective merits of the reflecting and the refracting telescopes are being investigated. As the trust deed directed that the instrument should be the most powerful in the world, a refractor of over thirty inches in diameter will have to be obtained, as two of twenty and thirty inches have recently been ordered, respectively for the Vienna and Pultkowa observatories. It will take two years from the time the order is given before the disks will be ready for the opticians, and it is calculated by the trustees that three years will elapse before they can turn their attention to the third bequest, the School of Mechanic Arts.

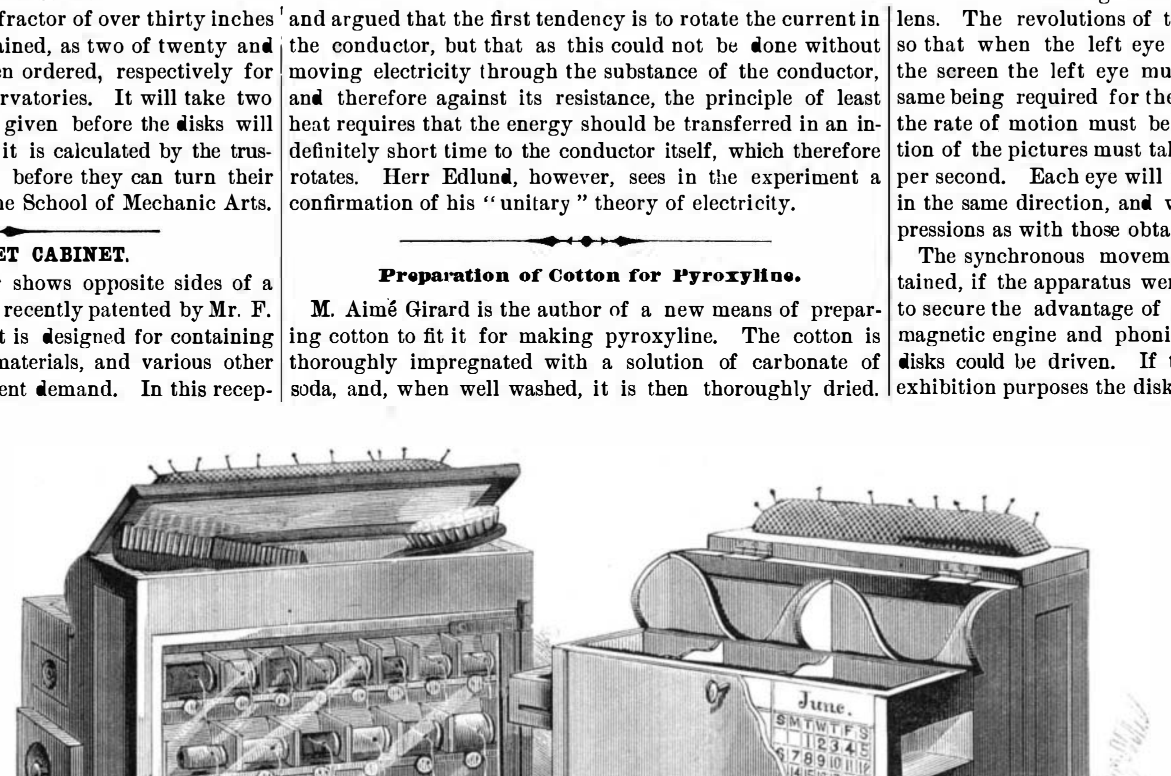
NOVEL TOILET CABINET.

The accompanying engraving shows opposite sides of a compact and convenient cabinet recently patented by Mr. F. C. Zanetti, of Bryan, Texas. It is designed for containing sewing, writing, and shaving materials, and various other articles of domestic use in frequent demand. In this receptacle these articles can be arranged in an orderly and convenient manner, so that any one or more of them can be obtained, when needed, instantaneously and without trouble.

The invention consists of an outer case, divided inside by horizontal and vertical partitions into three separate compartments. The first of these compartments, at the front of the cabinet, is provided with a mirror at the back, racks for spools, razor cases, and razor strop, and is closed by a glass door, on the inside of which are fixed racks for spools, and through the glass, opposite each spool, are perforations through which the ends of the threads are passed, so that the thread can be taken from the spools without opening the door. A subdivision of this compartment above serves as a receptacle for brushes and combs, and the cover of the receptacle has a mirror on its under side and a pincushion on the upper side. The second compartment is subdivided for the reception of drawers adapted to be drawn halfway out from each end, and envelope, card, and paper cases and pen racks. The third compartment is provided with a drawer opening from the front of the cabinet, said drawer being subdivided into cells for the reception of various articles used in sewing and mending. The back of the cabinet is provided with a hinged and folding slate and writing tablet and a place for a large calendar.

This cabinet is designed to contain a class of articles that too often are not provided with a place, and are liable to be found almost anywhere in the house.

Further information may be obtained from the inventor.



ZANETTI'S TOILET CABINET.

The Unitary Theory of Electricity.

Herr Edlund has drawn attention to an electrical experiment that has not hitherto been thoroughly explained. Let an open metal tube or cylinder, capable of rotation about its axis, be placed over a magnet of double its own length, so that its lower end is opposite the middle of the magnet, while its upper end is opposite the magnet pole. Then let a current of electricity of sufficient strength be passed from one end of the tube to the other. The tube is found to rotate with a velocity which is independent of the resistance of the metal of which it is composed and of its thickness. Longitudinal slits cut in the tube do not affect its rotation. There is, therefore, here a complete conversion of electromotive force into ponderomotive force. W. Weber inferred that the resistance of the movable conductor to the passage of the current is the medium of this transfer of the energy, and argued that the first tendency is to rotate the current in the conductor, but that as this could not be done without moving electricity through the substance of the conductor, and therefore against its resistance, the principle of least heat requires that the energy should be transferred in an indefinitely short time to the conductor itself, which therefore rotates. Herr Edlund, however, sees in the experiment a confirmation of his "unitary" theory of electricity.

Preparation of Cotton for Pyroxyline.

M. Aimé Girard is the author of a new means of preparing cotton to fit it for making pyroxyline. The cotton is thoroughly impregnated with a solution of carbonate of soda, and, when well washed, it is then thoroughly dried. The cotton thus treated is then plunged into a bath composed of water, 100 parts, nitric acid, 3 parts.

A very pulverulent cotton is thus obtained, which M. Girard names "hydro-cellulose." It appears that this product is far superior to the ordinary cotton for obtaining excellent pyroxyline for photographic purposes. The photographic pyroxyline is obtained by immersing the hydro-cellulose in a solution composed of sulphuric acid (66°), 1800 grammes, nitric acid (40°), 680 grammes.

After twelve minutes' immersion the pyroxyline is thrown into a basin of water and then well washed under a tap. It is then allowed to dry spontaneously in a dry room.

STEREOSCOPIC LANTERN PICTURES.

As you have again opened this interesting subject, I shall be glad if you will permit me to place on record a few thoughts of my own respecting it.

The production of stereoscopic effect by the lantern upon a large screen has at intervals, for a considerable period of time, been the object of experiment with me, says Mr. John Harmer, in the *British Journal of Photography*, the outcome of which, up to the present, is a method of obtaining it having one of the disadvantages of, though it appertains to, the other methods mentioned in your leading article, namely, the necessity for each spectator to be provided with a piece of apparatus to make the effect evident.

The arrangement requires a couple of lanterns—one to project the left eye half of a stereoscopic transparency, the other the right eye one, each of which when projected must occupy as nearly as possible the same part of the screen, and being, if viewed together, in hopeless confusion. In front of the two lanterns must be fixed a revolving disk, pierced with three apertures in such a position with respect to the lanterns that the light shall not be allowed to pass from one of these instruments till the other is exactly shielded. With this disk in motion the right and left halves will be thrown alternately upon the screen, producing, if the motion be sufficiently rapid, just the effect of two open lanterns, the only difference being that the extremely small intervals of darkness would slightly reduce the illumination without affecting the continuity of the mental impression in the least.

The piece of apparatus necessary for resolving this confusion into stereoscopic effect is composed of two eyepieces, having a revolving disk similar to the one just described in every respect except size, this latter bearing the same proportion to the larger disk as the eye does to the lantern lens. The revolutions of these must synchronize exactly, so that when the left eye picture is allowed to pass to the screen the left eye must be uncovered to view it, the same being required for the right eye and its picture, and the rate of motion must be such that the alternate projection of the pictures must take place not less than ten times per second. Each eye will then see its own proper picture in the same direction, and will deal with the dissimilar impressions as with those obtained direct from nature.

The synchronous movement of the disks could be obtained, if the apparatus were fixed by band and pulley, or, to secure the advantage of portability, by a small electro-magnetic engine and phonic wheel, by which a number of disks could be driven. If the above were constructed for exhibition purposes the disks could be arranged to produce stereoscopic, pseudoscopic, and superscopic effects—the first by an eyepiece adjusted as above, the second by providing for either to be uncovered at the instant the picture for its fellow was visible, and the last by a disk revolving at half the rate of the lantern one, thus cutting off the light of one lantern entirely.

In your *résumé* you omitted to mention a very excellent method discovered by the late M. Claudet some years ago, which he described and exhibited before the Royal Society at the time. He obtained the key note in the following manner: While experimenting with a "focimeter" he noticed that the image of the instrument upon the focusing screen of the camera appeared to possess its three dimensions—length, breadth, and thickness. This at once led him to investigate the cause, which he found to proceed from the fact that each eye actually sees a different view of the image produced by a lens upon a translucent screen, the natural object appearing to be viewed by the eye through screen and lens, the relations of its parts being affected by any change, just as would be the case if no apparatus were interposed, size excepted. This principle he embodied in an arrangement for exhibiting stereoscopic effect on a large scale in this wise: A large sheet of ground glass was erected perpendicularly, behind which, at a suitable distance, were placed a couple of lanterns, each one inclined inward sufficiently to throw its half of the stereoscopic picture upon the screen, with the axes of the lenses crossing there, to press onward into the eyes of the spectator some feet in front. It is manifest that this crossing will necessitate the right-eye picture being put into the lantern on the left hand, the left-eye one into that on the right, and the ground glass to be viewed from a fixed position in front, thus preventing the effect from being observed by many persons together.

AMERICAN INDUSTRIES.—No. 28.

THE MANUFACTURE OF WOOD-WORKING MACHINERY.

Among the various mechanical industries of the world there is none—with perhaps the exception of iron—which is more widely spread or employs more capital and labor than the working of wood in the manifold uses to which it is applied. In the present advanced state of manufactures machinery is employed for nearly every process to which wood is subjected. From the wooden toothpick to the railway car or the palace of royalty, machinery is used for producing the required form. The manufacture of machinery for working wood has become, therefore, one of our most important industries, for only by securing the greatest perfection in the machinery employed, can the best results be obtained.

We have selected as the representative of this industry the house of C. B. Rogers & Co., at Norwich, Conn., the oldest as well as one of the largest engaged in this business. The house originated at Keene, N. H., in 1832, when Mr. J. A. Fay commenced the manufacture of mortising and tenoning machines for sash and door work. Previous to that time, with the exception of the Woodworth and Daniels planers, saws, and a few special tools, very little wood-working machinery was used. The new machines made by Mr. Fay met a ready sale and increased demand, and in 1848 Mr. C. B. Rogers engaged with Mr. Fay in the business, opening a factory at Norwich, Conn., for the purpose, and bringing out the sash sticking machine, which met with such an unprecedented demand that for over three years one machine per day was the average sale. A few years later a shop was started at Worcester, Mass., which was devoted to Woodworth and Daniels planers.

In 1861 the death of Mr. Fay, together with the need of condensation of the business at some central shipping point, made it advisable to remove the entire business to Norwich. The firm was made into a joint stock corporation, a large works erected to accommodate the whole business, and the name, which up to this time had been J. A. Fay & Co., was changed, and the present title, C. B. Rogers & Co., adopted. The history of the establishment from the start has been one of progress, and the inventive talent of the managers has been kept constantly employed to keep pace with the demand for improvement. Many of the most indispensable machines in use originated with this house—notably the power mortiser, tenoning machine, sash sticker, and four side moulding machine.

The works, of which the central cut of our first page illustration is a fine representation, are located in the city of Norwich, Conn., on the banks of the river Thames. The location is most excellent as regards freighting facilities—an important item with this class of goods—the city being midway between Boston and New York, with a daily line of steamers to the latter, and two railroads centering there, by which freights may be forwarded expeditiously to all points, and are by special arrangement to all Western points at the regular New York freight tariff. The works, including the foundry, cover nearly three acres of ground. The manufactory surrounds three sides of a quadrangle, and consists of the main building, 125x45 feet, four stories, with blacksmith shop, 30x25 feet, attached; a wing, 65x40 feet, four stories ; and a second wing, 50x20 feet, three stories. The fourth side is occupied by a storehouse, 100x30 feet, three stories, for lumber and coal. The factory has about 40,000 feet of floor space.

Entering the works at the north end, ground floor, we come first to the motive power, steam, applied to an 80 horse power high pressure double engine, built by this company, running 125 revolutions, and so delicately adjusted in its valve motion that the stoppage of half the tools in the building can scarcely be detected in the speed. Passing the engine, we enter the "planer room," so-called from its being devoted exclusively to the manufacture of planing and matching machines. Our artist has sketched this room entire, with the various planers in process of construction. Of this class of tools this house make twenty different sizes and styles, from the diminutive "Pony," so-called, to the planer and matcher weighing from four and one half to five tons. The greatest care is used in the construction of these machines, and the latest improvements and processes are applied. A recent one is the use of cast steel for all cylinder heads, as well as for the smaller gearing where the wear is greatest. The severe tests to which these machines are put have always proved successful and eminently satisfactory to the user. In the center of the room, but upon the outside, is an elevator running to the fourth story, and sufficiently powerful to raise the heavy planers to the street level for shipment.

Leaving the planer room, we pass through a store room filled with bar iron, of all shapes and sizes, and enter the blacksmith shop, which has six forges, two trip hammers, power shears, and all facilities for the various forgings. From here we ascend to the second floor, machinist room. This floor is engaged on moulding machines, of which seven sizes are made; sash machines; mortisers, twelve sizes; tenoners, seven sizes; band saws, three sizes; scroll saws, railway cutting off and splitting saw frames, resawing machines, and various other tools.

Passing the casting room, where tons of castings are in process of cleaning, we ascend the main staircase to the third floor or "wood room." This floor is engaged upon wood work; framing machines, making foundry flasks, pattern work, of which a large amount is required in the production of new machines and alteration of the old. Although iron frames are the rule for most machinery, some of the wood frames are still retained as being lighter and cheaper—as the sash machine, tenoner, saw tables, etc. The frames retain their position equally with iron, but to insure this a large stock of hard wood is kept in store and seasoned for years before using. On this floor is the paint room, where the finishing touches are applied and the gray iron rendered more agreeable to the eye. At the south end of the room—the foreground in the sketch—is one of the most important departments in the building, where every machine before being shipped is thoroughly tested on the work it is designed to perform, and any error or oversight in the construction corrected. This was for many years a system followed only by this house, and its value has been amply proven by the universal success of the machines sent out.

Many purchasers have but a limited knowledge of machinery, and it is a great assistance to them to receive their machines all set and with tools prepared ready to set at work. The machine shown as being tested is a vertical tenoning machine made for tenoning car sills and doing the heaviest work with great ease and rapidity. The company have recently completed a machine of this class for working oak timber 16 inches square, cutting a double tenon 8 inches deep at one cut. A companion machine to this is the rotary car mortising machine, which works mortises 12 inches deep, 15 wide, and any length required, the timber being moved by power, and the whole operation almost automatic.

Upon the fourth floor is the "machinist room." This is similar to the second, but engaged on a lighter class of tools, with one exception—the inside head moulder, which is one of the finest tools in use. It weighs 3,500 pounds, and works moulding up to 12 inches wide, and by special adjustments is capable of producing 50,000 feet of narrow mouldings per day, a feat said to be unequaled by any other machine. Among the other tools are: iron frame tenoning machines, whose advantages consist in great facility of adjustment and ease of operation; upright shaping machines, five sizes; boring machines, one ingenious two-bit machine for cabinet work, cabinet jointers for piano work, Reidy's patent ironing and mangling machine, a specialty recently introduced into this country by an English patentee, its peculiarity being the method of heating the roll by a combination of gas and air. Last, but not least, in one corner, occupying but little space, is the manufacture of Boardman's barbed blind staple, which was invented by an employé of the house, and has been made by them for over twenty years. Here several machines are running constantly, for some time past night and day, to produce these little articles, 2,200 of which weigh but a pound, and of which orders have been received within three months for upward of forty tons. It would seem the work of a lifetime to produce such an amount, but the machines are tireless, and, like "Oliver Twist calling for more"—wire—they consume it in their insatiate maws, and the finished staples drop from them like the rain drops.

The three upper floors of the main wing are filled with finished tools ready to be shipped out on order, and the long lines of machines in dozens or half dozens of a kind make a fine display. On the third floor of this wing, a light, pleasant room, with a fine view of the river, is used for draughting the many new designs and improvements required in the business. Something in this line is in process constantly. One of the most recent is the large hub mortising machine, shown in the right hand cut of our illustration. This was produced on a requirement for a machine to mortise a hub 16x18 inches, a task as yet unaccomplished. The machine shown does the work successfully, mortising 8 inches deep in solid hard wood, and although very heavy and powerful—weighing 3,500 pounds—with as much ease to the operator as one of the lighter door mortisers.

This house have always given special attention to perfecting machines for specially difficult classes of work. Complete sets of machinery for making lead pencil woods and finishing the pencils were perfected by this house and furnished to the Messrs. Faber and others. Machines for making meat skewers, turning them out by the million, and many other specialties have been produced, it being only necessary to state the work to be done and something will be invented to meet the emergency. This company work their iron from the pig, the castings being produced in their foundry, of which an interior view is given. It has about 15,000 feet of floor space, two cupolas—one of seven tons capacity, large core ovens, cranes, and every facility for doing a large quantity of work. The present production is from three to four tons on alternate days. The quality of iron is an important item in this class of tools, and the company are able, by making their own castings, to insure the best. Attached to the foundry is the pattern house, 30x15 feet, two stories, and packed to overflowing with the patterns used.

The offices of the house are in the second wing of the works, fronting the street. Here are the accounting department, the correspondence which is extensively carried on with all parts of the world, and in addition to these is a constant production of catalogues, cuts, and circulars descriptive of the various machines. A catalogue is issued frequently of 175 pages, giving full information relative to the 125 different machines made by the house, among which are tools embracing in their ranges of work house building, sash and door, furniture, cabinet and musical instruments, wheels and wagons, railway cars and coaches, to which class special attention is given, planing mills, lumber producers, mouldings and picture frames, brooms, curtain rolls, and in fact for nearly every purpose to which wood is applied. The house has a wareroom at 109 Liberty street, New York, and their shipments extend to Great Britain, France, Germany, Sweden, Austria, Russia, Australia, New Zealand, South America, and every corner of North America, and in nearly every country named the house has a wareroom with machinery in stock.

The machines have been exhibited at every exhibition of note from the Crystal Palace down to the present time, and over 100 medals in gold, silver, and bronze attest the competitive merit of the exhibits.

The present officers of the company are: Lyman Gould, President; R. M. Ladd, Treasurer; and B. H. Rogers, Secretary and Superintendent.

Correspondence.

Electrical Generators.

To the Editor of the Scientific American:

It would seem that the authors of books and chapters on electricity are largely culpable for the numerous discussions which have appeared of late in the SCIENTIFIC AMERICAN on electrical generators. The problem to find the maximum current with a given lot of battery cells and external resistance is well known; also the answer to it, viz., internal resistance equal external resistance. But the other problem, viz., to find, with given external resistance, the number and arrangement of cells, for procuring a given current with a minimum consumption of zinc, seems to be far less common in books, and perhaps generally, though the result may often be of far greater importance.

To illustrate, suppose that in some electro-plating establishment a plating bath is so run as to offer about constant resistance to current; and suppose a certain standard constant current is preferred. If these conditions can be realized by one arrangement requiring $25 greater outlay in first cost for increasing the number of cells, whereby a saving of $50 a year for zinc is realized; a party, expecting to run for years, would be quite likely to adopt the greater first cost.

What is true in consumption of zinc in batteries will be true, in some measure at least, in dynamo-electric machines, because the zinc consumed in one case represents energy, and so do the foot pounds consumed in the other. Hence, for simplicity, batteries are here considered instead of machines.

That for a given external resistance a given current strength may be maintained by different arrangements of cells in rows, the total number of cells varying as required, is evident from considerations of Ohm's law. For instance, if 100 cells in 5 rows satisfies a certain current and resistance, the same effect may be secured with 10 rows of batteries, though 40 or 60 cells may be necessary. It may happen, however, that a large percentage of zinc will be saved with the 60 cells and 10 rows.

The energy of a current is stated, on good authority, to be proportional to the zinc consumed in a well conditioned battery; also, it is proportional to the electro-motive force multiplied by the current strength. These facts applied so as to bring about the relation between the zinc consumed in different cases will show that *for the same external resistance the weight of zinc consumed in a battery arranged for maximum current; divided by the weight of zinc consumed in a battery by like cells in greater number for an equal current, is simply equal to the number of cells in one row of the first battery, divided by the number of cells in one row of the second battery.*

Also for the relation of numbers of cells, it will be found that the ratio of the number of cells in one row, 1st battery and 2d, added to the ratio of number of rows, 1st battery and 2d, is equal to 2; also, the maximum value of this 1st ratio can never be greater than 2.

An example will serve to fix the ideas: Let the cells of battery considered be all alike, with equal electro-motive forces, and the internal resistance of each equal 1 ohm; let the external resistance equal 4 ohms. If the number of cells be 144, arranged in 24 rows of 6 each, we have the maximum current for the cells of resistance named. Again, if 192 like cells be arranged in 12 rows of 16 each, we will have the same current strength, though the total internal resistance of the 2d will be only a third of the 1st.

According to the rule above, the consumption of zinc in the 1st battery will be 50 per cent greater than in the 2d.

Hence it appears that the best arrangement of a battery of several cells for maximum of current is one thing, while the best number and arrangement for securing a given current with a minimum of zinc is quite another. The quantity of zinc diminishes with internal resistance.

From the fact that zinc consumption in a battery stands for about the same thing as foot pound consumption in the dynamo-electric machine, it would seem that for the minimum of power the internal resistance of the machine should be reduced to as small a fraction of the whole as possible, the size of the machine and conditions of working being, of course, consistent with the given current required.

S. W. ROBINSON.

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