STATIC ELECTRICAL MOTORS.

In our issue of August 1, of this year, we published a brief account of a static electro-motor devised by Mr. James Wimshurst, of England. Mr. Wimshurst is the author of the static or influence machine which bears his name, and his motor is but a modification of the machine. To quote from the account to which we refer: "It consists of a glass disk, mounted on a vertical spindle, and carrying on one face a number of tinfoil sectors. The upper face of the disk is touched at two places by brushes connected by wires to the poles of the influence machine, while at right angles to the diameter joining these brushes there are two other brushes connected by an equalizing rod. Below the rotating disk is a stationary one, having upon it two sectors of tinfoil extending about 90°. These sectors are also in communication with the poles of the influence machine. As soon as the latter is put in motion, the glass disk begins to rotate and rapidly attains a very considerable speed, turning with an amount of force which is quite remarkable." Those of our readers who are familiar with the well known pith ball experiments, and who also have a knowledge of the construction of the Wimshurst machine, will have no difficulty in forming a mental picture of the motor in operation.

Taking the above somewhat meager description of Mr. Wimshurst's production, Mr. William McVay, of 19 East Sixteenth St., New York, has constructed a motor which is very gratifying and instructive in its operation. We illustrate it in Fig. 1. Mr. McVay employs two glass disks, each 12 inches diameter. The upper one, which rotates, bears upon its upper surface sixteen tinfoil sectors, 3 inches in length, and in width from a quarter of an inch at the *inner* ends to five-eighths of an inch at the *outer* ends. The lower disk, which is stationary, carrying the 90° sectors, is supported four inches above the base by a piece of hard rubber tubing. The spindle to which the upper disk is attached is also of hard rubber. The metallic conductors, supported at either side of the disks by the standard of the frame, have each two arms, bearing at their extremities small brushes made of tinsel. One arm of each conductor passes under the lower disk, and presses its brush against one of the 90° sectors of the stationary lower disk, and the other arm is extended over the upper disk and presses its brush lightly against the sectors of the rotating disk as they pass. When the sectors of the rotating disk are brought into contact with a brush carrying a charge of electricity of one sign, they become similarly charged, and are, consequently, attracted by the sector on the lower disk, which is constantly charged with electricity of opposite sign. The equalizing rod, the position of which may be seen in the illustration, serves to discharge the sectors and put them in a neutral condition preparatory to their being recharged.

The motor may be made to turn with equal velocity in an opposite direction by connecting both sets of charging brushes with one pole of the machine and attaching the conductor from the opposite pole to the equalizing rod or by "grounding" the rod. In fact, it is a very accommodating motor, willing to do anything within its power to oblige. It occurred to Mr. McVay that there was no good reason for an adherence to the form of motor adopted by Mr. Wimshurst, and as a result he has produced four motors of his own design, all of which we illustrate. They furnish an excellent example of the evolution of an idea. In Fig. 2, Mr. McVay employs two glass shades as substitutes for the glass disks. The smaller shade is supported by a glass tube and is stationary, while the larger one is placed over it and turns on a point fixed to the top of the inner shade. Our artist has done his work so well that further explanation of the construction is not deemed necessary. A more elegant design is shown in Fig. 3. This motor stands about nineteen inches in height and has the appearance of being constructed entirely of hard rubber and brass. A glass shade is also used in this case, but instead of utilizing another shade as a carrier of the 90° sectors, as in Fig. 2, an inverted battery jar serves the purpose and at the same time furnishes a support for a glass spindle upon which the cylinder turns; thin brass brushes are substituted for the tinsel used in making contacts in the previous motors. When one sees this motor in operation, running as it does at a high rate of speed, it seems incredible that the motive power is static electricity.

Fig. 4 is so simple in its construction that the principle upon which it works can be understood at a glance. In the construction of this device a glass shade is also employed. It carries upon its surface eleven strips of thin sheet brass about six inches in length and half an inch in width.

In this case the pillars at either side serve the same purpose as the 90° sectors in Figs. 1 to 3, as they are constantly charged with electricity of opposite sign, and consequently there is a strong attraction between them and the sectors carried by the cylinder when they become charged in turn by coming in contact with the brushes, which are so situated that they come in contact with the sectors when the latter are about an inch away from the pillars, which, by the way, are also of brass. The speed attained by Fig. 4 is remarkable, and when it becomes thoroughly charged it shows such a decided inclination to leave its base that it has to be held down. In Fig. 5 we have the static electromotor in its most efficient form. It does actual work, and is here shown rotating a Geissler tube, which is lighted by the same machine that furnished the power for the motor. The optical effect of the rotation of the tube is shown in Fig. 6. This motor is constructed entirely of brass, rubber, and wood, and consequently is less fragile in appearance, and is suggestive of real power.

The cylinder of this motor is of hard rubber, and is six inches in length and about four and a half inches in diameter, with brass sectors ¾ of an inch in width running along the full length of the cylinder. The cylinder has a $\frac{3}{16}$ inch iron rod passing through it. The rod has steel ends where it comes in contact with the brass bearings. The supports for the cylinder are of hard rubber, as are also the supports for the pole pieces, which will be seen at either side of the cylinder. The dielectric used as a covering for the pole pieces is sheet rubber. The points at which the sectors receive their charges may be seen at the right hand side of the cylinder, at the rear, and at the left hand side of the front end. The position of the Geissler tube is well shown in the accompanying illustration. The projections from the ends of the pole pieces are for the purpose of lighting the tube, which presents a very weird appearance in a darkened room. The subject of the motive power of static electricity is one filled with interest for the student and well worthy of attention.

Mr. McVay has in mind a modified form of Fig. 5, from which he hopes to obtain greater efficiency and a decided improvement in appearance.

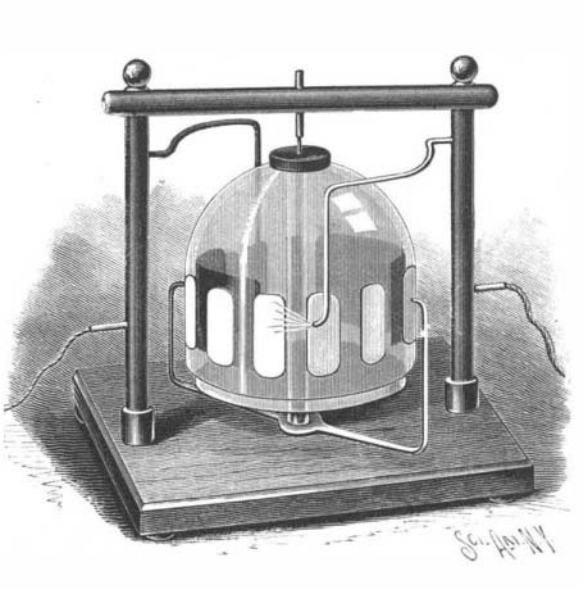


Fig. 2.

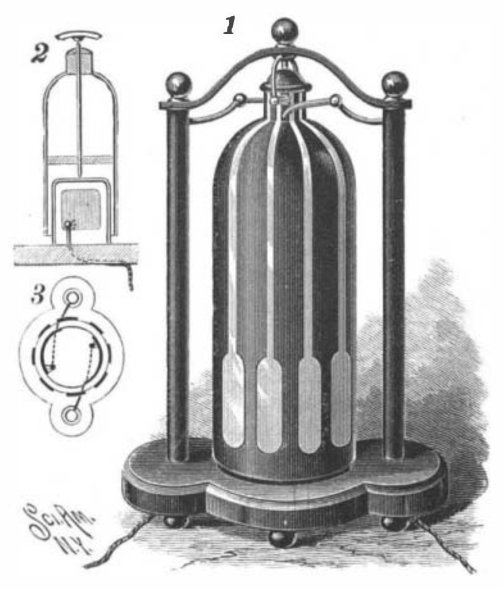


Fig 3.

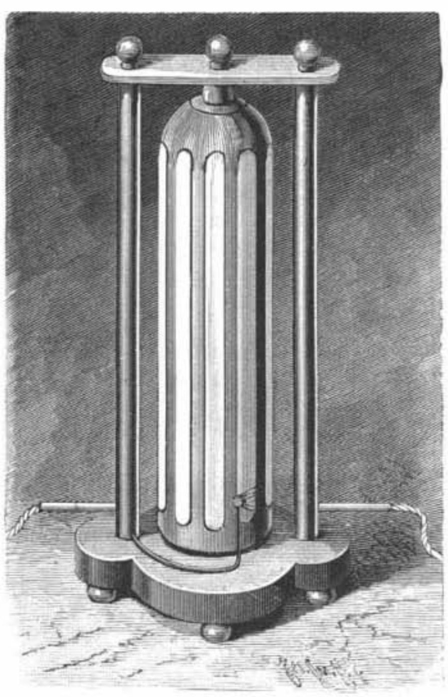


Fig. 4.

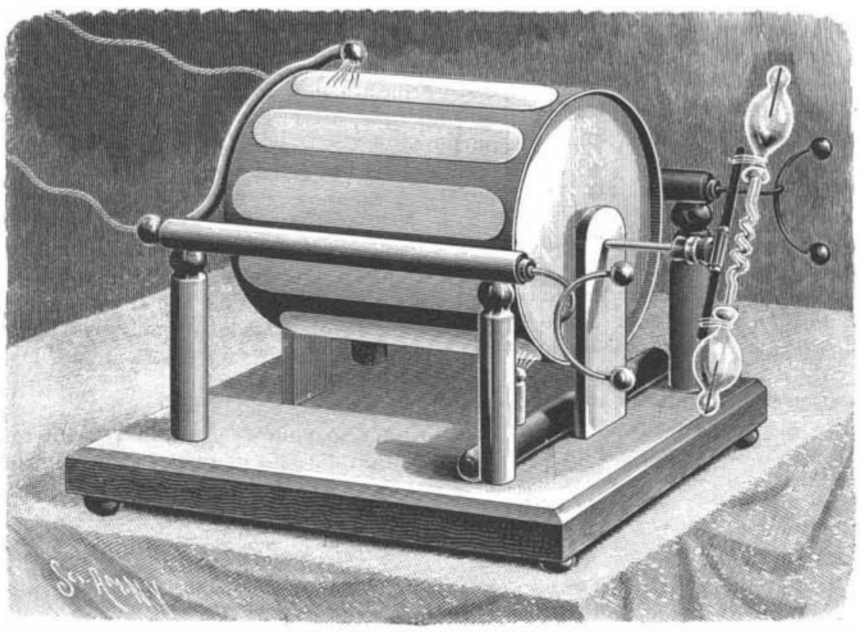


Fig. 5.

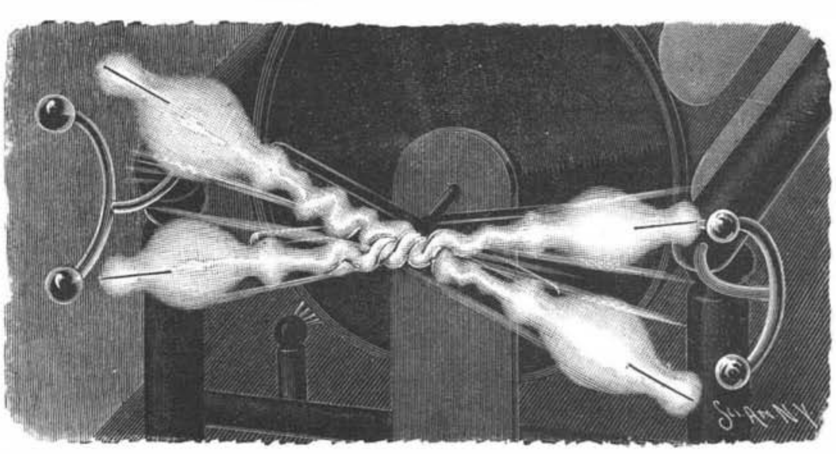


Fig. 6.

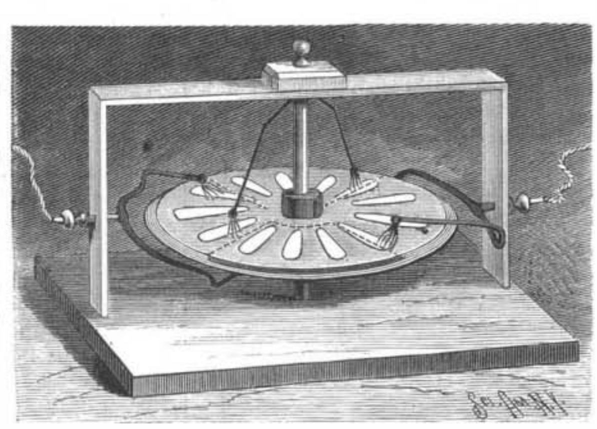


Fig. 1.

STATIC ELECTRIC MOTORS—CONSTRUCTED BY WILLIAM McVAY.

THE *Engineer*, London, in an article on high speeds on railways, speaks of the dangers which attend the working of the present style of locomotives, when running above 60 miles an hour. The centrifugal stresses in the reciprocating parts and counterpoises are enormous, and increase with the square of the speed. The *Engineer* thinks some form of rotary steam engine yet to be invented may prove best for high speeds. Here is a nut for inventors to crack.

Merchant Navies of the World.

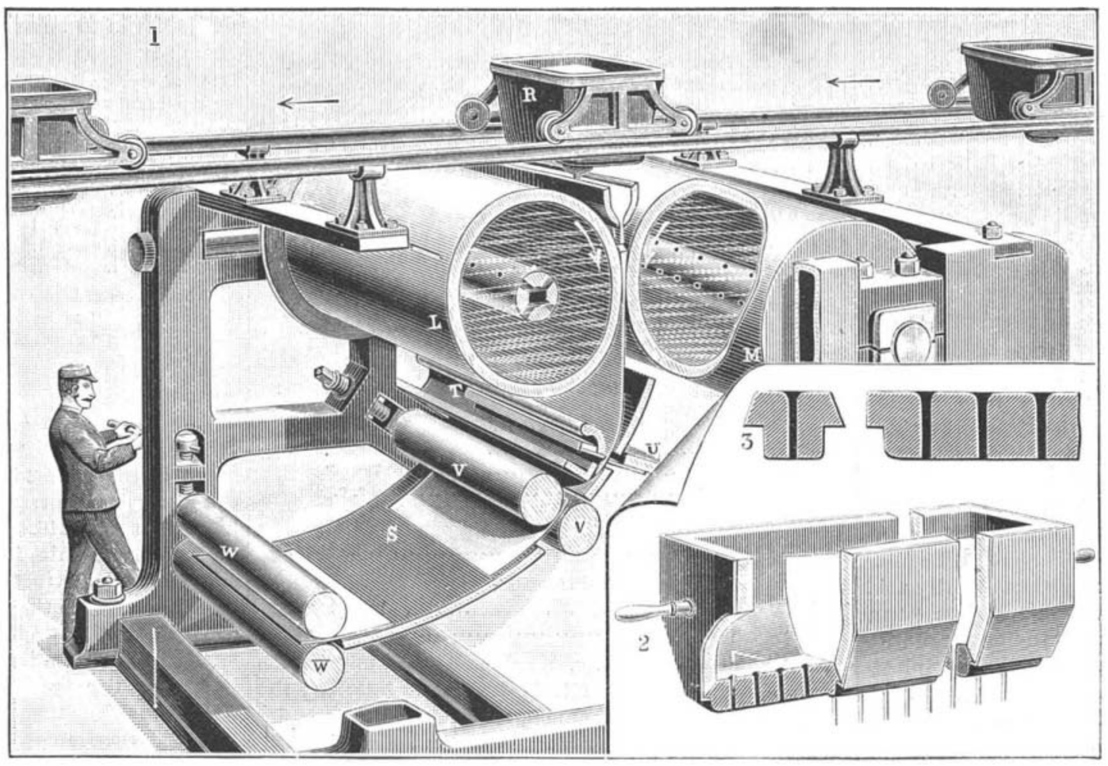
The estimate of the Bureau Veritas with regard to the merchant navies of the world for the present year puts the total number of vessels at 43,514, of which 33,876 are sailing vessels of 10,540,051 tons, and 9,638 steamers of 12,825,709 tons gross and 8,286,747 tons net. The figures as regards the steamers stand as follows:

Nationality.	Number of Ships.	Gross Tonnage.	Net Tonnage.
English	5,312	8,043,872	5,106,581
German	689	930,754	656,182
French	471	805,983	484,990
American	419	533,333	375,950
Spanish	350	423,627	273,819
Italian	200	294,705	185,796
Norwegian	371	245,052	176,419
Dutch	164	220,014	149,355
Russian	230	177,753	115,742
Swedish	403	172,013	126,612
Danish	197	154,497	103,578
Austrian	111	149,447	96,503
Japanese	147	123,279	76,412
Belgian	55	98,056	71,658
Brazilian	129	75,970	48,901
Greek	68	70,435	44,424
Portuguese	41	49,364	29,564

BESSEMER'S FLUID METAL ROLLING MILL.

In a paper by Sir Henry Bessemer, recently read before the British Iron and Steel Institute, is described a rolling mill for producing sheets and plates of malleable iron and steel direct from the fluid metal. This mill, shown in the accompanying illustration, is an improved form of one patented by him in 1857, and allowed to rest without development on account of the difficulties attending the perfecting of the steel-making process.

The rolls consist of two hollow drums, L and M, to each of which a tubular steel axis conveys water for keeping the rolls cool. The brasses supporting one of the rolls are fixed, while those of the other are movable and are pressed upon by a hydraulic ram in communication with an accumulator, whereby, should the feed of metal be excessive, one of the rolls will yield to prevent undue strain, and the only fault will be a slightly increased thickness at that part of the sheet, to be removed by subsequent rolling. The rolls are preferably three to four feet in diameter, and each has a flange at one end only, thus forming, when they are in position, a trough with closed ends to receive the fluid metal. For the regular and quiet supply of the metal, a small iron box or reservoir is employed, having a bar or handle at each end, by which it is supported on the side frames. This reservoir, the construction of which is shown in Figs. 2 and 3, is lined along its bottom with plumbago or fire clay, some ten or twenty holes about a quarter of an inch in diameter each being here neatly moulded by a row of conical brass pegs. The reservoir should be well dried, and its interior surface heated to redness prior to use, and in this state it is placed in position only when the first ladleful of metal is ready to be supplied. The ladle, R, is conveyed to the reservoir on rails, and has one or more valves or stoppers for regulating the flow.



ROLLING PLATES DIRECT FROM FLUID IRON AND STEEL.

An almost constant quantity of metal is thus delivered to the rolls, without splashing, through the several apertures of the reservoir, and these streams do not fall directly on the rolls, but into a small pool formed between thin films solidifying against the cold surface of the rolls, the metal at all times being free from floating slag. The speed of the rolls also affords a means of regulating the quantity of metal retained between them.

The sheet of metal as it emerges from the rolls is received between curved guide plates, S and T, to one of which a cutting blade, U, is bolted, the piece so cut passing between a second pair of rolls, V V, and thence to a third pair, W W, from which it is delivered on a table, or may be allowed to slide into a cistern of water. The construction allows for the cooling and stacking of the plates without labor or trouble.

The thickness of the plates it will be possible to make in this manner will depend largely on the size of the rolls, it being estimated that rolls of ten or twelve feet diameter will be capable of producing plates of about three-quarters of an inch in thickness. In the production of the thin sheets, as described, their exposure to the oxidizing influence of the atmosphere, prior to their immersion in the water, is for so brief a period that they will not acquire any scale, and in consequence of there being no overlapping of plates in rolling, there will be but little loss of metal in shearing.

The Boot and Shoe Industry.

Special Examiner Hyer, of the Patent Office, has just returned from a tour of inspection through the great boot and shoe factories of Lynn and Haverhill, in Massachusetts, which may be said to turn out footgear for pretty nearly the entire people of the United States. He was much impressed with the gigantic scale on which the manufacture is carried on at these establishments, some of which have a capacity of from eight thousand to ten thousand pairs a day. A large percentage of the goods thus produced are sold to retailers at from eighty-five cents to $1.50 a pair, although the "stock" used costs from eighty cents to $1.10. Inasmuch as the labor averages thirteen cents on each pair, there is necessarily an actual loss on the cheapest grades, which are merely intended to serve as "leaders." It is an interesting fact that sixty per cent of all the shoes and boots worn in this country are retailed for less than $2 a pair.

"Machinery," said Mr. Hyer recently to a Washington *Star* reporter, "has nowhere been put to more effective use for the saving of labor than in the manufacture of shoes. It is a wonderful thing to see a pair of boots turned out within a few minutes from the raw material, finished and all ready to wear. At the time of the Centennial Exposition in Philadelphia there was a contrivance exhibited which was called by its inventor the 'iron shoe maker.' It made shoes and turned them out complete, but they were clumsy affairs, and the process was a slow one. It has been found best to employ for the purpose a number of different machines, which together perform the operations necessary.

"With the aid of one ingenious device one man can sew together soles and uppers for four hundred and fifty pairs a day. On what is known as the 'standard nailer' a single operator can nail three hundred pairs, the machine making its own nails by wire, pointing them, driving them and at the same time automatically regulating the length of each nail to the thickness of the sole. With loose nails or pegs one person can do six hundred pairs a day, though the toes and heels must be made additionally secure afterward. One pegging machine will peg two pairs of women's shoes per minute, cutting its own pegs from strips of white birch at the same time. A thousand cords of wood are cut into shoe pegs every year in the United States. The wooden peg was invented in 1818, by a Massachusetts man named Joseph Walker.

"The Yankees have always been years ahead of Europeans in the art of making shoes, although the French excel to this day in the finest work for women's footwear. All machines for sewing shoes are of American invention. The last census showed that the manufacture of boots and shoes was the greatest single industry in America, employing the largest amount of capital and the greatest number of individuals. The employes of the trade are about equally divided as to sex. Men do the heavier part of the work, while women sew uppers, bind and fasten on the buttons. Each New England factory—most of them are owned by Boston men—has its specialty. One makes ladies' shoes exclusively, another slippers, another men's boots, another children's footgear, and so on.

"The oldest form of shoe was the simple sandal, which was nothing but a sole. Egyptian priests wore sandals of palm leaves and papyrus, while those of the common people were made of leather. The shoes of Roman soldiers were studded with nails. Heliogabalus had his shoes covered with white linen, and Caligula ornamented his with precious stones. Sandals were worn by both sexes among the Romans in the house, as we wear slippers. At one time the parliament of Great Britain regulated by law not only the quality of the leather, but the number of stitches to be taken in every shoe. Top boots were introduced in the sixteenth century. In China the cobbler goes from house to house and announces his coming with a rattle. In all history, as shown in pictures and bass reliefs, the shoemaker seems to have assumed the same attitude as now in doing his work. It is a very unhealthy one, and few of the craft live to old age. A hollow at the base of the breastbone is often produced by the continual pressure of the last."—*Washington Star.*

Ancient Egypt.

Mr. Flinders Petrie recently delivered at the Owens College, Manchester, a most interesting address on exploration in Egypt. It had been thought, he said, that the immense mounds of rubbish indicating the sites of towns had been made on purpose, but they resulted from the natural decay of the mud brick buildings. These heaps of ruined walls and earth and potsherds rose even to eighty feet high in some places; but other ancient sites were much less imposing, and might even not attract notice on the open desert. The higher the mound the longer the place had been inhabited; and if the surface was of a late period, the earlier parts, which were most needed, were under such a depth of rubbish as to be practically inaccessible. Much could be known at first sight; and prospecting had now become as scientific a matter in antiquities as in geology. Knowing, by a glance at the sherds on the top, what was the latest period of occupation of the site, and knowing the usual rate of accumulation of a mud brick town—about five feet in a century—we could guess how far back the bottom of the mound must be dated. Other remains had different indications. If the midst of a great mound there was a wide flat crater, that was probably the temple site, surrounded by houses which had accumulated high on all sides of it. Speaking of the results of exploration, Mr. Petrie said that we now realized what the course of the arts had been in Egypt. In the earliest days yet known to us—about 4000 B. C.—we found great skill in executing accurate and massive stone work, such skill as had hardly ever been exceeded. We found elaborate tools used, jeweled saws and tubular drills. We saw the pictorial arts as fully developed as they were for thousands of years later. But what led up to this we were still feeling for.

Influence of Surroundings in Producing Insanity.

In the last number of the *Journal of Medical Science* Dr. Savage discusses this question, and begins by protesting against the acceptance of what is a too widely spread notion, viz., that nearly all insanity is the outcome of direct neurotic inheritance. The influence of heredity is not denied or minimized, but the great importance of environment is insisted upon. To quote the words of the author: "We are what we are in mind and body, to a great extent, as organic results of our forefathers; but that we are no longer naked savages is some evidence that progress and development in the individual and the race may take place as the result of changing surroundings." There can be no two opinions as to the encouragement to be got from such a view. A too great insistence upon heredity as the determining cause of insanity must land us in a hopeless pessimism as regards treatment; whereas a recognition of the influence of surroundings is the first step toward the construction of a reasonable and efficacious system of therapeutics. The author also cites many examples of hallucinations and delusions which are suggested by surroundings; and while all will not be inclined to accept his dictum that disorder of function may lead to disease of tissue, there will be few who will not share his opinion as to the efficacy of restful, pleasant surroundings in the treatment of mental disorder, as compared with the virtues of "medicine out of a bottle."

BELTS running over pulleys of small diameter at high speeds ought to be as thin and as wide as possible. Orange tan leather of uniform thickness answers remarkably well.