Edison's New Laboratory.

A visitor at Orange, N. J., will notice in the beautiful Llewellyn Park, about a quarter of a mile from the main entrance, a palatial residence of Queen Anne style, with porte-cochère, conservatory, and large grounds beautified by the landscape gardener. This is the residence of Edison. Here one would think the great inventor might retire and enjoy in quiet the reward of his genius and of his untiring labors; but those who have followed his career and learned something of his indefatigable perseverance can never believe that he will cease to work while life lasts. Indeed, indications are not wanting that the characteristics of the future will be still greater activity and more thoroughly organized and better directed effort.

Not more than half a mile from Edison's residence are the foundations and rapidly rising walls of five large buildings, which, when completed and furnished, will constitute his laboratory. It will probably be the largest and most complete private laboratory in the world. Orders have been placed for the physical and chemical apparatus with the best makers in America and Europe. The finest machinery for all uses has been ordered, and will soon be in place. No purely historic apparatus or machinery has been purchased. Everything will be on a practical basis. The range of the laboratory will be extremely wide and diversified. Any experiment relating to anything of which we have any knowledge may here be tried speedily and with all possible precision. The laboratory is exclusively for Mr. Edison's own use, and will be wholly applied to perfecting his inventions and putting them in commercial form.

It may here be said that Mr. Edison makes no claims to the title of scientist. He is simply and purely an inventor, and as such is determined to see his inventions embodied in practical form in the shortest possible time after they have been conceived. He will employ a corps of competent men, and will have rough and finished material of all sizes and descriptions.

The main building of the laboratory is 250 feet long, 50 feet wide, and three stories high. It will contain on the lower floor a complete machine shop, provided with lathes of all descriptions and various sizes, from 60 inches down, planers, milling machines, gear cutters, and all varieties of machines required for working iron, steel, and other metals. This shop is driven by a 40 horse power engine, built by Brown, of Fitchburg, Mass. Upon the second floor of the main building there will be a grinding and polishing department, which will include the grinding of all tools, gear cutters, reamers, mills, mandrels, and arbors, lapidary work; lens grinding, etc. Upon this floor there will also be a room devoted to photography, another devoted to drawing, another to machinery and instruments of precision. Here there will be a large dividing engine for circles, another for bars. There will be three experiment rooms, in which apparatus made in other parts of the laboratory will be experimented with and perfected. Upon this floor the power will be distributed by electricity, a motor being placed at each machine. A 100 volt electrical conductor will extend all over the laboratory, and the motors will range from one-tenth horse power to three or four horse power. In each experiment room there will be a table provided with pipes for supplying city gas, fuel gas, compressed air, cold water, hot water, steam, and hydrogen. There will also be here, as elsewhere throughout the entire laboratory, wires for conveying electric currents, varying in electro-motive force as follows; One 3 volt conductor, one 1,200 volt, one 100 volt, and one 8 volt. In addition to the wires for conveying currents to the various parts of the laboratory, there will be portable batteries of various kinds, suited to different work.

The top floor of the main building is devoted mostly to fine apparatus. There will be 34 cases for such apparatus, each 2 feet 4 inches wide and 21 feet long. There will be about $18,000 worth of apparatus of this sort in this department. The apparatus has been ordered from such makers as Edlemann, Hartman & Brauhn, Lattimer, Clark & Muirhead, Siemens Bros., Carpentier, Societe Genevoise, and, in fact, from all the principal makers. Among the apparatus there will be a large Ruhmkorff coil, a Dubosc phosphoroscope, a Foucault photometer and heliostat, and photometric apparatus of every variety; spectroscopes, and Sir William Thomson's absolute electrometer and quadrant electrometer; a telescope having an Alvan Clark objective and provided with a Young spectroscope, the telescope being mounted equatorially by Fauth; a spectrometer costing $1,200, a micrometer costing $200, a Fauth chronograph. Upon the upper floor there will also be a room for projection, 50×40 feet and 16 feet high. A lantern is being made which will utilize the light of a 5,000 candle arc lamp. Upon this floor there will also be a pump room for lamp experiments, a glass blower's room, and a room for jeweler's work. In the line of mechanics, the laboratory will be able to produce any kind of machine varying in size from that of a locomotive to that of a watch. The main building will contain a large scientific library.

In an annex to the main building will be placed three Babcock boilers, 75 horse power each. In this room will be placed a 14½×15 Armington & Sims high speed engine, one 12×13 Armington & Sims high speed engine, and four dynamos driven by these engines. The dynamos during the day will be employed in testing incandescent lamps and in other work of the laboratory, and during the night they will be employed in furnishing a current to about 1,000 incandescent lamps in Llewellyn Park and 300 lamps in the laboratory.

In addition to the main building and its annex, there are four buildings, each 25 feet wide, 100 feet long, and 16 feet high. In one of these buildings, which is devoted to galvanometers, the use of iron has been carefully avoided, the nails being copper and brass, the tubes lead and copper, and the hinges, locks, window fasteners, etc., all being of non-magnetic material. In the galvanometer building there will be seven piers of solid stone entirely detached from the walls of the building, each being provided with a slate top, having a covering of vulcanized hard rubber 1 inch thick. There will also be two large piers on a level with the floor, 15 feet long and 8 feet wide. The apparatus used in this room will be devoted to all kinds of electrical and magnetic testing.

The second of the smaller buildings will contain a complete chemical laboratory, a balance and spectroscopic room, an analytical room, and a room for general experimental work. One-half of the third building will be used as a carpenter's shop, cabinet making and pattern shop. The balance of this building will be used for the storage of chemicals.

The fourth building will be devoted to metallurgy. It will contain a five stamp mill, a Blake crusher, a 6,000 ampere dynamo, and furnaces of various kinds. It will be supplied with fuel gas from a 40 barrel gasoline gas-producing machine.

$6,262 worth of pure chemicals have been purchased, a quantity of every known substance on the face of the globe has been ordered; all kinds of ores, metals, fabrics, gums, resins, and samples of every imaginable material.

The following is a small fragment of one of Mr. Edison's lists of materials, the entire list filling several volumes:

2 lb. horsetail hair.
2 " hogs' bristles.
5 " cows' hair.
2 " rabbit hair used by felt hat makers.
1 " common goat hair.
10 " best sheep's wool.
1 oz. mink hair
2 " human hair.
4 " porcupine quills, assorted.
1 " camel's hair, fine.
1 " " " coarse.
1 mink skin, hair on.
1 coon " " "
1 deer " " "
1 " " " off.
1 sable " " on.
1 fox " " "
1 cat " " "
1 " " " off.
1 dog " " on.
1 " " " off.
1 seal " " on.
1 " " " off.
1 bear " " on.
2 squirrel skins, hair on.
1 rabbit skin, hair on.
1 " " " off.
4 sheep skins, tanned.
2 rawhides (bulls').
2 hides, French kip.
2 " thick sole leather.
1 doz. chamois skins.
1 walrus hide, tanned.
2 common leather hides.
2 hides, patent leather (best).
½ doz. ostrich feathers.
100 goose quills.
100 assorted hen feathers.
½ oz. swan down.
1 peacock tail.
5 lb. hops.
1 bu. barley.
1 " oats.
1 " wheat.
1 " rye.
1 " buckwheat.
1 bu. beans (common).
1 " peas (common).
50 lb. bran.
50 " oatmeal.
1 bu. corn (shelled).
1 bbl. flour (wheat).
1 " flour (rye).
1 " buckwheat flour.
1 bag corn meal.
50 lb. rice.
5 " assorted ivory.
1 doz. walrus tusks.
1 " bulls' horns.
1 deer horn.
2 oz. sharks' teeth.
½ " small tortoise shells.
½ " common turtle shells.
1 large turtle shell.
50 lb. horse hoof.
50 " cow hoof.
6 sp. white sewing silk, each size, from largest to finest.
2 lb. unspun white silk, reeled on bobbin.
2 bobbins of silk from cocoon.
6 sp. each of finest to coarsest cotton sewing thread.
2 lb. worsted skeins, assorted sizes (white).
1 " shoemaker's wax.
1 " " cord.
5 balls each of finest to coarsest cotton twine.
6 " each of finest to coarsest linen.
25 lb. marlin.
50 fish lines, assorted.
50 lb. clothes line.
2 " best book ink (printer's).
10 " common printer's ink.
1 " each of printer's ink (every color).

Metals, moulding sand, lampblack, pumice stone, rotten stone, oils, soaps, mica, sugar, glycerine, glucose, dextrin, cork in all shapes, etc., etc.

This is a heterogeneous list, but since a complete list will comprise all known substances, these things must necessarily be included. Mr. Edison proposes to have on hand, at the time of the opening of the laboratory for work, materials of all kinds now known, in sufficient quantity to last for five years' experimentation. This enterprise has been a dream of Mr. Edison's since his youth. The realization of it is now rendered possible by the great success of his inventions.

The present buildings were started on the 5th of July, in the present year, and will be finished and ready for occupancy November 1. The cost of the buildings and their contents will be $180,000. The working force of the laboratory will comprise forty skilled men, aside from Mr. Edison and his first assistant, Mr. Batchelor.

The method of developing an invention will be as follows: Rough sketches will be submitted to model makers, who will secure from the vast supplies of material blanks for the necessary parts, or possibly completed pieces for the apparatus, and as many workmen as can be employed to advantage will be at once detailed for the work, and thus the working model will be brought out in a very short time. Any improvements necessary are then made, working drawings are prepared, the necessary patterns and castings made, and the complete, full sized machine or apparatus is at once constructed, tested, and if it is found to fulfill the expectations of the inventor, it is removed to be duplicated elsewhere. Inventions of sufficient magnitude to warrant the venture will be launched as the bases of separate industries. The Edison Machine Works at Schenectady, N. Y., employing 800 men, and the Edison Lamp Works at Harrison, N. J., employing 400 men and turning out 1,000,000 lamps per annum, are examples of what may be expected to follow the completion of the new laboratory.

Automatic Sprinklers for Theaters.

To a reporter of the *Pall Mall Gazette* Edward Atkinson recently said: "The New England factory mutuals require one sprinkler to every 100 square feet of area, and they require to be fixed in every place where the fire risk comes in, that is, where there is the first danger of fire breaking out. In a room 20 feet square you would have four sprinklers, and supposing a fire to break out, as soon as the temperature reached a moderate height, four taps at a high pressure would be turned on, which would convert the whole of the interior of the room into a shower bath. I cannot understand why you do not adopt the sprinklers in the theaters. Were the proprietors of the theaters in London to organize a mutual association, as the mill owners of America, the buildings could be made fireproof with little outlay. I would undertake to organize such an arrangement of sprinklers as to secure the following result: I might even fill your theater with a crowded audience, and then I might set a fire on the stage as a part of the spectacle. Not a single person need move from the auditorium, but watch the flames rise in a fashion which, under existing circumstances, would speedily reduce the whole of the theater to a mass of cinder; but at a given point, within a minute or two of the outbreak of the flames, the whole of the stage would be drenched by a sheet of water pouring down upon it from above and the sides in such a way as to extinguish every spark of fire in a few minutes, or to hold it in check until the firemen could complete the work."

AN INEXPENSIVE INDEX PLATE.

Mechanics generally, and amateur mechanics especially, often have occasion to divide a circle, as in gear cutting or fluting a reamer. To those possessing a gear cutter, or gear-cutting attachment to the lathe, it is very easy, but to one who has no conveniences for such work it is quite troublesome. It is not an easy matter to lay out and drill an index plate. It is comparatively easy to copy a plate, but the plate is not always accessible.

To enable the amateur to avail himself of the use of an index plate with little expense, the annexed photo-engraving has been prepared from a useful plate, and other engravings have been added, showing the application of the plate to a lathe. This print is designed to be cut from the paper and pasted on the metallic plate, B, and the plate is to be attached to the face plate, C, of the lathe, as shown in Figs. 2 and 3. It is important to center the plate with the paper impression accurately in the lathe. For this purpose a center mark and two circles have been provided. The metallic plate should project at least one-fourth inch beyond the paper disk, to receive the clamp by which the plate is held while the cutting is being done.

The following is a table of the divisions that may be made with this plate:

240, 200, 150, 144, 132, 124, 120, 112, 108, 104, 100, 92, 84, 80, 75, 72, 66, 62, 60, 56, 54, 52, 50, 48, 46, 44, 42, 40, 38, 36, 33, 31, 30, 28, 27, 26, 25, 24, 23, 22, 21, 20, 18, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2.

Below is a table of the divisions of each circle:

240	200	150	144	132	124
120x 2	100x 2	75x 2	72x 2	66x 2	62x2
80x 3	50x 4	50x 3	48x 3	44x 3	31x4
60x 4	40x 5	30x 5	36x 4	33x 4	
48x 5	25x 8	25x 6	24x 6	22x 6	
40x 6	20x10	15x10	18x 8	12x11	
30x 8			16x 9		
24x10			12x12		
20x12					
112	**108**	**104**	**92**	**84**	**76**
56x2	54x2	52x2	46x2	42x2	38x2
28x4	36x3	26x4	23x4	28x3	19x4
16x7	27x4	13x8		21x4	
14x8	18x6			14x6	
				12x7	

Referring to the engraving, A is the paper disk which is attached to the metal plate, B, by means of fine starch paste or a mucilage made from gum tragacanth. The plate, B, is secured to the face plate, C, of the lathe by three screws. After the plate is centered and fastened, the center is cut away to allow the blank-holding spindle, O, to enter the lathe mandrel in the place of the usual center.

A bar, D, which is preferably made of cast iron, but which may be made of wood, is secured to the lathe by

a bolt passing downward through the lathe bed and through a crossbar underneath. The bar, D, is provided with a standard, E, which extends behind the plate, B, about one-fourth inch. To the front of the standard, E, is loosely attached a jaw, F, by means of dowel pins. This jaw extends over the face of the plate, B, about one-fourth inch, and is made to bear upon the plate, and thus clamp it to the standard by means of the thumbscrew.

On a screw, K, extending into a standard, I, projecting from the bar, D, is pivoted an arm, J, having an enlarged end, *a*, in which there is an aperture a little larger in diameter than one of the circular dots on the index plate. The arm, J, may be swung opposite any row of dots on the plate, B. The registering of the plate is accomplished by bringing the dot opposite the hole in the index, so that an annular space is seen around the dot through the hole in the index. The hole should be countersunk and the index should be allowed to touch the plate lightly. A magnifying glass assists greatly in securing a perfect registration. As most wheels will be cut with teeth numbering aliquot parts of the rows of dots, the chances of inaccuracies will be correspondingly decreased, but in such a case errors may arise in the counting of the dots for a new position of the plate. To guard against such errors, a clamp, M, is provided which embraces the edge of the plate, B, and carries a pointer, N, which is pivoted, so that it may be made to point to a dot in any of the rows of dots. Suppose it is required to cut a wheel, the teeth of which would require the use of only one in four of the dots of a given circle; then after moving the plate and clamping it fast by means of the screw, the clamp, M, would be moved back four dots, and after the wheel was cut the screw, G, would be loosened and the plate, B, would be moved until the dot pointed to by the pointer, N, would be seen in the center of the hole in the index, J. The metal around the hole at the side and upper part of the index, J, is cut away to allow the pointer, N, to pass downward opposite the center of the hole.

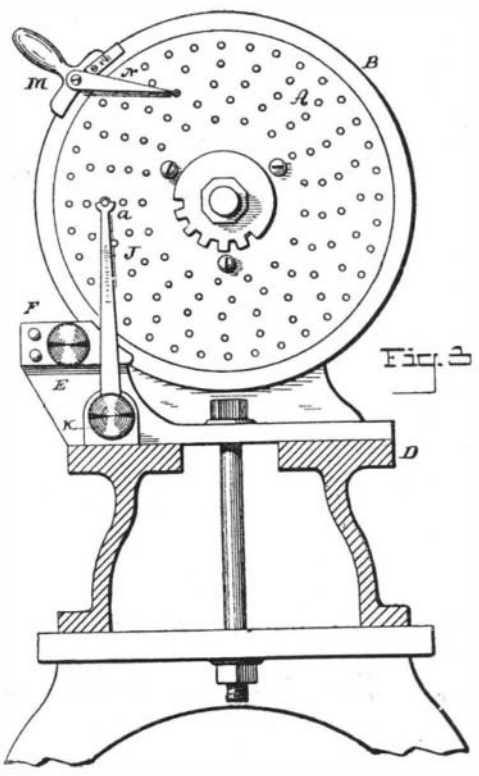

Fig. 3.

FIG. 3.—FRONT ELEVATION OF PLATE APPLIED TO THE LATHE.

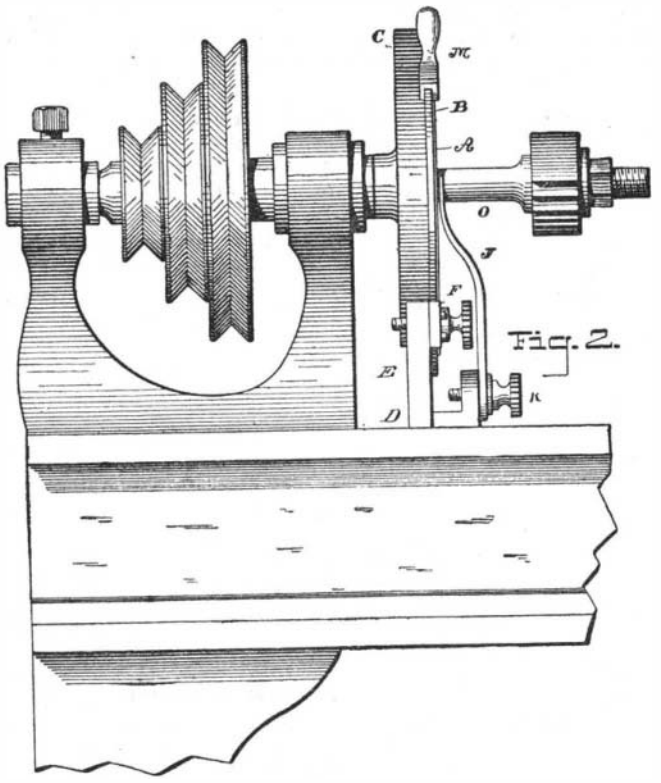

Fig. 2.

FIG. 2.—SIDE ELEVATION OF LATHE, SHOWING APPLICATION OF INDEX PLATE.

As to the method of cutting small gears in the foot lathe, the reader is referred to SUPPLEMENT, No. 317, "Amateur Mechanics."

Each row of dots may be divided up as follows, the heavy faced figures at the top of each column in the above table representing the whole number of dots in each row, while the figures below represent aliquot parts of this number. The figures in each column indicate how many spaces it is necessary to move the plate each time the wheel blank is to be shifted for a new cut to produce the number of teeth directly opposite in the other column. For example, in using the outer row of dots, if it is desired to cut 80 teeth, the plate must be moved three dots for every tooth, for 60 teeth four dots, and so on; or to reverse the order, to cut 3 teeth the plate must be moved 80 dots, and for 4 teeth 60 dots.

It is possible by the exercise of due care in registering and clamping to produce very good work with this inexpensive apparatus.

G. M. H.

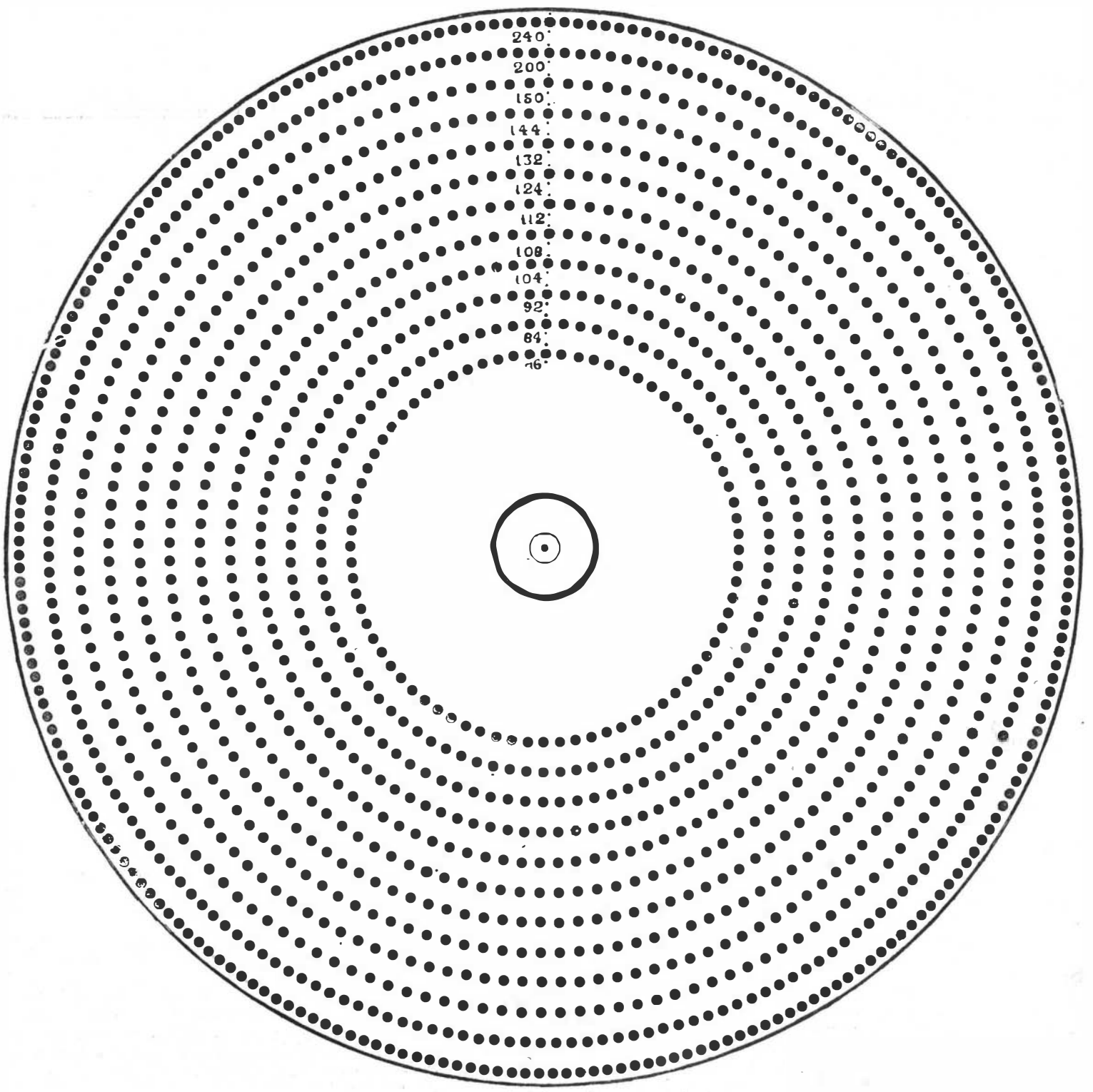

FIG. 1.—AN INEXPENSIVE INDEX PLATE.