A DEFECTIVE CEILING IN THE CAPITOL BUILDING, ALBANY, N. Y.

Probably the most expensive and gorgeous State Capitol building in this country is that at Albany, N. Y., upon which almost fifteen millions of dollars have already been spent, and it is not yet finished. It is a magnificent structure of noble design. But there are evidences of bad work, poor engineering skill, and lack of proper supervision during the construction of some portions of the edifice.

The Assembly chamber is one of the noblest auditoriums, grand in general appearance. Its ceiling of stone is supported on groined arches. An unfortunate settlement of the adjacent walls, which has for some time been going on, has of late made such further progress as to endanger, as was believed, the lives of the members of the Assembly when in session. The ceiling was regarded as liable to fall at any moment.

Immediately upon the assembling of the Legislature, early in January, the members began to be annoyed at the renewed reports in regard to the unsafety of the ceiling. Their fears continued to grow upon them until finally they moved into the Assembly parlor and voted an appropriation to allow the temporary "shoring up" of the vault by the Capitol Commissioner, Mr. Perry.

The Assembly chamber has extreme dimensions of 140 by 84 feet. It is, to use the terms of Gothic architecture, a nave of five bays with an aisled transept. The extreme length is shown in the gallery floor and at the ends of the nave. Each of these extreme spaces is a public gallery. What would be the last bays of the aisles on either side of them are walled out of the room altogether. The spaces under them are vaulted lobbies. The squares at the corners of the central space are also separated from the main room on the first floor, at the Speaker's end by a solid wall, and at the entrance end by columns carrying a stone screen, and each contains a gallery. The Assembly chamber proper is thus confined to the central transept, including the bays at either end, in one of which the Speaker's desk, shown in our engraving, is placed. The space bounded by the columns is 45 by 55 feet, nearly, and the keystone of the vault over it, the highest point of the room, is 62 feet from the floor. The ridges of the vaults are not horizontal, but have a rise in the central vault of three or four feet in the center. There are no ridge ribs and no wall ribs, the coping abutting directly upon the walls. The shafts of the four colums which support the central vault are four feet in diameter, composed each of three drums of red Connecticut granite, polished. The capitals and bases are of Westchester marble. The walls and cells of the vaults are of Ohio sandstone, with ribs and arches of Dorchester stone. The nook shafts of the windows are of brown stone from New Jersey, with capitals and bases of Ohio stone. The hood moulds of the windows are of brownstone, the voussoirs of Ohio stone, the archivolts within them, and the impost mouldings, of Dorchester stone. The moulding of the arches and ribs of the vault, and of the jambs, wall arches, and other features, is bold and simple in character, rather than delicate or complicated, and the decorative carving is throughout highly conventionalized from natural types in design.

The carved enrichment of the Assembly chamber is abundant, and incised arabesques are freely introduced, as well as modeled carving. The color decoration is everywhere a part of the carved decoration. Each groin of the ceiling bears two belts of decoration, one almost at the ridge, the other not far from the springing, which follow the line of the courses. The ornament in the upper belt, fifty feet from the spectator, is very bold in design and cut; the lower belt subordinate in all respects. The stone is excavated to the depth of some inches, and the ground filled with vermilion or ultramarine, the ornament edged with gold. The furniture of the room is mahogany. On the north and south walls of the chamber are the famous frescoes "The Discoverer" and the "Flight of Night," by William M. Hunt.

The chamber, as described above, is not the one that was originally designed. The ceiling of that one was to consist of panels of cast iron at a height of forty-two feet from the floor. In 1875 the Legislature abolished the Board of Capitol Commissioners and placed the work in the hands of the lieutenant governor, the attorney general, and the auditor of the canal department. When it was proposed to change the entire form of the Assembly chamber and load the weight of the ceiling upon the four great columns, the original architect, Mr. Thomas A. Fuller, resigned; and the Board put Mr. Leopold Eidlitz and the late Mr. Richardson in charge of the work. Mr. Edlitz proceeded to construct the Assembly chamber as it was finally built.

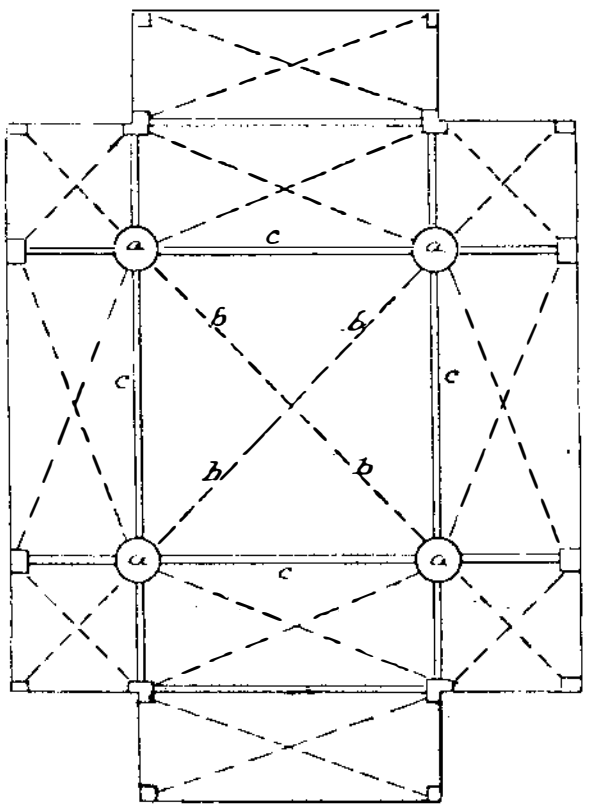
There appeared to be no feeling of insecurity until 1881, when a resolution asking for an investigation was defeated in the Senate. In 1882 a report was made to Gov. Cornell by a special commission consisting of W. P. Trowbridge, Chas. Babcock, and George B. Post, who reported that the workmanship of the building was, as a general thing, very thorough; but in the Assembly chamber they found that the four great columns were loaded to the extreme limit of safety; that the stone of which the ribs were constructed was not uniform in quality or strength; that the side vaults had a tendency to rise; and that the main arches were in good condition, although the transverse thrusts had been taken up by iron rods at points above the crowns of the main arches. Therefore the commissioners, being uncertain as to whether the columns had settled as much as they would, recommended that the stone vaulting be removed and be replaced with wood, the stone ribs still remaining. Mr. Eidlitz asked that he might repair the broken ribs at his own expense, and nothing more was done, except to all ow himto do so.

Examinations at that time showed very large cracks through which the room below could be seen. The Assembly, therefore, was obliged to meet in the room beneath, for a few weeks in the early part of the year 1883. When these repairs were concluded, the Assemblymen sat under the ceiling for four years without anything more than an occasional attempt to have some one investigate and report upon the alleged danger. By 1887, however, there was alarm. An engineer was employed to make a thorough examination. He reported there were many new fissures in the ribs, and the ceiling must come down and be replaced with a lighter one of wood. This report was not made until the end of the legislative session. Hence nothing was done during that year.

The commissioners appointed to make a preliminary examination, early in last January, were John Bogart, state engineer, Richard Upjohn, architect, and Thomas C. Clark. Early in February they made a report which contained, among others, the following statements: "We went up to the top of the ceiling, and found there had been many serious movements of the stones of the groined vaults, owing to the vaults and ribs not acting together. This has caused cracks at the joints, in some cases of considerable length. In one place, at the apex of the ceiling, the Assembly floor can be seen through the crack.

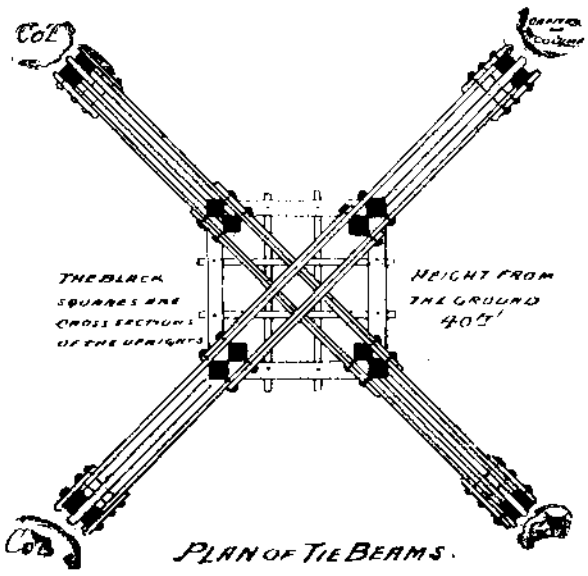
We found the main vault in two places had settled three inches below its original level. All the main ribs which support the central vault were found to be cracked and shattered near the circular keystone. In one of the ribs we found a stone three feet long split from end to end in strips. By the side of another rib was a spall, split by pressure, 10½ inches long, 7 wide, and 3½ thick. Its defect was not due to the material. There is clear evidence of sound sandstone split by a pressure many times what it had been calculated to sustain. The whole ceiling is in a dangerous condition, more or less cracked, showing signs of unexpected pressure. As the ribs originally were none too large to resist pressure, in their present reducing condition they are still less able to do their work. A time must come, and that we believe very soon, when without warning one or more of these overtaxed rib stones must give way. When that happens, the whole ceiling will fall."

A more thorough examination established the fact that the ceiling is not in a state of equilibrium, that is to say, the excess of pressure in one part, as at the base of the arches that spring from the southeast column tends to press upward all the ashlars—or what is called the "vaulting"—on whatever plane it may be laid. There was formerly just as much trouble with the rising of the arches that spring from the other three pillars; and the central dome showed a very bad disposition to rise, which was only corrected by placing upon it many tons of pig iron to load it down. The arches that spring from the four great columns are

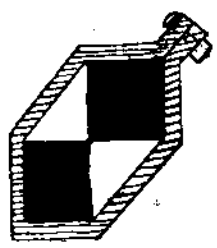


a. The four columns. *b*. The diagonal ribs that need support. The light ribs are all dotted. *c*. Heavier ribs.

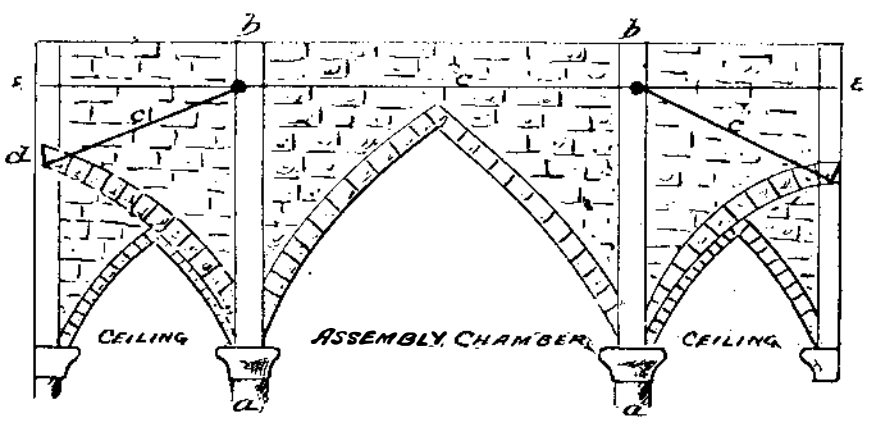
PLAN OF ASSEMBLY CHAMBER CEILING.



PLAN OF TIE BEAMS.

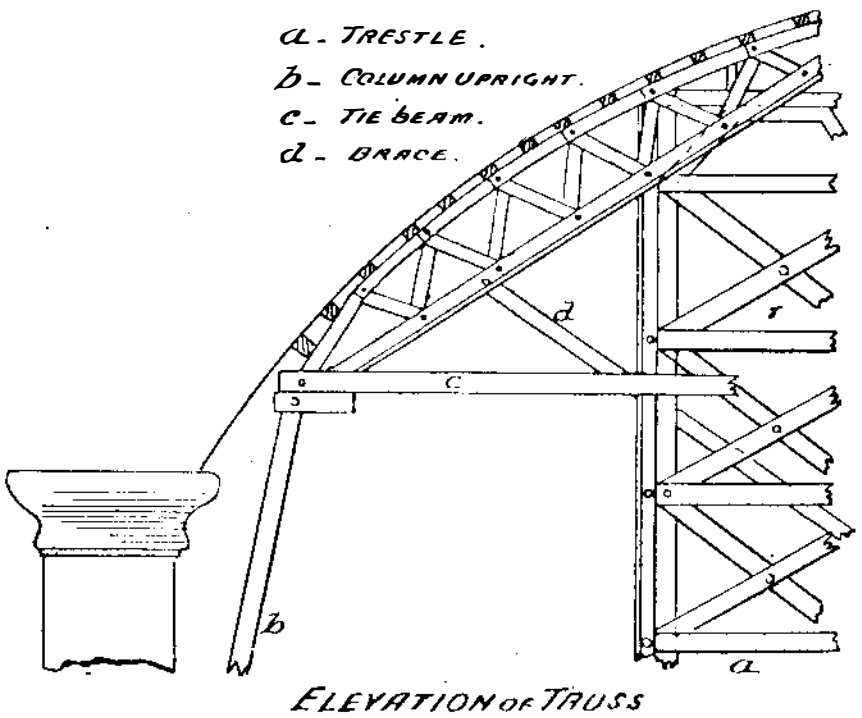


How bolted (cross section).



SECTION OF THE EAST & WEST WALLS.

a. Two of the great columns. *b*. The cross walls, north and south. *c*. The tie rods. *d*. The granite arch (hidden by a veneering of sandstone) holding the anchorage of the tie rods and receiving the thrust of the main arch. *e*. Extra tie rod in north and south walls.



ELEVATION OF TRUSS

surmounted by walls that reach a level of five feet above the respective keystones. The walls are carried beyond the columns into solid walls beyond. Just above each of the four great arches that connect the columns (and embedded in the solid masonry) there run straps of iron 3 inches broad and 1½ inches thick. Four of these straps are laid side by side, thus forming tie rods, which are anchored in the solid wall beyond. Thus each of the four columns is crossed at right angles by tie rods some distance above its capital. This will be shown more clearly by the accompanying section of the two east and west walls. The dotted lines at *d* show the hidden granite arch that receives the thrust from the main arch and keeps the four great columns from being pushed outward. As the tie rods expand in the summer, the arches drop a trifle. When they contract with colder weather, the arches will not rise, but spalls will chip off. This process has been going on for years, and it has beena source of great danger. These spalls which fall to the floor almost invariably appear when there is a considerable change in the temperature outside—in October and November. The staging that is in place now enables the visitor to examine closely the under surface of the ceiling. The dropping of the central keystone has pulled the ashlars away from the west walls, and has left great gaps, which were filled four or five years ago. At the same time many defective places caused by the dropping of spalls were pointed, so as not to appear from the floor. A closer examination shows that the ridges along the main vault are so thoroughly crushed that it is a wonder the broken stone did not fall long ago. The diagonal ribs of the great vault show many cracks, which prove they were made of too light material. The fact is, they should not only have been made of better material, but they should also have been three or four times as large.

The Capitol Commissioner, Mr. Perry, saw at once that these diagonal ribs must be supported. In this he did not agree with some who had thought that the ribs connecting the four great columns should be strengthened. Mr. Perry's first movement was to cut through the floor in four places near the center of the room, so that he might strike two columns in the floor below; and, for his other two foundations, go to the solid bases one story lower. Thus he had a parallelogram 18 feet one way and 12 feet the other. He placed on the corners sticks of Georgia pine 12 inches square as the uprights for the trestle. These sticks were reenforced by sticks of the same size placed edge for edge toward the interior of the parallelogram—the two being bolted by straps of iron. The trestle was continued all the way to the keystone. Excavations were made about the bases of the four great columns and heavy foundations of wood were laid, on which two uprights (each 12×12) were placed, with the inclination toward the great trestle in the center. When these uprights had passed above the capitals of the columns, they were met at right angles by great tie beams, which braced them into the central trestle. Having thus prepared a strong framework, it was a comparatively easy matter to construct four trusses running from the top of each column upright to the nearest corner of the central trestle. In the placing of the trusses, a chord was first run in a straight line. Then a rib, in very small sections, was built along in the curve about 6 in. for the stone rib of the ceiling above. The last of the work was to connect the ribs and the chords by the struts, or cross pieces.

The whole work has been an undertaking of great difficulty. It supports the ceiling so that there is no possible danger, and, at the same time, the support is so permanent that it can be used when the ceiling is finally removed. The chances are that it will be succeeded by one of wood or of iron. In either case it is probable that the pointed Gothic arches will not be repeated; but that Romanesque arches will be used, in harmony with the windows and doors, thus lowering the height of the room from 12 to 15 ft., and much improving its acoustic properties.

A New Treatment for Boils and Carbuncles.

In a communication to the French Academy of Medicine, at a recent meeting, M. Verneuil says:

The topical applications (prominent among which stand the carbolated and borated solutions) employed in a certain way, and particularly in the form of powder used repeatedly and for a long time, are of remarkable efficacy, and at the same time are absolutely harmless and easy of application.

These applications of powder quickly abort, with very few exceptions, boils and carbuncles. They arrest the progress of the disease in the gravest cases, ordinarily cause the pains to quickly cease, reduce the fever, disinfect the purulent and gangrenous centers, hasten resolution, and promote the formation of healthy granulations.

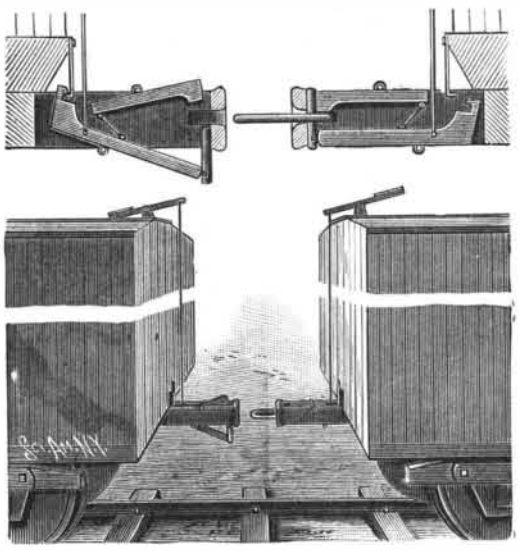
This treatment is suitable for all regions, and for all forms and periods of the disease. It is never harmful, and leads to a cure in a large number of cases. It assists surgical interference when that is necessary.

Finally, it tends to prevent auto-inoculation and general infection.

AN IMPROVED CAR COUPLING.

A car coupling in which a lever operated by a foot lever on top of the cars carries the coupling pin, a guide lever being connected with this lever, and a spring catch for holding it in place, is illustrated herewith, and has been patented by Mr. William H. Dawson, of Harlan, Iowa.

The manner in which the lever is fulcrumed to hold the coupling pin is plainly shown in the sectional view, the inner end of the lever being formed with a catch to engage a spring by which it is held in a locked outward position, and there being secured to the lever, in front of its fulcrum, a link connected with the rear end of a guide lever fulcrumed on the drawhead, and also moving in the vertical slot in which the coupling pin slides. The front end of this guide lever has a shoulder adapted to engage the inner end of the coupling link, to guide it to place when entering the other drawhead. When the fronts of the two drawheads come together, the catch is disengaged from the lever holding the coupling pin in the open drawhead, and as the cars are coupled the shoulder of the guide lever engages the top of the coupling link, locking it in place. To uncouple the cars, it is only necessary to press with the foot on the inner end of the foot lever on top of the car.

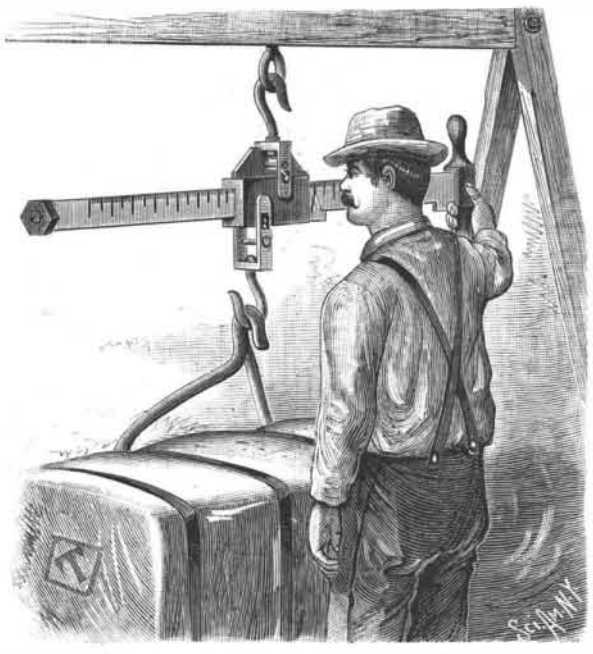


DAWSON'S CAR COUPLING.

AN IMPROVED WEIGHING SCALE.

A device to facilitate the convenient weighing of a wide variety of articles, and which has but few parts and can be economically constructed, is shown in the accompanying illustration, and has been patented by Mr. Waddy C. Thomson, of Lancaster, S. C.

The scale beam is arranged to slide in a suspended piece or box, so that at every sliding or shifting one end of the beam will project more and the other end less from the point of suspension. The weight is a constant, permanently fastened to the sliding beam, there being a larger weight attached to one end and a smaller one at the other end, both weights and beam adding to the capacity of the scale. Removable weights are not required, with their liability to being mislaid or dropped on one's feet. The top buffer, with the hanger, limits the swing of the beam, showing down or up weight. A fixed stop or buffer on the under side of the beam limits the sliding of the beam to the left, and protects the fingers from being mashed when the stop comes against a projection from the bottom of the box, the scale then being in equilibrium when no object is being weighed. To this projection is attached a pointer, indicating the weight on the graduated beam as it is moved in or out, the scale balancing with the weights. The weights cannot be tampered with without the scale indicating it. This invention is applicable to a variety of scales.



THOMSON'S WEIGHING SCALE.

The Care of the Eyes.

At the sanitary convention held at Ann Arbor, Mich., not long ago, Dr. C. J. Lundy, of Detroit, read a paper on "Hygiene in Relation to the Eye," which should have the widest circulation, especially among teachers and school officers. A fruitful source of eye troubles is shown to be the excessive strain upon the muscles and nerves of the eyes due to faulty educational methods, the ill planned and insufficient lighting of school rooms, poor ink and fine print in school books, and other causes which education might correct.

In conclusion, Dr. Lundy lays down the following rules for the better care of the eyes:

1. Avoid reading and study by poor light.
2. Light should come from the side, and not from the back or from the front.
3. Do not read or study while suffering great bodily fatigue or during recovery from illness.
4. Do not read while lying down.
5. Do not use the eyes too long at a time for near work, but give them occasional periods of rest.
6. Reading and study should be done systematically.
7. During study avoid the stooping position, or whatever tends to produce congestion of the head and face.
8. Select well printed books.
9. Correct errors of refraction with proper glasses.
10. Avoid bad hygienic conditions and the use of alcohol and tobacco.
11. Take sufficient exercise in the open air.
12. Let the physical keep pace with the mental culture, for asthenopia is most usually observed in those who are lacking in physical development.

A Mammoth Aphengescope.

The *English Mechanic* describes what it calls a mammoth aphengescope which has just been devised and constructed by Mr. W. C. Hughes, of Mortimer Road, Kingsland, for Princeton College, New Jersey. The object of the apparatus is to show diagrams, solid objects, such as machinery, the human face, and anatomical and other subjects occupying a large space, on a larger scale than has ever yet been attempted. The idea of an opaque lantern is, of course, not new, but hitherto the loss of light reflected has been an insuperable difficulty, which Mr. Hughes has overcome by constructing condensing lenses of larger diameter and special curvature, the object lens being of a very special character, being 8 inches diameter, and therefore very costly. In days gone by, the size of the largest object that could be shown was that of a carte-de-visite or watch face, but with this new instrument an object occupying 24 to 30 inches square can be shown on a disk of from 12 to 18 feet. To obtain these results the expenditure of no inconsiderable amount of money and numberless experiments have been necessary, extending over a period of more than eighteen months. After all this labor it is gratifying to find that the invention is a complete success, many scientists having expressed their approbation and approval, among others Mr. William L. Carpenter, B.A., who was commissioned to test the capabilities of the instrument, and whose verdict is that he has never seen so fine a result from reflected light.

Waxing Hard Wood Floors.

Take a pound of the best beeswax, cut it up into very small pieces, and let it thoroughly dissolve in three pints of turpentine, stirring occasionally if necessary. The mixture should be only a trifle thicker than the clear turpentine. Apply it with a rag to the surface of the floor, which should be smooth and perfectly clean. This is the difficult part of the work, for if you put on either too much or too little, a good polish will be impossible. The right amount varies, less being required for hard, close grained wood, and more if the wood is soft and open grained. Even professional "waxers" are sometimes obliged to experiment, and novices should always try a square foot or two first.

Put on what you think will be enough, and leave the place untouched and unstepped on for twenty-four hours, or longer if needful. When it is thoroughly dry, rub it with a hard brush until it shines. If it polishes well, repeat the process over the entire floor. If it does not, remove the wax with fine sandpaper and try again, using more or less than before, as may be necessary, and continue your experimenting until you secure the desired result. If the mixture is slow in drying, add a little of the common "driers" sold by paint dealers, japan, for instance, in the proportion of one part of the drier to six parts of turpentine. When the floor is a large one, you may vary the tedious work of polishing by strapping a brush to each foot and skating over it.

WE are glad to know that our correspondent Wm. R. Brooks, of Red House Observatory, Phelps, N. Y., has just been elected a Fellow of the Royal Astronomical Society of England, in recognition of his astronomical discoveries.