

A NEW PUZZLE.

Over the length and breadth of America, writes Mr. R. Proctor in the *Newcastle Weekly Chronicle*, a new puzzle is exercising the minds, and apparently also trying the temper and taxing the moral energies, of the American people. It is called the Fifteen Puzzle, and may be thus described: The numbers from 1 to 15 are printed on fifteen square blocks, which are placed in any order in a square space capable of holding sixteen such blocks. The problem then is to arrange these fifteen blocks without removing them from this space—that is by merely sliding them one by one to whatever square may at the moment be vacant—until they are in the order—

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	

A very little practice suffices to bring the numbers from 1 to 12 in the required position—and then the numbers 13, 14, and 15, will be in one or other of six positions—viz., 13, 14, 15; or 13, 15, 14; or 14, 13, 15; or 14, 15, 13; or 15, 13, 14; or 15, 14, 13. After a little further practice it will be found easy to reduce the positions 14, 15, 13 and 15, 13, 14 to the position 13, 14, 15; that, is, to complete the solution of the puzzle. It is equally easy to bring the positions 14, 13, 15 and 15, 13, 14 to the position 13, 15, 14. But here comes in the really trying part of the puzzle—to resolve the position 13, 15, 14 into the position 13, 14, 15. And it is over this task that (so far as I can judge from the papers) hundreds of thousands of Americans have lost their characteristic coolness, and that some of those hundreds of thousands have departed, in some degree, from the strict path of truth. At any rate, I have seen not a few announcements in the journals that this difficulty has been solved, whereas it is mathematically demonstrable that it cannot be solved. When any one says he has seen the thing done, he does not necessarily tell an untruth, for the hand is quicker than the eye, and he may readily have been deceived; but when a man says he has done this thing, he most unquestionably says the thing which is not. If any reader should wish to try this puzzle, let me give him a word of caution, suggested by the maddened aspect of American puzzled ones, whose movements I have noted. Let him assign to himself at starting a certain definite interval of time, during which he will continue his efforts to solve the insolvable, and when that time has elapsed let him set aside the puzzle for some other time—if he can. There is, however, a certain amount of interest in discussing the mathematical relations involved in this puzzle, and I would commend that problem—always within reasonable limitations as to time—to the attention of readers who may possess mathematical tastes. It is, perhaps, hardly necessary to say that the problem is one depending on the properties of numbers.

INTERIOR OF THE MODEL ROOM OF THE PATENT OFFICE, WASHINGTON, D. C. MESSRS. CLUSS & SCHULZE, ARCHITECTS, WASHINGTON.

After protracted discussions on the reconstruction of the Patent Office, it was decided by Congress that the external architecture should not be changed; that the reconstruction should, as nearly as possible, approach absolute fire-proof work, and that there should be full latitude given in the disposition of the space, as well as in the architecture and decorations within. Footing on these premises, Congress adopted the plans of Messrs. Cluss & Schulze, architects, of Washington, and the work under the superintendence of the architects, controlled by a board of supervision, whose members are Mr. W. E. Paine, Commissioner of Patents, Lieutenant-Colonel T. L. Casey, U. S. A., and Mr. Edward Clark, the present architect of the Capitol, approaches completion very rapidly. Absolute fire-proof construction was construed to imply the absence of all combustible matter and the

protection of all exposed metal-work by thick castings of fire-proof material. In explanation of the new design, it is necessary to state that the windows in the old side walls do not reach above half the height of the model-rooms, since they are arranged to suit the exterior architecture of the building. This necessitated recourse to skylights. Hence, continuous double skylights are provided along the centre of the halls, with an intermediate space from which side-light is thrown on and through the galleries. The outer skylight is covered with heavy hammered glass, laid on ropes and cork, the inner one with ribbed glass. The space between the skylights is ventilated so as to prevent sweating by condensation of vapor. The objects on exhibition requiring close inspection, alcoves were arranged on the main floor and on two galleries, with well-holes in the centre of the gallery-floors for the transmission of light to the darker portions of the rooms. False ceilings were carefully avoided. Safety and hygienic advantages were insured by the use of roofing arches formed of hollow fire-proof blocks. By such construction the whole cubic contents of the rooms were secured for useful occupation, and galleries are introduced where formerly there was but one. To obviate the injurious effects of expansion and contraction experienced with metal roofs of wide span, the halls have been arranged for a central nave and two aisles, by two rows of solid piers which are carried up for the support of the roofs. These piers are spaced transversely, as well as longitudinally, to suit the *points d'appui* in the lower stories, and are built of bonded brickwork laid in Portland cement. The piers are tied, in pairs, by fire-proof, wrought-iron girders stretched across the central nave; these are surmounted by decorated pediments. The wide spaces between the piers of each row are subdivided by double wrought and cast iron columns with intermediate fire-proof filling; these support the galleries, which are constructed of rolled-iron beams with ceilings formed of hollow, fire-proof blocks, and floors of huge slabs of slate. In order to retain the entire space between the middle piers and outside walls, for the fire-proof model-cases, balconies were designed on the first gallery, which project into the nave. The floors of the balconies have not the full thickness of the gallery floors, and even their reduced thickness has been lightened by panels in their underside, seen from below. The interior architecture of the model room is in modern Renaissance.

The floors of the central naves and communicating passages are laid with marble tiles. The ceilings of the galleries are kept plain, since the model-cases abut against them, and all the spaces between the cases are again relieved by the light-wells. Style is imparted to the piers along both sides of the central nave by facings of the fire-proof equivalent of statuary marble—Keene's marble cement. Substantial pilasters, with raised work, are formed of Egyptian and verdantique marble under the first gallery. Upon the floor of the first gallery a tier of loftier and more elaborate pilasters is raised with pedestals of verd-antique, fluted shafts of polished Sienna marble, and capitals with superincumbent consoles of Parian marble, the effect of which is enhanced by a moderate amount of gilding for the prominent parts. The merits of Keene's cement have induced an extensive use of it for plastering and floors under the model cases. The ceilings of the hall rest upon coved cornices, and mark the rather construction of the roof by sunk compartments between moulded styles. The whole coloring of the halls, with the exception of the prominent features in polished and plain marble, is kept in gray; the ceilings in shades of cold gray the side walls and plain parts of piers in greenish grays, and the finish of windows, doors, and galleries, in warm grays, all with sparing applications of gold. The balustrades of the galleries, as well as the railings of the well-holes and stairs, are bronze. The outside window sashes—the only wood in the halls—are of mahogany. It is to be noted as evidence of the fire-proof condition of the work that no carpenter was on the pay-rolls, nor was any carpenters' work furnished under contract up to the time of hanging the sashes. The fire-proofing is intended to be carried to its legitimate consequences by building the model-cases of light rolled-iron frames and doors, with shelvings of heavy fluted glass.

On March, 3, 1879, the funds necessary for the reconstruction were appropriated; they netted \$245,800. This sudden revival of the iron industries made it difficult to obtain the heavy quantities of rolled-iron required, but still the building will be restored to its uses by the early part of next summer. Nearly 1,100 tons were consumed; it required twenty-two tons of copper to cover the roofs; the skylights require about 21,000 square feet of hammered or fluted heavy glass; the galleries will be floored with 40,000 square feet of rubbed slabs, and the main floor with 33,000 square feet of marble tiles and Keene's cement.