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- Frice 10 cents. For sale by all newsdealers. ENGINEERS AND MECHANICS.—The South Pass Jetties. By MAX E. SCHMDT, C. E. An exceedingly valuable maper reviewing the pro-press of the improvement at the month of the Mississippi, the consoli-dation and durability of the works, and describing the concrete blocks and other constructions of the last year, with numerous illustrations, namely :Chart of the South Pass Jetties, etc. Compound Marine Engine. Vile's system. 3 figures. New Marine Railway. New heaving -up slip. Northam iron works. SouthAmpton, England. Ilustrated. Mackenzle's Screw Propeller Assistant. 2 figures. The Theory of Roller Milling. By GUSTAV PAPERNEEL, 1 figure. Measuring Devices. An elaborate review of English and American inventions, with illustrations of the more important one. Sfigures. ELECTRICITY, LIGHT. HEAT. ETC.—Acoustical Eve Damb De-I.
- II. ELECTRICITY, LIGHT, HEAT, ETC.-Acoustical Fire Damp De-tector. By Professor GEORGE FORBES.
- tector. By Professor GEORGE FORBES. A New Rheemetric Gas Burner. An Ingraved Gus Blowpipe. By F. H. WENHAM: 1 figure. On a 'Advanoueter for Demonstrating the Internal Current Trans-mitted through the Liquid within a Voltaid Cell. A British Association paper. By CONRAD W. COOKE. 1 figure. Orifetty Acro Battary. A pingragement of the Logianghe Battary. paper. By CONRAD W. COOKE. 1 figure. Gaiffe's New Battery. A nimprovement of the Leclanche Battery. On the Currents of Ampere and on Residual Magnetism. By M. TREVE.
- III. CHEMISTRY.THERAPEUTICS. ETC.—On the Presence of Nitrogen in Steel. By ALFRED H. ALLEN. Abstract of British Association

### PROTECTION FROM LIGHTNING.

large glass insulators, and has no electrical connection with tained by means of an electrical machine. A spark can be made to pass from the machine to an insulated body, although the force of the shock will be much less than when not insulated." After further illustration, Professor Macomber concludes thus: "Practically it would be almost impossible to insulate a building because after rain commenced to fall it would wet it so that communication with the earth illustration he causes a spark to pass from an electrical to the Comstock mines. insulated by a glass foundation. In a laboratory one is dealexists between the size of thunderbolts, the size of buildings, and the height of any glass foundation with which any building could be provided. We cannot regard his illusvented from working its effect upon the building by any inwith. The spark would strike the house and then pass by around the glass foundation; but for the practical purpose of demolishing the house, its energy would be but little im- intention. paired. Suppose that a metallic ball a foot in diameter should be hung up by a rubber cord just an eighth of an inch from the ground, and we should cause a spark twenty place? The ball would receive almost the entire force of the matter whether this space is filled with air or glass or any dents have occurred in this way. insulating medium now known.

given above.

For the same reasons the glass insulators with which the handles of their shovels they found him unable to move. most lighting rods are provided are useless. If there is a He had lost all volition, and had to be taken out on a car. path of least resistance from the lightning rod to the The graver results of overheating include insanity and ground through the house the discharge will take this path death. The death of a carman on the 1,400 level of the Calewithout regard to the glass insulators. The ordinary light- donia mine, Gold Hill, March 11, 1878, is a case in. point. ning arrester in telegraph offices is an illustration of this. He had been idle for six months, and that morning he was the discharge leaps across the short air interval provided working his first shift. At an early hour he rushed into the between the telegraph wire and an earth connection, this station of the 1,400 level and reported that the wheels of his air interval could be replaced by a plate of glass and the car were smashed. The station master returned with him to spark would still leap through it. All lightning rods should his car and found it all right. There was evidently somebe connected with the system of gas pipes and steam heating thing wrong with the man, and he was taken to a cooling apparatus, furnaces, or large masses of metal about a house, place. Here decided mental aberration was discovered, and and then carefully grounded in moist earth. The best ground the man, firmly lashed to the cage, was hoisted to the surcan be obtained by connecting the lightning rod with the face, where he fainted at once and died in a few minutes. water pipes if there are such about the house. In this case the heat was only about 90° Fah. In another case a miner died from cramps, attributed to ----**.**... FREEZING IN FIRE. heat, but which may have been due to drinking ice water; A few days since, while observing the action of his new and another death is charged to a cold taken while cooling off after being partially overcome with heat. Though conabsorption refrigerating machine at Ruppert's brewery, 92d street and 3d avenue, Mr. T. L. Rankine casually placed a trary to the rules of outside hygiene, the miners resort to copious draughts of ice water or to exposure to strong cold air curlighted candle against the expansion pipe leading from the rents for recovery from overheating, and usually with imliquid receiver. His intention was to melt the frost from the pipe; but to his surprise the effect was quite the opposite, punity. The cold air cooling is considered the safer method; frost forming within the flame much more rapidly than on but to gain time Mr. Church commonly chose the ice water, other portions of the pipe. He afterward observed in the and never felt any ill effects from it. With several thousand cellar he was refrigerating that directly over the burning gas cases a day of rapid cooling off by one or the other of these jets the frost on the pipes along the ceiling was whiter and methods it is surprising that fatal consequences have been so more abundant than elsewhere. infrequent.

To those unfamiliar with the fact that the vapor of water We learn that a lightning rod company in Cincinnati has is always a necessary product of combustion, the production patented a system of lightning protection which consists of of frost in an atmosphere of fire seems to be not merely an iron rod running along the ridge of the building, with wonderful but magical. And we confess that perfect familipoints at each end projecting upward. It is supported upon arity with the chemistry of combustion did not greatly mitigate our surprise on witnessing the phenomenon Of course the building and no rod running to the ground. It is said the principle is the same as in the familiar experiment of that there are many public buildings in Iowa which have freezing water by the rapid vaporizing of sulphuric ether been provided with this system of lightning rods. We also or other volatile liquid in the presence of high heat; but in perceive in the September number of the College Quarterly, this case refrigeration is from within, and one sees only the a journal issued by the Iowa Agricultural College, in the in fame surrounding an iron pipe, on which the nascent water terest of industrial progress, an inquiry addressed to Pro- vapor is immediately transformed into white frost. It is fessor Macomber of that college in regard to the possibility worthy of remark that the frost is whitest where the flame of protecting a building from lightning by insulating it with is hottest, for there the vapor is formed and the combustion a glass foundation. Professor Macomber in his reply admits is freest from smoke. Incidentally the phenomenon gives that it would be possible that a house thus built could be evidence of the intense cold generated by the machine, which struck by lightning; but adds, "By insulating a building is as compact and simple as it is powerful. It will be rethe tendency to be struck by lightning would be very much membered that Mr. Rankine is the gentleman who constructed lessened and the severity of the shock much de- the large skating rink at Gilmore's Garden last winter, maincreased. Practical illustrations of this can easily be ob-taining for some weeks the largest sheet of artificial ice ever known.

#### . . . . . EFFECTS OF HEAT IN THE COMSTOCK MINES.

In an interesting paper read at the Pittsburg meeting of the American Institute of Mining Engineers, Mr. John A. Church reviewed at considerable length the accidents in the Comstock mines and their relation to deep mining. During would be established." The belief is quite common that by the twenty-two months preceding May, 1879, there were providing a chair or a bed with glass blocks upon which it 101 accidents, killing outright 53 persons and wounding 70 rests, safety from lightning is secured, and the lightning others. The accidents were classifiable under the eight folcompany of Cincinnati and the inquirer in the College lowing heads: 1. Falls of rock, timber, etc.; 2. Tramming; Quarterly both have the belief in mind. Professor Macom- 3. Effects of heat; 4. Falls of men; 5. Explosions, 6. Hoistber is evidently not a believer; but we are nevertheless ing apparatus; 7. Overwinding, 8. Miscellaneous. Most of tempted to criticise the tender manner with which he treats these causes of danger and loss of life are common to all this belief, and his use of the word "practical." In his mining operations; the third class includes accidents peculiar

machine to an insulated body, and says that the shock of I is several instances miners have been fatally scalded by this spark will be much less than when the body is not in- falling into the hot mine waters, which exhibit temperatures sulated. We cannot regard this as a practical illustration rising to 158° Fah. The most remarkable casualties, howof what would take place even if a house could be perfectly ever, are due to the killing effect of labor in the hot and steaming atmosphere. The proportion of fatal casualties is ing with feeble sparks. Moreover the relation between the larger in this class than in any other, being 73 per cent; and size of the spark, the size of the insulated body, and the from the peculiar mental effects of the heat it is highly probheight of its insulation from the earth or neighboring con- able that it may be the real cause of many mishaps, which ducting masses is entirely different from the relation which under other circumstances would be ascribed to culpable blundering.

On the 1,900 level of the Gould & Curry mine a drift was run along and quite near to the black dike, one of the hot tration in any sense a practical one. A thunderbolt which spots of the mine. At a spot where the thermometer marked can leap to a house or other building would not be pre- at times 123° Fah., Thomas Brown fainted while at work. When taken to the surface and revived he was found to have sulation which human means could provide its foundation completely lost his memory. He could not tell his name or where he lived, and had to be dressed and taken home by his another leap the comparatively insensible interval which friends. The newspaper which recorded the occurrence said separates the house, provided with a glass foundation, from that such sudden loss of memory from overheating was quite the ground. It is true that the spark would be divided into common in the mines; and suggested that the fact might a spark to the house and another to the ground, through or furnish an explanation of the walking off into fatal winzes and chutes by experienced miners, seemingly with deliberate

A frequent accident in these mines is fainting in the shaft while the cage is rising to the surface. The faintness is always felt immediately upon reaching the cooler air, a hunfeet or more in length to leap to the ball, what would take dred or a hundred and fifty feet from the surface, where there is usually a side draught through some adit. This shock, and the discharge would find its way, so to speak, to happens so often that a man who has been working in a hot the ground through the space of one eighth of an inch drift is never allowed to go up alone. Long habitude to the which separates the ball from the ground. It does not heat is no safeguard against this danger, and serious acci-

Among minor casualties, Mr. Church mentions one which This relative magnitude between the discharge and the happened to Mr. Sutro, in the Sutro Tunnel, before it made object struck is apparently not considered by the "Cham- a connection with the Savage mine. After spending some bers National Lightning Protection Company" of Cincin- time in an air temperature of 110° Fah., Mr. Sutro went to nati. It is needless to say that their system is impractica- the air pipe to cool off. He stayed so long that the miners ble and entirely untrustworthy, for the reasons that we have told him to get way from the pipe and let them have air. He did not move, and when they tried to stir him up with

in Steel, By ALFRED H. ALDER, ACCRED & LINEAR OF LINEAR OF STREET, On the Dissociation of Chlorines. By E. P. DUNNINGTON, University, Virginia. Detection of Phenol. Dr. E. HOFFMANN'S Method. Detection of Phenol. Dr. E. HOFFMANN'S Method. Saponine from the Bark of Quillar Saponaria. By H. COLLER, An extremely elaborate and valuable paper read before the British Phar-maceutical Conference, with the discussion of the members.

Anhydrous Air as a Therapeutic Agent. By G. A. KEYWORTH. The use of dry air as a mechanical anodyne. Apparatus employed. New treatment of cancerous growths and tumors. Cements for the Teeth. How to make oxychloride and phosphide

cements Curious Foods. A review of singular and remarkable food stuffs.

- IV. GEOGRAPHY, GEOLOGY, ETC. —Geography. Opening address of Clements R. Markham, President of Section E, British Association. (Continued from SUPPLEMENT, No. 199.) The Age of Ice. By H. B. NORTON. The astronomical key to gla-cial epochs.
- V. NATURAL HISTORY, ETC.-The Ostrich Parks of Algeria. 3 illus-trations. General view of an ostrich park at Kouba, Algers. trations. General view of an ostrich park at Kouba, Algiers. The Leather Turtle By JOHN FORD. Hew to Explore for Minerals. Rules laid down by an experienced mining engineer. The Finest Diamonds in the World.
- VI. ASTRONOMY AND METEOROLOGY —The Berginning and End of the Worklas. By CAMULE PLANMARION. 'Party IF.' A New Metcorite. 1 fig. Meteorite which fell October 13, 1877, at Soko Bauja, Servia.

By J. F. BURRELL, Professor of Butany and Hortigniture, Dinois State By J. F. BURRELL, A foreson of round, and the water weed, Elodea canadensis. New Food for Cattle. Virtues of the water weed, Elodea canadensis. The Standard Requisites for the Successful Raising of Poultry. Large Flocks of Foultry made Profitable. Hay as Food for Hogs. How prepared and fed.