THE PROPOSED RAILWAY TUNNEL UNDER THE ENGLISH CHANNEL.

The preliminary arrangements for the commencement of this great work are progressing favorably, and there appear to be good prospects for its execution under the combined auspices of the English and French governments. Preliminary surveys of the best routes have been made by eminent engineers, who have become satisfied thereupon that no especial difficulties are likely to be encountered. The length of the tunnel will be about twenty-two miles.

The subject came up for discussion recently before the British Association, when Sir John Hawkshaw, who is one of the engineers of the work proposed, gave a variety of interesting particulars:

The channel waters, he said, were a mere fish pond. They were only 180 feet deep. Borings have been made to a depth of 600 feet on each side of the Channel, and also in the Channel bottom at many points on the line, and it has been experimentally ascertained that the tunnel would pass through a chalk formation for nearly the whole distance. The tunnel would be 230 feet below the bottom of the Channel; and with this large amount of material existing between the bed of the tunnel and the ocean above, there was little danger of any trouble from the ingress of water.

Some people seemed to assume that the tunnel would be so badly ventilated that nobody would dare to go into it. When the tunnel came to be constructed the great difficulty would be to get in and out of it. There would be a vast number of workmen and an enormous amount of building material to be carried in and out. There would be a drift way tunnel; and in order to facilitate the men and the material going in and out, it would be desirable to put on each side of the tunnel a pneumatic tube—in fact, they would be almost essential for the mere construction of the tunnel When the tunnel was finished, he would suggest that these tubes remain. All that was necessary would be to make apertures on one side of the tunnel, and by pumping the air which flowed in at each end of the tubes into the tunnel the ventilation would be practically easy and not very expensive. He had been silent as to this point because engineers were generally silent about works until they were executed. When the work was accomplished, the way in which it was executed would be patent to everybody.

SCIENCE PUGNACIOUS.

"The battle ground of Science" has hitherto been but a metaphor. Not that Science has not waged conflicts, and won victories: that, indeed, is her constant course against error and superstition: but such warfare has been of mind to mind, not hand to hand, and Science, exemplifying truth, prevails, as truth against falsehood always will. For once in history, however, Science has had a genuine battle ground, and a genuine combat. Not the antagonism of two learned pundits, who wax wrathful, and resort to personalities, and hurl jaw-pulverizing epithets across a debating room at each other; but a "square" fight, between Science, as exemplified by the Hayden surveying party, and Error, or stupidity, or dirt, or any other antithesis, in the form of a band of thieving redskins. And Science prevailed as usual, and got herself out of a bad scrape.

The army of Science consisted of seven men, commanded by Geographer Gardner. The army of Error, etc, numbered several times as many souls. Science was peaceably cracking stones, and chasing butterflies, and pulling up plants and measuring lines. She had some of her latest devised firearms along, firearms which could shoot several times to Error's once, but they had nothing to do with the stone-cracking, etc.; they were auxiliary to the theodolites and the hammers. Error met Science smilingly, and requested fire water and plug tobacco. Science had a large store of valuable information to impart about these delusive materials, but no fire water, save such as was improved by the presence of pickled toads, and not even a chew of the nicotian weed. Error departed disgusted and opened fire as soon as Science's back was turned. Then came hot work; if Science stood still, starvation and thirst would result; to proceed was to face the enemy in rocky and precipitous cañons. It was voted to press on. Science exhibited splendid marksmanship at 1,000 yards, with redskins for bulls-eyes. Twenty-four hours' continuous running fire followed, Error being dislodged from every stronghold as fast as gained, until, finally, open country was reached; and Error, having no more rocks to hide among, ran away, *minus* several of her numbers.

It was a good fight, bravely fought, and as bravely won, against heavy odds. The world will benefit by the contemplation of the valor of the scientist, in defense of his country, his flag, and his—specimens.

GAS FROM NIGHT SOIL AND DEAD ANIMALS.

Some time ago an improved method of making illuminating gas from night soil and dead animals was invented by A. Sinderman, of Breslau, Germany, and was very favorably reported upon by a committee selected by the authorities of that city. Subsequently the system has been put into practice under the supervision of the Director of Gas Works, Professor Troschel, who submitted it to a scrupulous examination in regard to quality of the gas produced and the cost of production. Recently the results have been published, and they are mainly as follows:

1. The quantity of gas obtained from a certain mass of material is considerably less than that obtained from an equal quantity of coal; so much so that, to obtain the same quantity of gas, the works required would have to be of double the dimensions sufficient for the coal.

2. The expense of production is, contrary to the expectation of the inventor and the report of the committee, double that of making gas from coal.

3. The method is objectionable. Ten per cent of the material used for gas-making must be heated in ninety per cent of water; and the aqueous vapors of this ninety per cent of water must be condensed in an enormous cooling apparatus.

4. When making gas from such materiai, the fuel must be bought; while when making gas from coal, forty-five per cent of the coke obtained is abundantly sufficient for fuel.

5, The enormous amount of various impurities, such as nitrogen, sulphur, and phosphorus, and their compounds, such as ammonia, sulphuretted hydrogen, and phosphoretted hydrogen, are present in this gas in much larger quantity than in coal gas; and the purification of the same requires, by reason of this abundance, arrangements of so complex a nature as to become utterly impracticable in working on a large scale.

It is proved thus that the utilization of these materials for the purpose of illumination is not as profitable as transforming them into fertilizers of the soil.

LIGHTNING RODS.

To the Editor of the Scientific American:

In the issue of the SCIENTIFIC AMERICAN dated September 18, in an article on lightning rods, you say, in speaking of the terminal: "This terminal may consist of an iron water pipe, * * * * or a very considerable extension of the rod into wet or damp earth; or a trench filled with iron ore or charcoal may be made available."

Now, I have a lightning rod on my house, the end of which was inserted to the depth of six feet in the earth upon the southerly side of it, at the time the rod was put up. Would the earth be sufficiently damp (the house is on a hill) at that depth? In the country, but few dwellings would be likely to have iron water pipes with which to connect lightning rods; there are none in this vicinity.

In the sentence quoted, you say: "Or a trench, filled with iron ore or charcoal, may be made available;" and, in the concluding sentence of the article: "We repeat, the golden rule for safety is to have the bottom of the rod placed in connection with a large mass of conducting material in the ground."

Now, the query is: How large should the trench be that is filled with iron ore, to afford protection to the building? Scrap cast or wrought iron, I suppose, will do as well (as ore is not found on Long Island), or charcoal, which is easily obtained. Definite information is wanted as to quantity.

Glen Cove, L. I. ISAAC COLES.

REPLY.—A test with the galvanometer would doubtless show that our correspondent's lightning rod is unsafe—that its bottom is sealed up or insulated so that the bulk of an ordinary discharge of lightning would be more likely to go through the dwelling than through the rod. Situated as his house is, the earth would ordinarily be dry, and a length of six feet of rod, say ¾ inch square, in the ground, furnishes less than one square foot of conducting surface, which is insufficient as a terminal.

This correspondent, and also several others, request definite information as to the quantity of conducting material that the rod terminal should have in order to ensure safety. This can only be measurably determined by a test in each case, with the galvanometer, because the requirements vary with almost every building and with the hygroscopic condition of the ground. But an approximately safe rule has been suggested by Mr. David Brooks, the electrician, of Philadelphia, which is to the effect that, in dry soils, the terminal of the lightning rod (which may be composed of any of the conducting materials mentioned by our correspondent) should have a conducting surface, in contact with the ground, equal in area to that of the roof surface of the building. For example: If the roof surface is 30x40 feet, or 1,200 square feet, then the rod terminal should have 1,200 square feet of conducting surface in contact with the earth. Now this is only a suggestion of Mr. Brooks, intended for extreme cases of dryness in the soil; and if it errs, it is probably on the side of safety.

In our paper of September 11, we gave an account of a lightning rod test, made at the instance of Mr. George B. Prescott, Chief Electrician of the Western Union Telegraph Company. In that case the rod was arranged substantially like that of our present correspondent, had less than one square foot of conducting surface in the ground, and the galvanometer test showed it to be very unsafe; but the instrument also showed that the rod would be rendered a safe conductor, if put into connection with the house water pipe as a terminal, and this was accordingly recommended. This pipe, of iron, was half a mile long; and allowing it to be one inch in diameter, it presented a conducting surface, in contact partly with the earth and partly with water, of not far from 1,200 square feet.

THE FAIR OF THE AMERICAN INSTITUTE.

Owing to the fact that manufacturers throughout the country are now busily completing their preparations for the coming Centennial, we have been inclined to the belief that the local fairs held this fall would not receive their usual amount of attention, and hence, in point of novelty and variety of exhibits, would fall somewhat below the standard hitherto maintained. We have, however, been agreeably disappointed; for, judging from the reports which reach us from Cincinnati, from Newark, and other localities where industrial exhibitions are now in progress, the displays have never been better, and perhaps never so good. It is certain that, in the case of the Fair of the American Institute, the present show is far superior to any that has been held during the last five years. It is larger, and the exhibits, as a rule, are more elaborately prepared, while there is a goodly variety of new inventions, well calculated to interest as well as instruct the public.

So far as the interior aspect of the building is concerned, there are not many changes from last year, to note. The general arrangement is about the same, and a better and more refined taste has evidently been exercised on the decoration. We note with pleasure the abolition of the Fourth-of-July festoons which were a standing menace of conflagration to the dry wooden arches from which they hung. In place of this, a neatly painted strip of canvas has been carried around the building, so as to resemble a gallery, with very good effect. A number of large paintings, representing scenes in different sections of the country, very fairly executed, are suspended in frames in front of the imitation gallery rail, and agreeably break its monotony. The old pictures on the main arches remain as hitherto; and as there have been no further attempts made toward ornamentation, it will be seen that the same, as it should be, is very simple, and in no wise detracts from the display of articles on the floor.

It is difficult, at the time we write, to form any fair idea of the future contents of the machinery department, owing to many of the exhibits not yet having arrived. The most remarkable features are the

FOUR DRIVING ENGINES.

These consist of an 80 horse power Wheelock, 14 x 42; a 60 horse power Wright, 16 x 36; a 60 horse power Hampson & Whitehill, same dimensions, and a 60 horse power Harris-Corliss, 14 x 36. In the Wheelock machine we note several improvements, tending to simplify the working parts. The dash pots have been raised above the floor, and there is a new and ingenious form of cylinder oil cup, into one portion of which the steam condenses, and then, flowing in the shape of water into a larger portion, lifts the oil to proper hight for entering the cylinder. The Wright engine has a new way of attaching the governor to the cut-off valve. Instead of the governor acting directly on the valve, it merely determines the fall or closing of the same by controlling a lug, which throws a spring catch off a cam. The cam is actuated by the engine itself, and the catch connects with the valve. It is of course impossible to convey a very clear idea of this or other devices in the brief terms here necessary, but, the attention of the reader being directed to the novel features, he may perhaps find it interesting and profitable to examine for himself. In

MACHINE TOOLS,

the machinery department will have an unusually fine display—to which, in our future reports, we shall take occasion to allude in detail. Woodworking machinery is also well represented. We notice several portable engines for farm use, and one especially, of English make (Ransome, Sims, & Head, Ipswich), which has a furnace fitted to burn straw and similar fuel. Two heavy drop hammers are in position, and there is a prospect of a good show of pumps. Any further comment on the contents of this department must, for the reason already given, be reserved for the future.

THE MAIN BUILDING.

About the most prominent object on the main floor is a Jardine organ, a fine instrument of very powerful tone. Advantage is taken of that well known experiment in physics, the hydrostatic paradox, to drive the bellows. Water is pumped up into a barrel on the roof, and thence it descends, through a two inch pipe, a distance of 50 feet, moving a piston 4 inches in diameter over an 8 inch stroke. Near the organ, the visitor will find a handsomely built cottage or summer house, covered entirely inside and out with wood papering. This last is merely thin sheets or veneers of wood attached to paper and applied to the wall in the same manner as paper hangings. The effect is that of solid planks, or of fine inlaid work. Almost every kind of wood is employed, and the results, when several varieties are contrasted, are very striking and elegant.

There is another house in the fair, made entirely of packages of Hecker's flour. It encloses an area large enough for the exhibitor to manipulate his cooking utensils over gas stoves, and use up his building material in the manufacture of excellent griddle cakes and waffles, which are freely distributed to visitors. This is a practical way of showing up articles of food, which, to our minds, is far better than loading people down with circulars setting forth long schedules of "advantages." Why do not the other "cereal" exhibitors follow the same plan?

The fair is especially rich this year in

HOUSEKEEPING ARTICLES,

a fact which will ensure its popularity. There is an ingenious grindstone which may be adapted to hold a polishing wheel for plate, for knives, or for stair rods, and will save a world of hard rubbing. The stone is horizontal and has beveled edges (adapting it excellently for sharpening mowing machine knives), and its spindle is surrounded by a spiral into which a pawl, on a traveling slide actuated by a spring treadle, engages. The pawl on its downward motion only acts upon the thread, and thus rotates the stone very swiftly The silver plate manufacturers as usual show several cases of fine ware; and the china dealers have a remarkably large exhibit, including some specimens, from celebrated European factories, which will greatly interest lovers of rare porcelain. The visitor will find a table covered with pails, dishes, bowls, in fact every kind of vessel, made from paper. These are very light and strong, and for many uses will be preferred to tin or wood.