Correspondence.

Explosive Effects of Dynamite.

To the Editor of the Scientific American:

I have seen of late in various publications many theories advanced in trying to account for the almost utter annihilation of human bodies by dynamite or nitro-glycerine explosions, most of which point to the direct action of the explosive. Owing to extraordinary rapidity of ignition and expansion, and consequent instantaneous formation of a vacuum, may not the terrible rending into fragments of bodies within the immediate vortex of the explosion be accounted for on the hypothesis of a sudden expansion of the air contained in the lungs and other parts of the body?

J. H. DURHAM.

Cape Vincent, N. Y., Jan. 21, 1887.

Discovery of a New Comet (Comet Brooks No. 1 of 1887).

To the Editor of the Scientific American:

On Saturday evening last, January 22, 1887, about 7 o'clock, I discovered a new comet in the constellation Draco.

Its approximate right ascension at that time was 18 hours; declination north, 71 degrees. The comet is rather small, faintish, and has a slow easterly motion. Telegraphic announcement was at once made, and news of the discovery was cabled to Europe the same evening.

This is the first comet of the new year, and ranks as the tenth comet it has been my good fortune to discover during the past few years. It was in this constellation—Draco—and a few degrees distant, that I discovered the second comet of 1883, now known as the Pons-Brooks comet. The new object being circumpolar does not set, but remains above the horizon the entire night.

WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y., January 22, 1887.

Another Poisonous Snake in Pennsylvania.

To the Editor of the Scientific American:

I am a frequent reader of the SCIENTIFIC AMERICAN. The very interesting article in it on rattlesnakes, by Henry Guy Carleton, in March, 1886, and the saying of an "Undergraduate," "They were being taught we have but two poisonous snakes in this section of the United States, and the blowing viper is not poisonous," prompt me to offer a description of a third poisonous one, killed by myself, here in Lycoming County, Pennsylvania, my home for over thirty years.

This snake was a dull black color from head to tail, above; beneath, three colors, mechanically mingled—white, cobalt blue, and gamboge yellow. Length, 4 feet; thick and clumsy; the skin loose and very thick; head, 2 inches broad, with a horn solidly attached to the nose, three-eighths of an inch broad and the same high, having an arched point, bent backward. There are two fangs in the upper jaw, three-quarters of an inch long; stouter than a rattlesnake's; of the same size.

On striking it with a stone, it came straight at me, the head raised about a foot, its throat flattened to 3 inches or more, and the jaws opened very wide, and blowing and hissing like a goose.

I have met with but one other, that hissed and moved away quickly. We have had rattlers killed every year; copperheads, less frequently. We have another blowing snake, not uncommon, with a head like an eel's, a thin tail, no fangs; these are of very light colors—pinkish chestnut and white, chiefly; mostly about 2½ feet long, with round bodies.

E. R.

Williamsport, Pa., Jan., 1887.

Algaborilla.

Husks known under the name of algaborilla contain a tannin-like substance, which can be used for dyeing yellow. The trees from which these husks are obtained are the Prosopis pallida and the Prosopis algarobo, which occur in the mountainous districts of South America. The seeds form about one-fifth of the weight of the husk, but contain no tannin. The husks contain about 27 to 29 per cent of the tannin. The coloring matter yields yellow precipitates, with salts of tin, antimony, lead, or alumina; the tin compound is the brightest. For dyeing yarn, the latter is mordanted with tin, as usual, and placed in the dye bath, which contains water heated to boiling and about 7 to 10 per cent of algaborilla. After working the yarn in the bath for some time, the bath is left to cool, and the yarn afterward washed and dried. The color is not as brilliant as that obtained with fustic, but more of a straw color; it is, however, pretty fast, and resists weak acids; alkalies change the color into brown. With iron mordants, good grayish black shades can be produced, and 5 to 7 per cent of the husks will be sufficient for the bath. Wool can also be dyed with algaborilla.

Birds' Nests and Eggs.*

The philosophy of birds' nests and eggs involves questions far too profound to be settled in an hour's lecture. The extreme partisans of one school regard birds as organic automata. They take a Calvinistic view of bird life; they assume that the hedge sparrow lays a blue egg because, under the stern law of protective selection, every hedge sparrow's egg that was not blue was tried in the high court of evolution, under the clause relative to the survival of the fittest, and condemned, a hungry magpie or crow being the executioner. The extreme partisans of the other school take an entirely opposite view. They regard the little hedge sparrow not only as a free agent, but as a highly intelligent one, who lays blue eggs because the inherited experience of many generations has convinced her that, everything considered, blue is the most suitable color for eggs.

Perhaps the first generalization that the egg collector is likely to make is the fact that birds that breed in holes lay white eggs. The sand martin and the kingfisher, which lay their eggs at the end of a long burrow in a bank, as well as the owl and the woodpecker, which breed in holes in trees, all lay white eggs. The fact of the eggs being white, and consequently very conspicuous, may have been the cause, the effect being that only those kingfishers which bred in holes survived in the struggle for existence against the marauding magpie. But the converse argument is equally intelligible. The fact that kingfishers breed in holes may have been the cause, and the whiteness of the eggs the effect; for why should nature, who is generally so economical, waste her coloring matter on an egg which, being incubated in the dark, can never be seen? The fact that many petrels and most puffins, which breed in holes, have traces of spots on their eggs, while their relations the auks and the gulls, who lay their eggs in open nests, nearly all lay highly colored eggs, suggests the theory that the former birds have comparatively recently adopted the habit of breeding in holes, and that, consequently, the color, being no longer of use, is gradually fading away. Hence, we assume that the color of the egg is probably the effect of the nature of the locality in which it is laid.

The second generalization which the egg collector is likely to make is the fact that so many of these birds which breed in holes are gorgeously colored, such as kingfishers, parrots, bee eaters, etc. The question naturally arises, Why is it so? The advocates of protective selection reply: Because their gay plumage made them so conspicuous as they sat upon their nests, that those that did not breed in holes became the victims of the devouring hawk, exactly as the conspicuous white eggs were eaten by the marauding magpie. But the advocates of sexual selection say that all birds are equally vain, and wear as fine clothes as nature will let them, and that the kingfisher is able to dress as gorgeously as he does because he is prudent enough to breed in a hole safe from the prying eyes of the devouring hawk. The fact that many birds, such as the sand martin and the dipper, which breed in holes, are not gorgeously colored, while others, such as the pheasants and the humming birds, are gorgeously colored, but do not breed in holes, is evidence, as far as it goes, that the gorgeous color of the bird is not the effect of its breeding in a hole, though the white color of the egg probably is. It must be admitted, however, that the latter cases are not parallel. While the hen kingfishers and bee eaters are as gorgeous as their mates, the hen pheasants and the hen humming birds are plainly, not to say shabbily, dressed. If birds be as vain as the advocates of sexual selection deem them, it must be a source of deep mortification to a hen humming bird to have to pass through life as a foil to her rainbow-hued mate. While the kingfisher relies for the safety of its eggs upon the concealed situation of its nest, the humming bird depends upon the unobtrusiveness of the plumage of the sitting hen.

A very large number of birds, such as the grouse, the merlin, most gulls and terns, and all sandpipers and plovers, rely for the safety of their eggs upon the similarity of their color to the ground on which they are placed. It may be an open question whether these birds select a site for their breeding ground to match the color of the eggs, or whether they have gradually changed the color of their eggs to match the ground on which they breed; but, in the absence of any evidence to the contrary, it is perhaps fair to assume, as in the previously mentioned cases, that the position of the nest is the cause, and the color of the egg the effect.

Many birds make their nests in lofty trees, or on ledges of precipitous cliffs. Of these, the eagles, vultures, and crows are conspicuous examples. They are, for the most part, too powerful to be afraid of the marauding magpie, and only fear the attacks of beasts of prey, among which they doubtless classify the human race. They rely for the safety of their eggs on the inaccessible positions of the nest. Many of them also belong to a still larger group of birds who rely for the safety of their eggs upon their own ability, either singly, in pairs, or in colonies, to defend them against all aggressors. Few colonies of birds are more interesting than those of herons, cormorants, and their respective allies. These birds lay white or nearly white eggs. Nature, with her customary thrift, has lavished no color upon them because, apparently, it would have been wasted effort to do so; but the eggs of the guillemot are a remarkable exception to this rule. Few eggs are more gorgeously colored, and no eggs exhibit such a variety of color. It is impossible to suppose that protective selection can have produced colors so conspicuous on the white ledges of the chalk cliffs; and sexual selection must have been equally powerless. It would be too ludicrous a suggestion to suppose that a cock guillemot fell in love with a plain colored hen because he remembered that last season she laid a gray colored egg. It cannot be accident that causes the guillemot's eggs to be so handsome and so varied. In the case of birds breeding in holes secure from the prying eyes of the marauding magpie, no color is wasted where it is not wanted.

The more deeply nature is studied, the more certain seems to be the conclusion that all her endless variety is the result of evolution. It seems also to be more and more certain that natural selection is not the cause of evolution, but only its guide. Variation is the cause of evolution, but the cause of variation is unknown. It seems to be a mistake to call variation spontaneous, fortuitous, or accidental, than which expressions no adjectives less accurate or more misleading could be found. The Athenian philosophers displayed a less unscientific attitude of mind toward the unknown when they built an altar in its honor.

* Abstract from *Nature* of a lecture delivered by Mr. H. Seebohm at the London Institution on December 20, 1886.

Krupp's Prussian and Carnegie's Pittsburg Steel Works.

A visitor to the famous Krupp steel works gives an interesting account of its operations, which is related in the *American Engineer*. He saw a ten ton crucible steel casting being poured, and an enormous seventy ton steel casting being very gradually cooled, the outside being warmed with coke fires until the inside has partly solidified, when the block is hammered into shape to form the main piece of an immense gun. The enormous array of furnaces, and the perfect manner in which such a large number of men—in some cases as many as eight hundred—all lift their eighty pound crucibles out of the furnaces and pour them into the mould in rapid succession, is described as a wonderful sight. The scrupulous care bestowed upon the minutest detail was a noticeable feature about their manipulation of steel. If, after extended trials, a certain practice or proportion of ingredients has been found to give the best results, that practice is absolutely and exactly adhered to, nothing being left to mere possibilities. Apropos of the above, the Pittsburg *Gazette* states that Andrew Carnegie and his partners pay out more money in wages every month than Krupp, the celebrated gun maker of Essen, Germany, disburses among his men. Krupp employs 10,000 men, and Carnegie's various Pittsburg mills are operated by 6,000 men. The difference in the aggregate of salaries is the difference between American and European pay. The monthly pay roll of the Pittsburg iron master is over half a million dollars. Eight of the Carnegie blast furnaces produce each day 1,500 tons of metal. For making a ton of any kind of metal it requires four tons of material, consisting of ores, limestone, coke, and in mill metal cinder is used, making for each day 6,000 tons of material handled. Estimating this immense amount at twenty tons, or 40,000 pounds, to a car, it would require the use of 300 cars. In addition to this, the firm finishes every day at least 1,000 tons, requiring fifty cars more. Besides this, 150 tons of unfinished old iron and raw steel are handled at Thirty-third Street. The liquid metal, 650 tons daily, handled at the steel rail mill is transferred in what are called ladles. In making an estimate fully within bounds, it is safe to say that 375 cars are required every day to handle the raw and finished material used by Carnegie's mill. Twelve engines, or one locomotive for every forty cars, each being thirty feet long, added to the 375 cars, would make a train of 12,380 feet, or more than two miles in length. For 300 days it would take 111,000 cars. This would make a train 3,330,000 feet long, which would reach over a distance of 630 miles—from Columbus to New York. The plants owned by the Carnegies cover 200 acres of ground. Upon this there are laid and maintained thirty-five miles of tracks, and the firm own twenty-two locomotives.

Beware of Draughts.

This is the time of year for colds, neuralgia, rheumatism, pneumonia, and kindred complaints. A little draught may produce either. A Spanish proverb runs as follows:

If cold winds reach you through a hole,
Go make your will and mind your soul.

A Multitudinous Clock.

The renowned horologist of Villingen in the Black Forest, Christian Martin, has just completed a clock which, as a marvel of construction, probably surpasses all that has hitherto been achieved in the clockmaking art. The clock is three and a half meters high, two and three-quarters broad, and is set in a magnificent Gothic case. It shows the seconds, minutes, quarter hours, hours, days, weeks, months, the four seasons of the year, the years, and leap years until the last second of the year 99,999 A.D. The clock is not only chronological, but geographical, and shows the right time, by comparison, in every latitude of the northern and southern hemispheres. It records the successive phases of the moon; and it strikes the minutes as well as the quarters and hours.

The mass of automatic machinery in it will seem stupendous, even to those who have seen the splendid specimens of local Black Forest clockmaking in the public Clockmakers' Halls at Tribery, Furtwangen, and other places, and the great clock on the opposite side of the Rhine in Strassburg Cathedral. There are multitudes of working figures, representing the life of man, the creed of Christendom, and the old Roman and German mythologies. There are sixty different personages to strike the sixty minutes—the Guardian Angel, Death as a skeleton, the twelve Apostles, the ages of man, the four seasons, the twelve signs of the zodiac, the seven Teutonic deities—after which our days of the week are named—and many others.

During the night hours, winter and summer, a night watchman comes forward and blows the hour on his horn. At sunrise a cock appears and crows lustily. The cuckoo, the inevitable ornament of a Black Forest ideal clock, remains concealed in the works of Herr Martin's clock until spring. The great face of the clock has thirty-two distinct compartments. A whole series of movable pictures are exhibited in succession by the works—representing in turn the seven days of Creation and the fourteen "Stations of the Cross." A little sacristan rings a bell in the spire, and then kneels down and folds his hands. The musical works, always a great feature in the Black Forest clock, have a sweet, flute-like tone.—*Echo.*

IMPROVED SPRING WHEEL TRACTION ENGINE.

We illustrate an improved spring spudded wheel, by Messrs. J. & H. McLaren, Midland Iron Works, Leeds. The tires of the wheels are formed with openings, through which shoes are protruded by the action of spiral springs, in such a manner that two or more of these spuds of each wheel will bear at the same time upon the road. Fig. 2 shows a side view of a wheel fitted with spring shoes, and Fig. 3 a cross section of the same wheel.

The rim, A, of the wheel is formed with openings, B, through which the shoes, C, protrude. The projections are shown as being made in pairs, cast in one with a connecting piece, D, bridging the portion of the tire

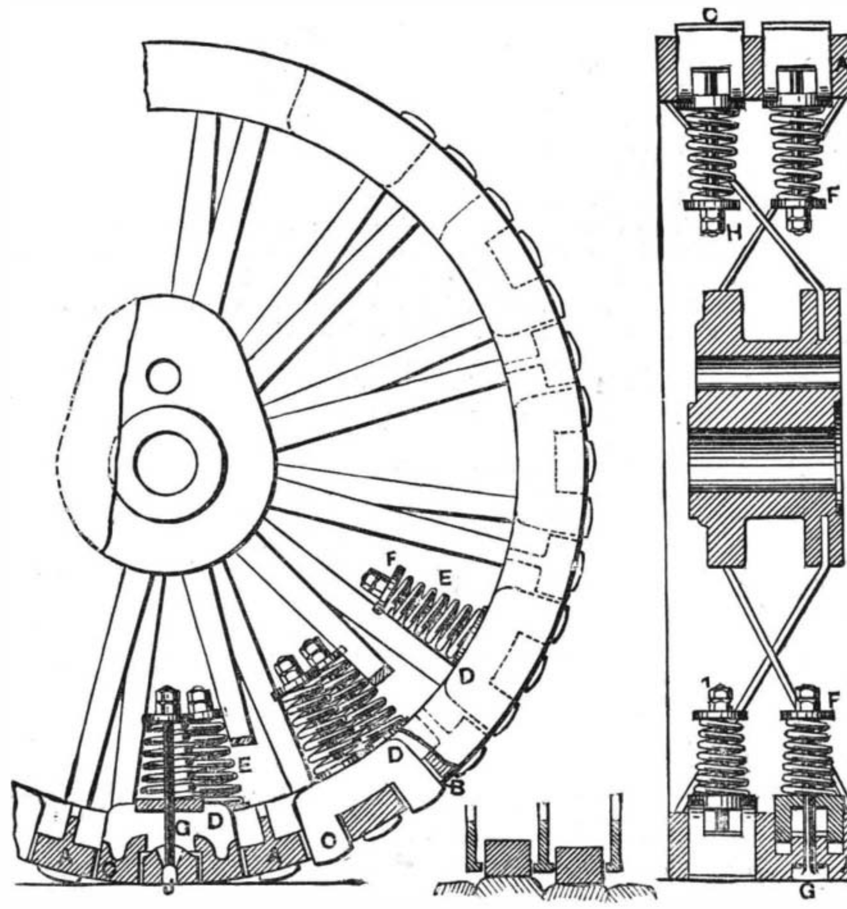


Fig. 2. Fig. 4. Fig. 3.

SPRING WHEELS FOR TRACTION ENGINES.

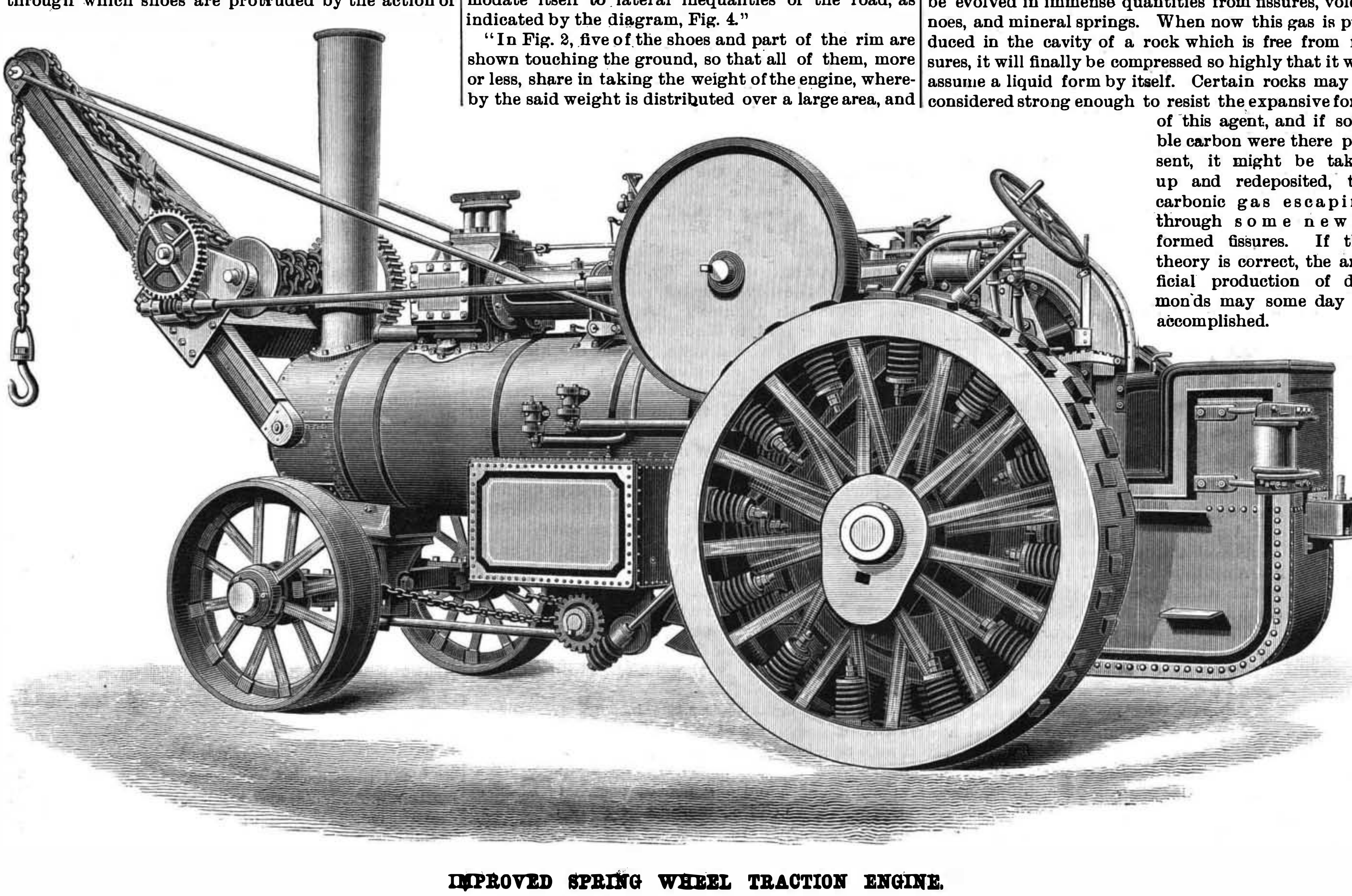
between two adjacent openings, and having a seat, upon which bears one end of the spring, E, the other end bearing against the piece, F, carried upon the bolt, G, furnished at its upper end with nuts, H, for adjusting the pressure of the springs, and at its other end with a crosspiece, J, engaging in a recess correspondingly formed in the part of the tire between two adjacent openings, B. It will be readily seen, say Messrs. McLaren, that "when the projections or shoes are arranged in more than one circumferential row, acted upon by independent springs, the wheel will accommodate itself to lateral inequalities of the road, as indicated by the diagram, Fig. 4."

"In Fig. 2, five of the shoes and part of the rim are shown touching the ground, so that all of them, more or less, share in taking the weight of the engine, whereby the said weight is distributed over a large area, and great tractive power is obtained, and the road is preserved from much damage. If desired, the springs, D, may be compressed by means of the nuts, H, to such an extent that the rim is always off the ground, whereby the advantage of a spring wheel is obtained, or if the pressure on shoes be applied by spring spokes from the boss, there is obtained a spring-carried engine."

This engine, says the *Mechanical World*, is very powerful, a load of 76 tons, viz., a marine boiler weighing 56 tons and trolly 20 tons, having been drawn by one of its class over the streets of Liverpool.

Formation of the Diamond.

Among the many theories existing as to the formation of the diamond, that of Professor Simmler, of Switzerland, is certainly not the least probable. The diamond often incloses cavities which, in some instances, contain a gas, in others a liquid. Sir David Brewster, who had given much attention to the subject, found, in investigating the nature of the liquid, that its refractive power is less, but its expansive power greater, than that of water. In comparing the results obtained by Brewster with those calculated for other liquids, Simmler found the numbers for the expansive and refractive power of the liquid referred to to coincide singularly with those for liquefied carbonic acid. But other facts observed by different savants tend to prove also the presence of this agent in the coating of the most valuable of gems. Upon the bursting of such crystals there often occur two liquids in the cavities, the one behaving like water, the other like liquid carbonic acid. On one occasion it was observed that the liquid in a quartz crystal which was dashed to pieces scattered its contents around with a great noise, burning holes in the handkerchief wound around the hands of the experimenter. The acid content itself had disappeared. Upon these observations Professor Simmler based his theory. If carbon be soluble in liquid carbonic acid, it would then only be necessary to subject the solvent to slow evaporation; the carbon would thereby be deposited, and, by taking proper care, assume crystalline forms. In evaporating quickly the so-called black diamond, which, in the state of powder, is much used for polishing, the colorless diamond might be produced. Though the liquid referred to has never been subjected to chemical analysis, the formation of liquid carbonic acid in the interior of our globe may, nevertheless, be considered as highly probable. In the gaseous form we know it to be evolved in immense quantities from fissures, volcanoes, and mineral springs. When now this gas is produced in the cavity of a rock which is free from fissures, it will finally be compressed so highly that it will assume a liquid form by itself. Certain rocks may be considered strong enough to resist the expansive force of this agent, and if soluble carbon were there present, it might be taken up and redeposited, the carbonic gas escaping through some newly formed fissures. If this theory is correct, the artificial production of diamonds may some day be accomplished.



IMPROVED SPRING WHEEL TRACTION ENGINE.