AN INTERESTING BOILER EXPERIMENT.

Numerous instances are on record of strong boilers, well made in all respects and handled with good care, having suddenly exploded with terrific violence, just at the instant when the valve was opened to admit steam to the cylinder; or at the moment when cold water was injected into the boiler. The usually received theory of this class of explosions is that by opening the valve or throwing in cold water, the pressure of steam on the surface of the water is suddenly reduced, whereupon the water, charged as it is with the tremendous energy of its heat, leaps from its place, divides, and strikes with the solidity and force of cannon balls against the interior walls of the boiler, tearing everything to pieces with its resistless momentum. Water may in fact be easily heated to such a degree that a pound of the liquid will equal a pound of gunpowder in energy. At sixty pounds pressure to the square inch every cubic foot of boiler water has the energy of a pound of gunpowder. Given the proper conditions for discharging that energy against the boiler, and it will be rent as if it were exploded with a corresponding weight of cannon powder.

In the SCIENTIFIC AMERICAN of July 3, 1880, we presented an engraving and description of an improved form of boiler, invented by Mr. Daniel T. Lawson, of Wellsville, Ohio, which was designed by him to promote safety in the use of steam by preventing all danger from explosions or injurious strains arising from the causes we have mentioned. In the article describing his invention Mr. Lawson's theory was fully set forth; it differs somewhat from that we have stated as ordinarily held. Mr. L. claims "that when water is superheated it becomes as explosive as gunpowder, exploding by bursting into steam from a reduction of pressure." This explosive formation of steam produces a concussion on every square inch in the boiler, much greater, Mr. L. thinks, than the regular steam pressure. "There is abundant reason to believe," he says, "that it is this concussive action which causes the numerous and mysterious boiler explosions, and which cause is wholly independent of the amount of water in the boiler; in fact the greater the amount of water in the boiler the more terrific the explosion."

We are not disposed at this time to question the correctness of Mr. Lawson's theory; but will only suggest that the other mentioned theory better explains the actual result, since steam has a yielding or gaseous action, whereas projected water acts like a solid.

Mr. Lawson has lately tried, at Pittsburg, Pa., a very interesting and important practical experiment, for the purpose of verifying his theory and demonstrating the advantage of his invention. His first step was to prove that boilers were liable to and did explode in the manner he asserted; and this he has apparently proved by actually getting up an explosion, which took place at the time and hour he named and in the way he said it would, namely, by simply opening the boiler valve and letting off some steam.

This experiment has been heretofore tried by various engineers, some of them very learned, but Mr. Lawson is the only one, so far as we know, who has succeeded. He has certainly taught us a good lesson in the boiler explosion art, which we think will result in great benefit. A letter in the *Tribune* gives the following particulars:

"The experiments were made in June, at Munhall Farm, on the Monongahela river, nine miles above Pittsburg, Pa., where the United States Government Commissioners made signal failures in their attempt to produce the same result a few years ago. The same foundations, furnaces, water supply, and bomb proofs were used on this occasion. The boiler was made of the very best iron, and showed a tensile strength of 624 pounds to the square inch, according to the United States standard. It was six feet in length by thirty inches in diameter. Before being taken to the ground it was tested by the boiler inspector of this county and pronounced one of the best and most perfect steam boilers he had ever examined.

"The cylinder of an old steamboat engine was connected with the boiler by means of a two-inch pipe, in which was fitted a quick-lifting valve. The steam was permitted by means of this valve to enter the cylinder in the same manner as it enters the cylinder of any ordinary engine, with the exception that it was not cut off suddenly, as in a working engine. Had it been, Mr. Lawson claims the explosion would have been still more certain. When the pressure reached a certain point the furnace was fed with petroleum by means of a small pipe connected with a tank located at a safe distance.

The majority of those who saw the boiler were of the opinion that it would safely stand 500 pounds pressure, and would not give way to less than 600. In order to save time no test was made until a pressure of 325 pounds to the square inch had been obtained. The valve was then lifted quickly, and the steam rushed into the cylinder rapidly, but with no other effect than to produce a shock distinctly noticeable by those in the bomb-proof.

The final test was made at a pressure of 380 pounds, a little over half the capacity of the boiler. At this time the water was eight inches above the fire line, the boiler being at least three-fourths full. No sooner was the cylinder filled with the rushing steam than a slight shock was felt, followed by a terrific report. Vast volumes of steam enveloped everything, but there were no signs of any hot water, it all having burst into steam when the pressure was removed. This accounts for the absence of water marks in the vicinity of boiler explosions, which has often led to the conclusion that they were caused by the extremely low water.

The report had scarcely died away before a shower of condensed steam began falling, accompanied by pieces of iron, bricks, steam pipes and other *débris*. Scarcely a vestige of the furnace or boiler was left. The latter had not merely given way at a single point, but was literally torn into fragments. One of the largest pieces yet found was about a foot and a half long and a foot wide. It had been blown fully half a mile. One of the heads was found nearly half a mile from the bombproof. The other one had not been found at last accounts. The most of the pieces picked up were of irregular shape, with very ragged edges, showing the iron to have been of excellent quality.

Mr. Lawson has invented a boiler which he believes to be proof against explosions of this kind. It is constructed with a partition intervening between the flues and the top of the boiler, thus creating a steam compartment over the water, to be supplied with steam from the water through valves in the partition, which valves, to insure safety, must be smaller in the aggregate than the port or valve through which the cylinder is fed from the steam compartment. By this means the pressure is kept approximately uniform upon the surface of the superheated water, thus preventing the dangerous effect which must follow the sudden reduction of pressure from its surface. Mr. Lawson's next step will be to show that his improved boiler cannot be exploded.

How to Tell Good Butter.

The Legislature of Ohio has just passed a bill providing for the inspection of butter and cheese, "and all substances having the semblance of butter and cheese," and of dairies and other places where milk is sold or butter and cheese manufactured; to be done by inspectors appointed by the State Board of Health. The superintendent of inspectors of butter and cheese, Mr. Robert Orr, has issued a circular of instructions to his subordinates giving information which may be of value to butter makers and buyers generally. He says:

"When butter is properly churned both as to time and temperature it becomes firm with very little working, and is tenacious; but its most desirable state is that of waxy, when it is easily moulded into any shape, and may be drawn out a considerable length without breaking. It is then styled gilt-edged. It is only in this state that butter possesses that rich nutty flavor and smell, and shows up a rich golden yellow color, which imparts so high a degree of pleasure in eating it, and which increases its value manifold.

"It is not always necessary when it smells fresh and sweet to taste butter in judging it. The smooth, unctuous feel in rubbing a little between the finger and thumb expresses at once its rich quality; the nutty smell and rich aroma indicate a similar taste; and the bright golden glistening cream-colored surface shows its high state of cleanliness. It may be necessary at times to use the trier, or even use it until you become an expert in testing by taste, smell, and rubbing."

Don't Whip a Frightened Horse.

It seems to be a characteristic failing of most coachmen to lay the lash upon a horse that exhibits fear at an object in the street or beside the road. Mr. Bergh, President of our Society for the Prevention of Cruelty to Animals, says in the organ of that society, what every reasoning being ought to know, and that is to never whip your horse for becoming frightened at any object by the roadside, for if he sees a stump, a log, or a heap of tan-bark in the road, and, while he is eying it carefully, and about to pass it, you strike him with the whip, it is the log, or stump, or the tan-bark that is hurting him in his way of reasoning, and the next time he will be more frightened. Give him time to smell all of these objects, and use the bridle to assist you in bringing him carefully to those objects of fear.

Velocity of Light.

Professor G. Forbes lately explained to the London Physical Society the experiments made by him and Dr. Young to determine the velocity of light. The method employed was that of Fizeau; but instead of having one distant reflector, and observing the total eclipse of the reflected ray by a tooth of the revolving wheel, two reflectors, one a quarter of a mile behind the other, were used, and two rays, which were observed when of equal brightness. This method was found more accurate than Fizeau's own plan, and gave curves of brightness. The speeds of the toothed wheel were adjusted until the two rays appeared of equal brightness. The general result was that the velocity of the light of an electric lamp is 187,200 miles per second. Corner found the light of a petroleum lamp to be 186,700 miles per second, and Michelson that of the sun to be 186,500 miles per second. The higher number of Professor Forbes is probably due to the bluer light of electricity, for further experiments made with colored lights and the spectrum seemed to prove that blue light travels probably over 1 per cent faster than red light. The experiments were made at Wemyss Bay, in Scotland.

An Invention Called For.

A prospecting drill is in demand in the mining regions of the West. A Colorado correspondent writes that such an implement is much needed in that State. It should be a simple affair, worked by hand, light enough to be carried by a man, and not cost more than $25 or $30, as prospectors are as a rule poor men. It should be capable of drilling an inch hole from 15 to 30 inches deep, thoroughly practical, and such as one man can operate easily. Such a machine, he is confident, will find ready and remunerative sale.

As this is not the first time that the demand for a portable drill for single-handed use has been made known to us, and as there is an obvious and increasing need for such an aid to individual prospectors in the development of our mining regions East as well as West, it is safe to say that the problem is worth considering by inventors and manufacturers.

The Periodical Cicada.

The anticipated appearance of the seventeen-year locust, so called, in Illinois (referred to in a notice of Prof. Riley's paper, page 408, SCIENTIFIC AMERICAN), has been justified by fact. The cicada began to appear at Carrolton, Ill., May 20, and in the forepart of June became very abundant. At Vandalia, Ill., the woods were filled with them before the 10th, the noise of them being audible above the rattle of the cars to travelers on the railway. In other parts of Southern Illinois and in Kentucky the insects swarmed in myriads. At Little Rock, Fort Smith, and Hot Springs, Ark., they appeared in large numbers, and also as far south as Mobile.

Mica and Asbestos in the Black Hills.

It is claimed that the finest mica obtained in the United States is now taken from the mines at Custer, Dakota Territory. An open cut has been run 150 feet and a shaft sunk 24 feet on the ledge. At the opening of the cut the mica was 4 feet wide. Now, at the rear end of the cut it is 23 feet wide, and the maximum of the ledge has not yet been attained. The largest sheets are 8 by 16 inches, while the average sheets are 5½ by 6 inches.

Another useful mineral lately discovered in quantity in the Black Hills is asbestos. The mine is about six miles from Deadwood. It is said that the croppings can be traced for nearly 300 feet, while a large body of it has already been unearthed. Tests have been made which prove that this body of asbestos is equal to any yet discovered in America.

A Dairy Scheme.

A heavy dealer in cheese in Canada projects a great dairy farm or farming community to be suitably located in the West. The plan involves the establishment of a group of 224 farms of 160 acres each, each farm to be provided with a good house and stocked with 30 cows. Each farm is to have 40 acres of plowed land. For a calf ranch, 75,000 acres of grazing land will be leased, in addition to the regular farms.

The plan further contemplates the erection of a large cheese and butter factory, and a narrow gauge (2 foot) railroad to connect the farms with the factory. The railroad will have to be from 30 to 40 miles long, with 58 stations. The milk is to be collected twice a day. A capital of $400,000 is named as the sum required for carrying out the project. The farms are to be leased or sold to tenants, as they may prefer.

The Newfoundland Seal Catch.

The sealing operations about Newfoundland have been very profitable the past season. Twenty-seven steamers and many sailing vessels were engaged, the steamers making two trips each to the ice floes, where the seals are taken, during the season which lasted from March 15 to May 15. The total number of seals captured by the steamers was 334,513, young and old; the weight of the blubber and skins exceeded eight thousand tons; the approximate local value of the steamer catch being $850,000. The entire catch was as follows:

	Number of Seals.
Captured by steamers	334,513
Captured by sailing vessels	63,500
Captured in the northern bays of Newfoundland	17,000
Captured on so-called French shore of Newfoundland,	21,000
Captured on west coast of Newfoundland by schooners there fitted out	19,800
Total catch around the island	455,813

Estimated value in European markets, $1,250,000.

Hall's Life Raft.

Mr. Thomas Hall of Newton, Mass., has just received a patent for a life-raft which is both novel and practicable. It consists of a double float or raft made of cork or other light material in such form as to fit the outside of any ordinary ship's boat. The raft is made in two parts secured to opposite sides of the boat by suitable lashings. On shipboard the raft may be carried on deck or suspended from davits. When launched it is impossible to either swamp or sink it. Life-lines are provided on all sides, so that it will not only float those actually in the boat, but as many as can hang on by the lines.

A raft of this kind if generally adopted would save many lives, as in times of intense excitement the ordinary boats are very liable to be overcrowded and swamped in launching; they are also in great danger of being overturned by people in the water in their attempts to save themselves.

A Correction.

By the accidental omission of the word "city," in acknowledging the source of Prof. J. D. Parker's article on "Heath's Discoveries in South America," in a late issue of this paper, the *Kansas City Review of Science and Industry* was deprived of the credit which was its due.