the ratio of 1 to ·706, being an increase of nearly one-third on the crystalized metal when solidified under about six times the pressure. From these facts Mr. Fairbairn observed, it is evident that the power of bodies to resist strain is greatly increased when solidified under pressure; and he said he considered it highly probable that the time is not far distant when the resisting powers of metals, as well as their densities, may be increased to such an extent as to ensure not only greater security, but greater economy by solidification under pressure. He said he was borne out in these views by the fact, that the specific gravities of the bodies experimented on were increased in a given ratio to the pressure. Spermaceti solidified under a pressure of 908 lb. on the square inch had a specific gravity of 0·94859; whilst that solidified under a pressure of 5,698 lb. had its specific gravity increased to 0,95495. The specific gravity of tin solidified under a pressure of 908 lb. was 7·3063; and that solidified under a pressure of 5,698 lb. was 7·3154, which gave ·0091 as the increased density from pressure. There are further experiments in progress to determine the law that governs this increase of specific gravity, and to determine the conducting powers of bodies solidified under severe pressure. Experiments have also been made on such substances as clay, charcoal and different kinds of timber. From the experiments on powdered dry clay, it appeared that a bar of that substance 3½ inches long and 1¼ inch diameter, after being hammered into the cylinder, so as to become slightly consolidated, was reduced in bulk with a pressure of 9,940 lb. on the square inch to 2·958; with a pressure of 54,580 lb. to 2·3; with 76,084 lb. to 2·288; and with a pressure of 97,588 lb. to 2·195 inches.

A New Arithmometer, or Calculating Machine.*

BY M. T. DE COLMAR, PRESENTED BY THE ABBÉ MOIGNO.

As the Abbé spoke English with difficulty, he requested Professor Wilson to explain the machine to the Section. The machine, which was very beautifully executed, consisted of an oblong box, about thirty inches long by six inches wide. On the face, the machine was furnished with a handle to turn round a number of small holes, at which the digits of the common arithmetic scale, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, made their appearance as the machine worked, and which finally gave the answer. In this machine they were eight in number, but they might be extended to any number. To each of these was an index to be set to the required digit, engraved on a small attached vertical scale, and a small ivory ball to be moved along its scale according to certain simple rules, as the operation to be conducted by the machine varied from addition to multiplication, &c. Upon drawing out the sliding bottom of the machine, the machinery was exposed to view. This, though simple, could not be intelligibly explained without the machine or diagrams. The chief part of it consisted of eight cylinders so arranged that, as they turned, the digits, enamelled on a circle at their upper parts, came in succession to the holes in the face; while by a number of indentations arranged spirally round them the digit to which the index was set would be stopped at the hole on the face at the digit corresponding to that at which the index was set; while by a set of pinions a connexion was given to them something similar to that in the common bank-note machine, so that addition could be performed and the result appear on the face:—thus by turning the handle once, the number itself appeared; by turning a twice every digit in it was doubled, and the result appeared above it twice the number originally set, and so on with any multiple of the number so set; then by moving the ivory ball any simple multiple of 10 times, 100 times, 1,000 times, and so the number set could be obtained and added to those previously obtained, and thus the operation of multiplication performed of any number by any number to the extent the machine could give, in this case up to 99,999,999 or nearly 100,000,000. The Professor then exemplified this, by setting a large number and multiplying it by a number which consisted of three digits. He then explained how the other operations were to be performed, showing that the machine could add, subtract, multiply, divide, raise to an integer power, or extract the square or cube root with precision and rapidity. The price of the machine exhibited was £50.

On the Cause of the Phenomena exhibited by the Geysers of Iceland.*

BY DR. STEPHENSON MACADAM.

These Geysers were singled out, because our knowledge of them is such as to entitle us to speculate on the force at work; but, at the same time, it is highly probable that a theory which will explain the Iceland Geysers will also account for those found in California. These Geysers are essentially intermittent hot springs from which, at intervals, there issue successive jets of water, and thereafter immense volumes of steam. When these have been ejected, the Geysers remain quiescent for a longer or shorter time. In endeavouring to account for the phenomena in question, the author assumes that there exists in connexion with each Geyser a subterranean chamber, the floor of which is of a roundish form, and at a temperature of not less than 340° Fahr. At or near the roof there are fissures communicating with springs or reservoirs of water, by which the latter may be allowed to flow into the caverns,—the tube which passes from the cavity to the surface of the earth taking its rise from the side of the chamber and very near the lowest part. Without entering into details, the author assumed this tube (as other writers on the Geysers have done) to be somewhat like an inverted syphon; the shorter limb of which communicates with the chamber, whilst the longer limb, pursuing a tortuous course upwards, forms the exit or omission tube of the Geyser. Water finds access by the fissures into the cavity, where, from the high temperature of the matter it falls upon, it is immediately compelled to assume the spheroidal condition; its temperature while in that state being 205·7° Fahr. The water gradually accumulates, till at last so much has entered the cavity that the heated floor can no longer keep the liquid in the spheroidal state, the water in consequence touches the mineral surface; its temperature is almost instantly raised to 212° Fahr.; and large volumes of steam are generated. This steam, in its passage to the mouth of the Geyser, encounters a body of water which it raises to the boiling point, and thereafter when no more steam can be condensed it forces the heated water from the conduit. The propelling agent having thus cleared a path for itself, the steam escapes in large volumes, with a rushing sound more or less violent. The author, by means of diagrams, illustrated the various forms which the Geyser might be suppposed to present in its internal mechanism. He considered it quite possible that the details given might require to be modified. What he wished to bring prominently forward was, that the spheroidicity of water afforded a means of accounting for the intermittence of the hot springs.

On the Silurian Anthracite of Cavan.*

BY DR. WHITTY.

The author described this deposit as a bed of soft anthracite or culm, about 4 feet thick, occurring in dark grey clay-slate, dipping 80° south-east, with an average strike of 37° west of north. The slaty rock occurs alternately with beds of shale and conglomerate, much altered by metamorphic action. The bed of anthracite varied its direction, but seldom more than a few degrees; it appeared to have suffered much by compression and dislocation, diminishing in a short space to a few inches in thickness, or giving off spurs into the slate rock; portions of the slate were also included in the culm. Its composition was carbon, 77·64; water, 4·35; ash, 18·1. For burning it required mixture with wood or turf. It might be worked like the cornish mines, being nearly vertical, and the water brought out by an adit, without pumping. The value of culm in Cavan was 8 to 10 shillings per ton; of coal, 24 shillings per ton; the culm would be of value for lime-burning.—Dr. Griffiths stated that he had not met with anthracite elsewhere in the grauwacke of Ireland; if this bed could be traced at the surface for a long distance it might be worked like a mineral vein.—Prof. Harkness said, that the attempt to work Silurian anthracite in Scotland had been unsuccessful.

COLONIAL POSTAGE.—There are now thirty-three British colonies, to and from which the letter postage has been reduced to 6*d.* In fourteen of these colonies the postal arrangements are under the control of the local colonial authorities, viz., Ceylon, Trinidad, Barbadoes, Bermuda, Canada, Nova Scotia, Newfoundland, Prince Edward's Island, St. Helena, the Gold Coast, New Brunswick, New South Wales, South Australia, and Victoria; in the remaining nineteen colonies the posts are controlled by the British Postmaster-General, viz., Hong-Kong, Antigua, Gibraltar, Granada, Malta, Berbice, Honduras, Demerara, Bahamas, Curiaco, Jamacia, Tobago, St. Vincent, Montserrat, St. Lucia, Nevis, St. Kitt's, Tortola and Dominica. The whole of the 6*d.* private-ship letter rate belongs to the British post-office for letters to or from the latter-mentioned colonies; and on letters to and from the other colonies the 6*d.* private-ship letter rate is divided equally between the local, colonial and British Governments.

* Meeting of the British Association in 1854.—*Athenæum.*

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