Quick Method for Chilling Test Pieces.

Writing on the use of liquid carbon dioxide for chilling test pieces, especially stone, iron, and steel, at low temperatures, M. Haller says that a cheap and simple form of apparatus in which the test specimens could be cooled would consist of a wooden box with double walls, top and bottom, the spaces between being filled with some non-conducting substance. The liquid gas could be led into such a box from the iron or steel flasks in which it is furnished, and would be deposited in great part in the form of frost at a temperature of about —78 degrees Centigrade. The test specimens could be readily put into and taken from such a box, and would quickly get to a low temperature. One of the Russian railroad companies is on the point of having such an apparatus constructed for testing rails and wheel tires at low temperatures. The possibility of accomplishing the desired object with such an outfit, viz., the rapid freezing of specimens, was demonstrated by putting a number of iron test pieces into a bag of several thicknesses of coarse cloth and then introducing the liquid gas. This at once became solid, and filled all the spaces between the specimens, which thus lay packed in snow. Each specimen was provided with a depression into which mercury could be poured, and on doing this, after a short exposure in the freezing bag, it was found that the mercury immediately soldified, showing, in the absence of a suitable thermometer, that the temperature of the specimens was certainly below —39 degrees Centigrade, if not lower. At the St. Petersburg Laboratory of Experimental Medicine a cold room of quite large proportions has been fitted up in which also liquid carbonic acid is the cooling agent.—Industrie Zeitung.

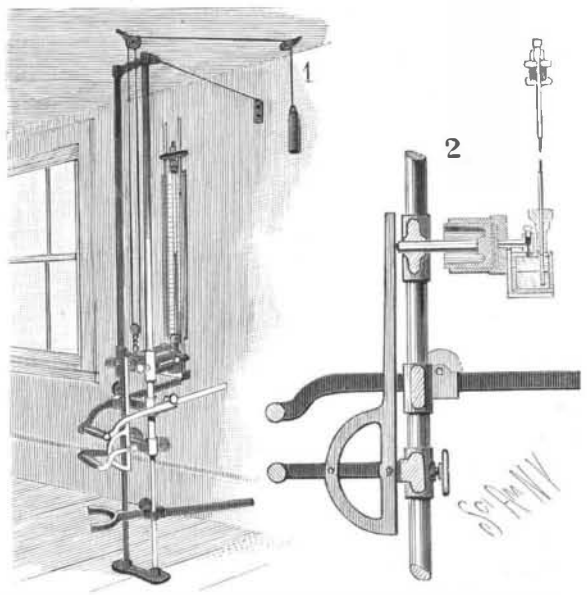
Alumina from Clay.

Suppose a clay of a known strength in alumina. For each mol. of alumina we incorporate with the clay 3 mols. ammonium sulphate and an almost equal weight of neutral potassium sulphate; 1 mol. of potassium sulphate is theoretically sufficient. The whole is well worked up and made into hollow bricks. These bricks are baked at 270°—280°. The ammonium sulphate is then decomposed into acid ammonium sulphate and ammoniacal gas, which may be collected in a condenser. The acid of the acid ammonium sulphate is first thrown upon the neutral potassium sulphate, which becomes acid sulphate. The latter at this temperature, in presence of alumina and clay, is neutralized by the alumina, forming double aluminum and potassium sulphate, i. e., alum. The bricks are then extracted by methodic lixiviation. The silica may be used for cement. The alum is freed from iron by recrystallization, and the solution may be treated for the precipitation of the alumina by means of the ammonia which has been distilled off. To obtain the alumina in a granulated state it is spread out upon stages in a tower traversed from bottom to top by the hot moist ammonia obtained on baking the bricks. The alum is thus transformed into a mixture of ammonium and potassium sulphates and of granular alumina.—Joseph Heibling.

NEW DYNAMOMETER FOR USE IN ANTHROPOMETRY.

The modern method of making progress in any branch of science or mechanics consists in governing future practice by what has been learned by past experience, making every step looking toward advancement only after analysis of what has already been accomplished.

Dr. J. H. Kellogg, of Battle Creek, Mich., has applied this principle to the human body by means of



KELLOGG'S ANTHROPOMETRICAL DYNAMOMETER.

a very simple yet thoroughly practical machine, which he calls the universal dynamometer.

What the indicator and brake are to the steam engine, what the electrical dynamometer and other meters are to the dynamo, Dr. Kellogg's device is to the human body.

It is used for testing the strength of individual groups of muscles; in fact, it can be applied to every important group of muscles in the body, these groups numbering twenty-five for each side. It not only furnishes a basis for the scientific study of muscular dynamics, but it also furnishes a means of testing to secure accurate data on which to base prescriptions for exercise, so as to insure the scientific application of gymnastics to the correction of deviations from the normal standard of symmetry.

This apparatus, as will be seen by reference to the engraving, is simple. It does not show the amount of labor involved in bringing it to perfection. The frame consists of parallel standards secured to base and top pieces and braced. On these standards is placed a rest for the foot or leg, and above this a lever having an arm extending upwardly and bearing on a piston rod projecting from a piston, which acts through the medium of a body of oil and a layer of water on a column of mercury, serving the double purpose of an indicator and a resistance. The mercury column is inclosed by a glass tube and moves in front of a scale. The hydraulic cylinder is adjustable on the parallel rods and is counterbalanced by a weight attached to a cord running over pulleys. An adjustable rest is supported by the rods between the cylinder and the lever.

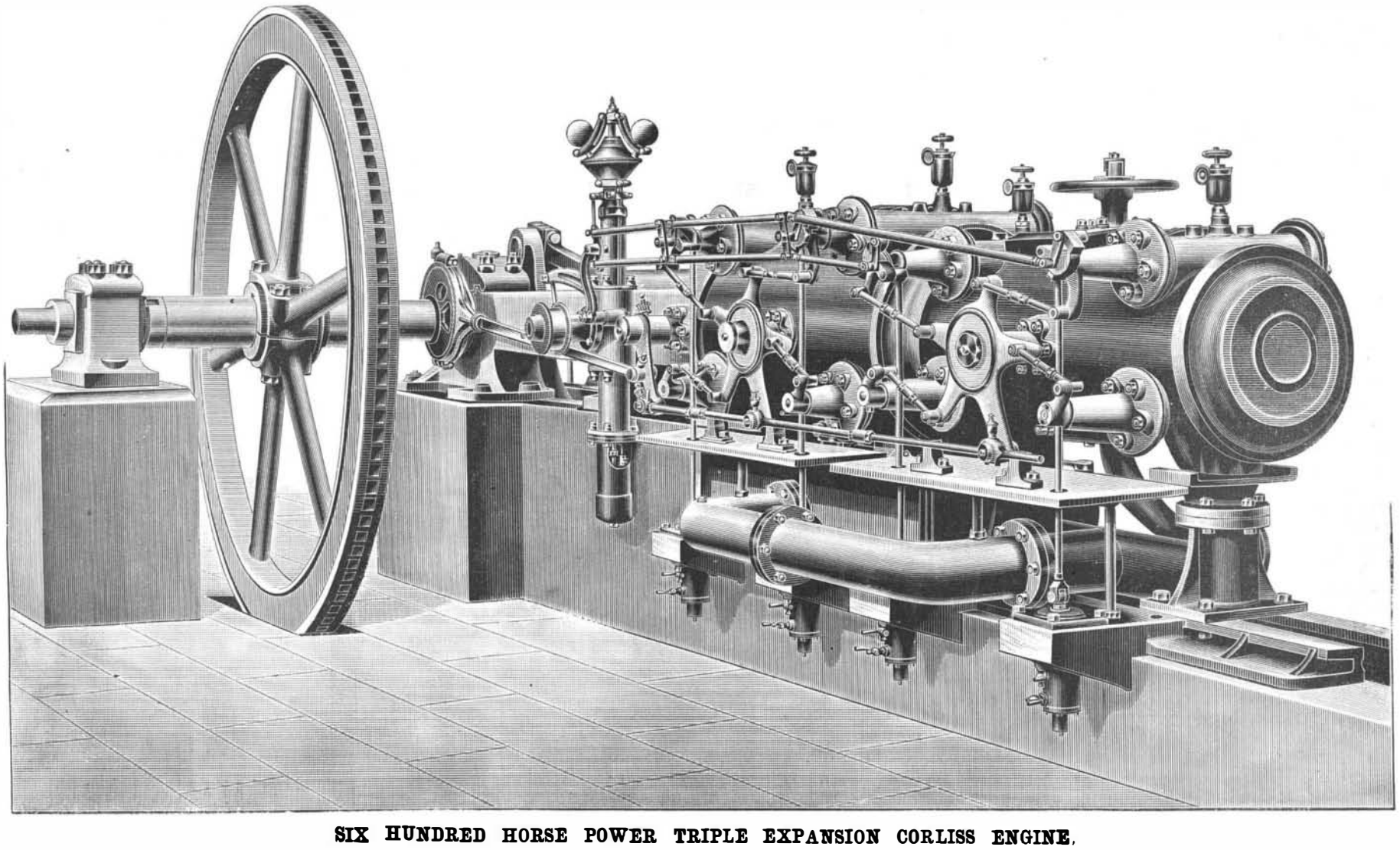
In connection with the dynamometer, Dr. Kellogg's "Percental Charts" are used for making a record of a given case. These charts are based upon the examination of hundreds of healthy men and women of different ages.

This dynamometer has been adopted by the government for testing cadets at West Point, and is in use at Yale University, Wisconsin State University, and in other places where special attention is given to physical culture.

TRIPLE EXPANSION ENGINE—FRIKART'S SYSTEM.

We illustrate herewith, from the Engineer, a triple expansion engine, which has lately been exhibited by Messrs. John Cockerill & Company, at the Antwerp Exhibition. In no country has the rotary valve, which is the main feature of the Corliss system, found more favor than in Belgium. All the large horizontal engines exhibited at Antwerp have valves of the Corliss type, though each manufacturer has a different method for regulating the admision and cut-off, which he considers superior to that adopted by rival makers. In Messrs. Cockerill's engines the system used is called the Frikart. They have for some time made single cylinder engines on this principle, and exhibit one of 100 indicated horse power, with cylinder 1 foot 7¾ inches diameter and 3 feet 5¼ inches stroke. This machine is used to drive a dynamo, and works very steadily under a varying load. The application of the Frikart valve to triple expansion engines is quite new, and the one exhibited at Antwerp is the first that has been made. It works at a pressure of 150 pounds, and its principal dimensions are: Diameter of high pressure cylinder, 1 foot 3¾ inches; intermediate, 1 foot 11⅝ inches; and low pressure, 3 feet 1⅜ inches. The length of stroke is 3 feet 11¼ inches, and the number of revolutions is 80.

The chief characteristic of the Frikart valve is that by it any degree of cut-off from 0 to 75 per cent, or even more if necessary, can be obtained with a single eccentric, as the governor completely controls the admission. It is of the highest importance to be able to prolong the admission, as by this means the power of the machine to deal with extreme cases is greatly augmented. For instance, it may be required to exert increased power; or the pressure in the boiler may fall, either accidentally or because the fires are allowed to burn down before stopping the works. If, as in many machines when the admission of steam extends over more than four-tenths of the stroke, the cut-off only takes place toward the end, this sudden increase



SIX HUNDRED HORSE POWER TRIPLE EXPANSION CORLISS ENGINE.