No. 688,562. Patented Dec. 10, 1901.

H. WATKIN.

MEANS FOR INDICATING THE TEMPERATURE OF KILNS.

(Application filed Feb. 16, 1901.)

(No Model.)

FIG 1

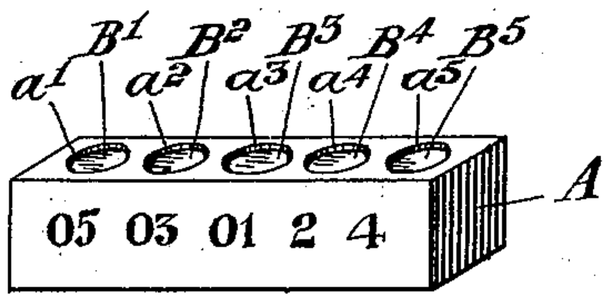


FIG 2

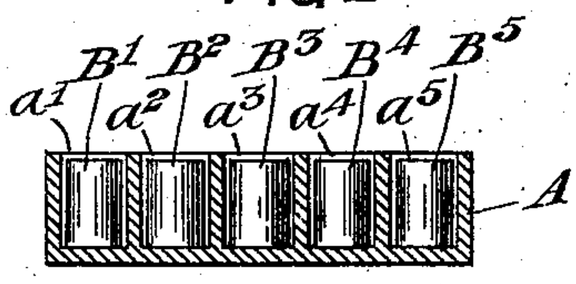


FIG 3

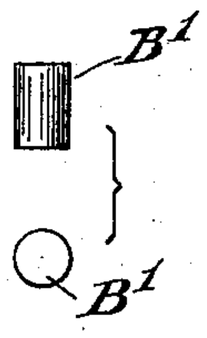


FIG 4

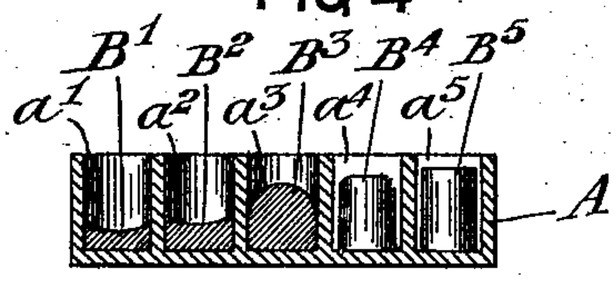


FIG 5

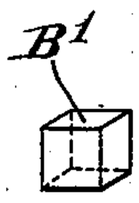


FIG 6

FIG 7

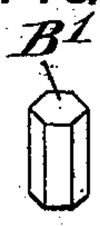
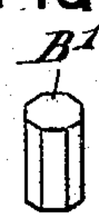


FIG 8



WITNESSES.

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UNITED STATES PATENT OFFICE.

HENRY WATKIN, OF BURSLEM, ENGLAND.

MEANS FOR INDICATING THE TEMPERATURE OF KILNS.

SPECIFICATION forming part of Letters Patent No. 688,562, dated December 10, 1901.

Application filed February 16, 1901. Serial No. 47,665. (No model.)

To all whom it may concern:

Be it known that I, HENRY WATKIN, potter, a subject of His Majesty the King of Great Britain and Ireland, residing at Watcombe House, 229 Waterloo road, Burslem, in the county of Stafford, England, have invented certain new and useful Improvements in Means for Indicating the Temperature in Pottery and Similar Kilns, of which the following is a specification.

This invention consists of the herein-described improved method of and means for ascertaining the temperatures to which pottery, porcelain, and similar articles may be, have been, or are being exposed during firing. In the methods at present in use for this purpose the main object aimed at is to ascertain the temperature of the kiln or oven during the firing operation; but these methods do not take into account the registering of the maximum temperature attained except in an exceedingly limited degree. My invention provides for actually registering the maximum temperature to which every article in the kiln or oven has been exposed, no matter what position that article occupies.

The method heretofore adopted for ascertaining the temperature of the kiln or oven is as follows: The pyrometers, thermoscopes, pyro cones, or trial-pieces are placed in certain saggars, which have pieces taken out of their sides or ends, either to allow the trial-pieces to be seen or to be withdrawn for the purpose of showing by the effect produced upon the trial-piece the heat attained at that particular moment. This removal of the piece of the saggar prevents the saggar from being of any other service during that or subsequent firings, inasmuch as in all first-class pottery or porcelain goods the articles must be sealed and protected from the direct action of the flame or smoke. On this account wherever a trial-piece is placed in a kiln or oven a saggar is lost. Consequently the number of points at which the temperature is ascertained is necessarily limited and usually does not exceed eight—one at the top and one at the bottom of what are technically known as the "four quarters." Further, to be of any use these saggars containing the trial-pieces can only be placed in the outer ring of the kiln or oven, where they can be seen and from which the trial-pieces may be withdrawn, (unless a second saggar is rendered useless by removing a portion of its side to allow of the second ring being visible.) Consequently the temperature of the saggars in other parts of the circular kiln or oven which are hidden by the first ring or row of saggars cannot be ascertained, and this may be and very frequently is very different from the temperature indicated by the trials from the outer ring. These difficulties and defects I overcome by my invention, which is carried out as I will now describe by referring to the accompanying drawings, on which—

Figure 1 is a full-size general view of one form of recessed tray with small trial or test blocks constructed according to this invention. Fig. 2 is a sectional elevation of the same. Fig. 3 shows in full size one of the test-blocks of the same separately in elevation and in plan. Fig. 4 shows the same tray with its test-blocks after being burned in the oven. Figs. 5, 6, 7, and 8 show modifications in the shape of the test-blocks.

The same letters of reference indicate the same parts in all the figures.

In carrying out my invention I insert in every saggar of the oven (or in as many as may be thought desirable) a number of very small trial or test blocks of any definite suitable shape—such, for instance, as cubes, short cylinders, or other blocks composed of such materials as may from time to time be found desirable and which will under the influence of heat become fusible at different degrees of temperature, according to the proportions of the various ingredients. These small trial or test blocks are placed in order in the recesses of a small recessed refractory tray of suitable form, hereinafter more fully described, in such a manner that they cannot easily be disarranged, and they are so compact that they take up the least possible room in the saggar, thus enabling them to be used in a saggar without any necessity for excluding the legitimate contents of the same. I find the recessed tray A shown on my drawings to be of the most convenient form, but it will be understood that the shape of the tray and the number and shape of the recesses and test-blocks can be varied without departing from the nature of my invention. The tray A is

an elongated rectangular pottery-ware block made to stand the highest temperature to which it is likely to be subjected and furnished with five circular recesses (marked, respectively, a' a^2 a^3 a^4 a^5) in its upper side, arranged in a row and each of which contains one of the small test-pieces B′ B^2 B^3 B^4 B^5, which are made of cylindrical shape, so as to fit easily in the recesses. The test-blocks forming this series are each made to fuse at a different temperature, B^3 fusing, for instance, at the proper temperature to which the goods in the saggar ought to be heated, B′ B^2 fusing several degrees below that temperature, and B^4 and B^5 several degrees above it in a gradual scale. For instance, if the test-pieces are for an enamel-kiln the test-blocks may be made to fuse as follows: B′, marked "022," fuses at about 590° centigrade; B^2, marked "020," fuses at about 650° centigrade; B^3, marked "018," fuses at about 710° centigrade; B^4, marked "016," fuses at about 770° centigrade; B^5, marked "014," fuses at about 830° centigrade. For a glaze-kiln the test-blocks may be made to fuse as follows: B′, marked "010," fuses at about 950° centigrade; B^2, marked "08," fuses at about 990° centigrade; B^3, marked "06," fuses at about 1,030° centigrade; B^4, marked "04," fuses at about 1,070° centigrade; B^5, marked "02," fuses at about 1,110° centigrade. For a glost-oven the test-blocks may be made to fuse as follows: B′, marked "07," fuses at about 1,010° centigrade; B^2, marked "05," fuses at about 1,050° centigrade; B^3, marked "03," fuses at about 1,090° centigrade; B^4, marked "01," fuses at about 1,130° centigrade; B^5, marked "2," fuses at about 1,170° centigrade. For an earthenware biscuit-oven the test-blocks may be made to fuse as follows: B′, marked "05," fuses at about 1,050° centigrade; B^2, marked "03," fuses at about 1,090° centigrade; B^3, marked "01," fuses at about 1,130° centigrade; B^4, marked "2," fuses at about 1,170° centigrade; B^5, marked "4," fuses at about 1,210° centigrade. For a granite biscuit-oven the test-blocks may be made to fuse as follows: B′, marked "01," fuses at about 1,130° centigrade; B^2, marked "2," fuses at about 1,170° centigrade; B^3, marked "4," fuses at about 1,210° centigrade; B^4, marked "6," fuses at about 1,250° centigrade; B^5, marked "8," fuses at about 1,290° centigrade. For a china biscuit-oven the test-blocks may be made to fuse as follows: B′, marked "4," fuses at about 1,210° centigrade; B^2, marked "6," fuses at about 1,250° centigrade; B^3, marked "8," fuses at about 1,290° centigrade; B^4, marked "10," fuses at about 1,330° centigrade; B^5, marked "12," fuses at about 1,370° centigrade.

The distinguishing-marks of the test-blocks above referred to, which I mark on the front of the tray—for instance, as in Fig. 1—and which designate the temperatures at which the test-blocks fuse, are the same as adopted by D. H. Seger and E. Cramer for their pyro cones and set out in their well-known German book entitled "*Chemisches Laboratorium für Thonindustrie*," which also gives the kinds and proportions of the ingredients of which the test-blocks should be composed so as to fuse at the required temperatures, and as these ingredients and proportions are well known they require no description by me. As what are known as "Holdcroft's" numbers are also well known in the pottery trades to designate the temperatures at which his pyroscope test-pieces fuse, I also use or may use these numbers to distinguish my test-blocks and mark them on the back of the tray, in addition to using Seger's marks at the front.

It will be observed that in the various series of test-blocks above set out I have omitted every alternate number. This is done so as to obtain a wide range of temperatures with a small number of test-blocks.

After the oven or kiln has been fired the test-blocks in the various trays A show by their fusion or non-fusion the degree of heat attained—for instance, as in Fig. 4, where it will be seen that the blocks B′, B^2, B^3, and B^4 are all fused, but the block B^5 is not fused, showing that the maximum temperature attained in this case was between 1,170° centigrade, the fusing-point of B^4, and 1,210° centigrade, the fusing-point of B^5—that is, assuming that the test-blocks are the series "05," "03," "01," "2," and "4" for an earthenware biscuit-oven, as indicated in Fig. 1. This fusion of the trial-pieces thus becomes a means of determining the maximum temperature attained according as the definite form of the pieces has been partially or completely destroyed by the fusion, or the unalterability of the piece shows that the heat has not been sufficient to cause the fusion. By placing one of the trays with its series of test-pieces in each saggar or by placing the trays outside the saggars in various parts of the kiln it is possible by observing the number of the piece which is deformed to determine accurately the temperature to which the goods in that particular saggar or part of the kiln have been exposed. These trial-pieces being mainly for the purpose of a maximum thermometer, there is no need to see them nor to withdraw them during the firing. Hence they do not necessitate the destruction of the saggars for that purpose.

Instead of the test-blocks being of cylindrical form, as above described, and shown upon my drawings, they may be made of any other suitable form, but by preference such a form as has angles or sharp edges, which by their disappearance by fusion indicate the presence of the heat required for fusing them. The test-blocks may, for instance, be cubes, as in Fig. 5, or triangular prisms, as in Fig. 6, or hexagonal prisms, as in Fig. 7, or octagonal prisms, as in Fig. 8.

It is to be understood that the recesses in the trays to receive the test-blocks are by preference, although not necessarily, made of

the same shape as the test-blocks which they are intended to hold.

In order to keep the test-pieces in their proper places in the tray before use, the open ends of the recesses are inclosed by a proper label pasted over them. As the trays with the test-blocks are very small they take up but very little room in the saggar, and after use they can readily be packed away as permanent records.

What I claim as my invention, and desire to secure by Letters Patent, is—

The improved means for indicating and recording temperatures in kilns and the like comprising a plain rectangular brick having a plurality of cup-shaped pockets therein, and a plurality of test-blocks of less size than the pockets and seated therein, said blocks being of varying degrees of fusibility and being retained in said pockets after melting, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

HENRY WATKIN.

Witnesses:
CORBETT WILLIAM WOODALL,
THOMAS HEYWOOD.