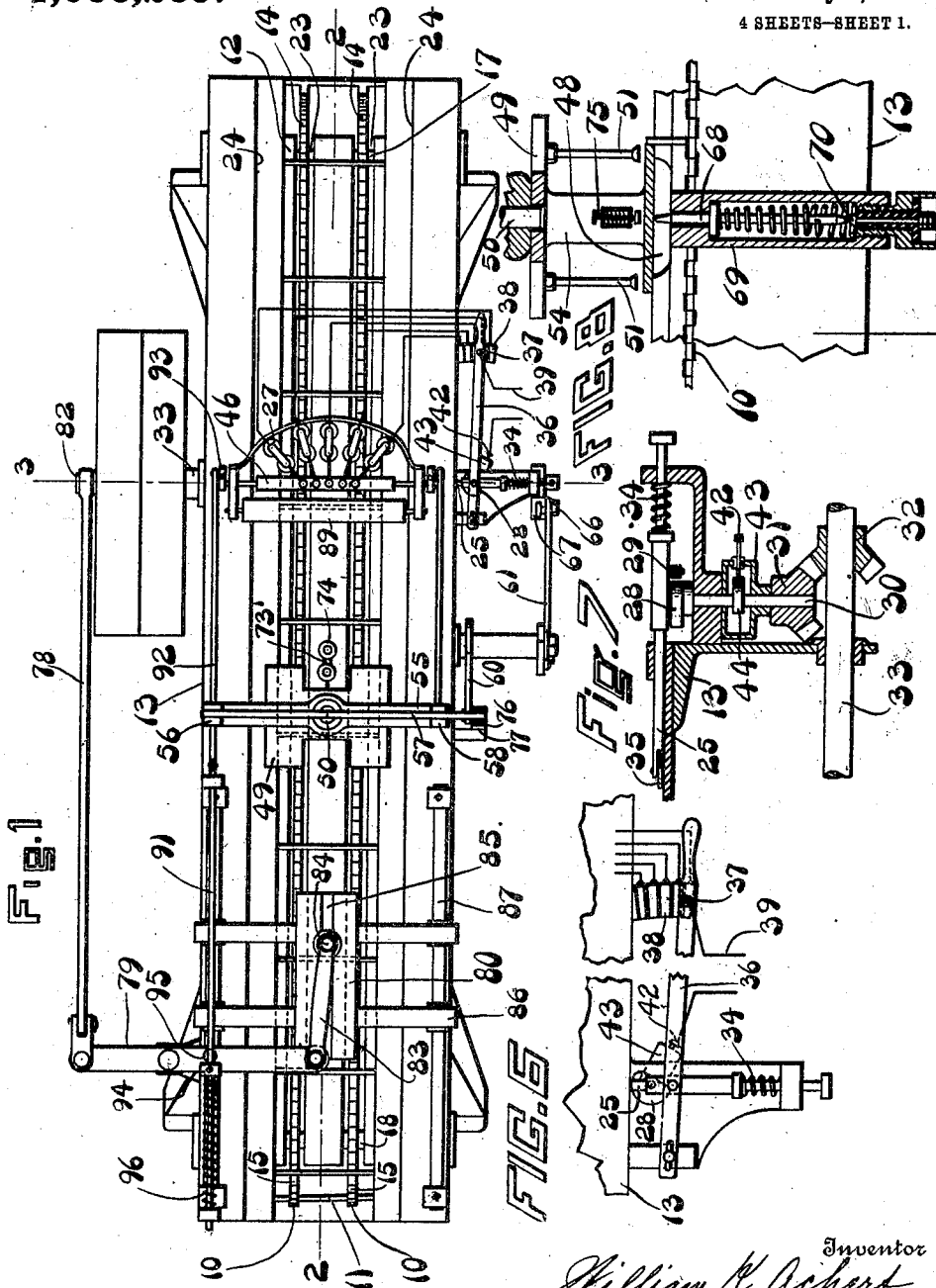


W. K. ACHERT.
TILE GRADING MACHINE.
APPLICATION FILED NOV. 20, 1911.

1,066,239.

Patented July 1, 1913.

4 SHEETS—SHEET 1.



Witnesses

W. Thornton Boggs
C. H. Wright

Inventor
William K. Achert

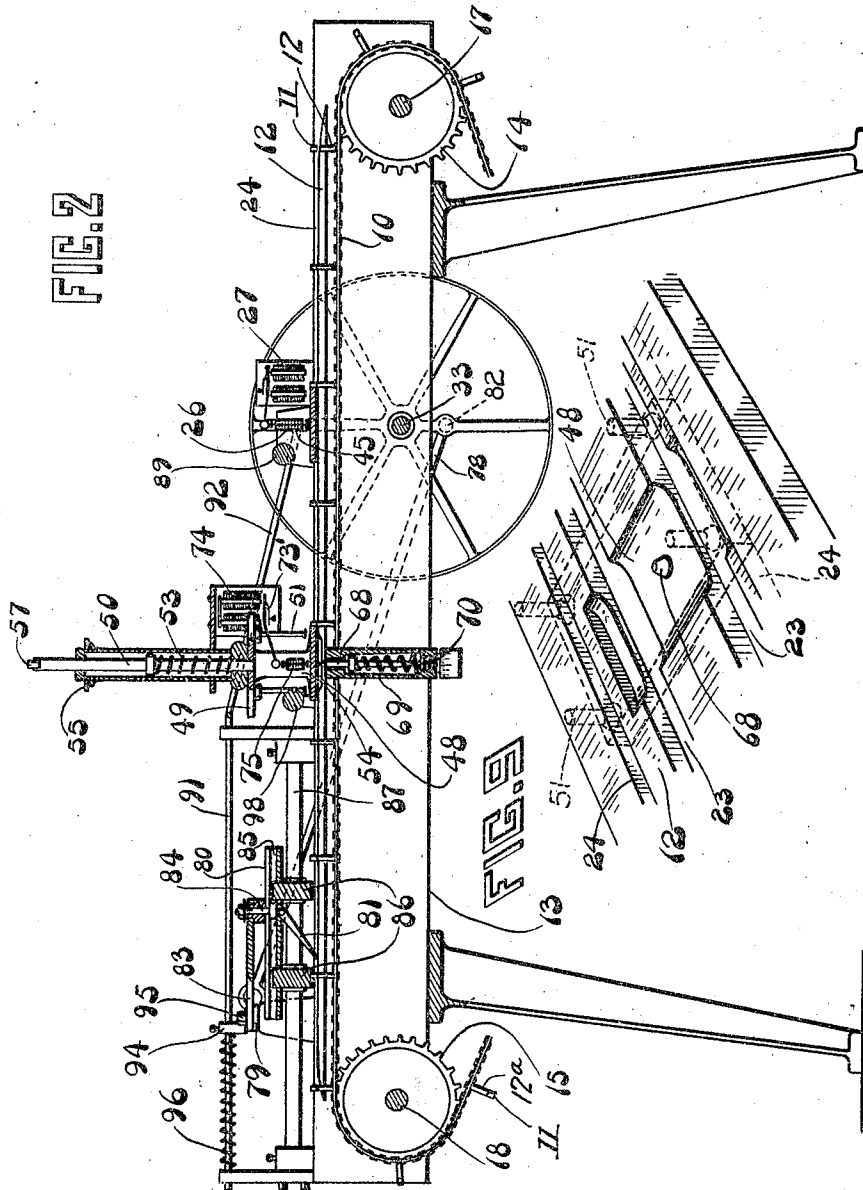
By Murray & McCallister
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4 SHEETS—SHEET 2.



Witnesses

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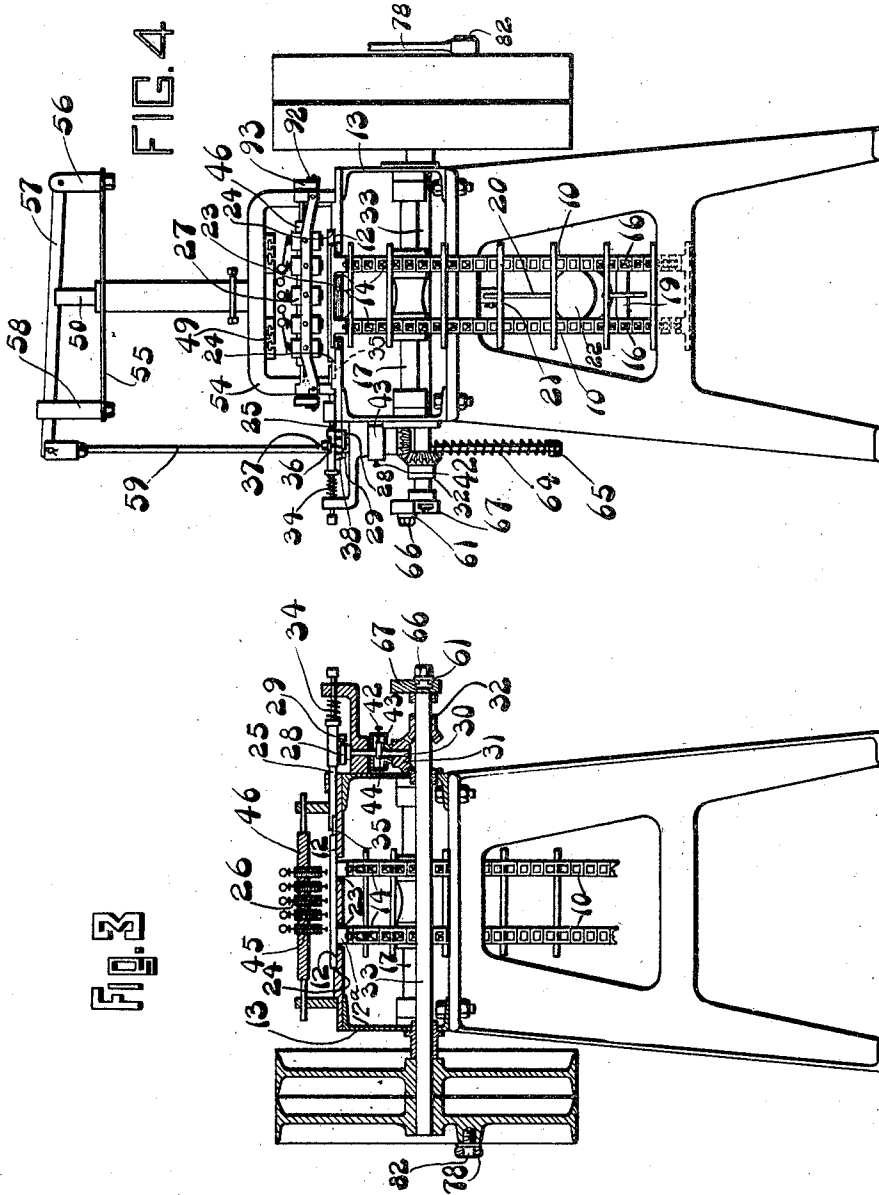
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4 SHEETS—SHEET 3.



Witnesses

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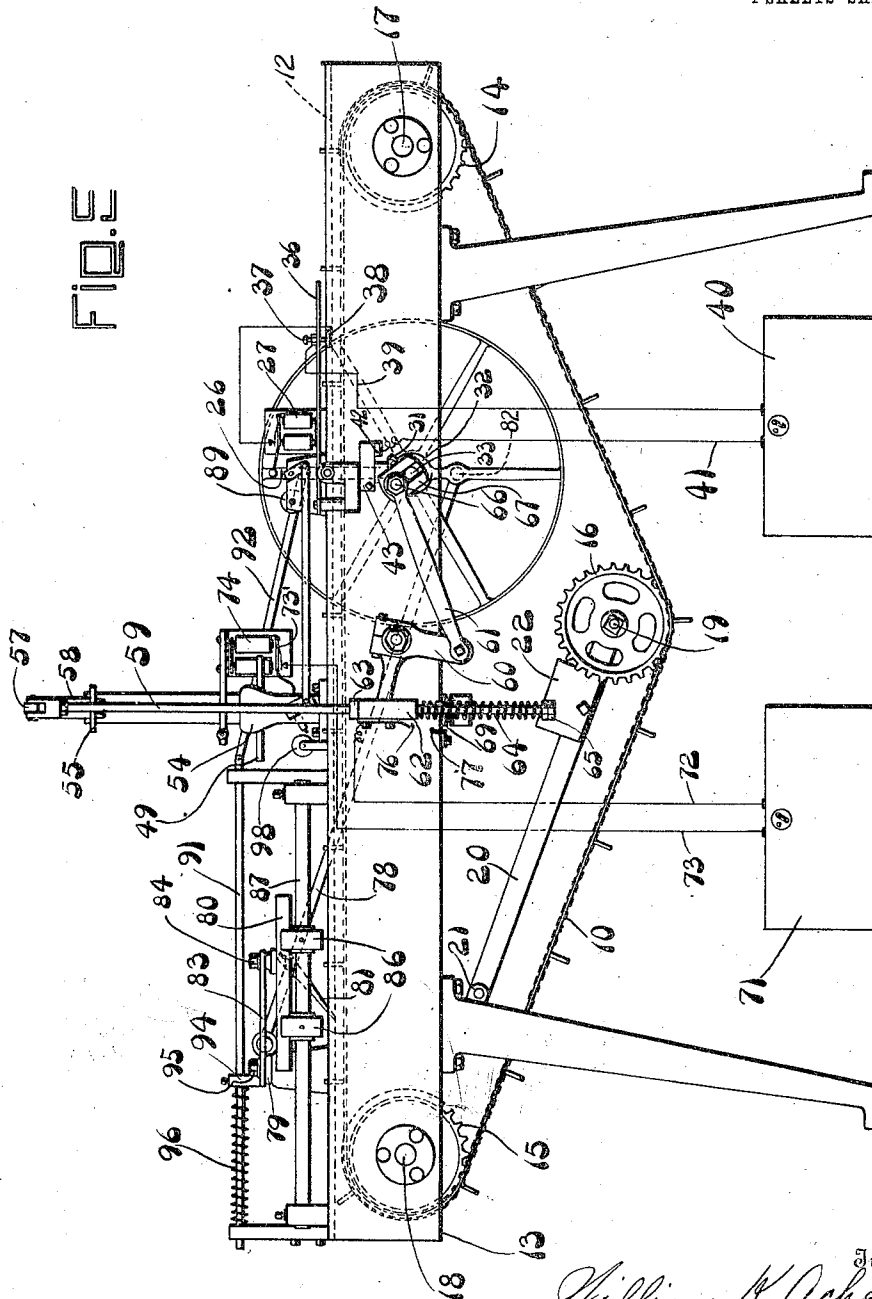
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4 SHEETS-SHEET 4.



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM K. ACHERT, OF NORWOOD, OHIO, ASSIGNOR TO THE AUTOMATIC TILE MACHINE COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

TILE-GRADING MACHINE.

1,066,239.

Specification of Letters Patent.

Patented July 1, 1913.

Application filed November 20, 1911. Serial No. 661,205.

To all whom it may concern:

Be it known that I, WILLIAM K. ACHERT, a citizen of the United States of America, and resident of Norwood, county of Hamilton, and State of Ohio, have invented certain new and useful Improvements in Tile-Grading Machines, of which the following is a specification.

An object of this invention is to produce a machine for grading tile, or similar articles, in accordance with their size, and for indicating imperfect tile which are warped or otherwise distorted.

This and other objects I attain by means of apparatus embodying the features herein described, and illustrated in the drawings accompanying and forming a part of this application.

In the drawings, Figure 1 is a plan view of a machine embodying my invention. Fig. 2 is a longitudinal section along the line 2-2 of Fig. 1. Fig. 3 is a transverse section along the line 3-3 of Fig. 1. Fig. 4 is an end elevation of the tile-receiving end of the machine. Fig. 5 is a side elevation of the machine. Fig. 6 is a fragmental plan view on an enlarged scale, and illustrates in detail a portion of the grading apparatus of the machine illustrated. Fig. 7 is a fragmental sectional view, on an enlarged scale, along the line 3-3 of Fig. 1. Fig. 8 is a fragmental sectional view, on an enlarged scale, along the line 2-2 of Fig. 1, and illustrates the means employed for adjusting the warp-indicating mechanism, forming a part of my invention. Fig. 9 is a fragmental perspective view of a portion of the machine, and illustrates the arrangement of the tile guide and the tile-testing means employed in connection with the warp-indicating apparatus.

The machine illustrated as an embodiment of my invention includes an endless conveyer, which is adapted to receive tile or other articles to be graded, and to carry them first to the grading apparatus, where they are stamped or in some manner marked to indicate their size, and then to the warp-indicating apparatus, which designates in a characteristic manner that the tile is imperfect, if it is warped or distorted an objectionable amount.

The conveyer is moved intermittently, as will hereinafter be more fully described, so that each tile carried by it traverses the machine in short steps, which are of such length that each tile stops in its passage through the machine while it is being graded, and also while it is being tested by the warp-indicating apparatus. After the tile have passed the warp-indicating apparatus, they are conveyed to the delivery end of the machine, where they may be received by an operator, or may be delivered by the machine into a suitable receptacle.

The conveyer is preferably a chain conveyer, and, as illustrated, consists of two chains 10-10, which are secured together by means of conveyer bars 11, adapted to contact with the tile and to move them along a way 12, Figs. 9 and 1 which is formed in the frame portion 13 Fig. 5 of the machine, and extends longitudinally of the machine from the receiving to the delivery end. Each chain 10 extends over sprocket wheels 14 and 15 and is held taut by means of a weighted sprocket 16, which engages the lower loop of the chain. (See Figs. 1, 2 and 5.) The sprockets 14 and 15 of both the chains are respectively mounted on shafts 17 and 18, which are respectively journaled on the frame at the receiving and the delivery end of the machine. The sprockets 16 of both the chains are journaled on a shaft 19, which is secured to the free end of a lever 20, fulcrumed at 21 on the frame 13, and provided with a longitudinally adjustable weight 22, which may be locked in different positions along the lever, for the purpose of varying the tension of the chain. (See Fig. 5.)

The wheels 14 and 15 are so located, that the upper loop of each chain passes along one of two parallel slots 23 Fig. 9, which are formed in the tile way 12 and extend parallel to the way, from one end of the machine to the other. The conveyer bars 11 rest on the way 12, and are provided with lugs 12^a, which are adapted to extend downwardly through the slots, and to which the chains are secured. The bars 11 are adapted to slide along the way 12, as the upper loops of the chains move along

the slots 23, and they partially support the weight of the upper loop of the chain. The weighted sprockets 16—16 are provided for the purpose of reducing the sliding friction between the bars 11 and the way 12, and, if desired, additional means, such as rollers, may be employed on the frame, for supporting the upper loop of the chain, so that the bars will move across the way with little or no friction.

The way is provided at each edge with a shoulder 24, which in connection with the conveyer bars, guide the tile in their motion through the machine. One of the shoulders is cut away or slotted to provide an opening, through which a grading finger 25 Fig. 3 of the tile-grading apparatus is adapted to project into the way. (See Figs. 1, 3, 4, 6 and 7). The grading apparatus illustrated is adapted to grade the tile passing through the machine, in accordance with their length, and to characteristically mark each tile, so as to indicate its length. This is accomplished by means of the finger 25, a series of type bars 26, (Fig. 3) a separate electro-magnet 27 Fig. 2 for each type bar, and a switch actuated by the finger 25 which controls the delivery of energizing current to the separate magnets 27 (Fig. 6). The finger 25 is retracted or withdrawn from the way 12, by a cam 28, which engages a lug 29 provided on the finger, and which is mounted on a vertical shaft 30, (Fig. 7) journaled in a bracket provided on the frame 13. The shaft 30 is provided at its lower end with a bevel gear 31, which meshes with a bevel gear 32 mounted on the driving shaft 33 of the machine.

The cam 28 is so timed that it withdraws the finger from the way during the time that the intermittently moving conveyer is moving one tile from under the type bars and another tile under them and also opposite to the recess through which the finger projects. The finger is moved forward by means of a coiled spring 34, which surrounds the finger, and is located between a collar carried by it and an extension of the bracket, in which the shaft 30 is journaled. The forward end of the finger is provided with a roller 35, which is moved by the spring 34 into engagement with the end of a tile, as the tile is moved under the type bars by the conveyer. The tension of the spring presses the opposite edge of the tile into engagement with the opposite shoulder 24, and, consequently causes the finger to occupy a definite position corresponding to the length of the tile. An arm 36 (Figs. 1 and 6) is fulcrumed on a projecting lug on the frame 13 and is pivotally connected to the finger 25, so that it swings about its fulcrum point, as the finger reciprocates in its guides, and, consequently occupies definite positions which correspond

to different lengths of tile engaged by the roller 35 of the finger. A contact or brush 37 is carried by the arm 36 and is adapted to move over and to contact with a series of contact or terminal bars 38, which are located adjacent to, but are insulated from each other. Each terminal bar 38 is electrically connected with one of the electro-magnets 27 and the contact 37 is connected to the lead 39 Figs. 5 and 6 of a suitable source of electricity, such as a battery 40. The other lead 41 of the battery is connected to a current interrupter, which is illustrated in Fig. 7, and which completes the battery circuit, after the roller 35 has come to rest against the edge of a tile to be graded, and thereby actuates one or another of the magnets 27, depending upon which of the terminal bars 38 is engaged by the contact 37.

The current interrupter consists of a contact 42 Fig. 7, to which the lead 41 of the battery is connected, and which is mounted on an insulating casing 43, so that it is insulated from the frame 13, to which one terminal of each magnet 27 is connected. The casing 43 incloses a cam 44, which is mounted on the shaft 30, and is adapted to periodically contact with the terminal 42 and thereby complete the battery circuit and energize one or the other of the magnets, as has been described.

The armature of each magnet 27 is pivotally mounted at one end and is provided at the other with a hammer Fig. 2, which normally rests upon the upper end of one of the type bars 26, and is adapted to move the bar downwardly and into engagement with the tile, when its corresponding magnet is energized. (See Figs. 1, 3 and 4). Each type bar is partially inclosed by a cylindrical casing 45, Fig. 3 which is secured to a rotatable bar 46, capable of being turned, as will hereinafter be described, for the purpose of inking the type provided on the lower end of all the bars. Each casing also incloses a coiled spring, which engages the bar it surrounds and holds it and the corresponding armature in the raised position.

The type on the ends of the different bars differ, so that the characters impressed on the tile indicate different lengths. The apparatus illustrated is provided with five type bars, and consequently is capable of grading the tile into five classes, and four intermediate classes, or into nine classes in all. Tile of the so-called intermediate classes are marked by two of the type bars. This results from the fact that the contact 37 engages two of the terminal bars 38, and thereby delivers energizing current to two of the magnets 27. This actuates two of the armatures and, consequently, depresses two of the type bars and indicates that the tile with which the roller 35 is in contact

is of such length, that the arm 33 occupies an intermediate position between two of the bars 38.

After the tile have been stamped to indicate their length, they are moved to the warp-indicating apparatus, where the imperfect tile are marked or otherwise indicated. The way 12 is provided with a depression 48, as shown in Fig. 9, which is so arranged that the lateral edges, or, if desired, the corners only of each tile, will be supported by the way and the tile will span the depression. The motion of the conveyer is so controlled, as will hereinafter be described, that the tile are successively moved into position over the depression and held there, until after they have been tested.

The operation of testing the tile consists in holding it in place on the way, with its corners firmly against the edges of the depression 48, so that it will contact with a pin 68 Figs. 8 and 9, if it is warped so as to extend down into the depression. The tile is held in place during the testing operation, by means of fingers 51, shown in Figs. 2, 8 and 9, which are mounted on a plate 49, and are capable of being moved to different positions along the plate, for the purpose of adjusting them to engage tiles of different widths and lengths. The plate is loosely mounted on the lower end of a reciprocating rod 50 shown in Figs. 2 and 4, there being sufficient relative motion between the plate and the rod to insure a firm contact between the lower end of each pin 51 and the tile. A cylindrical casing surrounds the rod and forms a guide for it and also incloses a coiled spring 53, which normally tends to move the rod, and, consequently, the plate 49, upwardly. The cylindrical casing is shown integrally formed with a yoke 54 Fig. 4, which straddles the way 12 and forms a part of the frame of the machine. A narrow beam 55 is rigidly mounted upon the upper end of the casing and supports one end of a link 56, to which the lever 57 is pivotally connected. The other end of the beam supports a guide 58 for the lever, and the lever engages the upper end of the rod 50, so that it is capable of moving the rod down against the pressure of the spring 53. The lever is actuated by the driving shaft 33 of the machine, through the agency of an eccentric rod 61 Fig. 5, a bell crank 60 actuated by the eccentric rod, a spring connection, and a link 59. The link is pivotally connected to the free end of the lever 57 and is provided with a sleeve 62, which is capable of moving longitudinally along it, but which is normally held in place against a collar 63, by means of a spring 64, which surrounds the link and seats upon an adjustable spring block or nut 65 as is illustrated in Fig. 5. The sleeve 62 and the spring 64 form a spring connection

between the link 59 and the bell crank 60. The bell crank is journaled upon a suitable pin, secured to the frame 13 and one of its arms engages a lug or projection formed on the sleeve 62; the other arm is pivotally connected to one end of the eccentric rod 61. The other end of the eccentric rod is journaled on an eccentric pin 66, mounted in a longitudinal slot, provided in a crank arm 67, which is rigidly mounted on the shaft 33. The pin 66 is capable of being secured in different positions along the crank arm, for the purpose of varying the throw of the eccentric rod, and consequently the amount of motion of the sleeve 62 and the parts operated by it. During a portion of a revolution of the shaft 33, the sleeve 62 is moved downwardly by the bell crank, and this moves the plate 49 downwardly, through the agency of the link 59 and the lever 57, since the strength of the spring 64 is greater than that of the spring 53. When the pins 51, carried by the plate 49, check the downward motion of the plate by contacting with a tile, located on the way 12, the sleeve 62 overrides the link 59 and the pressure of the pins on the tile depends upon the tension of the spring 64. With this arrangement, each tile is yieldingly, but firmly, held in place during the testing operation and there is no danger of subjecting it to a breaking pressure.

The pin 68 Figs. 8 and 9 projects upwardly through the depressed portion 48 of the way and is reciprocally mounted in a casing 69 Figs. 8 and 2, which depends from the frame 13. A coiled spring is located in the casing, surrounds the pin 68, and normally operates to hold the point of the pin on a level with the edges of the depression, or in other words, in the plane of the bottom surface of the way. An adjustable point or contact 70 is mounted in the bottom of the casing, immediately below the lower end of the pin 68, so that the pin will contact with it, when it is moved downwardly by a warped tile. The contact 70 is insulated from the casing 69, and consequently from the frame 13, and is electrically connected to a suitable source of electricity, such as a battery 71 Fig. 5, by a lead 72, and a current interrupter, which will hereinafter be described. The other lead 73 of the battery is connected to one terminal of an electromagnet 74 Fig. 2, which is similar to the magnets 27, and which actuates an armature 73' to depress a type bar 75, when the pin 68 is moved into contact with the contact 70 by a warped tile, and the circuit of the battery 71 is completed. A micrometer adjustment is provided for the contact 70, so that it can be moved upwardly or downwardly minute amounts, and so that the warp-indicating apparatus may be accurately adjusted. In Fig. 5 of the drawings, I have illus-

trated a current interrupter, which consists of a contact 76, mounted on, but insulated from the sleeve 62, and a contact 77, mounted on, but insulated from the frame 13, and electrically connected to the adjustable contact 70, inclosed within the casing 69. The lead 72 of the battery is connected to the contact 76, and the contact is so located on the sleeve that it engages the contact 77, when the sleeve is moved downwardly by the bell crank 60. This will complete the battery circuit, provided the pin 68 is depressed by a warped tile and forced into engagement with the contact 70, in which case the electromagnet 74 will be energized, and, in attracting its armature, will actuate the type bar 75 Fig. 2 and characteristically mark the imperfect tile. It will be apparent that various means will be employed for indicating imperfect tile, such, for example, as a bell or any other alarm, which may be sounded electrically or otherwise, when the pin 68 or its equivalent is depressed. The alarm may be employed to replace the type bar and its actuating mechanism, or it may be employed in connection with it. After the tile has been tested, the sleeve 62 is moved upwardly by the bell crank 60, and the spring 53 Fig. 2 lifts the fingers 51 out of engagement with the tile, by moving the rod 50, and, consequently the plate 49 upwardly.

In Fig. 4 of the drawings, I have shown the plate 49 provided with transversely extending under-cut or T-slots, which are adapted to receive the T-heads on the fingers 51. Each finger is also provided with a bolt, which coöperates with its T-head to firmly secure it in an adjusted position on the plate. With this arrangement, the fingers can be moved along the under-cut heads and secured in different positions on the plate. I have shown each plate provided with two under-cut slots near each end, so that the positions of the pins can be adjusted for different lengths of tiles, as well as for tiles of different widths.

After the testing operation, the tile are moved to the delivery end of the machine by the intermittently moving chains, and are there received by the operator and may be separated into the different grades, indicated by the marks on them. The chain is moved forward around the sprockets 14 and 15, by means of a connecting rod 78, a lever 79, a cross head 80, and a ratchet pin 81, which is mounted on the cross head and operatively engages the chain, during each forward movement of the cross head, as is shown in Figs. 1, 2 and 5. One end of the connecting rod is journaled on a pin 82, which is shown as mounted on a fixed driving pulley of the shaft 33. The other end of the rod is connected to one end of the lever 79, by means of a universal joint, so that the connecting

rod may be moved in two planes relatively to the lever. The lever is fulcrumed on a portion of the frame 13, and is connected to the cross head by means of a link 83 and a specially formed bolt 84, on which one end of the link is journaled. The bolt is capable of being secured in different positions along an under-cut slot 85, which extends longitudinally of the cross head, and the cross head is mounted on parallel supports 86 Figs. 1 and 2, which are slidably mounted on rods 87, located at each side of the frame 13.

The ratchet pin or pins 81 are so mounted on the cross head, that they engage the chain and move it forward a determined amount, during each forward movement of the cross head, and then moved back over the chain to a new position of engagement, while the chain remains stationary. The operation of the cross head is so timed, that the chain is at rest during the operation of grading and testing the tile, and the grading and testing apparatus are so located and arranged, that they operate simultaneously on different tiles.

It is, of course, necessary for the chain to move the separate tile to the proper positions relatively to the grading finger of the grading apparatus, and the depression 48 and pin 68 of the testing apparatus. This is accomplished by varying the position of the cross head relatively to the link 83, by adjusting the position of the bolt 84 along the slot 85. The amount of travel of the chain, during each forward movement, is dependent upon the throw of the connecting rod 78, which, if desired, may be made variable by means of apparatus similar to that shown in connection with the eccentric rod 61 Fig. 5 and the eccentric pin 66. The amount of motion of the cross head, and consequently of each forward movement of the chain, could also be varied by varying the fulcrum point of the lever 79, or by varying the point of connection between the lever and the connecting rod 78. The relative positions of the grading and testing apparatus, however, determines the length of each forward movement of the chain, and means for adjusting the throw of the cross head is not absolutely essential. The length of each forward motion of the chain must be such, that each tile will first be moved to the proper position relatively to the grading apparatus, and then to the proper position relatively to the testing apparatus. In the machine illustrated, I have so located and proportioned the parts, that each tile will be moved from the grading apparatus to a point between it and the testing apparatus, and then from the intermediate point to the testing apparatus. The conveyer bars are therefore so spaced along the chain, that tile will be simultaneously located in the

proper positions relatively to the grading and testing apparatus, and at an intermediate point between the two apparatus.

The type bars 26, as has been said, are mounted on a bar 46, which is capable of being rotated to bring the ends of the bars into engagement with an inking roll 89 Fig. 1. The type bar 75 Figs. 2 and 8 is similarly mounted on a rotatable bar, which is operatively connected to the bar 46, by means of a connecting rod shown in Fig. 5. The bar 46 is also connected to a reciprocating rod 91 Fig. 1, by means of a connecting rod 92 and a crank 93, so that it, and consequently the rod supporting the type bar 75 are turned in their bearings by the reciprocations of the rod 91. The rod 91 is mounted in guides on the frame 13, and is provided with a finger 94, which is adjustable along it and is adapted to be engaged by a lug 95 on the lever 79, during the operation of the lever. The lever is adapted to move the rod longitudinally in opposition to the pressure of a coiled spring 96, which surrounds the rod and is located between the finger 94 and an upright, forming one of the guides for the rod. The finger is so located on the rod relatively to the positioning of the lug 95 on the lever, that the type bars 26 and 75 will be turned to engage their respective inking rolls, during the interval that the conveyer is moving the tile forward, and will be returned to their normal positions during the first part of the backward motion of the cross head. The inking roll for the type bars 26 is indicated at 89 and the roll for the bar 75 is indicated at 98.

One of the features of my invention is the combination of a grading and a warpage-determining and indicating apparatus in the same machine and the organization of the parts of the machine, so that the two apparatus work synchronously and in conjunction with the same conveyer. In this connection it is to be noted that while I have shown the grading apparatus particularly adapted to measure the length of tile and to grade them in accordance with their lengths, it may be employed to measure the width, or the thickness, of the tile and to grade them in accordance with either or both of these dimensions. It is also to be noted that while the testing apparatus is particularly adapted to indicate a convex warpage on one side of the tile, it may be so arranged, that it will indicate warping of any character evidenced on any portion of the tile. A plurality of pins 68 may be employed for engaging different portions of the tile during the testing operation, and each pin may be arranged to separately operate a marking or indicating device, such as a type bar, or the pins may be so arranged that they will all cooperate in completing the operating circuit of one type-actuating electro-magnet

or similar apparatus. The electro-magnets of both the grading and the testing apparatus are the preferred means for actuating the type, but they are also merely illustrative, and may be replaced by various means, such, for example, as mechanical means, consisting of a selective mechanism, similar to the lever 36 Figs. 1 and 6, and an operating mechanism for depressing the selected type, similar to the operating mechanism of the plate 49.

Various means may be employed for locating the tile or the article to be graded and tested on the conveyer, but at present I contemplate placing each tile by hand in the proper position on the conveyer, adjacent to one of the conveyer bars and between the shoulders 24 of the tile way 12.

The machine illustrated is particularly adapted for grading and testing tile or similar articles made of clay or vitreous material, but it may also be employed for grading and testing other articles, as will be readily apparent to those skilled in the art.

The operation of the apparatus is somewhat as follows: The tile to be graded are placed on the conveyer so that one edge of each tile is engaged by one of the conveyer bars 11. The conveyer operates so that it moves each tile to a position under the grading mechanisms and opposite to the end of the grading finger 25. When a tile is in this position the finger moves into contact with one of its ends and forces the other end against the opposite shoulder 24 of the way along which the tile moves. This causes the finger, and consequently the contact arm 36 to occupy definite positions corresponding to the length of the tile. After the finger and the arm 36 have come to rest the current interrupter operates to complete an electric circuit including one of the electromagnets 27, and to thereby actuate one of the type bars so that it characteristically marks the tile to indicate its length. After the tile is marked the conveyer advances and moves the tile to position over the warpage indicating pin 68. This operation of the conveyer also moves another tile to position under the grading mechanisms and the machine operates to grade a tile during the operation of testing the first tile for warpage. During the warpage testing operation, the tile is clamped in place over the depression 48 by means of the fingers 51, and this clamping operation moves it into contact with the pin 68 if the tile is warped a determined amount. The pin responds to the pressure of a warped tile and moves downwardly into engagement with a contact 70, which is included in the operating circuit of a type bar 75. The operating mechanism of the fingers 51 also actuates the electrical contact 76 so that it completes the circuit of the operating mechanism of the

bar 75 and causes the bar to stamp the tile if the tile is warped to such a degree as to be defective. After the tile has been tested for warpage, the conveyer advances it along the tile way and finally delivers it from the discharge end of the machine.

What I claim is:

1. In a machine for grading tile and similar articles, a grading finger adapted to contact with a tile to be graded, an intermittently moving conveyer for moving tile up to and away from said finger, driving means for the conveyer, indicating mechanisms, and means jointly controlled by the finger and the driving means for actuating the indicating mechanisms during the periods of rest of the conveyer.

2. In a machine for grading tile and similar articles, a grading finger adapted to contact with tile to be graded and to occupy different positions corresponding to the size of the tile, an intermittently moving conveyer for conveying tile to the finger, driving means for actuating the conveyer, indicating mechanisms controlled by said finger and means actuated by the driving means for rendering the indicating mechanism inactive during the motion of the conveyer.

3. A grading machine, comprising, a conveyer for articles to be graded, means for intermittently moving the conveyer, means for engaging the articles moved by the conveyer during the intervals of rest of the conveyer, and means controlled by said last mentioned means and actuated during the intervals of rest of the conveyer for indicating the size of the article on the conveyer.

4. A grading machine comprising a grading finger, means for moving articles to be graded opposite to said finger, means for moving said finger into engagement with said articles, electrically actuated means for indicating the size of the articles engaged by the finger, an electric circuit, a controller for said electrically actuated means actuated by said finger and included in the circuit, and a current interrupter in the circuit for rendering the electrical means inoperative between grading operations.

5. A grading machine comprising a conveyer for articles to be graded, a grading finger for engaging the articles conveyed, means for actuating said finger to move it into contact with and to withdraw it from the article to be graded, electrically actuated means for indicating the size of the article graded, an electric circuit means actuated by said finger and included in the circuit for controlling the operation of said electrically actuated means, and a current interrupter included in the circuit and actuated by the finger actuating means for rendering the electrical means inoperative during the motion of the finger.

6. A grading machine for tile and simi-

lar articles comprising an intermittently moving conveyer for the articles to be graded, a driving means therefor, a grading finger, means actuated by the driving means for actuating the finger, electrically actuated indicating devices for indicating the size of the articles tested, an electric circuit, means actuated by said finger and included in the circuit for controlling the operation of the indicating means, and a current interrupter located in the circuit and controlled by the finger actuating means for rendering the indicating devices inactive between grading operations.

7. A grading machine comprising a grading finger, a moving conveyer for moving articles to be graded into engagement with the finger, a driving agent for the conveyer, means actuated by the driving agent for actuating the finger, indicating means for indicating the size of each article graded, and means actuated by the finger for controlling the operation of the indicating means.

8. In a machine of the character described, a grading finger, a conveyer for moving articles to be graded adjacent to said finger; means for intermittently actuating the conveyer, means actuated by the conveyer actuating means for causing the finger to move into engagement with an article conveyed while said conveyer is at rest, adjustable means for controlling the motion of the conveyer, so that it successively moves the articles conveyed by it into the proper position relatively to said finger, means for characteristically marking each article engaged by said finger, and means controlled by the finger for actuating the last-mentioned means.

9. In a machine of the character described, a grading finger, means for moving the finger to different positions, a conveyer for moving articles to be graded into engagement with the finger, adjustable means engaging the conveyer and controlling the motion of the conveyer, and means for reciprocating said adjustable means to actuate the conveyer.

10. A testing apparatus for determining the warpage of tile and similar articles, comprising, a support for the tile to be tested, a conveyer for moving tile onto the support, means for intermittently actuating the conveyer, movable means capable of occupying different positions corresponding to variations in the contour of the surface of the tile on the support, an electric circuit including said means and controlled thereby, an indicating device, electrically actuated means included in said circuit for actuating said indicating device, and a current interrupter located in said circuit and actuated by said conveyer-operating means for breaking the circuit during periods of operation of the conveyer.

11. A testing apparatus for determining the warpage of tile and similar articles, comprising a support for the tile to be tested, a conveyer for moving tile to be tested onto said support, means for intermittently moving the conveyer, means for clamping the tile in place on the support after the conveyer has come to rest, and for releasing the tile prior to the movement of the conveyer, movable means engaged by the tile on the support and capable of occupying different positions corresponding to variations in the contour of the engaging surface, and indicating means controlled by said movable means for indicating the warpage of the tile.

12. A testing apparatus for determining the warpage of tile and similar articles, comprising a tile way, means for advancing tile to be tested along the way, a support for the tile traversing the way, movable tile engaging means engaged by the supported face of the tile engaged by said support, and movable to different positions dependent upon the contour of the engaging surface of the tile, an electric circuit controlled by the movable tile engaging means, electrically actuated tile-marking means included in the circuit, and periodically operating means for holding the tile in place on the support during the testing operation.

13. A testing apparatus, for determining the warpage of tile and similar articles, comprising a support for the articles to be tested, a tile conveying means for moving the tiles to engage the support, clamping means for holding the tiles, moved by said conveying means, against the support during the testing operation, a movable pin, engaged by the tiles engaged by the support, and capable of occupying different positions corresponding to the variations in the contour of the engaging surface of the tile on the support, an electric circuit controlled by the pin, electrically actuated tile marking means included in the circuit, and a current interrupter operating to close the circuit after the clamping means has operated to secure a tile in place on the support.

14. A testing apparatus for determining the warpage of tile and similar articles, comprising a support for the tile to be tested, a conveyer for moving tile onto said support, means for intermittently actuating the conveyer, clamping means for yieldingly holding tile in position on the support during periods of rest of the conveyer, movable means engaged by the surface of tile on the support and capable of moving to different positions corresponding to variations in the contour of the engaging surface, a tile marking device, for marking tile located on the support, actuating means for the marking device controlled by said movable means, and means actuated by the conveyer-actuat-

ing means for rendering the marking device actuating means inactive during the motion of the conveyer.

15. A testing apparatus for determining the warpage of tile and similar articles, comprising a way, a conveyer for moving tile along the way, driving means for intermittently moving the conveyer, means actuated by the driving means for holding each tile in place on the way during the testing and marking operation, a pin engaged by the tile on the way and movable to different positions corresponding to the contour of the engaging surface of the tile, and means controlled by said pin for marking the tile.

16. A testing apparatus for determining the warpage of tile and similar articles, comprising a way having a depression formed therein and along which the tile to be tested is moved, a pin located in said depression, a conveyer for moving tile along the way and into position over said depression, means for intermittently moving the conveyer, means for clamping the tile in place on the way over the depression, electrically actuated means controlled by the pin for marking the tile tested, an electric circuit including said electrically actuated means and a current interrupter in said circuit for rendering said electrical means inoperative during the motion of the conveyer.

17. In a machine of the character described, a warp-indicating apparatus for tile and similar articles, comprising a support for the article to be tested, testing means engaged by the article on the support, a conveyer for successively moving articles to place on said support, a driving agent, means driven thereby for intermittently actuating the conveyer, and means actuated by the driving agent for yieldingly holding the article to be tested in place on the support during the testing operation.

18. A warpage-testing and indicating apparatus for tile and similar articles, comprising a support for the tiles to be tested provided with a depression, a conveyer for moving the tiles along the support, adjustable means for intermittently actuating said conveyer, so that the conveyer successively moves the tile to be tested in place across said depression, a pin located in the depression so as to be engaged by warped tile, reciprocating means for moving into contact with and for holding each tile in place on the support across the depression, an indicating device for marking the tested tile, means controlled by said pin for actuating the device to mark the tested tile, and means for rendering said device inactive until said reciprocating means is moved into engagement with the tile to be tested.

19. In a machine of the character de-

scribed, a mechanism for grading tiles in accordance with their sizes, a warpage testing and indicating mechanism for indicating warped tiles, a conveyer for conveying 5 tile to one, and then to the other, of said mechanisms and for simultaneously moving a tile to an operative position with relation to each mechanism, means for intermittently moving the conveyer and means for simultaneously actuating both of said mechanisms during periods of rest of the conveyer. 10

20. In a warpage testing and marking machine, a support for tile to be tested, a tile conveying means for moving the tile to 15 engage the support, a movable pin engaged and operated by the tile on the support, driving means for actuating the tile conveying means, periodically actuated means for yieldingly holding a tile in place on the 20 support during the testing operation, means for periodically actuating the tile holding means, and means controlled by the pin for indicating warpage of the tile on the support.

21. In a machine of the character described, a warpage testing and marking device comprising, a support for articles to be tested, and a pin for engaging the surface of the article on the support, means for 30 yieldingly projecting the pin, a conveyer for moving articles to be tested on to the support and for removing them therefrom, means for intermittently moving the conveyer, reciprocable means for moving into 35 engagement with, and for holding each article in place on the support during periods of rest of the conveyer, means for reciprocating said reciprocable means and means controlled by the pin for marking the 40 articles on the support.

22. A testing apparatus for determining the warpage of tile and similar articles, comprising a support for tile to be tested, a conveyer for moving tile onto the support 45 and for removing them therefrom, driving means for intermittently moving the conveyer, a movable pin engaged by the tile located on the support, means for yieldingly projecting the pin, an electric circuit 50 including the pin, a tile marking device for marking tile located on the support, electrical actuating means therefor included in the circuit and controlled by the pin, a current interrupter located in the circuit, and 55 means for actuating the interrupter to break the circuit and to thereby render the marking device inactive while the conveyer is operating to convey tile.

23. In a machine of the character described a warpage testing and marking device comprising a support for articles to be tested, a pin for engaging an article on the support, means for yieldingly projecting the pin, a conveyer for moving articles to

be tested onto the support and for removing 65 them therefrom, driving means for the conveyer, means actuated by the driving means for clamping the article to be tested in place on the support during the testing operation and means controlled by the pin for marking 70 the article on the support.

24. In a machine of the character described, a warpage testing and marking device comprising a support for tile to be tested, means for engaging the tile on the support, a conveyer for moving successive tile 75 into place on the support and for moving them therefrom, driving means for the conveyer, a marking device actuated by the first mentioned means for marking the tile 80 on the support and means actuated by the driving means for clamping the tile in place on the support during the operation of the marking device.

25. In a warpage testing and marking 85 machine, a support, a pin for engaging tiles mounted on the support, tile conveying means for moving tiles onto and removing them from the support, driving means for the tile conveying means, a marking device 90 for marking tile located on the support, an electrically actuated mechanism for actuating said marking device, an electric circuit including the actuating mechanism of the tile marking device and the pin, and a current interrupter actuated by the driving 95 means and included in the electric circuit.

26. In a machine of the character described, grading mechanisms, warpage testing mechanisms, a conveyer for simultaneously moving tiles to operative positions 100 with relation to the grading and warpage testing mechanisms, means for actuating the conveyer and means actuated by the driving means of the conveyer for simultaneously 105 actuating the grading and warpage testing mechanisms.

27. In a machine of the character described, grading mechanisms, warpage testing mechanisms, an intermittently moving 110 conveyer for simultaneously moving tile to operative positions with relation to the grading and warpage testing mechanisms, and means actuated by the driving mechanisms of the conveyer for simultaneously actuating 115 the grading and warpage testing mechanisms during periods of rest of the conveyer.

28. In a tile grading and marking machine, a conveyer for tile to be graded, driving means for intermittently moving the 120 conveyer, a finger for engaging the tile on the conveyer, means actuated by the driving means for moving the finger, a tile marking device, and means controlled by the finger for actuating the tile marking device during 125 periods of rest of said conveyer.

29. In a tile grading and marking machine, a conveyer for tile to be graded, driv-

ing means for intermittently moving the conveyer, a finger for engaging tile on the conveyer, means actuated by the driving means for withdrawing the finger from the path of travel of the tile, a spring for moving the finger into engagement with the tile during periods of rest of the conveyer, an indicating device, and means controlled by the finger for operating the indicating device to indicate the size of the tile engaged by the finger.

30. In a tile grading and marking machine, a conveyer for tile to be graded, driving means for the conveyer, a finger for engaging tile on the conveyer, means actuated by the driving means for moving the finger, electrically actuated tile marking devices, an electric circuit including said devices, means actuated by the finger and included in said circuit for controlling said devices and a current interrupter included in said circuit and actuated by said driving means.

31. In a tile grading and marking machine, a conveyer for tile to be graded, driving means for intermittently moving said conveyer, a finger for engaging a tile on the conveyer while conveyer is at rest, means for withdrawing the finger out of the path of travel of the tile, a spring for moving the finger into engagement with a tile on the conveyer, electrically actuated tile marking devices, an electric circuit including said devices, a controller for said devices, included in said circuit and actuated by the finger and a current interrupter included in the circuit and actuated by the finger actuating means.

32. A grading machine for tile, comprising a grading finger, a conveyer for moving tile to be graded up to said finger, driving means for the conveyer, electrically actuated means for marking the size of the tile on the tile engaged by the finger, an electric circuit including said electrically actuated means, a controller in the circuit actuated by the finger, a current interrupter in the circuit and means actuated by the driving means for actuating the current interrupter.

33. In a tile testing machine, a tile support, electrically actuated indicating mechanisms, an operating circuit for said mechanisms, a movable pin located in said circuit, for engaging the surface of tile located on the support, an adjustable contact for said pin located in said circuit, a current interrupter located in the circuit, a conveyer for moving tile onto said support, and means for actuating the current interrupter to break the circuit between testing operations.

34. In a machine for grading tile and similar articles, a conveyer for moving tile, a reciprocable grading finger for engaging tile conveyed by the conveyer, and adapted to occupy different positions corresponding

to the size of the tile conveyed, means for actuating the finger, indicating means for indicating the size of tile engaged by the conveyer, means controlled by the finger for actuating the indicating means and means for rendering the indicating means inactive during the motion of the finger.

35. In a machine of the character described, a warpage indicating apparatus for tile, comprising, a tile way, a conveyer for moving tile along the way, driving means for intermittently moving the conveyer, a movable pin, means for pressing a tile while located on the way into engagement with the pin during periods of rest of the conveyer, means for periodically actuating said tile pressing means, and a warpage indicating mechanism controlled by the pin.

36. In a warpage testing machine, a conveyer for articles to be tested, means for intermittently moving the conveyer, a rigid support engaged by articles moved by the conveyer, during intervals of rest of the conveyer, movable means for engaging the supported face of a tile while engaged by the support and a mechanism controlled by said last mentioned means and actuated during intervals of rest of the conveyer for indicating warpage of the article engaged by the support.

37. A warpage indicating apparatus comprising, a tile support, tile conveying means, for moving a tile to position relatively to said support, movable means for engaging a tile engaged by the support, a warpage indicating mechanism, means controlled by said movable means for actuating said mechanism, holding means for pressing a tile into engagement with the support, during the testing operation, and means for actuating said tile conveying means and said holding means.

38. In a warpage indicating apparatus, a tile way, a tile support, movable means for engaging the supported face of a tile supported by the support, a conveyer for moving tile along the way, driving means for intermittently moving the conveyer, means for pressing tile, traversing the way, against the support and into engagement with the movable means during periods of rest of the conveyer, means for periodically actuating the tile pressing means and means controlled by the movable means for indicating the warpage of the tile supported by the support.

39. A testing apparatus for determining the warpage of tile and similar articles, comprising, a tile way, a conveyer for moving tile along the way, a support for the tile traversing the conveyer, means for intermittently actuating the conveyer, movable means for engaging the supported face of a tile supported by the support and ca-

pable of occupying different positions corresponding to variations in the contour of the supported surface of the tile on the support, an electric circuit including said movable means and controlled thereby, an indicating device, electrically actuated means included in said circuit for actuating said indicating device and a current interrupter located in said circuit and actuated by said conveyer operating means for breaking the circuit during periods of operation of the conveyer.

WM. K. ACHERT.

Witnesses:

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