(No Model.)

H. G. & W. BUTLER.

METHOD OF BURNING CLAY TO MAKE BALLAST.

No. 486,761. Patented Nov. 22, 1892.

Fig. 1.

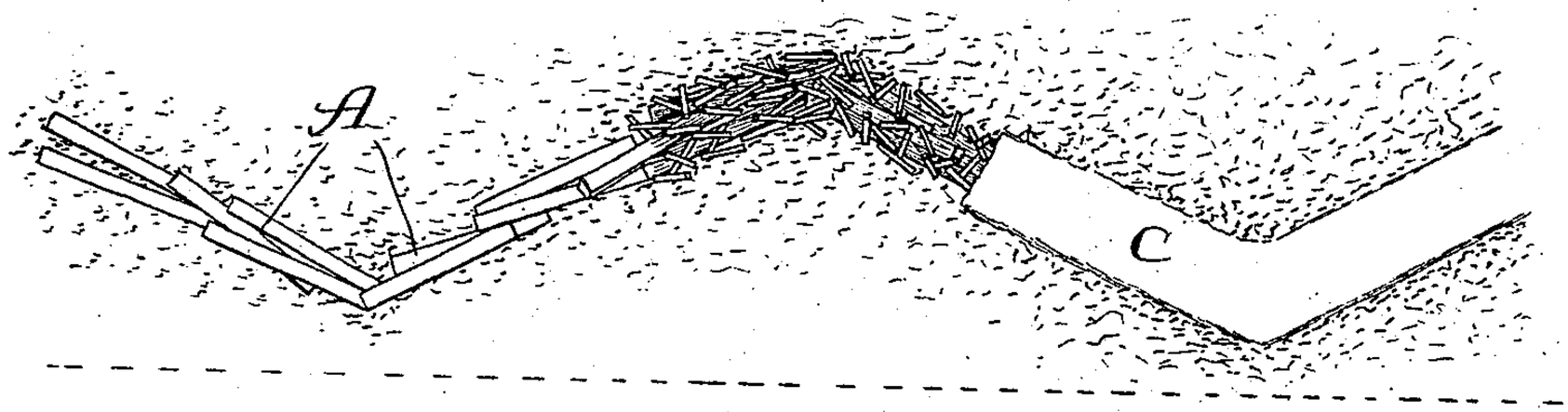
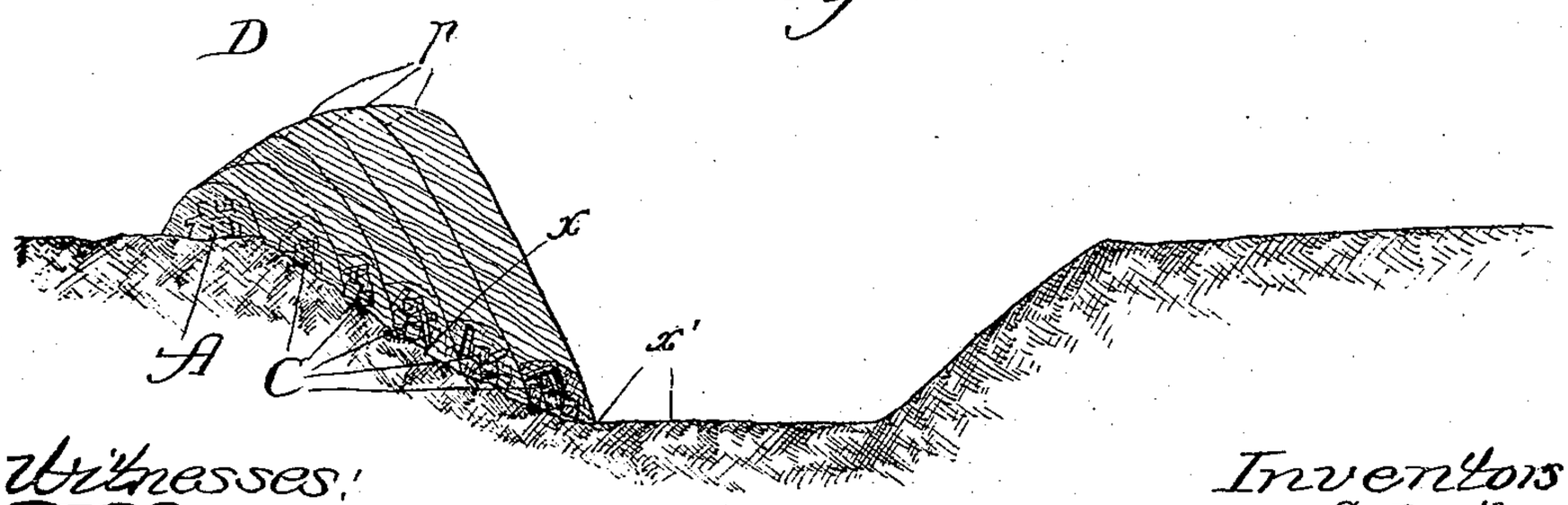


Fig. 2.



Witnesses:
Chas. E. Gaylord.
Clifford N. White.

Inventors
Henry G. Butler.
and William Butler,
By Dyrenforth & Dyrenforth,
Attys.

UNITED STATES PATENT OFFICE.

HENRY G. BUTLER AND WILLIAM BUTLER, OF KENOSHA, WISCONSIN, ASSIGNORS TO THE DAVY CLAY BALLAST COMPANY, OF SAME PLACE.

METHOD OF BURNING CLAY TO MAKE BALLAST.

SPECIFICATION forming part of Letters Patent No. 486,761, dated November 22, 1892.

Application filed May 9, 1892. Serial No. 432,305. (No model.)

To all whom it may concern:

Be it known that we, HENRY G. BUTLER and WILLIAM BUTLER, citizens of the United States, residing at Kenosha, in the county of Kenosha and State of Wisconsin, have invented a new and useful Improvement in Methods of Burning Clay to Make Ballast, &c., of which the following is a specification.

Our invention is in the nature of an improvement in the now well-known procedure of making ballast, paving material, &c., from clay by burning the clay in the open air in a long pile or "fire" supplied with clay dug from alongside the pile and fuel, (commonly coal,) the clay and fuel being applied alternately; and the burning is controlled with a view to producing, so far as possible, a uniform quality of the burnt-clay product throughout the pile.

The ultimate object of our improvement is to lessen the cost of burning clay according to the plan thus generally outlined. This we effect by about one-half over the method of burning as now practiced by forming and maintaining a peculiar shape of the long pile or fire by our peculiar manner of preparing the same, by our peculiar manner of preparing the ground before starting the fire, and also after starting it, and by a particular manner of building onto the fire or pile in its development, whereby we avoid necessity for drawing it, and thus are enabled to save materially in fuel, heat, time, and labor.

The several features of our invention are not interdependent, since each will serve to afford some advantage if incorporated alone with the otherwise old practice in burning clay, and we do not therefore limit our invention to the practice of all the steps we have invented, though our object is fully attained by observing all the features above outlined, hereinafter described in detail, in burning the clay.

The peculiar nature of the subject of our invention renders impracticable illustration thereof otherwise than indicatively by representation in diagrammatic form in the accompanying drawings, in which—

Figure 1 is a plan view, in the nature of a diagram, showing the general zigzag shape in which we prefer to form our fire from the beginning, and defining also the successively prepared strips of ground along a side of the fire; and Fig. 2 is a cross-sectional view of the finished pile, also in the nature of a diagram, having indicated upon it all the steps of our proceeding capable of representation.

To practice our improvement we proceed as follows upon suitable clay ground, the location of which is ordinarily selected for the sake of convenience near a line of railroad.

We first prepare the ground by spreading carbonaceous fuel (usually coal, and preferably the cheaper variety thereof, as coal-slack or mine-refuse) over the portion thereof on which the fire is to be built, and we then loosen or plow it to a depth of, say, several inches, whereby the earth and fuel are well mixed. We then lay the kindling, using by preference long lengths of wood—such as old railroad-ties, old bridge-timbers, and the like—disposing them in more or less regular zigzag relation to each other, as represented in Fig. 1 on the drawings, wherein they are shown as placed end to end. We thus form a zigzag heap and prefer to pile thereon sufficient kindling material to render the initial heap, indicated at A in Fig. 2, two or three feet high. We then cover the pile of kindling thus formed with clay, preferably, to a depth of from six to eight inches, dug from one side or from both sides of the line of the fire. In fact, the burning may be continued to the end on both sides, when the digging may proceed on one side or on both sides of the fire, though we prefer to continue it on one side only, since then the finished ballast may be taken and loaded for transportation from the other side while the burning on the one side is progressing. The initial width of the surface of the ground loosened, as hereinbefore described, should be greater than that of the initial zigzag line of kindling laid, in order that the clay for heaping upon the pile may be the more easily and economically dug from either side or both sides thereof. To facilitate the burning with some kinds of clay prior to piling it on the kindling, the latter may be strewn with coal. The zigzag shape of the fire thus initially formed, and which is maintained throughout the burning, affords particularly the advan-

tage over the straight fire hitherto employed of preventing side or diagonally-directed winds from sweeping the pile from end to end and thereby driving the heat away from the surface, which tends to retard the burning of the more recently imposed covering or coverings of clay. A further advantage thereof is due to the "pockets," so to speak, formed by sections of the pile meeting at respectively converging and diverging angles, whereby the exposed portions catch the air or draft, allowing it readily to penetrate into the uneven fire at its projections and thus hasten combustion and by the enhanced action thereof the better spread the heat throughout the fire and accordingly improve the quality of the product.

When the initial pile has been lighted and allowed to get sufficiently under way, we begin to increase its transverse dimension in a manner to obviate the necessity for subsequently drawing it by placing more wood on the ground at the side or sides at which the earth has been previously loosened in preparing the initial bed of the fire by imposing more kindling material (as wood) thereon, following the outline of the initial pile to maintain its zigzag form. Over this wood more coal should be scattered in coaling the surface of the burning pile, after which more clay is dug and piled on the fire. While the fire is burning, we further prepare the ground at the base of the pile by strewing coal over a width, say, of a foot or so along it and plowing it up to loosen the clay and mix the coal with it, as indicated at B in Fig. 1, and then piling on more wood, more coal, (by preference, as aforesaid,) and more clay from the base of the pile so increased in diameter. This proceeding of preparing the ground for a desired width along the pile by strewing with coal, then plowing and imposing the clay thereon, (or on interposed wood, if desired,) is continued at intervals (say daily) until the desired width of the fire has been attained. In Fig. 2 the result of each of the aforesaid proceedings is indicated at C.

It should be stated that it is not necessary that each of the operations involved by the proceeding referred to as "preparing the ground and widening the pile" shall be carried on separately, as all may be performed simultaneously on different sections of the fire. As will be observed by reference to Fig. 2, with all the operations completed on any section or length of the fire and the base thereof accordingly increased in width, the desired dome shape in cross-section of the pile is maintained, which allows the entire surface of the fire to be sufficiently exposed to enable it to receive its full share of air. It will be further noticed that by digging the clay from the front of the fire (or side thereof facing the operators) a gradual slope is made and maintained since the gradual increase of the surface of the pile to be covered with clay requires a larger quantity of the latter to cover it, and accordingly it has to be taken from a gradually-increasing depth, thus producing the slope indicated at *x* in Fig. 2, of the base of the fire. When the slope has attained a sufficient depth, as indicated at *x*, Fig. 2, (say about six to eight feet,) and the fire has reached a height beyond which it would be inconvenient to handle it (say ten to twelve feet) a level is maintained of both base and crown of the pile, the bottom still being prepared in the manner described and the coverings of clay being carried only to the crown, but not over it. Thus by successive coverings along the side (or sides) the crown D becomes almost level though the upper ends of the successive coverings will produce ridges or furrows *p* lengthwise of the fire, which should be filled when the burning of the top is well under way with coal and covered with partially-burned clay from the crown, thereby increasing the heat and the more thoroughly burning the mass on the top of the fire.

To facilitate the burning the whole surface of the fire should be gently probed from time to time with metal bars, thereby to break the surface and permit air to penetrate into it freely.

By plowing along the base and mixing in coal with the plowed clay two particular advantages are gained—namely, first, an open base for the fire which admits draft thereto, thereby promoting combustion, and, secondly, the loosened clay is ultimately burned as well as the remainder of the fire to a considerable depth into the ground by the burning of the coal mixed with it from the heat above it. The extra large quantity of burnt clay thus obtained is gained at very slight cost, and thus greatly cheapens the cost of producing the whole.

By building onto the fire instead of and in contradistinction to drawing it to increase its width and forming the dome-shaped fire with a top like ours affords great saving in coal, since the heat is thereby not wasted that rises through the consecutive coverings of clay and rapidly reduces them to and maintains them a glowing mass.

There is no particular difficulty in maintaining a well-defined zigzag form of our fire, though it will afford the advantage ascribed to it even if it be less well defined, and we desire to have included as within the spirit of our invention even an approximately zigzag form of the pile. Furthermore, it is not indispensably necessary that the fire shall be laid or initially in the zigzag form, since it may in various ways be gradually caused to assume it.

What we claim as new, and desire to secure by Letters Patent, is—

1. In burning clay to make ballast, &c., by laying and maintaining a fire in the open air with fuel and clay, the method of promoting the burning, which consists in forming the fire in zigzag shape, substantially as described.

2. In burning clay to make ballast, &c., by laying and maintaining a fire in the open air with fuel and clay, the method of promoting the burning and increasing the products, which consists in loosening the soil and mixing fuel with it preparatory to building on it the fire, substantially as described.

3. In burning clay to make ballast, &c., by laying and maintaining a fire in the open air with fuel and clay, the method of promoting the burning and increasing the product, which consists in loosening the soil of the foundation and mixing fuel with it and piling thereon kindling-wood preparatory to applying thereon the clay to be burned and coal for burning it and preparatory to increasing the width of the fire with additional clay and coal, substantially as described.

4. In burning clay to make ballast, &c., by laying and maintaining a fire in the open air with fuel and clay, the method of promoting the burning and increasing the product, which consists in loosening the soil of the foundation and mixing fuel with it, laying thereon a zigzag bed of kindling and piling on the kindling and burning clay and coal and increasing the width of the pile by loosening the soil along the same and mixing fuel with it and laying thereon kindling in the zigzag line of the initial pile and piling on the newly-prepared foundation the clay to be burned and coal for burning it, substantially as described.

5. In burning clay to make ballast, &c., by laying and maintaining a fire in the open air with fuel and clay, the method of promoting the burning and increasing the product, which consists in loosening the soil of the foundation and mixing fuel with it, laying thereon a zigzag bed of kindling and piling on the kindling and burning clay and coal, increasing the width of the pile by loosening the soil along the same and mixing fuel with it and laying thereon kindling in the zigzag line of the initial pile and piling on the newly-laid foundation the clay to be burned and coal for burning it, thereby also gradually increasing the height of the fire to a desired altitude, thenceforward piling additions of clay and coal only to the crown of the fire and coaling the furrows thus formed on the crown and covering them with clay from the pile, substantially as described.

HENRY G. BUTLER.
WILLIAM BUTLER.

In presence of—
M. J. FROST,
J. N. HANSON.