No. 791,782. PATENTED JUNE 6, 1905.

E. E. HENDRICK.

SCREEN.

APPLICATION FILED DEC. 17, 1902

Fig. 1

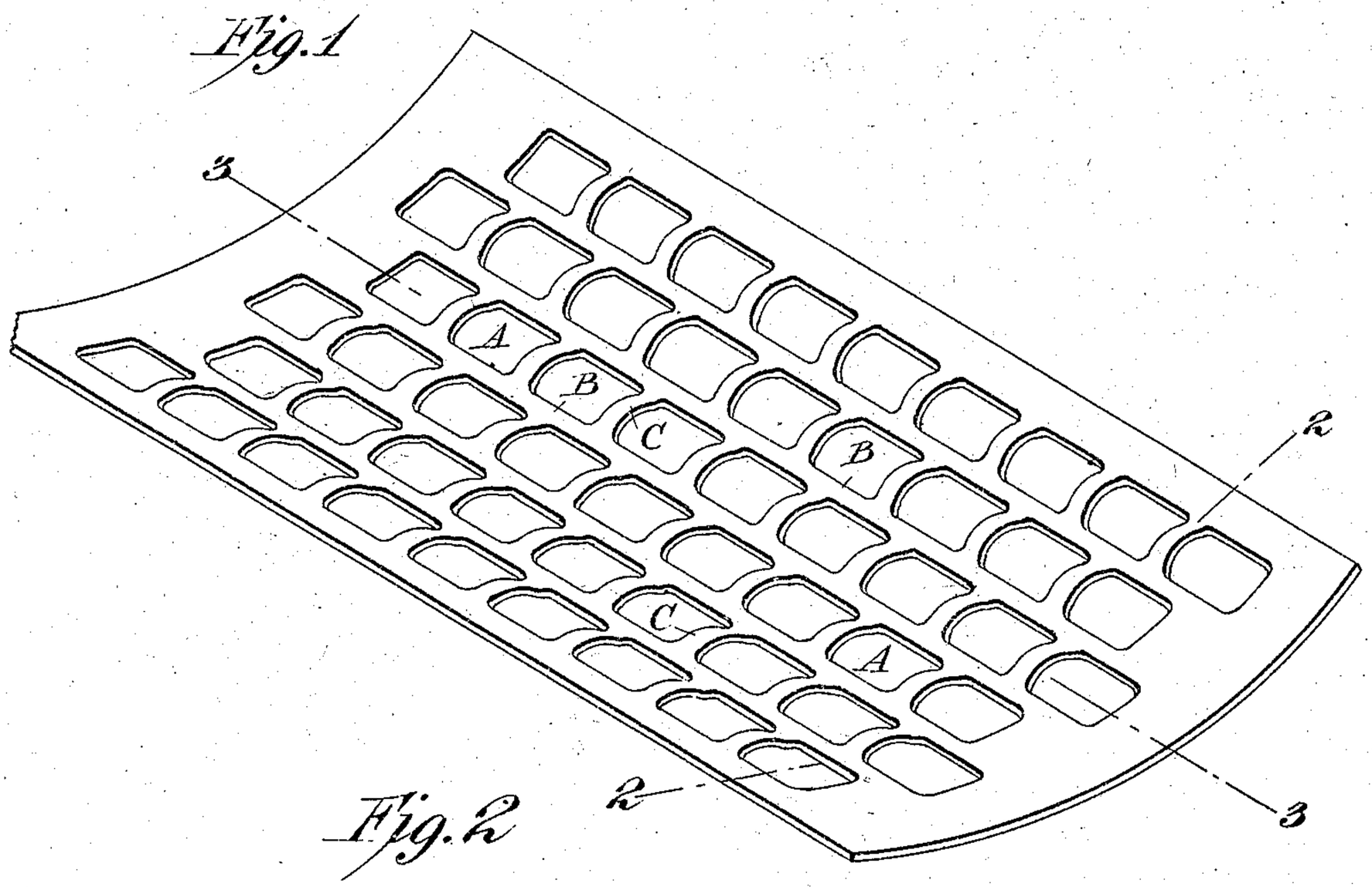


Fig. 2

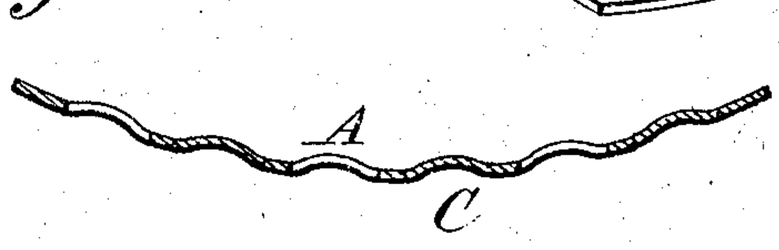


Fig. 3

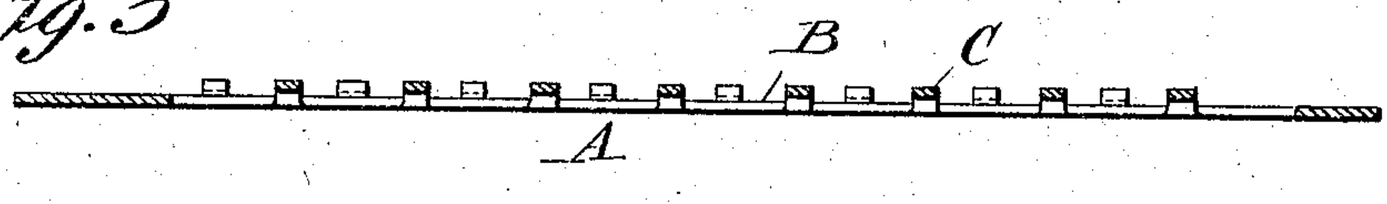
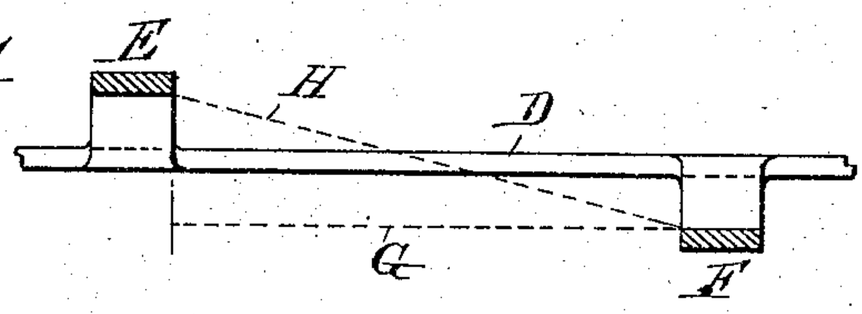


Fig. 4



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No. 791,782. Patented June 6, 1905.

UNITED STATES PATENT OFFICE.

ELI E. HENDRICK, OF CARBONDALE, PENNSYLVANIA.

SCREEN.

SPECIFICATION forming part of Letters Patent No. 791,782, dated June 6, 1905.

Application filed December 17, 1902. Serial No. 135,473.

To all whom it may concern:

Be it known that I, ELI E. HENDRICK, a citizen of the United States, residing at Carbondale, in the county of Lackawanna and State of Pennsylvania, have invented a certain new and useful Improvement in Screens, of which the following is a description.

This invention relates to screens of the character employed in the separation of particles of coal into various sizes. Screens of this character are of two types, the revoluble type and the shaking type, the latter employing a flat perforated surface to which a shaking or gyrating movement is given and the former employing a cylindrical screen-jacket pitched from end to end and revolved by suitable power, the coal being fed to the interior thereof. In the latter the perforated jacket may be continuous, but for convenience is preferably made up of a series of segments having imperforate side and end margins, the latter for attachment to the spider-bands of the screen-barrel. The mesh of the separating-surfaces used in both types of screens is also generally divisible into two classes, in one of which the interstices are arranged in rows both longitudinally and transversely, (this description being known as "opposite mesh,") while in the other the interstices are arranged in rows in one direction, but only alternate interstices are arranged in rows in the direction at angles thereto, (this description being known as "staggered mesh.")

Heretofore it has been the custom to perforate integral metallic sheets and to then crimp or curve the webs or bars lying between and bounding the interstices. This resulted in adding to the efficiency of such screening-surfaces over the surfaces formerly employed, in which such webs or bars were permitted to lie in the general plane of the screen margins. The crimping or curving operation, however, has brought to light two considerations which I deem of the greatest importance. In the first place, excessive crimping or curving of the web-bars tends to weaken the mesh either at the junctions between the longitudinal and transverse webs or at the apices of the curvatures, and, second, where it has been sought to crimp the webs or bars of a staggered-mesh surface this has commonly resulted in the distortion of such mesh, by reason of which improper sizing of the coal has resulted.

The present invention relates particularly to a screening-surface of the staggered-mesh type in that it employs interstices which are arranged in rows longitudinally of the screen, while of the interstices arranged transversely or circumferentially of the screen only the alternates are in rows, the center of each interstice being opposite a web or bar dividing the two interstices of the next adjacent longitudinal rows.

The object of the invention is fourfold: first, to so fashion the screening-surface as to avoid weakening thereof in the "crimping" operation; second, to avoid excessive fracture of the particles of coal; third, to economize screening-surface by assuring the proper separation of the particles early in their travel across the perforated surface and without permitting them to slide in mass beyond the point where by reason of their size such separation is possible, and, fourth, to give the screening-surface sufficient curvatures of the web-bars to properly agitate and turn the particles of coal, without, however, interfering with the uniformity in size of the interstices. In carrying out my invention to meet these requirements I employ a staggered-mesh surface in which the longitudinal web-bars separating those rows of interstices which lie in the longitude of the screen are undisturbed in the crimping operation, being allowed to remain in the general plane of the end margins of which they form an integral part. The transverse webs, however, which connect these longitudinal webs, are curved or crimped, all in the same direction and toward the axis of the screen—in other words, the transverse webs on the working surface of the mesh presenting a series of convexities. In this construction the first requirement is met by leaving the longitudinal webs undisturbed and by crimping the transverse webs all in the same direction—*i. e.*, toward the center of the screen. There are no sharp angles or abrupt curvatures; but the longitudinal webs are permitted to contribute maximum strength to the transverse webs which they support. The

second requirement is met, since the particles of coal next to the screening-surface are acted upon by each of the transverse webs, which tends to oppose the passage of such particles across the surface. In other crimped and staggered screening-surfaces heretofore employed only the alternate transverse webs were curved or crimped inwardly toward the axis of the screen, the other transverse webs being curved in the opposite direction. As a result of this, only the alternate webs—*i. e.*, those presenting convexities—acted upon the particles of coal, so that such particles were permitted to travel just twice the distance before such travel was interrupted by a convex web, and the force of the impact was therefore twice as great, resulting commonly in splitting the particles of coal or chipping off edges, which being too fine for commercial use found their way eventually into the culm. Even where the fracture did not produce this wasteful result the chipping or excessive breaking of the particles of coal has had the effect of decreasing the value of the product, coal of the larger sizes commanding higher prices than coal of smaller sizes. The third requirement is met in the construction which I have here described, since the particles of coal passing over the surface of the screen are acted upon at each interstice, each transverse row of interstices extending obliquely to the longitude of the surface, presenting a series of convexities which catch and turn the particles, sliding close to the mesh in such manner as that if a particle presented in a certain direction at one interstice prove of too great size to pass therethrough it will be caught by one of the convex webs and turned so as to present another side to the next diagonally adjacent interstice and, moreover, guided to that interstice, in view of the height of the convex transverse web and the depression (in the original plane of the plate) of the adjacent longitudinal web separating the two interstices referred to. The fourth requirement is met in the construction herein referred to, since every interstice in the screening-surface is of the same size no matter in what direction the particles of coal be presented to the same for separation. This feature will be hereinafter alluded to.

For convenience I shall describe the invention as embodied in a segmental plate designed to be attached to the spider-bands of a revoluble screen, although it is obvious that such invention may be embodied in a continuous jacket for such a screen or in a flat plate designed for use in a shaking screen.

In the drawings, Figure 1 is a perspective view of a screen-segment employing my invention. Fig. 2 is a transverse section on the line 2 2 of Fig. 1. Fig. 3 is a longitudinal section on the line 3 3 of Fig. 1; and 4 is an enlarged detail view, hereinafter to be referred to.

Referring to the drawings, in which similar letters denote corresponding parts, it will be seen that the plate is provided with imperforate margins both at the sides and at the ends. The latter, however, may, if desired, be perforated for the reception of bolts, by means of which the plate may be secured to the spider-bands of a revoluble screen. The interstices A are substantially quadrilateral in form, those lying in the longitude of the plate being in straight rows, but only the alternate interstices being in rows transversely of the plate. In other words, the center of each interstice is opposite a transverse web bounding two interstices of the next adjacent row. The longitudinal webs B, or those lying lengthwise of the screen segment and barrel, are left undisturbed in the crimping operation, remaining, therefore, in the original plane of the end margins of the plate. The transverse webs C are all crimped or curved inwardly toward the axis of the screen, so as to present on the working surface of the segment a series of convexities designed to catch and turn the particles of coal passing over such surface. It will therefore be seen that each quadrilateral interstice is bounded by four webs, two opposite webs being parallel and flat, while the remaining two opposite webs are parallel and convex. It will also be seen that in a screen mesh as here arranged each interstice is of exactly the same size as every other interstice, and this regardless of the direction in which a particle of coal may be presented thereto for separation. To appreciate the improvement made in this respect, attention is called to the construction illustrated in Letters Patent No. 632,201, illustrating a form of crimped and staggered mesh surface heretofore introduced for the separation of coal. In this construction, as in the present case, the longitudinal webs are flat and in the plane of the end margins, of which they form an integral part. The transverse webs, however, are alternately convex and concave. This arrangement presents serious objections realized in the commercial use of mesh so fashioned. The first of these is the fact that by the alternate crimping of the transverse webs in opposite directions the uniformity of the mesh is destroyed. This is made clear by the diagrammatic view, Fig. 4, above referred to, illustrating a section through a screening-surface in which, as in that illustrated in Pa ent No. 632,201, the longitudinal webs D are straight, while the transverse webs E F are alternately convex and concave. Were these transverse webs arranged in the plane of the longitudinal webs D the size of the interstice would be that indicated by the dotted line G. By the arrangement of these webs alternately above and below the plane of the longitudinal webs, therefore, the size of the interstice longitudinally is represented by the dotted line H, the size

of the interstice in a direction at right angles thereto, however, remaining that indicated by the dotted line G. In other words, instead of a substantially square interstice this method of crimping results in an interstice which has a greater dimension longitudinally than laterally. Again, by reason of the alternate elevation and depression of the transverse webs particles of coal of too great size to pass through an interstice if presented in one direction would pass therethrough if presented in another direction. If, therefore, the interstices were of a size to separate half-inch particles, larger particles intended to be separated from the mass only at a distant point in the screen-barrel would also pass through at this point with particles of smaller size, the result being imperfect sizing of the coal in the bins below the screen.

Another defect of the previous construction here referred to and one which is removed in the invention herein described arises out of the direction of travel of the mass of broken coal. This direction is not in the exact longitude of the screen, but, because of the pitch of the screen-barrel and of the movement of the screening-surface, which tends to carry the coal up the side of said barrel, is in a direction oblique to the longitude of the screen. A particle of coal, therefore, passing over the surface of the screen shown in the patent referred to would impinge against a convexity and be turned thereby so as to fall not into the next diagonally adjacent interstice, but upon the next diagonally adjacent concave transverse web, from which the movement of the screen and the pressure of other particles of coal against it would move it either through the next longitudinal interstice or up upon the next longitudinal web only to cause the same to fall upon the next concave transverse web, all the time precluding its passage through the screen. In the screen herein shown and described this operation is impossible. A particle of coal impinging against a convex web and of a size precluding its passage through the interstice bounded by that web would be turned and presented with a different face directly to the center of the next diagonally adjacent web, so that if of such form as to pass therethrough its separation would be assured at this point in the screen and without permitting further travel of the particle upon the screening-surface.

The considerations last discussed express the chief respects in which the screen of the present invention constitutes an advance upon screens heretofore in use, the former being not only of higher efficiency and economy of screening-surface, (and therefore of the space occupied by the screen,) but also making it possible in the use of a screen of staggered mesh to obtain absolutely reliable separation of the various sizes of coal.

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

1. An integral screen of staggered mesh, all of the longitudinal webs whereof are parallel and straight and all of the transverse webs whereof are parallel and curved or crimped inwardly toward the axis of the screen, substantially as set forth.

2. An integral screen having substantially quadrilateral interstices, each interstice being opposite a transverse web separating two transverse and adjacent interstices, all of the longitudinal webs of such interstices being parallel and flat and all of the transverse webs of such interstices being parallel and convex, substantially as set forth.

This specification signed and witnessed this 4th day of December, 1902.

ELI E. HENDRICK.

Witnesses:
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