W. D. ALTHOUSE.

DRIER.

APPLICATION FILED NOV. 15, 1915.

1,201,131.

Patented Oct. 10, 1916.

4 SHEETS—SHEET 1.

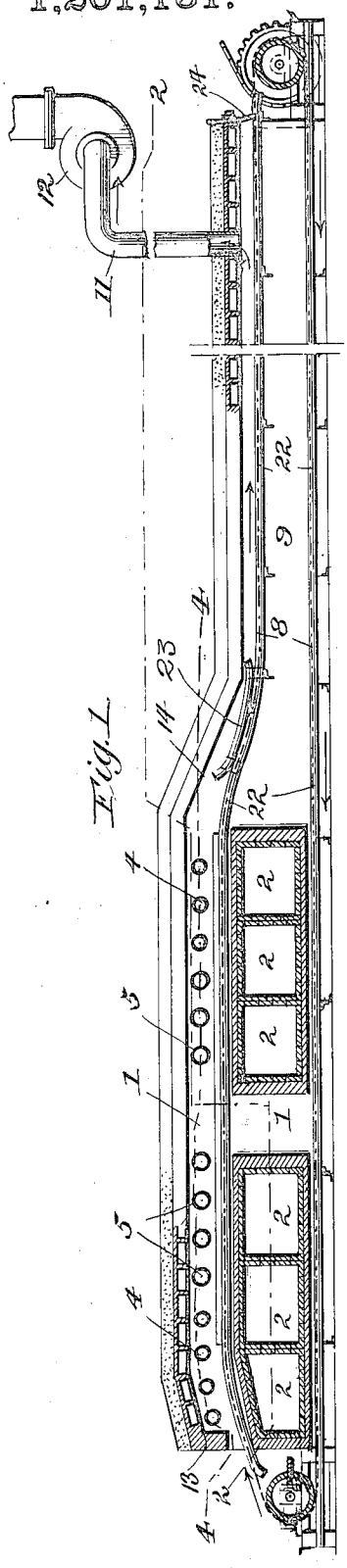


Fig. 1.

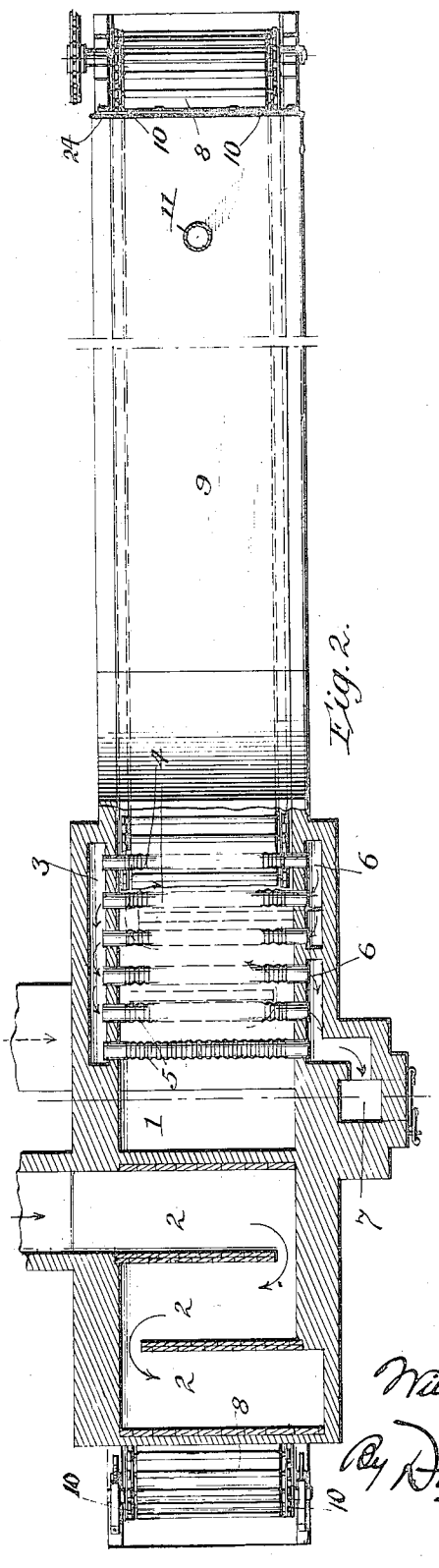


Fig. 2.

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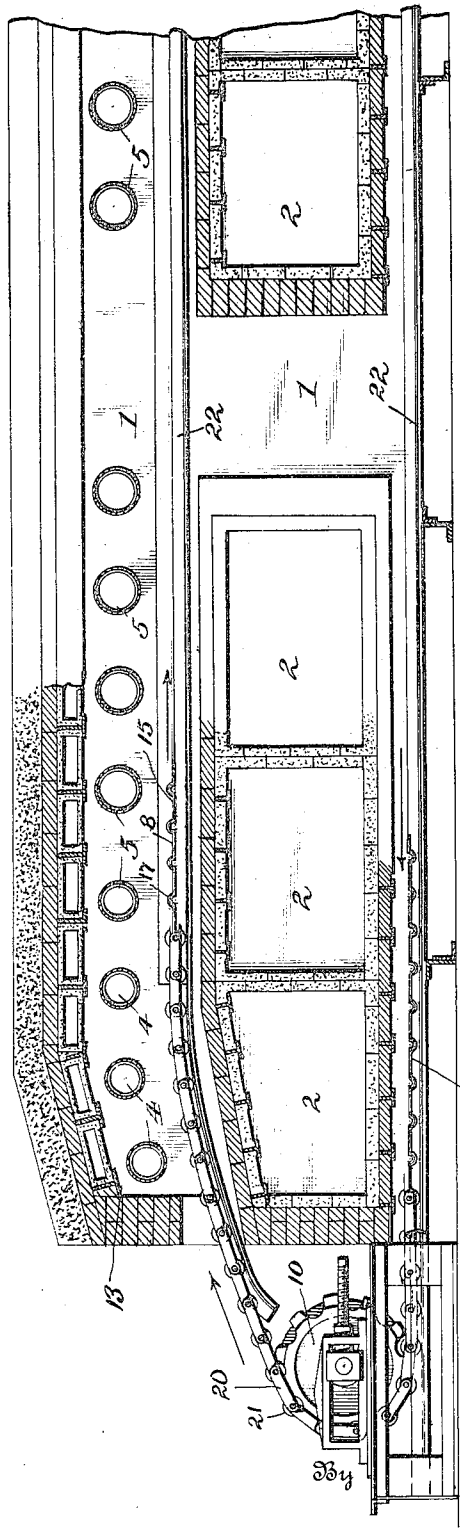


Fig. 3.

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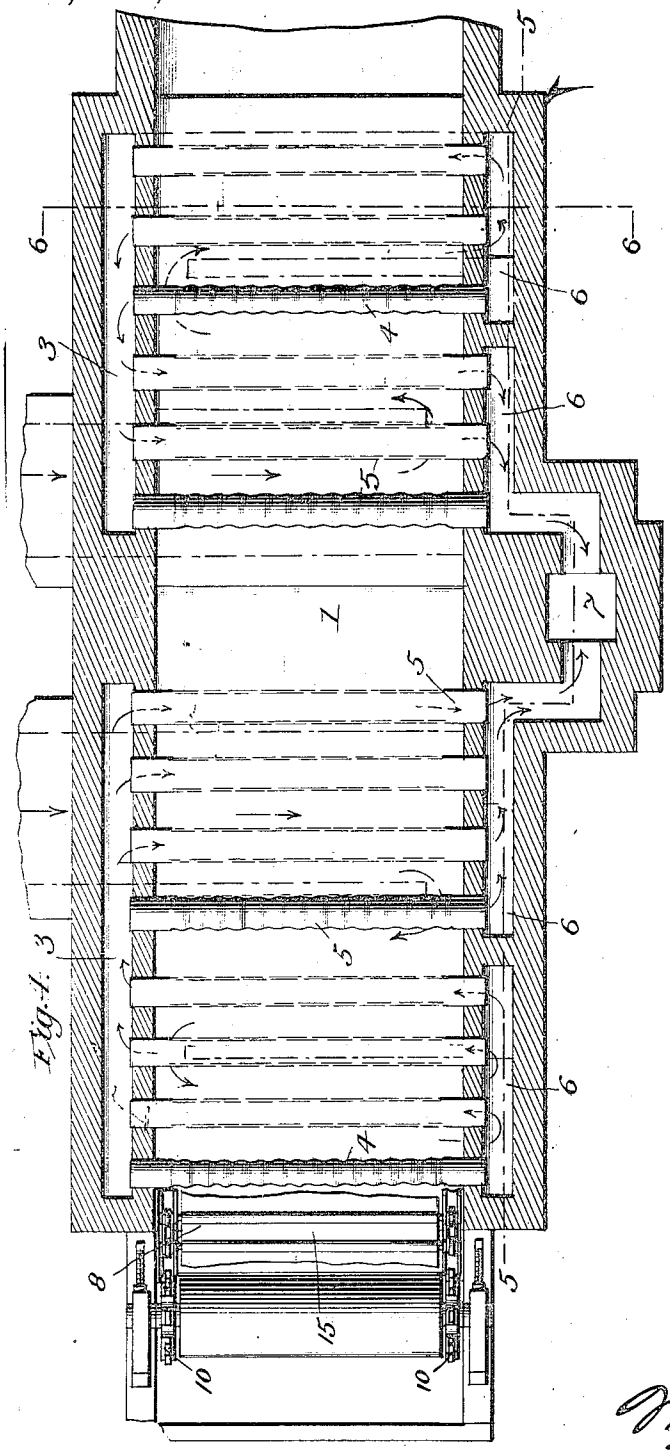


Fig. 4.

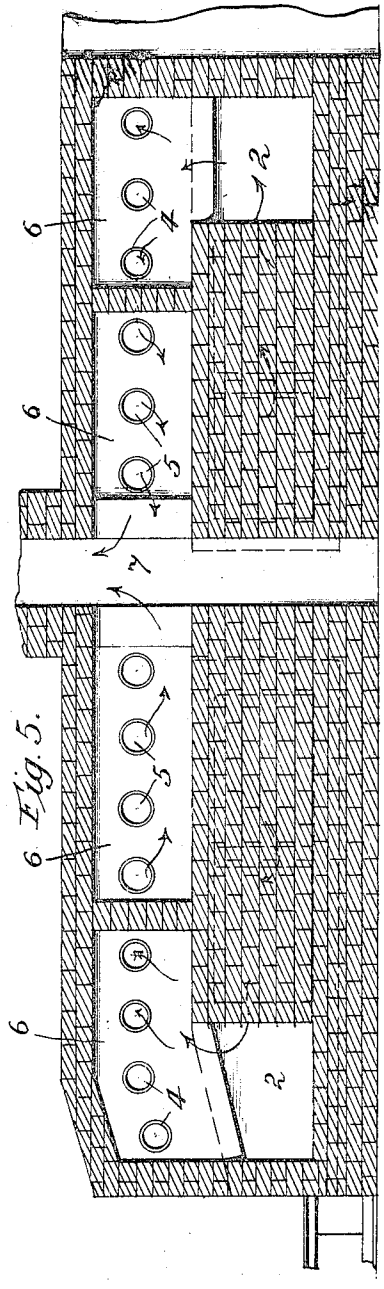


Fig. 5.

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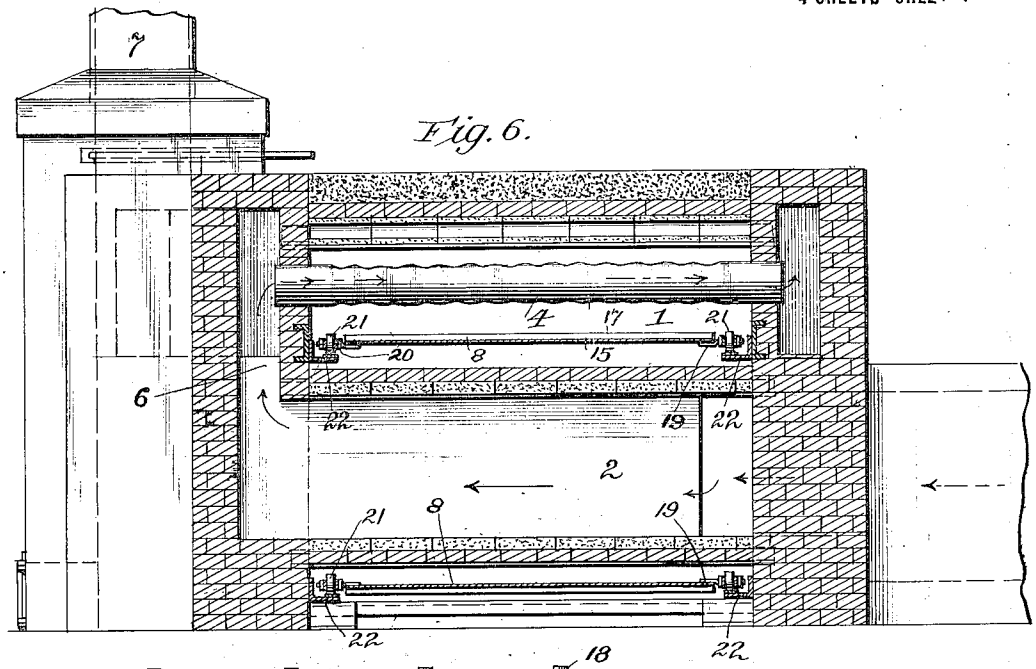
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4 SHEETS—SHEET 4

Fig. 6.



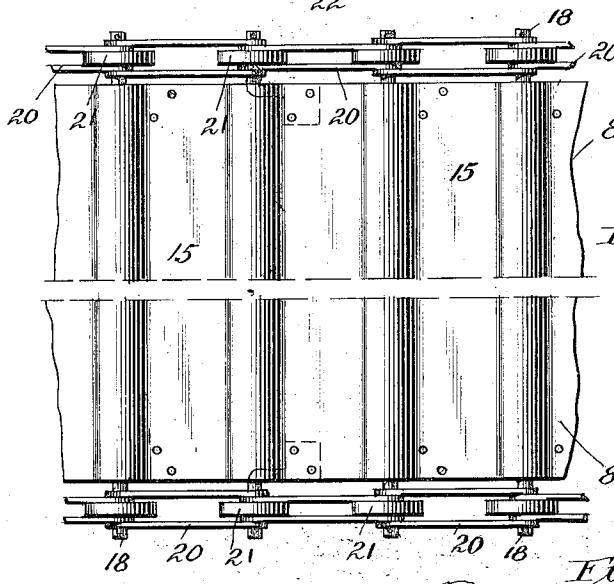
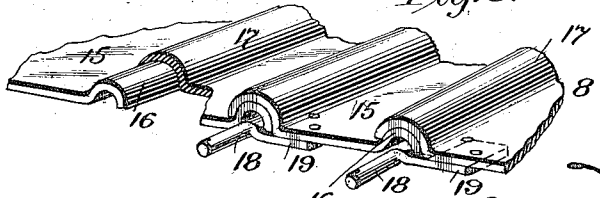


Fig. 7.

Fig. 8.



Inventor:

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UNITED STATES PATENT OFFICE.

WILSON D. ALTHOUSE, OF NORRISTOWN, PENNSYLVANIA.

DRIER.

1,201,131. Specification of Letters Patent. Patented Oct. 10, 1916.

Application filed November 15, 1915. Serial No. 61,681.

To all whom it may concern:

Be it known that I, WILSON D. ALTHOUSE, a citizen of the United States, residing at Norristown, in the county of Montgomery and State of Pennsylvania, have invented certain new and useful Improvements in Driers, of which the following is a specification.

This invention pertains to drying apparatus designed more particularly for drying fuel briquets, but capable of use for drying other bodies possessing similar characteristics, or requiring like conditions of drying.

The briquets for the drying of which the structure about to be described is primarily intended, consist of particles of coal, lignite, or like substance, cemented together in compact bodies or blocks of suitable form and size, and having as delivered from the molding apparatus, more or less surface moisture. It is desirable that this moisture be removed, and that the briquets be delivered in dry and hard condition, to the end that they may maintain their shape and condition when stored in considerable quantities, and during handling as in transportation and delivery. The removal of the moisture is further desirable in order to prevent the briquets or blocks from freezing together in cold weather. Such drying I accomplish by the structure and means here illustrated and described.

In the accompanying drawings: Figure 1 is a longitudinal vertical section of the drier, shortened by breaking away a portion to bring the drawing within the available limits of the sheet; Fig. 2, a partial top or plan view and horizontal section, taken on the line 2—2 of Fig. 1; Fig. 3, an enlarged vertical section of the left-hand portion of the structure shown in Fig. 1; Fig. 4, a horizontal section on the line 4—4 of Fig. 1; Fig. 5, a vertical section on the line 5—5 of Fig. 4; Fig. 6, a transverse section on the line 6—6 of Fig. 4; Fig. 7, a top plan view of the carrier-belt, broken away in its mid-width; and Fig. 8, a fragmentary perspective view of the same.

In these drawings, the cross hatching or like indication is extended over a portion only of the cut surfaces, and parts which are duplicated to a considerable extent are in part shown only in outline.

As seen in Fig. 1, the structure consists essentially of a receiving chamber or section 1, in the lower part of which are formed circuitous passages or flues 2, for the flow of heated air or gases, which may be the waste gases and products of combustion from a boiler furnace or the like, or the air may be heated by special means and introduced through said passages or flues 2. This air or gas after traversing said passages, rises through flues 3, and passes in a like circuitous or zigzag course through metallic pipes 4 and 5 in the upper part of the receiving chamber, and through a suitable flue 6, finally escaping into and passing off by a suitable stack or chimney 7. The pipes 4 and 5 are preferably circumferentially corrugated, to afford ample radiating surface. An endless carrier-belt 8 traverses said receiving chamber 1 and cooling or tempering extension or chamber 9, in which latter the drying is completed, and the briquets or blocks are gradually cooled or reduced in temperature. This belt 8 is provided with drive chains which pass about sprocket-wheels 10, the upper stretch of said belt passing above the circuitous flues or passages 2 in the base of the receiving chamber 1, and beneath the pipes 4 and 5 through which the heated air or gases pass to the chimney or stack 7. By such passage between the two sets of heating flues, the carrier-belt 8 and the briquets or articles to be dried, lying thereon, are subjected to heat on all sides, and the metallic plates of which the carrier-belt is formed become heated to a proper degree, and by reason of their mass and their being contained within a substantially closed chamber, retain their heat for a considerable time. As a consequence, fuel is economized, and all danger of chilling the briquets or other articles by bringing them into contact with a cold carrier-belt is avoided. The warm dry air of the receiving chamber 1 rapidly takes up the moisture of the briquets, vaporized by the heat of the chamber, and, charged with such moisture, is drawn longitudinally through the tempering chamber 9 above the endless carrier-belt 8 to near its delivery end, where it passes through a suitable pipe or flue 11 to a suction fan 12, or other draft-producing device.

The roof of the receiving chamber 1 is made considerably higher than that of the extension or tempering chamber 9, but has at its ends depending or downwardly-extending portions 13 and 14, which tend

to confine a body of the lighter and warmer air always in the receiving chamber.

The walls and body of the structure may be constructed in any usual manner, and of any suitable materials, as brick, tile, and the like, or of cement or concrete. In the drawings I have illustrated a brick-work structure with fire-brick lining the heating flues, and terra-cotta hollow tiles forming the ceiling of the receiving and tempering chambers, suitable structural steel members being employed to carry the roofs of the chambers and the flues. No claim is, however, made to these features *per se*, and such details of construction may be varied as desired.

The endless carrier-belt 8 is preferably made of imperforate plates 15, the meeting or overlapping edges 16 and 17 of which are bent into semicircular form and fit one within the other, as best shown in Fig. 8, so that the respective plates may move and change their relative planes without separation, and without opening the joint between them. In other words, they are in effect hinged together at these points. Concentric with the axes of the hinges or joints so formed, are short axles 18 which may be conveniently formed upon small plates 19, which latter are secured to the plates 15 near the edges 17. These plates 19 serve to support the edges 16 of proximate plates, and prevent their dropping down. The axles 18 are connected one with another by links 20, arranged in pairs, each axle being furnished with a roller 21 placed between the inner pair of links 20 carried by it. This construction will be understood upon reference to Fig. 7. By this construction a series of hinge-joints is formed, connecting the various plates of the carrier-belt, and concentric with the axis of each of said joints are supporting rollers by which the belt is carried upon suitable tracks or ways 22. In this manner the carrier-belt is maintained in proper plane throughout its travel through the chambers 1 and 9, and by reason of the rollers the power required to move the belt and its load is reduced to a minimum. The links 20 connected by the axles 18 constitute driving chains, and the rollers coming in contact with the teeth or sprockets of the wheels 10, give a rolling instead of a rubbing friction, and thus tend further to reduce the power required for moving the belt.

Driving power is applied to the shaft or journal carrying the sprocket-wheels at either end of the structure, and suitable tension or take-up devices are provided to prevent slack in the chains and carrier-belt, such, for instance, as indicated in Fig. 3. The track 22 may be of any suitable form and construction, Fig. 6 indicating light rails carried by angle bars extending longitudinally of the chambers 1 and 9, and secured to the walls thereof, or to metal beams built into said walls. In the extension or tempering chamber 9 I have shown transverse angle beams to tie the walls together and afford support for the rails, but as indicated, such details of construction are variable at will.

Below the downwardly-inclined portion 14 of the roof where chambers 1 and 9 meet, a short guard-rail 23 is placed above each track 22 to compel the rollers to follow the track-rails, and pass properly to the somewhat lower level which the upper stretch of the chains and carrier-belt take in passing through chamber 9.

Through employment of the imperforate metal plates in the construction of the endless carrier-belt, I accomplish two principal results.

First. A practical separation of the space above the upper or carrying stretch of the belt and the space below it, thus causing the moisture-charged air to pass directly to the flue 11 and exhaust fan 12, and preventing any considerable draft of air upward from beneath said carrying stretch of the belt. In other words, I compel a constant travel of air longitudinally through the chambers 1 and 9, between the lower flues 2 and the upper flues or pipes 4 and 5 in the former, and thence above the carrier-belt through chamber 9 to flue 11 and suction device or fan 12. This constant inflow of fresh air and outflow of moisture-laden air enables me to dry the briquets and like bodies very perfectly and with rapidity, a result largely attributable to the confinement of a body of warm air in the upper part of chamber 1, and to the passage of the carrier-belt between upper and lower heating flues therein.

Second. I prevent in considerable degree any flow of air from the space below the upper or carrying stretch of the belt to the space above it in the tempering chamber 9, or in other words, I better assure an adequate flow or current of air longitudinally through chambers 1 and 9. Incidentally, the solid plates retain their heat much longer than would perforate plates or foraminous sections, thus maintaining greater uniformity of temperature conditions throughout the apparatus.

The briquets or other bodies to be dried will be supplied in any convenient way to the carrier-belt 8 where it enters chamber 1, and will be delivered from the opposite end to conveyers of any suitable character, or directly into bins or receptacles.

The pipes 5 are represented as of larger diameter than the pipes 4, in order to give a freer passage to the warm air as it nears the flue or stack 7, thus insuring a freer flow or stronger draft. By the use of the wheeled carrier-belt and the supporting tracks, the belt is kept in horizontal plane while pass-

ing through the drier, and the briquets are thus precluded from falling off or rolling about.

Any suitable form of suction device, pump, or the like, may be employed for inducing a flow of air through the drier, the ordinary centrifugal fan being here represented merely as illustrative of suction devices generally.

The dimensions of the apparatus and its parts may vary as circumstances require, and the flues 2, 3 and 6 may be arranged in any convenient way that will secure an adequate heating of the space above.

In drying different substances or bodies, or bodies employing binders of different natures, it is desirable to vary or temper the heat as the exhaust flue 11 is approached. If the structure be built with reference only to one special use, or to the drying of products of one definite and unvarying character, the location of the flue 11 with reference to the chamber 1 and its inlet, and to the delivery end of the tempering chamber 9 and space between the ceiling of said tempering chamber and the belt, may sufficiently govern the ingress of air at the delivery end, and the consequent tempering of the air at and near the exhaust flue 11. To permit such regulation to be more perfectly controlled, however, to suit different products, a curtain or valve 24 may be provided at said delivery end, as indicated in Fig. 1. This may conveniently be made of heavy duck or like fabric, of a suitable number of plies or thicknesses, or it may be made of metal if desired. In practice, however, I find it convenient to employ the duck. The lower portion of the curtain should be free, in order that when adjusted close to the carrier-belt or apron, or where contact with the briquets, boulets, or other articles does or may occur, it may yield sufficiently to permit them to pass. Where high temperatures are employed, the curtain will be made of asbestos, or other suitable heat-resisting material. The upper edge of the curtain may be clamped in any convenient manner, to permit its adjustment. Under this construction, a greater or less quantity of air, as required, may be permitted to enter at the delivery end of chamber 9, thus meeting the air flowing in the opposite direction from chamber 1, and tempering or chilling the same at or near the flue 11. This is quite desirable when treating briquets of the character referred to, since the air entering at the receiving end of chamber 1, and becoming heated and expanded, rapidly absorbs the moisture contained in and upon the briquets, and causes them to become quite well set and hardened as they pass through the tempering chamber 9. In this condition the briquets are somewhat rapidly chilled and more perfectly hardened, through suddenly meeting the colder current of air entering at the delivery end of chamber 9. The effect is found to be highly beneficial, and perfectly set and hardened boulets or briquets result.

The importance of the several features of construction above set out is in no sense matter of mere theory, but has been proven by long and careful experimentation, and demonstrated through the more recent practical production of briquets or boulets of excellent commercial quality and properties.

I do not claim broadly an endless imperforate carrier-belt or apron *per se*, but do claim such carrier-belt in the combination and relation here set forth. The specific details of its construction are immaterial and may be varied at will, provided its imperforate character and its capacity to properly support and carry the briquets, and constitute a partition or diaphragm between the space above and the space below the upper stretch of such belt as it passes through the heating and tempering chambers, be assured.

Having thus described my invention, what I claim is:—

1. A drying apparatus comprising a receiving chamber closed at its top, bottom and sides but open at its ends, and having downwardly-extending roof portions at said ends; heating flues in the base of said chamber and near the roof or ceiling thereof; and an endless carrier-belt, the upper or carrying stretch of which passes through the receiving chamber between the upper and lower flues thereof.

2. A drying apparatus comprising a receiving chamber and an extension or tempering chamber connected therewith, the ceiling of the receiving chamber being higher than that of the tempering chamber, and formed with downwardly-extending portions at its ends; heating flues in the base of the receiving chamber and near the roof or ceiling thereof; an endless carrier-belt, the upper or carrying stretch of which passes through the receiving chamber between the upper and lower flues thereof, and thence through the tempering chamber; and means for producing a flow of air from the inlet end of the receiving chamber, through said chamber and through the tempering chamber, and thence to the outer atmosphere.

3. In combination with receiving and tempering chambers, the former having an elevated air-retaining space and provided with upper and lower heating flues; an endless conveyer or carrier-belt movable through said chambers, and composed of imperforate metal plates overlapping at their meeting edges and fashioned to maintain close connection at all times, substantially as and for the purpose set forth.

4. In combination with chambers 1 and 9, and with flues 2, 4 and 5 communicating with the up-take stack, track rails 22 extending above and beneath the flues 2; an endless carrier-belt 8 passing through said chambers and about sprocket wheels 10; supporting rails 21 for said carrier-belt; axles 18 carried by the plates of said belt; links 20 connecting said axles and forming sprocket chains; and an exhaust device.

5. A drier comprising a receiving chamber provided with means for heating the same, said chamber open at its receiving end; a tempering chamber forming a continuation of the heating chamber and open at its delivery end; a curtain or valve at the delivery end of said tempering chamber, serving to regulate the ingress of air; an exhaust flue opening from said tempering chamber; and means for causing an outward current of air through said flue.

In testimony whereof I have signed my name to this specification.

WILSON D. ALTHOUSE.