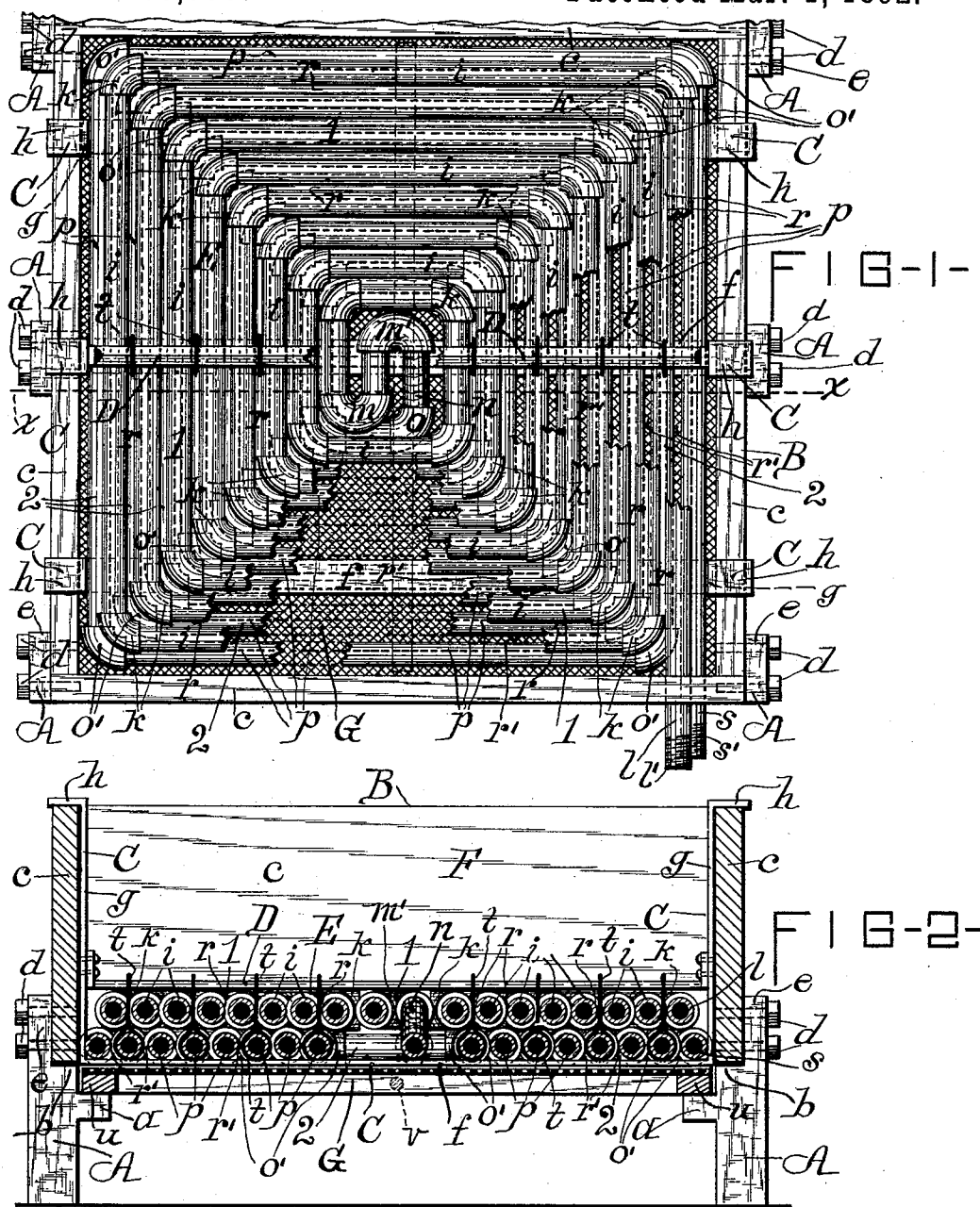


(No Model.)

G. D. GRANNIS.
SAND DRIER.

No. 469,939.

Patented Mar. 1, 1892.



Witnesses —

E. Butler

Mr. Georgeron

Inventor—

George D. Grannis,

By his Attorney—

Wm C. Raymond

UNITED STATES PATENT OFFICE.

GEORGE D. GRANNIS, OF SYRACUSE, NEW YORK.

SAND-DRIER.

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To all whom it may concern:

Be it known that I, GEORGE D. GRANNIS, a citizen of the United States, residing at Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Sand-Driers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, in which—

Figure 1 is a top plan of my sand-drier with portions broken away for clearer illustration of underlying parts; and Fig. 2 is a transverse vertical section taken upon line *x x*, Fig. 1.

My invention relates to an apparatus (or machine) primarily designed for drying wet or damp sand, and broadly adaptable, without any or but slight modification, for the drying of other substances or materials—as, for instance, sawdust, clay, grain, &c.—and wherein the drying is accomplished from the heat generated or imparted to the treated material through steam, warm or hot water, or heated air passing through pipes or other tubular conveying medium located in proximity to the material undergoing treatment.

The object of my invention is to construct a drier affording requisite and varied capacity, of ready utility, reliable in operation, of virtually simple construction, easily and cheaply operated, and forming an efficient, reliable, and durable drier for sand, &c., of comparatively small cost as compared with the common forms of driers now employed for the drying of sand and other substances; a drier particularly and directly valuable for the use for which it is the more specifically intended—the drying of sand; a device wherein horizontal layers of rectangularly, circularly, or otherwise coiled pipes or a pipe, in connected sections or unbroken, are so individually arranged in juxtaposition to each other as to create a strong bed or support for the wet sand, &c., until the grains or particles composing the wet-sand mass are sufficiently dried, and thus disintegrated or separated, and thence necessarily being precipitated, through gravity and lack of cohesiveness, downward through slight interstices occurring

between the heat generating and diffusing pipes (of the coil or coils) onto the ground or flooring; an apparatus wherein the dried sand is sufficiently cooled upon its precipitation to be immediately used without the intervention of any auxiliary cooling device; such a drying apparatus as may readily be separated into parts for purposes of examination, removal of foreign matter that may possibly accumulate, or for transportation, and easily erected in operative position by the connection of the separable portions together; a drier embodying simple and reliable fastenings and supports for the horizontally-disposed coil or coils of pipes, and also additional novel features in its detail formation, imparting increased effectiveness and reliability of operation to the apparatus.

My invention consists, essentially, in the novel features of construction, combination and co-operativeness of parts, and manner of operation hereinafter described, and which are specifically enumerated in the claims here-to annexed.

In the drawings like letters or figures of reference denote corresponding parts throughout the several views.

My device is constructed as follows:

A are strong supporting-legs (usually of cast metal) arranged, respectively, at the corners of a square, and preferably at two opposite sides of the square auxiliary legs erected lineal with the adjacent corner legs and midway, or thereabout, between them. Each of the aforesaid legs A has at its inner face, a suitable distance up, a laterally-projecting shoulder *a*, and at a brief distance above the shoulder *a* an internal shoulder *b*, which terminates inwardly with a vertical back extending to the top of the leg. Mounted upon the shoulders *b* is a frame or boxing B of rectangular form, (usually of wood,) comprising right-angular vertical walls *c* of some considerable thickness, and which project upward a suitable height, said walls preferably being of a thickness corresponding to the width of the shoulders on which they are seated.

The box-frame B is securely and rigidly retained in place upon the shoulders *b* of the supporting-legs A by means of cross bolts or screws *d* passing through perforations in the

reduced portions *e* of the legs and into or through the contacting portion of the box-frame. Extending in a parallel direction across the interior of the said box-frame B and at suitable distances apart are pendent metallic supports C of practically U shape longitudinally, comprising, respectively, a straight horizontal portion *f*, extending from side to side of the interior of the box-frame and about in line with the lower edges of the said frame, and thence at either end terminating in a perpendicular side arm *g*, extending to the top edge of the opposite walls of the frame and ending in a horizontal flange (or hook) *h*, adapted to rest upon the top edge of a wall *c*, and whereby said top edge of the opposite walls form a reliable bearing or support for the pendent metallic support C. Upon the horizontal portion *f* of the supports C, I mount coils of medium-sized pipes, (or tubes,) preferably two connected coils, as shown, disposed, respectively, on a horizontal plane, the lower coil 2 lying directly upon the supports C and the upper coil 1 resting on the aforesaid coil 2, the plan outline of each coil preferably being rectangular to correspond with the surrounding rectangular box-frame, and, moreover, more fully occupy the bottom portion thereof horizontally.

i represent the pipes comprising the upper horizontal coil 1, said coil preferably being composed of pipes *i*, disposed right angularly to each other and connected at their extremities (which are screw-threaded) by flangeless elbow-joints *k*, fitted thereto steam and air tight, which flangeless joints insure the parallel pipes comprising the four sides of the rectangular coil to lie so closely together as to permit of but slight interstices or spaces *r* between the adjacent parallel pipes *i* of said top coil.

l is the steam (or hot-water or air) supply pipe entering into the formation of the aforesaid upper coil 1. The pipes *i* of said coil, which continue in a connected and gradually-decreasing area in a like direction rectangularly, terminate centrally in an exceedingly short section of pipe connected at its rearward end to a flangeless direct coupling or U-union *m* and forwardly to a flangeless return-bend or U-union *m'*, to the diametrically-opposite extremity of which return-bend or U-coupling *m'* is connected a short descending or inclined pipe *n*, connected to a flangeless elbow-joint *o* on a lower plane, said parts forming a reversal of the direction of travel of the steam, &c., and wherefrom extend the elbow-joint *o*, the pipes *p*, and connecting flangeless elbow-joints *O'*, creating the auxiliary or lower coil of pipes 2, rectangular in plan outline, said right-angular-connected pipes *p* gradually increasing in area and lying so adjacent to each other, parallel, as to create slight spaces or interstices *r'* between them and terminating at the coil extremity in the exhaust pipe or portion *s*, which, as well as the supply-pipe *l*, are provided at their

outer ends (projecting outside the box-frame) with threaded extremities *l'* and *s'*, respectively, whereby by means of proper couplings they are respectively connected with any suitable steam-generator (or hot air or water heater or reservoir) and a receiver for the return steam, &c., and whereby the heat-producing element is adapted to be kept in continuous circulation. As is clearly illustrated in the drawings, the pipes entering into the formation of the set below will be directly under the spaces or openings of the one above. Moreover, the outer row of pipes of the rectangular secondary coil 2 project laterally slightly beyond the outer portion of the top coil, although evidently that arrangement may admit of variation.

D represents one or more metallic bars extending transversely across parallel pipes of the upper coil 1 and resting upon or in rear proximity thereto, said bars terminating adjacent to the side walls of the box-frame or provided with upward flanges, whereby they may, if preferred, be secured by bolts or screws rigidly to an adjacent coil-support C or to the side walls *c* direct.

At intervals along the bar D, I transversely wind lengths of strong wire or metallic straps *t*, which, passing between interstices in the top adjacent coil, (*i. e.*, between parallel pipes,) project downward, making a twist to and around a pipe of the secondary coil 2, and thence upward to starting-point, said binding wires or straps serving to hold together in comparative close contact the upper and lower coils or tiers of coiled tubing and bracing and stiffening the same in a positive manner.

The combined upper and lower tiers of coils 1 2, supported in position relatively, as shown, form, conjointly, an elevated bed or platform E, which when heated is permeable to the primarily wet sand (which through the action of heat becomes dry) deposited thereon, and the rectangular space above, created by the walls *c* of the box-frame B, forms, in conjunction with the permeable bed E, a bin or receiving-chamber F for the reception and deposit of the wet or damp sand or other suitable substance to be treated.

G is a screen of rectangular outline and comprising side and end bars joined together and provided with any suitable screen fabric stretched horizontally across from side to side thereof and secured thereto. The side bars *uu* of the screen rest upon the shoulders *a* of the respective legs A, and the screen fabric *w* lies in close proximity to the lower coil 2 of the elevated permeable bed E of my apparatus.

As is apparent, my manner of mounting the screen G insures its ready withdrawal, when desired, from its position under the bed, also the shaking or other jarring thereof, and free accessibility in every sense. Moreover, by my manner of supporting the coiled-pipe bed E in position no obstruction is presented to

the operation or removal or insertion of the screen on its supporting-shoulders, and free clearance or room therefor under the entire bed E from side to side is absolutely insured.

5 If deemed necessary, I erect a supporting-rod *v* underneath and bearing against the screen fabric *w*, said rod *v* extending from one bar to the opposite bar of the screen-frame and secured firmly in position.

10 My device is operated substantially as follows: Steam either live or exhaust (or warm water or hot air) being in circulation through the coil or coils composing the permeable bed or platform, wet or moist sand (or other substance applicable) is thrown into the bin or receiving-chamber, and consequently deposited on the permeable bed. The grains or particles entering into the formation of the sand mass obviously adhere more or less together when in

20 a wet or moist state, and practically continue in such condition until the influence or effect of the heat generated from the heated pipes of the coils comprising the bed gradually dry the sand mass, and necessarily first the sand lying directly upon or in close proximity to the heated coil or coils, whereupon, under the influence of heat, the sand grains or particles becoming dry lose their cohesiveness, and becoming separated or disintegrated from

30 each other are precipitated, through gravity, downward through the slight interstices occurring between the parallel pipes (and joints) comprising the coil or coils of the supporting-bed down upon the ground (or floor) on which the drier rests, and the dry grains of sand becoming cooled in their precipitation from the bed insure the deposited sand mass being in such non-heated condition as to be immediately utilized for desired manufacturing purposes.

40 In the event of any of the coherent sand particles dropping through the interstices of the heated bed prior to their being thoroughly dried they will fall upon and lie on the screen fabric directly beneath the bed until perfectly dry, and thence upon arriving at that state fall through the small apertures of the screen fabric direct to the earth. The only instances in which there is any likelihood or possibility of any sand dropping through

50 the interstices of the permeable heated bed of coiled pipe is when a fresh lot of wet or moist sand is deposited in the bin or receiving-chamber, wherein the force of the falling material upon the bed and weight may cause a slight portion of the sand to fall through the interstices before it is thoroughly dried, and the material in such instances being deposited upon the fine meshes of the screen fabric located directly underneath the heated

60 bed will remain thereon until thoroughly dried, whereupon, it being disintegrated, will fall through the screen onto the ground or other platform on which the apparatus stands. Moreover, the function of the screen is to retain and prevent foreign substances that may be in the sand and have passed through the interstices of the bed from dropping onto the

pile of dried sand deposited beneath the apparatus.

As is evident, my drier is practically automatic in its action, for beyond the manual labor entailed in the depositing of wet sand in the receiving-chamber an occasional rapping or shaking of the screen and removal thereof to take off foreign substances that may have lodged thereon the apparatus performs the remainder of the work and in a manner virtually automatic in its action, for, as fast as the wet-sand particles become dried, and consequently separated from each other, they naturally drop through the interstices between the pipes comprising the coils of the elevated bed and thence through the opening in the fine screen fabric to the earth.

It is obvious that the capacity of my drier may be increased or diminished, as the case may be, by the enlarging or diminishing of the area of the coils or by the addition or lessening of the number of horizontally-disposed coils arranged one above the other; also, that the formation of the coil or coils on a horizontal plan (or plan outline) may be practically circular, oblong, or of other preferred or desired form, and the side walls of the receiving-chamber (or bin) corresponding thereto in outline without involving any material departure from the spirit or scope of my invention. Moreover, that the coil or coils may be formed, if desired, of an integral continuous pipe or pipes bent to required shape upon a suitable former, particularly in the case of a circular coil or coils.

It is obvious that in the application of my drier for the heating of sawdust, plaster, and the like it is advantageous and preferable to create wider interstices between the parallel pipes of both the upper and lower respective coils, and also allow of a wider space between the upper and lower tiers of coils, which result may, it is evident, be accomplished by the employment of flanged joints or couplings to the pipes comprising the respective coils and by the erection of horizontal bars between the upper and lower tiers of coils or other preferable or advantageous means that will insure the desired results.

To clearly illustrate the interstices between the coupled pipes entering into the formation of the coils comprising the permeable and heated bed upon which the sand, &c., is deposited, I have in the drawings represented the width of said interstices slightly exaggerated or distorted as compared with the diameter of the pipes shown and entering into the formation of the coils or coil.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A sand-drier composed of two or more horizontally-disposed coils of piping disposed one above the other upon different horizontal planes and connected together and having interstices between the adjacent parallel portions of each respective coil and a horizontal

passage between the overlying tiers of coils, said coils creating a permeable supporting-bed for the material deposited thereon and the bed secured in position by suitable supports, substantially as described, and for the purposes set forth.

2. A sand-drier consisting of two or more connected continuous coils of piping disposed on a horizontal plane one above the other and in near proximity, the adjacent parallel portions of the respective coils so alternating one with the other as to create infinitesimal and

indirect spaces between the portions, and the permeable bed formed by said coils being elevated upon suitable supports, substantially as described and shown, and for the purposes specified.

In testimony whereof I affix my signature, in presence of two witnesses, this 12th day of February, 1891.

GEORGE D. GRANNIS.

Witnesses:

JAMES L. BREET,
WM. C. RAYMOND.