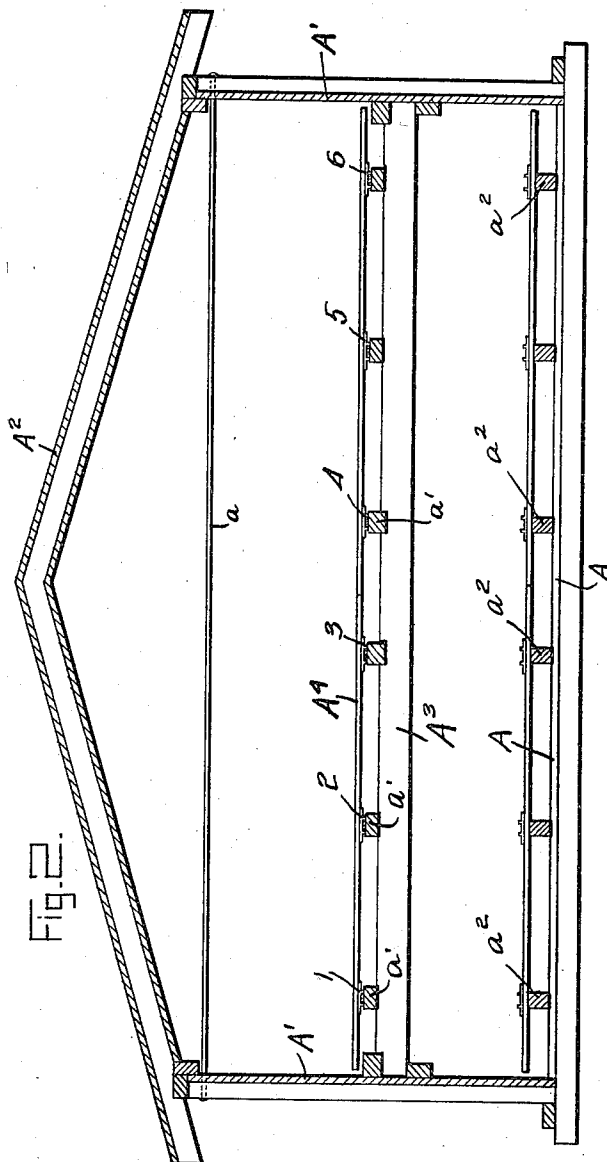
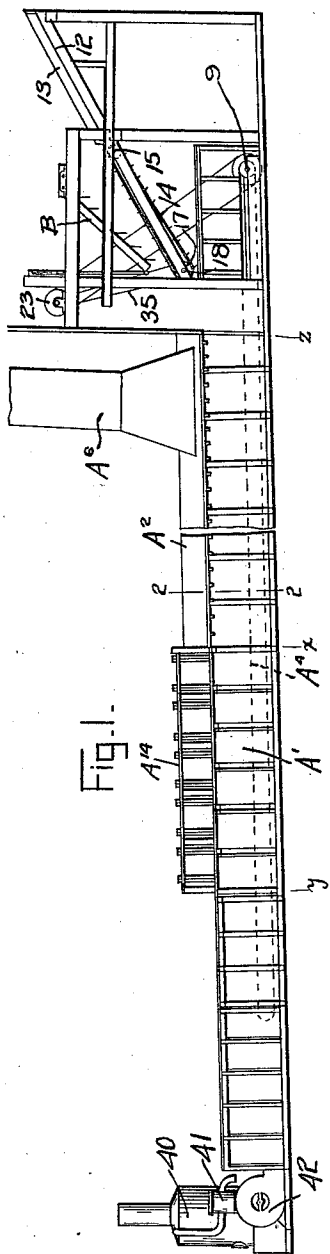


1,013,600.

J. F. JACK.
CURING APPARATUS.
APPLICATION FILED APR. 17, 1909.

Patented Jan. 2, 1912.
4 SHEETS—SHEET 1.



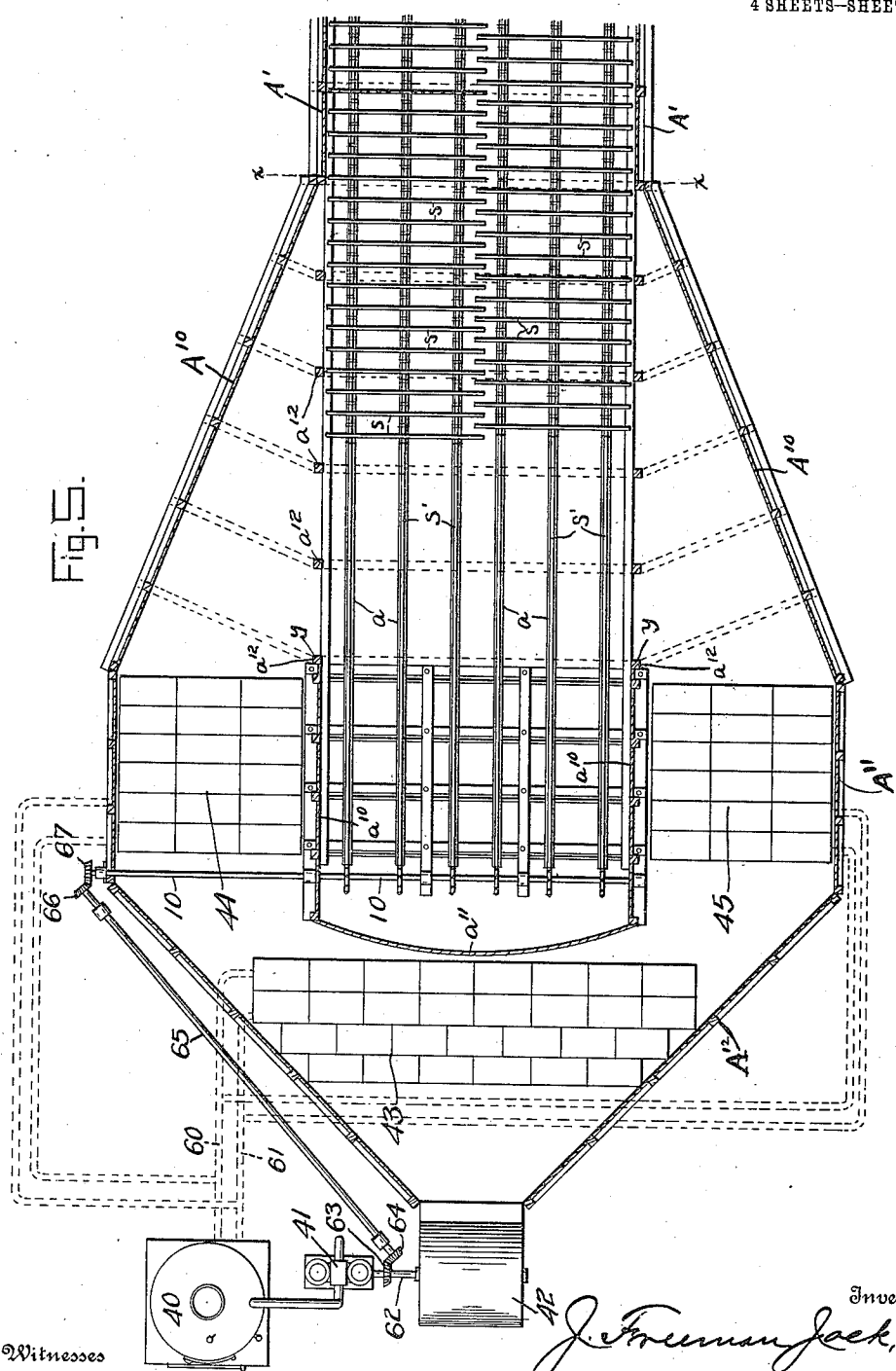
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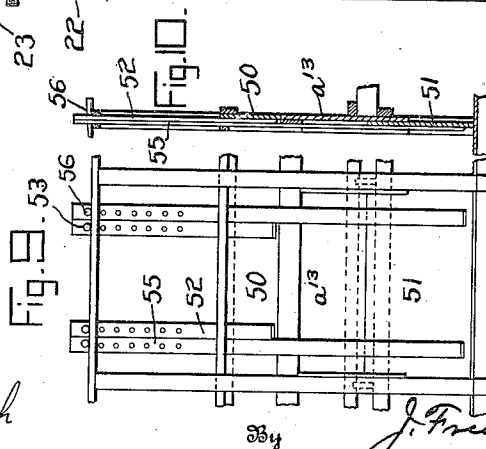
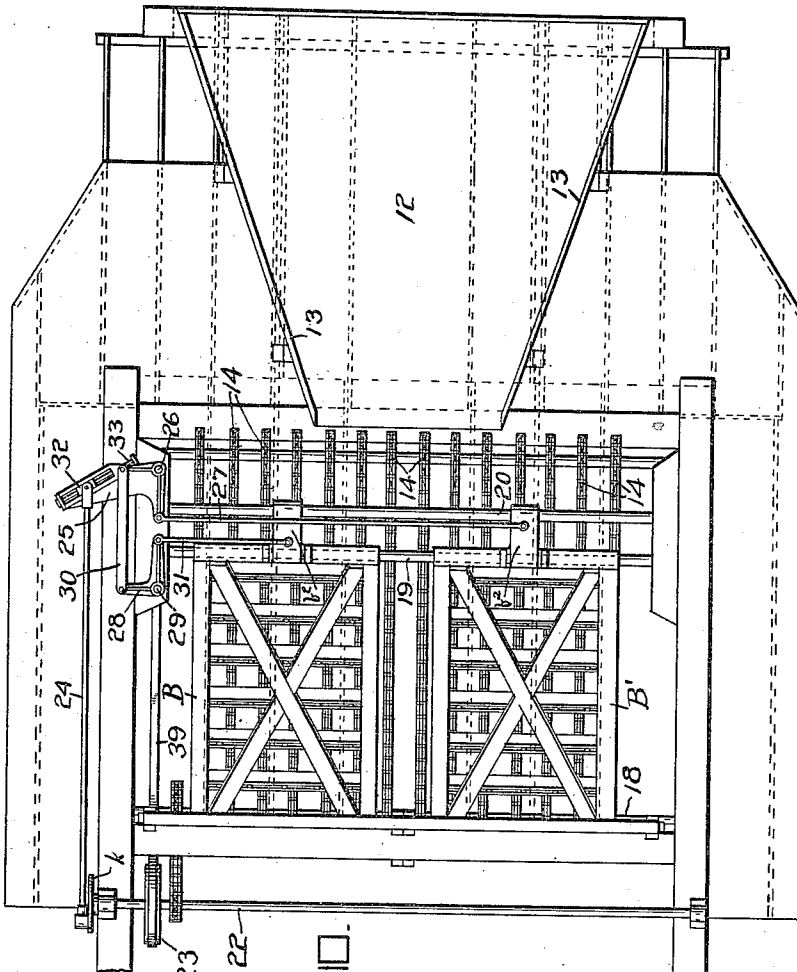
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4 SHEETS—SHEET 4.

Fig. 6.



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UNITED STATES PATENT OFFICE.

JOE FREEMAN JACK, OF LOS ANGELES, CALIFORNIA.

CURING APPARATUS.

1,013,600.

Specification of Letters Patent.

Patented Jan. 2, 1912.

Application filed April 17, 1909. Serial No. 490,581.

To all whom it may concern:

Be it known that I, JOE FREEMAN JACK, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Curing Apparatus, of which the following is a specification.

The object of my said invention is to provide an apparatus for curing vegetable substance such as grass, alfalfa and the like, for the purpose of converting it rapidly into a condition suitable for storage or feeding purposes, all as will be hereinafter more fully described and claimed.

Referring to the accompanying drawings which are made a part hereof and on which similar reference characters indicate similar parts, Figure 1 is a side elevation of an apparatus embodying my said invention with the central portion broken out to enable the ends to be shown on a larger scale, Fig. 2 a cross section on a still further enlarged scale on the dotted line 2—2 in Fig. 1, Fig. 3 a central longitudinal section of the rear end of the apparatus, Fig. 4 a similar view of the front end of the apparatus, Fig. 5 a horizontal section of the rear end of the apparatus, Fig. 6 a similar view of the front end of the apparatus, and, Figs. 7, 8, 9 and 10 detail views illustrating parts on an enlarged scale.

The apparatus consists in the main of a long closed curing conduit communicating with a heating chamber at one end and with a feeding mechanism at the other and embodying an endless carrier for conveying the substance to be cured from the receiving to the discharge end of said conduit. The main structure comprises sills covered by a floor A, suitable sides A' and roof A². The sides are tied together by tie-rods *a* extending from one side to the other near their tops. Cross timbers A³ are also provided upon which longitudinal runners *a'* are mounted to support the endless carrier A⁴ with the load, while other runners *a''* are provided on the floor A to support the lower side of said carrier on its return movement, as will be presently more fully described. The sides A' terminate at the rear end at a

point marked *x* in the drawings and at the forward end they terminate at the receiving opening.

The endless carrier A⁴ consists of a series of sprocket chains 1, 2, 3, 4, 5 and 6 mounted upon the runners *a'* and passing over sprocket wheels 7 mounted on a shaft 9 at the receiving end and sprocket wheels 8 mounted on a shaft 10 at the discharge end, said shafts being journaled in suitable bearings on supports provided therefor. Cross slats *s* are secured on said chains at suitable intervals to form a proper support for the substance. In Fig. 5 I have shown the extreme rear end of the carrier broken away to show the runners and other parts more clearly. Said runners are preferably faced with metal strips *s'* to provide a suitable wearing surface therefor. At the rear end a discharge chute A⁵ is provided immediately beneath the end of said carrier. A vent-stack A⁶ is mounted on the roof of the structure at the receiving end adjacent to the feeding mechanism and communicates with the interior through an opening in the roof for this purpose. See Fig. 4.

At the receiving end the apparatus is provided with an inclined feed hopper or table 12 formed with side boards 13 which converge toward the center of the machine. Said table is elevated above the receiving end of carrier A⁴, as shown. An endless feeding belt comprising a series of sprocket chains 14 carrying outwardly projecting points and mounted at one end upon suitable sprocket wheels 15 on a shaft 16 and at the other end on sprocket wheels 17 on a shaft 18, extends at an incline from the front end of said table to discharge upon the receiving end of the endless carrier A⁴. Spreading devices are mounted above the feeding belt 14 and consist of reciprocating frames B, B' having projecting teeth *b* and mounted on a pair of transverse bars 19 and 20 which extend across the top of the frame at this point. Said frames are supported at their lower ends so that the points of the lower teeth *b* will be in near proximity to the top surface of the feeding belt, being hung upon the lower end of supporting rods 21 which are connected to the

frame-work above to permit them to swing freely. The top bar of each frame is perforated longitudinally and the bar 19 extends through said perforations. An outwardly
 5 extending arm b^2 is secured centrally to each of said top bars and is formed with a transverse perforation mounted to slide upon said bar 20. An operating shaft 22 is mounted in suitable bearings on the top of the frame
 10 being driven from a pulley 38 on shaft 9 by a belt 39 running to the pulley 23 thereon. On its outer end said shaft 22 is provided with a crank-wheel k the crank-pin of which is connected by pitman rod 24 with one arm
 15 of a bell-crank lever 25 which is mounted on a pivot 26 on the top of the frame, the other arm of said lever being connected by a rod 27 with the arm b^2 of the frame B' . Another bell-crank lever 28 is pivoted on a
 20 pivot 29 opposite said bell-crank lever 25 and is connected by a connecting rod 30 with the arm of the bell-crank lever 25 to which rod 24 is connected, while its other end is connected by a rod 31 with the arm b^2 of
 25 the frame B . It is thus seen that as the shaft 23 revolves and the crank-wheel k on its end operates the pitman 24 that the bell-crank levers 25 and 28 will be rocked on their pivots and through the connecting rods
 30 27 and 31 will slide the spreading frames B , B' toward and from each other at their upper ends, their lower ends being permitted to move freely by reason of the free swinging motion of the supporting rods 21.
 35 Rod 24 is connected to the arm of lever 25 by means of a sliding block 32 to which it is pivoted and which block is mounted in a groove in said arm and is adapted to be adjusted by means of an adjusting screw 33
 40 which operates through a screw-threaded perforation in said block and turns in a perforation in said arm. By this means the throw of the bell-crank lever may be regulated to give to the spreading frames B , B'
 45 the length of sweep desired. The feeding apron 14 is also driven from the shaft 22 by means of a sprocket belt 35 running from a sprocket-wheel 36 on said shaft to a sprocket-wheel 37 on shaft 18.
 50 It will be understood, of course, that the receiving end of the apparatus and the feeding mechanism just described may be inclosed within a building or left open as indicated in the drawings. The substance
 55 to be dried is deposited upon the inclined feed-hopper or table 12 and sliding down upon the feed apron 14 is held by the prongs or projections on the upper surface of said apron and fed toward the endless carrier A^4
 60 at the speed of the apron. During the passage of the substance the length of said apron, the reciprocating spreading frames B , B' are moved back and forth transversely of said apron and serve to spread the sub-

stance over the apron in an approximately 65 even condition and distribute it uniformly over the entire surface so that it will be deposited upon the carrier A^4 in a substantially uniform condition throughout the
 70 width thereof. Referring now to the opposite or discharge end of the machine: 40 is a steam boiler for generating the heat and power required for the operation of the apparatus, 41 an engine for driving the
 75 mechanism, and 42 a blower for driving the air into the apparatus. Each of these devices may be of any suitable or approved construction. The shape of the structure at the discharge end is best shown in Fig. 5. From the point marked x the outside walls
 80 of the apparatus comprise the sides A^{10} , which extend at an angle for a distance, the sides A^{11} , which extend parallel with the main sides of the apparatus for a distance, and the converging sides A^{12} which form the
 85 end, and together inclose a heating chamber surrounding this end of the main conduit. A series of heating coils 43, 44 and 45 are mounted across the end and in the sides of this chamber and the air driven in by the
 90 blower 42 passes through these coils and is heated thereby. The extreme end of the conveyer A^4 is surrounded by imperforate sides a^{10} and an imperforate end a^{11} which
 95 guard against any of the air passing into the drying conduit until it passes in front of the discharge chute and insures that the air currents will not interfere with the discharge of the dried substance and that the heated air will be received into said drying
 100 conduit through the sides. From the point marked y to the point marked x on each side the spaces between the uprights a^{12} are partially closed by walls a^{13} which extend for a
 105 distance on each side of the top of carrier A^4 , but have openings for communication between the conduit and heating chamber both above and below said carrier. The width of said openings may be regulated by
 110 vertically sliding doors 50 and 51, respectively, the doors 50 being mounted in the upper openings on the lower end of vertical bars 52, which are provided with a series of perforations through which pins 53 may
 115 be inserted above a bar A^{14} of the frame to support said doors at the desired elevation. The lower doors 51 are mounted on the lower ends of similar vertical bars 55, likewise provided with a series of perforations
 120 through which holding adjusting pins 56 may be inserted, also adapted to rest on the top of bar A^{14} of the frame. The central portion being covered by the stationary walls a^{13} the heated air must enter above and below the carrier and the width of the inlet
 125 openings may be regulated by the vertical adjustment of said doors to secure just the operation desired to suit the character of

substance being cured. In Figs. 9 and 10 these doors are shown closed while in Fig. 3 both doors are shown open. It will be seen that the construction enables any area of opening desired to be secured to direct the heated air through or over the substance so as to secure the best results. The width of the several openings may be uniform, both above and below, or made wider or narrower above or below, according to whether more or less heat is desired to pass through or over the substance, or it may be directed entirely above or entirely below the substance if conditions require it. Part of the openings on either side may be closed and part open. In fact, the independent adjustment of each door enables any regulation of heat admission openings to be secured that may be most advantageous.

In Fig. 1 I have shown the apparatus as inclined downwardly from the receiving end to the discharge end and I regard this as the preferable construction inasmuch as it will materially decrease the power required for carrying the load on the endless carrier A⁴.

The inclosed curing conduit, extending from the point marked *x* to the point marked *z*, may be of such length as found necessary to perform the work. In actual practice I have found that the apparatus will perform its work satisfactorily when built four to five hundred feet in length.

The steam coils 43, 44 and 45 are preferably of the arrangement shown most clearly in Figs. 7 and 8, wherein the branches of the coils are set staggered so that the air in being driven through under pressure from the blower 42 will zig-zag through the coils, coming in better contact with the heating surfaces of the pipes, thus insuring more efficient operation of the heating apparatus and a higher temperature for the air when it is received into the conduit through the door openings provided therefor.

In operation: the steam is generated in boiler 40 and carried through the pipes 60 and 61, in circulation through the several heating coils. The engine 41 operates through a shaft 62 to drive the blower 42 and said shaft 62 is provided with a miter-gear 63 which meshes with a similar gear 64 on the end of a shaft 65 which is likewise geared to shaft 10 by intermeshing miter-gears 66 and 67 and thus serves to drive the endless carrier A⁴, which drives shaft 9 at the opposite, or receiving, end of the apparatus, from which shaft 36 is driven by belt 39 and the feeding mechanism at the receiving end of the machine operated, as before described. The blower 42 being operated at a high speed drives the air from the outside into the chambers surrounding the coils 43, 44 and 45 and through the pipes composing said coils, which serve to heat said air to a

high temperature and passing under pressure around the end casing composed of the sides *a*¹⁰ and end *a*¹¹ it passes through the door openings in the sides of the conduit, which are controlled by the doors 50 and 51, both above and beneath the endless carrier A⁴ on which the substance to be cured is carried. The heated air absorbs the moisture contained in said substance passing entirely through the body of it and passes along to the vent-stack A⁶ adjacent to the receiving end of the apparatus where the moisture-laden air is discharged. It will be understood, of course, that the air pressure generated by the blower 42, while sufficient to maintain a constant circulation of the heated air toward the vent-stack A⁶, will not be sufficient to carry with it any of the grass, alfalfa, or other substance being cured. The substance coming into the curing conduit green at the receiving end meets the heated air and advances slowly through the conduit toward the discharge end continuously meeting air of a drier character and higher temperature until as it approaches the point of discharge it is in a substantially cured condition, where it passes through the perfectly dried air of the highest temperature and is discharged from the apparatus in a condition suitable for being stored at once without further curing, thus avoiding all delay and danger of exposure to the weather incident to the ordinary method of curing hay by exposure to the sun.

Having thus fully described my said invention what I claim as new and desire to secure by Letters Patent, is:

1. An apparatus for curing vegetable substance such as grass, alfalfa, etc., comprising an inclosed conduit containing a carrier for conveying the substance therethrough, a feeding and spreading mechanism arranged to supply the substance to said carrier at the inlet end of the apparatus, a heating apparatus communicating with said conduit at the discharge end, a casing inclosing said heating apparatus and the discharge end of said conduit, means for forcing air through the heating chamber and into said conduit, and a vent for the discharge of the moisture-laden air, substantially as set forth.

2. An apparatus for curing vegetable substance, comprising an inclosed conduit, a conveyer within said conduit, means for feeding the substance onto said conveyer at one end of said conduit, means for spreading said substance over said conveyer, a heating apparatus at the opposite end of said conduit, a casing inclosing said heating apparatus and the discharge end of the conduit, and means for forcing the air through the heating chamber thus formed into the discharge end of said conduit and through to its opposite end, substantially as set forth.

3. A curing apparatus comprising a conduit, a traveling carrier therein, a heating apparatus arranged to discharge heated air into the conduit at its discharge end, a feeding mechanism arranged to feed the substance to be cured to said carrier at the receiving end, said feeding mechanism comprising reciprocating spreaders arranged to distribute the substance throughout the width of the carrier, substantially as set forth.

4. A curing apparatus comprising an inclosed conduit, a traveling carrier therein, means for producing a current of hot air in said conduit, feeding mechanism for feeding the substance to be cured to said traveling carrier comprising a hopper, a feeding apron running from said hopper to above the receiving end of said carrier, and a spreader arranged above said feeding apron and adapted to spread the substance over the surface thereof from side to side, substantially as set forth.

5. A curing apparatus comprising a conduit, a heating apparatus communicating therewith, a traveling carrier in said conduit, a receiving hopper, a feeding apron running from said hopper to above the receiving end of the traveling carrier, and a spreader above said feeding apron comprising reciprocating frames carrying spreading teeth arranged to move back and forth transversely of said apron and distribute the substance evenly thereon, and means for operating the reciprocating frames, substantially as set forth.

6. In a curing apparatus, the combination, of a conduit, a heating apparatus communicating therewith, a traveling carrier therein, a feeding hopper, a feeding apron arranged to discharge onto said traveling carrier, and a spreader comprising frames mounted to slide transversely on suitable supports and connected to oppositely acting bell-crank levers, and said bell-crank levers connected to an operating crank-shaft, substantially as set forth.

7. In a curing apparatus, the combination of a conduit, a heating apparatus communicating therewith, a traveling carrier therein, feeding mechanism at the receiving end of said conduit, and a spreader forming a part of said mechanism and comprising frames mounted to slide transversely on suitable supports each frame being connected to one arm of a bell-crank lever, the other arm of said bell-crank levers being connected together and one of said arms being connected to an operating crank-shaft, the connecting rod running from the crank of said crank-shaft to said bell-crank lever being connected to said bell-crank lever by an adjustable connection, whereby the length of the throw may be adjusted.

8. In a curing apparatus, the combination, of a conduit, a traveling carrier therein, a feeding apparatus at the receiving end of said conduit, a heating apparatus at the opposite end comprising a heating chamber embracing the discharge end of the conduit, stacks of heating coils therein, a blow-fan arranged to discharge into said chamber for forcing the air through said heating coils, openings being formed between said heating chamber and said conduit and provided with means for regulating the size thereof, substantially as set forth.

9. In a curing apparatus, the combination, of an inclosed conduit, a traveling carrier therein, feeding mechanism at the receiving end of said conduit, a heating apparatus at the opposite end of said conduit comprising a boiler, a heating chamber surrounding the end of the conduit and communicating therewith through the sides thereof in front of the point of discharge, steam coils in said heating chamber, a blower for forcing the air through said steam coils, and adjustable doors for controlling the size of the openings between said heating chamber and said conduit, substantially as set forth.

10. In a curing apparatus, the combination, of an inclosed conduit, a traveling carrier therein, feeding mechanism at the receiving end of said conduit, a heating apparatus at the opposite end comprising a chamber surrounding the end of the said conduit and communicating therewith through the sides thereof, heating coils therein, a blower for forcing air through said coils and into said conduit, an engine for driving said blower and operating the carrier and other operating parts of the apparatus, and adjustable doors for regulating the size of the openings in the side partitions between the heating chamber and the conduit, substantially as set forth.

11. In a curing apparatus, the combination, of a conduit, a traveling carrier therein, mechanism for feeding the substance to the receiving end of the carrier, a heating chamber embracing both sides of the discharge end of said conduit and communicating therewith through its sides, a blower for forcing air through said heating chamber into said conduit, and adjustable doors for regulating the size of the openings between said heating chamber and said conduit, substantially as set forth.

12. A curing apparatus comprising a conduit, a traveling carrier extending from the receiving end to a discharge point in said conduit, said conduit formed inclosed except for a distance on each side near its discharge end where it is provided with openings above and below said carrier, a chamber surrounding the part containing said openings, adjustable doors for regulating the size of said

openings, heating coils within the surrounding chamber, and means for driving air through said heating coils into said conduit through said openings, substantially as set
5 forth.

In witness whereof, I have hereunto set my hand and seal at Los Angeles, Cali-

fornia, this 10th day of April, A. D. nineteen hundred and nine.

J. FREEMAN JACK. [L. S.]

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."