June 3, 1924. 1,496,651

H. BENTZ

COOLING DEVICE

Filed Aug. 15, 1922 2 Sheets-Sheet 1

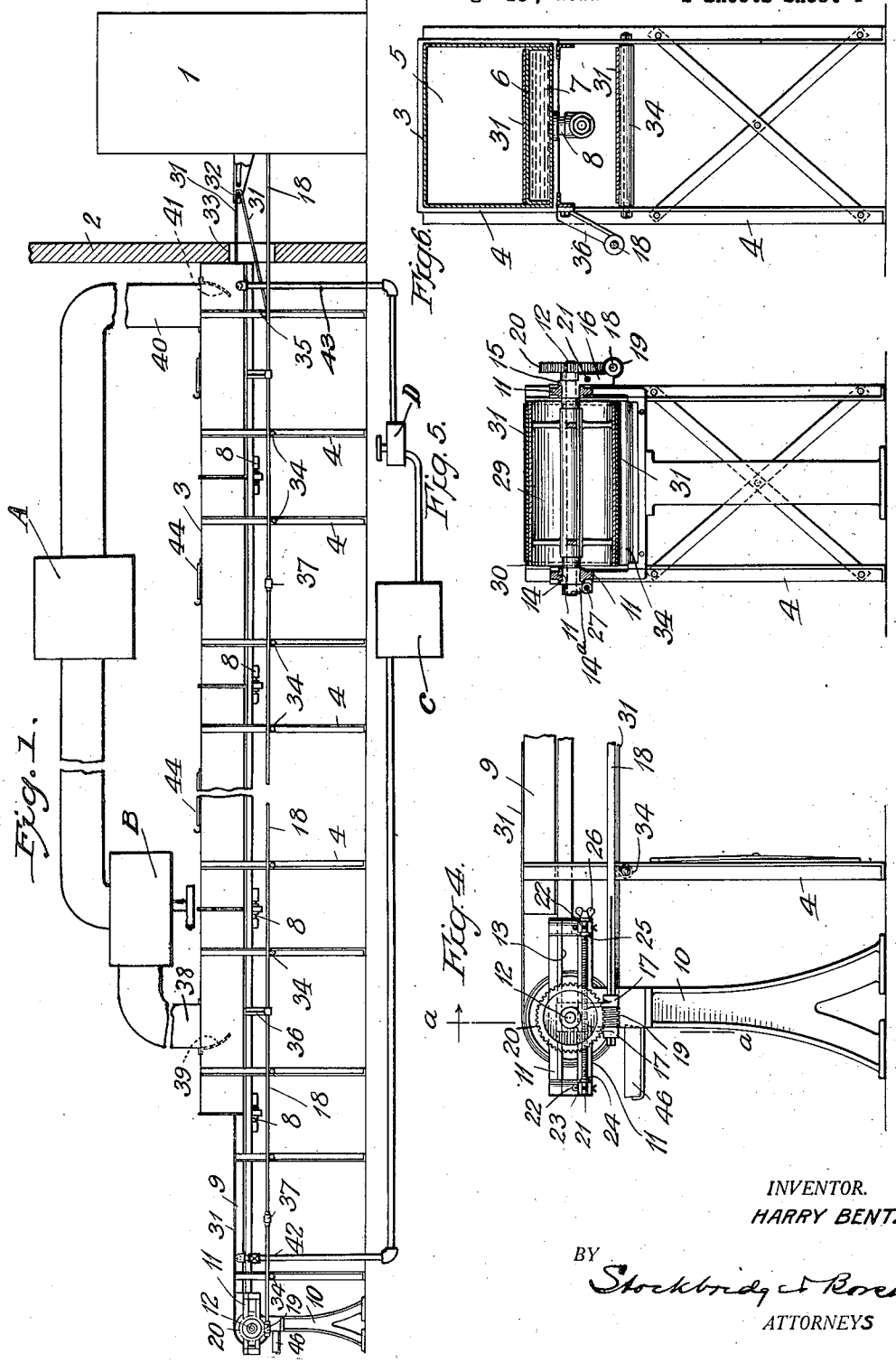


Fig. 1.

Fig. 6.

Fig. 5.

Fig. 4.

INVENTOR.
HARRY BENTZ

BY Stockbridge & Rose.
ATTORNEYS

June 3, 1924. 1,496,651

H. BENTZ

COOLING DEVICE

Filed Aug. 15, 1922 2 Sheets-Sheet 2

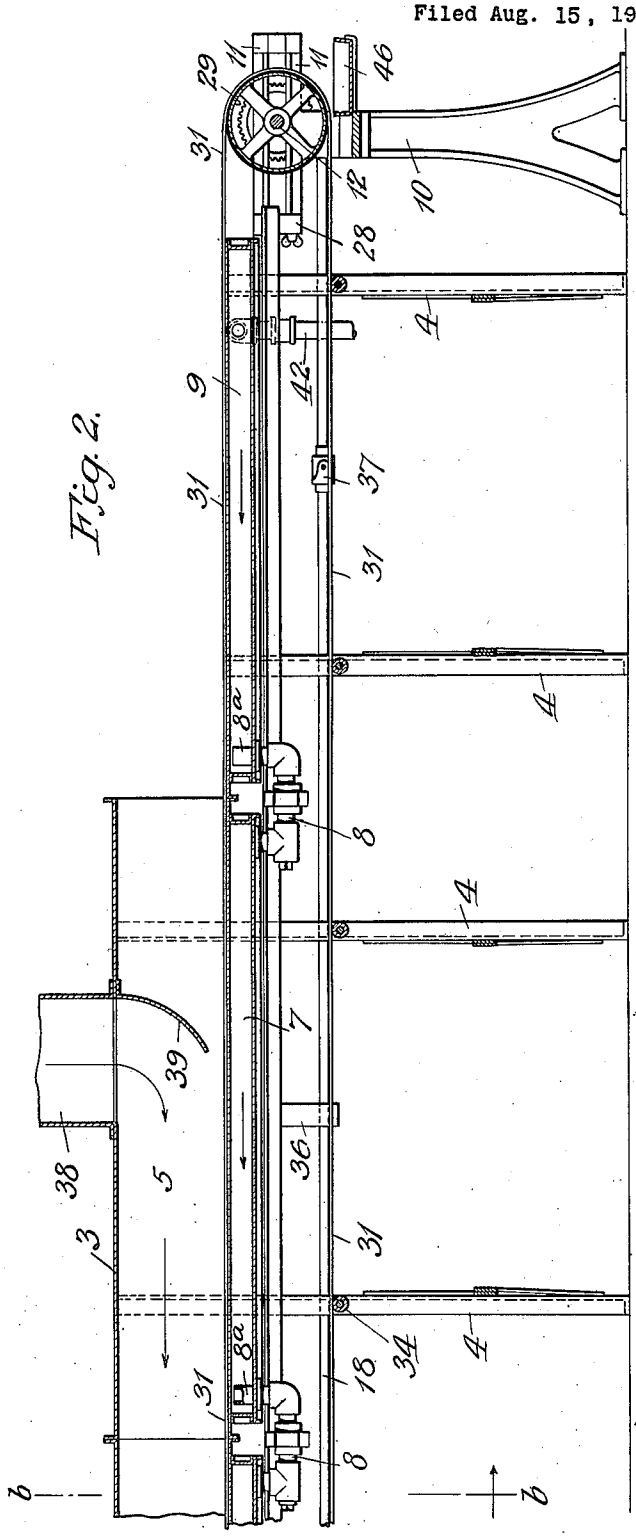


Fig. 2.

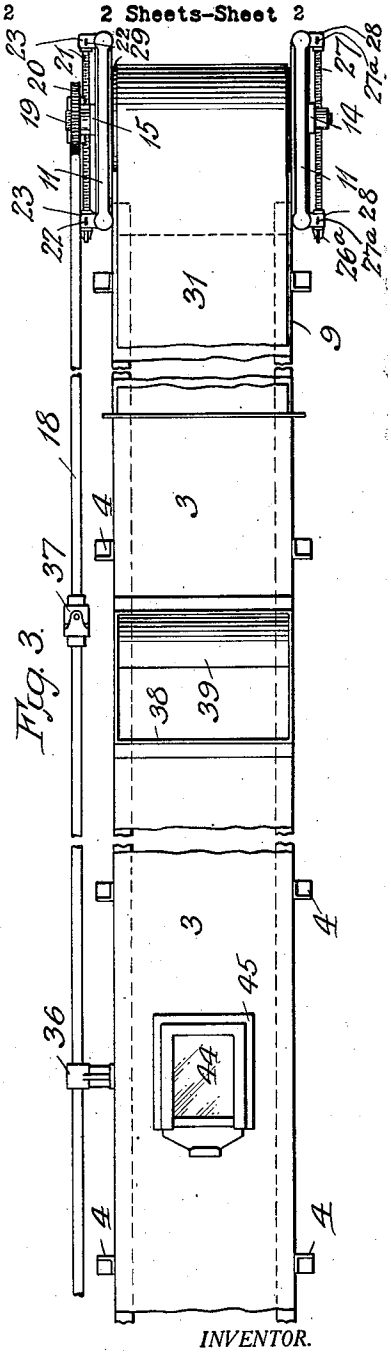


Fig. 3.

INVENTOR.
HARRY BENTZ

BY Stockbridge & Boret

ATTORNEYS

Patented June 3, 1924. 1,496,651

UNITED STATES PATENT OFFICE.

HARRY BENTZ, OF MONTCLAIR, NEW JERSEY.

COOLING DEVICE.

Application filed August 15, 1922. Serial No. 581,937.

To all whom it may concern:

Be it known that I, HARRY BENTZ, a citizen of the United States, residing at Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Cooling Devices, of which the following is a full, clear, and exact description.

This invention relates to devices for subjecting articles to changes in temperature and atmosphere, and particularly to devices for cooling articles coming from an enrobing machine in which they have received an application or coating of a heated substance which congeals or hardens at a lower temperature. The enrobed or coated articles from the enrobing or coating machine are commonly stored in racks in chilled rooms until the chocolate or coating has set or hardened. This entails considerable handling, necessitates the employment of a large amount of storage space, and delays the final packing. Attempts have been made to simplify this process by conducting the coated articles upon a conveyor through a chilled chamber, but the results have been unsatisfactory for various reasons, such as poor control of the temperature which results in greying the chocolate if chilled too suddenly, and incomplete hardening of the coating upon the surfaces of the articles in contact with the conveyor.

An object of this invention is to provide an improved method and apparatus for subjecting coated or enrobed articles to temperature conditions varying progressively in kind from a given starting temperature, in an efficient, convenient, and expeditious manner. A further object is to provide an improved method and apparatus for cooling coated or enrobed articles to cause the coating to set, with which the articles may be progressively chilled on all sides concomitantly and in an efficient, effective and expeditious manner; which chilling can be effected within a minimum of floor space and with a minimum of handling of the articles; with which the temperatures to which the articles are subjected can be accurately regulated; and the apparatus of which is simple, durable, compact, convenient and inexpensive. A further object is to provide an improved apparatus for attachment to and forming a part of an enrobing machine for continuously receiving directly therefrom the coated or enrobed articles and chilling them in a desired manner without manual handling, and for delivering the same in a condition for direct packing. Other objects and advantages will be apparent from the following description of an embodiment of the invention and the novel features will be particularly pointed out in claims.

In the accompanying drawings:

Fig. 1 is an elevation of an embodiment of the invention in connection with an enrobing machine;

Fig. 2 is a sectional elevation of a portion of the same;

Fig. 3 is a plan of the portion of the device shown in Fig. 2;

Fig. 4 is an elevation of the discharge end of the cooling device;

Fig. 5 is a sectional elevation of the cylinder and mounting means; and

Fig. 6 is a section of the device taken substantially along the line *b*—*b* of Fig. 2.

In the illustrated embodiment of the invention a suitable enrobing machine 1 is disposed in a room at one side of a partition 2 and the cooling device is disposed in a room upon the opposite side of the partition 2. An elongated enclosure 3, rectangular in cross section is supported upon suitable frames 4 so as to extend away from the partition 2 adjacent the enrobing machine. The enclosure is composed of a number of sections connected end for end so as to form with their connected interiors a continuous tunnel or conduit 5. The floors 6 of the enclosure sections are made hollow, as at 7, to form a conduit extending lengthwise of each section, and the ends of the conduit 7 of each section are closed. The conduits of the floor sections are, however, connected at their abutting ends by pipes 8 which permit of a circulation of a liquid through the hollow floor from end to end of the united sections. An extra section 9 of the hollow floor is provided beyond the end of the tunnel so as to form a delivery surface or platform.

At the end of the end section 9 of the floor, a standard 10 is disposed and provided with suitable guide bars 11 arranged in pairs in parallel horizontal relation at each side of the standard 10. A shaft 12 extends crosswise of the standard 10 and at each side projects through the opening 13, between the pair of parallel guide bars 11. The ends of the shaft 12 which project through the openings 13 pass through bearing blocks 14 and 15 which are mounted between the guide bars 11, one at each side, so as to permit the shaft to be shifted bodily toward and from the end section 9 forming the delivery platform.

The bearing block 15 is provided with an arm 16 depending along the exterior faces of the adjacent guide bars 11 and this arm is forked at its lower end so as to provide a pair of spaced and aligned bearings 17. A driving shaft 18 extends lengthwise of the enclosure, at one side thereof, and passes through and has bearing in the two bearings 17 of the depending arm 16. Between the bearings 17, the shaft 18 carries a worm 19 which is keyed thereto so as to be slidable along the shaft 18 when the bearings 17 and the bearing block 15 are shifted along the guide bars 11. The end of the shaft 12 which projects through the bearing block 15 is provided with a worm wheel 20 which meshes with the worm 19.

A screw rod 21 is rotatably confined, as by cotter pins 22, in slotted bosses 23 at the ends of the bearing bars 11 upon the side of the standard 10 carrying the worm wheel 20. The screw rod is provided with collars 24 and 25 which engage with the ends of the slotted bearing bosses and limit lengthwise movement of the screw 21 while permitting rotary movement. One end of the screw rod 21 is provided with a wing button 26 by means of which the screw rod may be rotated. The screw rod 21 passes through and has threaded engagement with the arm 16, depending from the bearing block 15, so that whenever the screw rod is rotated the bearing block 15 will act as a nut thereon and be shifted along the same and thus carry the shaft 12 in a direction lengthwise of the screw rod 21.

A screw rod 27 is confined by cotter pins 27^a in slotted bosses 28 upon the bars 11 at the opposite side of the standard 10, and has threaded engagement with an arm 14^a depending from the bearing 14, so that when the screw rod 27 is rotated by its wing button 26^a the bearing 14 will be shifted along the opening 13 formed between the guide bars 11 at that side of the standard 10. By turning the screw rods 21 and 27 the shaft 12 can be shifted bodily toward and from the end of the delivery platform 9. The shaft 12, between the bearing bars 11 at each side, is provided with a cylinder 29 carrying a corrugated rubber sheet or layer 30 upon its periphery.

An endless belt or conveyor 31 passes over and around the guide bar 32 of the enrobing machine and also passes through an aperture 33 in the partition 2 which separates the enrobing machine from the cooling device. The upper stretch of the endless belt passes lengthwise through the tunnel 5 of the combined sections of the enclosure, in close proximity to or resting upon the hollow floor 6, and emerges over and upon the delivery platform 9. The upper stretch of the belt or conveyor passes over and around the cylinder 29 and then returns beneath the tunnel to the enrobing machine, being guided during its travel beneath the tunnel or enclosure by suitable idlers 34 arranged at intervals in the supporting frames 4. The lower stretch passes beneath an idler 35 before passing upwardly through the aperture 33 to the guide bar 32 of the enrobing machine. By rotating the screw rods 21 and 27 the cylinder 29 may be shifted toward or from the end of the delivery platform 9 so as to tighten or loosen the endless belt or conveyor.

The shaft 18 which drives the cylinder 29 extends along the side of the enclosure of the cooling device and is supported at intervals therealong by means of bearing brackets 36 projecting from the supporting frames 4. The shaft 18 extends through the partition 2 and has a driving relation (not specifically shown) with the enrobing machine so as to be operated concomitantly therewith. Therefore, when the enrobing machine is in operation the endless belt or conveyor 31 will be driven continuously and will carry the enrobed or coated articles, deposited by the enrobing machine, upon the upper stretch thereof through the partition 2, the tunnel 5 from end to end, and out upon the delivery platform 9 at which point the articles are removed by attendants and packed directly into suitable containers. The rod 18 is preferably formed in sections which are connected one to another by suitable universal couplings 37.

At the delivery end of the tunnel the enclosure 3 is provided with an inlet conduit 38 through which a current of air, that has been previously chilled to a desired temperature such as by a cooler A, is delivered into the interior of the tunnel through the action of a suitable circulating pump B. A deflecting wall 39 is provided in the tunnel below and to the rear of the inlet conduit 38 and is curved toward the inlet end of the tunnel so as to deflect the incoming current of air toward the opposite end of the tunnel and counter to the direction of travel of the upper stretch of the conveyer. At the inlet end of the tunnel and adjacent the partition 2, the enclosure 3 is provided with an outlet con-

duit 40 which connects with the interior of the tunnel 5, and also preferably with a suitable exhaust fan, so as to remove the air from the tunnel 5. A suitable deflecting plate 41 is provided in the tunnel 5, slightly spaced, above the conveyor, curved toward the opposite end of the tunnel, and arranged nearer the inlet end of the tunnel than the opening of the conduit 40, so as to deflect upwardly into the conduit 40 the current of chilled air passing through the tunnel from the inlet conduit 38.

An inlet pipe 42 is connected to the extreme outer end of the channel or conduit 7 in the hollow floor of the section 9, and an outlet pipe 43 is connected to the channel or conduit 7 of the hollow floor 6 in the section nearest to the enrobing machine and at the end thereof nearest to the enrobing machine, so that a liquid entering the channel or conduit of the platform 9 will progress from section to section towards the enrobing machine and leave the floor through the outlet pipe 43 at the point where the conveyor first enters the tunnel. The liquid is previously chilled to a suitable temperature, such as by a cooler C which temperature may be varied, and circulated through the floor by suitable means such as by a pump D, so that the floor over which the upper stretch of the conveyor moves will be given any desired temperature and the floor becomes progressively warmer toward the entrance end of the tunnel due to an interchange of heat with the articles upon the conveyor. The inlet end of each pipe 8, which will be at the discharge end of each floor section, extends into close proximity to the upper wall of the channel of that floor section. In this manner the air enclosed in each channel of the floor section will be carried out when the channels are filled initially with the liquid, or when air enters during the operation of the device. The outlet pipe 43 extends into close proximity to the upper wall of the conduit of the floor section to which it is connected, so that the air which is carried along from section to section will be eventually and entirely removed from the floor channels.

The sections of the tunnel 5 are provided at intervals with suitable windows 44 which are slidably mounted in guides 45 upon the upper face of the enclosure, so as to permit of observation of the movement of the articles through the tunnel without opening the enclosure. The window may, however, be operated so as to permit access to be had to the interior of the enclosure for removing samples at various stages in the chilling, and for the purpose of making repairs. A tray 46 may be disposed upon the standard 10 beneath the cylinder 29 so as to receive and hold any articles falling from the conveyor as it passes around the cylinder 29.

In the operation of the machine the articles which are coated or enrobed in the enrobing machine are deposited upon the upper stretch of the conveyor 31. During the operation of the enrobing machine the shaft 18 will be driven therefrom, and the shaft in turn operates through the worm 19, worm wheel 20 and cylinder 29 to drive the endless conveyor and carry the upper stretch from the enrobing machine through the tunnel. The articles deposited upon the conveyor will therefore be carried through the aperture 33 in the partition 2, then lengthwise through the tunnel 5 in the enclosure, and when emerging from the tunnel will be carried over the delivery platform 9.

At the same time, a current of chilled air will be forced by a pump or fan through the conduit 38 into the interior of the tunnel near the outlet thereof. The deflector plate 39 is disposed so as to clear the articles moving with the conveyor and is curved to deflect this incoming current of air lengthwise of the tunnel toward the end where the conveyor enters the tunnel. The air passing through the tunnel will pass around the articles carried by the conveyor and will chill the same to the desired temperature and upon reaching the end of the tunnel where the articles enter, the air will be deflected by the curved plate 41 into the outlet conduit 40. The outlet 40 is also preferably connected with an exhaust fan or pump so as to facilitate the movement of air along the tunnel counter to the direction of movement of the conveyor.

At the same time, water is forced under pressure through the inlet pipe 42 into the channel or conduit 7 of the platform floor section 9 and thence from section to section of the hollow floor until it reaches the end adjacent the enrobing machine where it is conducted away through the outlet pipe 43. The water passing through the hollow floors is previously chilled to the desired temperature and will accordingly chill the upper surface of the floor. The upper stretch of the conveyor moves in close proximity to the floor, and preferably rests upon same, during its travel through the tunnel. An exchange of heat will consequently occur through the conveyor between the enrobed or coated articles and the cool liquid in the hollow floor, so that the articles will be chilled upon the surface upon which they rest concomitantly with their chilling by the current of air passing through the tunnel.

By varying the rate of travel of the air and water through the tunnel and floor respectively, and by varying the initial temperatures, the rate of chilling of the articles can be accurately controlled, so as to prevent too rapid chilling with consequent greying of the chocolate when the device is used for chocolate enrobed articles. When the arti-

cles emerge from the tunnel, the coating or covering has been chilled and set on all of its surfaces so that as they move over the platform 9 attendants can remove and pack the same directly in cartons.

Broken particles will fall from the conveyor as it passes around the cylinder 29 and be received in the receptacle 46. If any of the articles unadvoidably pass by the attendants they will fall into the receptacle 46 and can then be subsequently removed. The corrugated peripheral surface of the rubber coating 30 of the cylinder 29 insures a firm and positive drive for the conveyor, and by turning the screws 21 and 27 the cylinder may be adjusted to tighten the belt equally or unequally at opposite sides so as to compensate for slackness or inequalities in the conveyor. The conveyor after passing around the cylinder 29 is guided upon the idlers 34 and 35 beneath the enclosure back to the enrobing machine, where it receives a new deposit of enrobed or coated articles. The universal couplings 37 in the shaft 18 serve to prevent binding of the shaft in the bearings which might be due to non-alignment of the bearings, and to permit of the extension of the shaft when other tunnel sections are added to the chilling device. The conveyor is preferably formed of fabric, and is provided upon its outer face with a layer of wax paper, or is otherwise glazed so as to prevent sticking of the articles deposited thereon.

I have found that very satisfactory results are obtained when the air is admitted to the tunnel at a temperature of 40° F., and when the water is admitted at a temperature ranging from 36° to 40° F., but obviously other temperatures will be utilized when changes in the rate of chilling of the articles is desired. The enrobing machine is usually operated in a room having a temperature considerably above that desired for the room in which the articles are packed, and the partition 2 serves to separate these rooms and permit of a maintenance of different temperatures therein, the aperture 33 in the partition serving to permit of the passage of the conveyor from one room to the other.

It will be obvious that various changes in the details and arrangements of parts herein described and illustrated for the purpose of explaining the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention.

I claim:

1. Cooling apparatus for chocolate coated articles comprising an elongated enclosure having therein a tunnel, a conveyor passing through the tunnel and initially carrying the articles to be cooled, and means for admitting a cooling gas to the tunnel at one point and removing it at another so as to cause a circulation of the gas through the tunnel counter to the direction of travel of the conveyor in the tunnel in order to progressively chill the articles.

2. Cooling apparatus comprising an elongated enclosure having therein a tunnel, a conveyor passing through the tunnel and initially carrying the articles to be cooled, means for admitting a cooling gas to the tunnel at one point and removing it at another so as to cause a circulation of the gas through the tunnel counter to the direction of travel of the conveyor in the tunnel, and means for simultaneously refrigerating the floor of the tunnel over which the conveyor travels in close proximity thereto, so that the articles will be approximately uniformly cooled on their entire surface.

3. In heat interchange apparatus, an enclosure having therein a tunnel with a hollow floor, a conveyor passing through the tunnel and adapted to carry the articles to be acted upon, means for causing a flow of cooling fluid through the tunnel counter to the direction of travel of the conveyor, and means for simultaneously circulating a cooling fluid through the floor of the tunnel over which the conveyor travels in close proximity thereto so that the articles will be concomitantly cooled upon their entire surface.

4. Cooling apparatus comprising an enclosure having therein a tunnel with a hollow floor, a conveyor passing through the tunnel in close proximity to the floor, means for causing a circulation of a chilled gas through the tunnel and means for passing a chilling fluid through the hollow floor counter to the travel of the conveyor over the same, whereby the articles will be chilled from their under sides as well as from the upper sides.

5. In enrobing devices, an enrobing machine in which the articles are coated with a suitable substance which hardens when cooled, an endless conveyor upon which the coated articles are conveyed from the machine, an enclosure having therein a tunnel through which the loaded stretch of the conveyor passes, a roller at the emergence end of the tunnel, around which the conveyor passes, a shaft driven from the enrobing machine, gearing between the shaft and the roller whereby the roller and conveyor will be driven from the machine, and means for circulating a chilled fluid through the tunnel in a direction counter to the direction of travel therethrough of the loaded stretch of the conveyor.

6. Cooling apparatus comprising an enclosure having therein a tunnel, a conveyor passing through the tunnel in close proximity to the floor thereof and adapted to carry articles to be chilled, the floor of the tunnel being hollow, and means for circulating a fluid through the hollow floor in

a direction counter to the direction of travel of the conveyor through the tunnel.

7. Candy cooling apparatus comprising an enclosure having therein a tunnel, a conveyor passing through the tunnel in close proximity to the floor thereof and adapted to carry articles to be chilled, the floor of the tunnel being hollow, completely closed and cut off from the atmosphere, and means for circulating a cooling fluid through the hollow floor.

In witness whereof, I hereunto subscribe my signature.

HARRY BENTZ.