

May 17, 1949.

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2,470,721

PORTABLE INFANT INCUBATOR

Filed Aug. 15, 1947

3 Sheets-Sheet 1

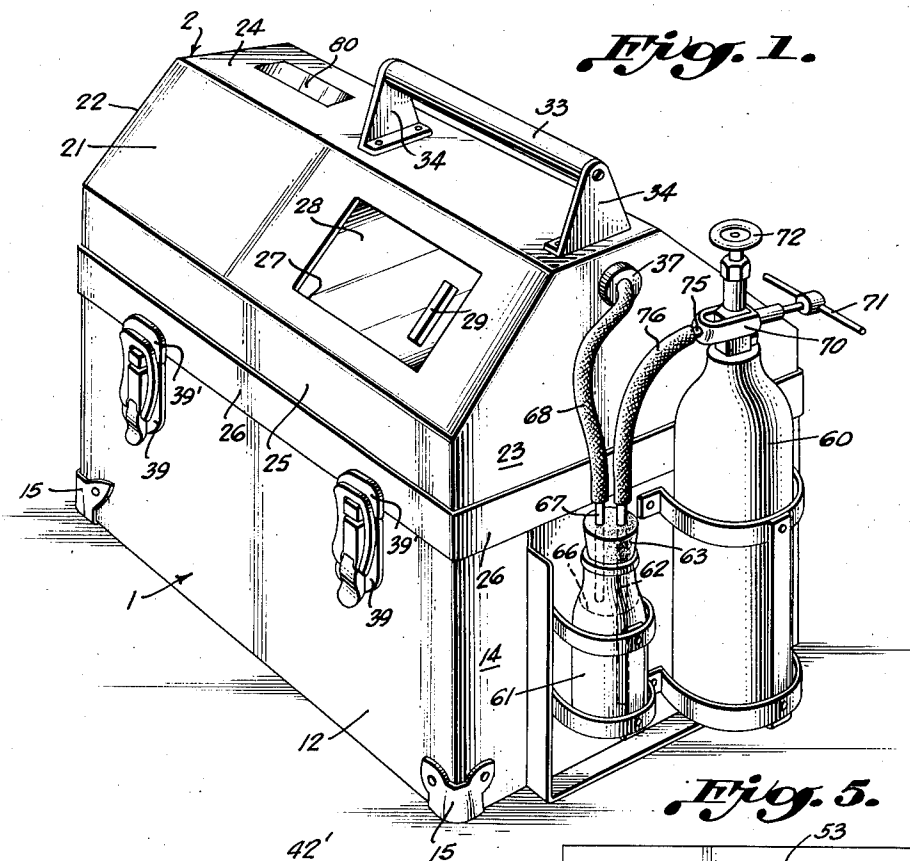


Fig. 1.

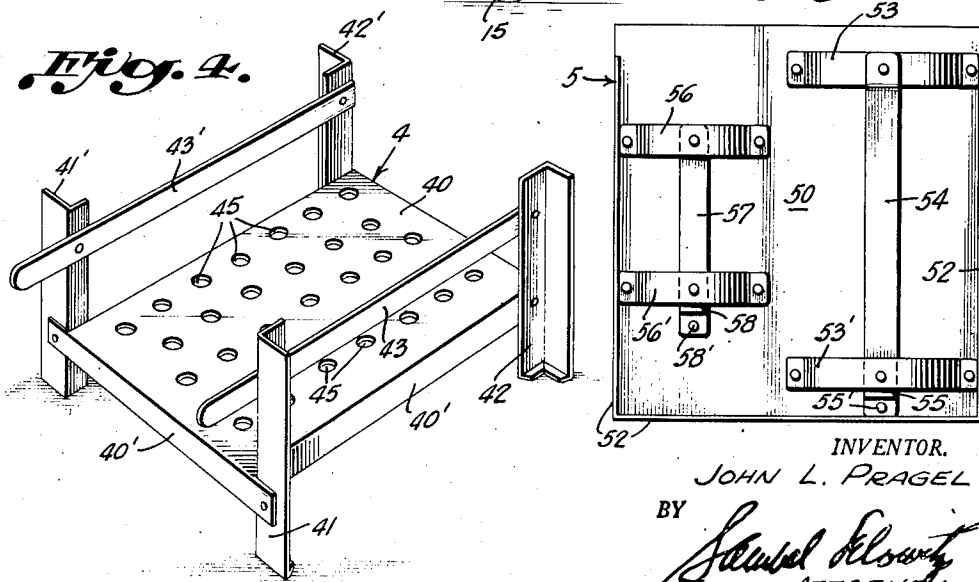


Fig. 4.

Fig. 5.

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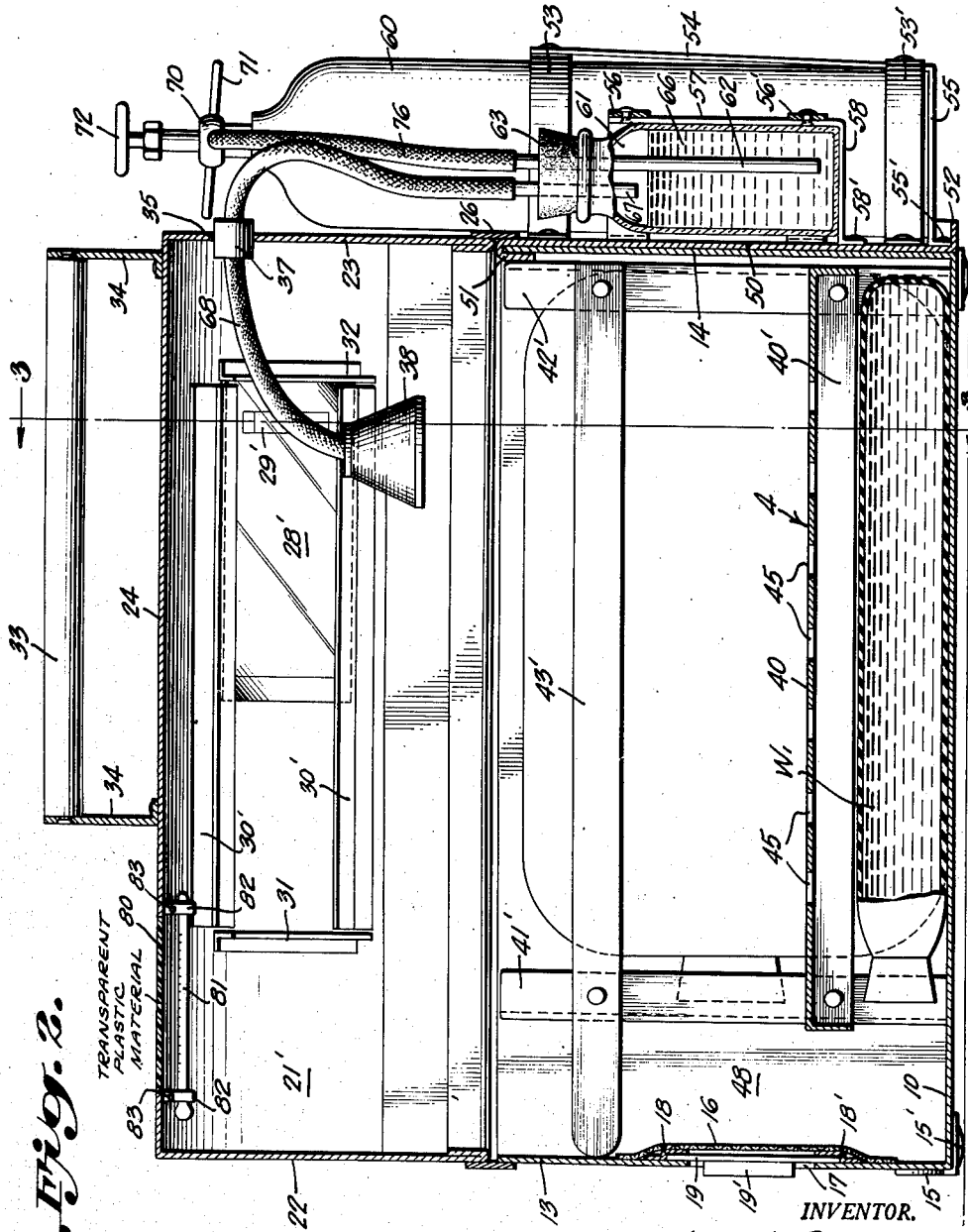


Fig. 2.

TRANSPARENT
PLASTIC
MATERIAL 80 83

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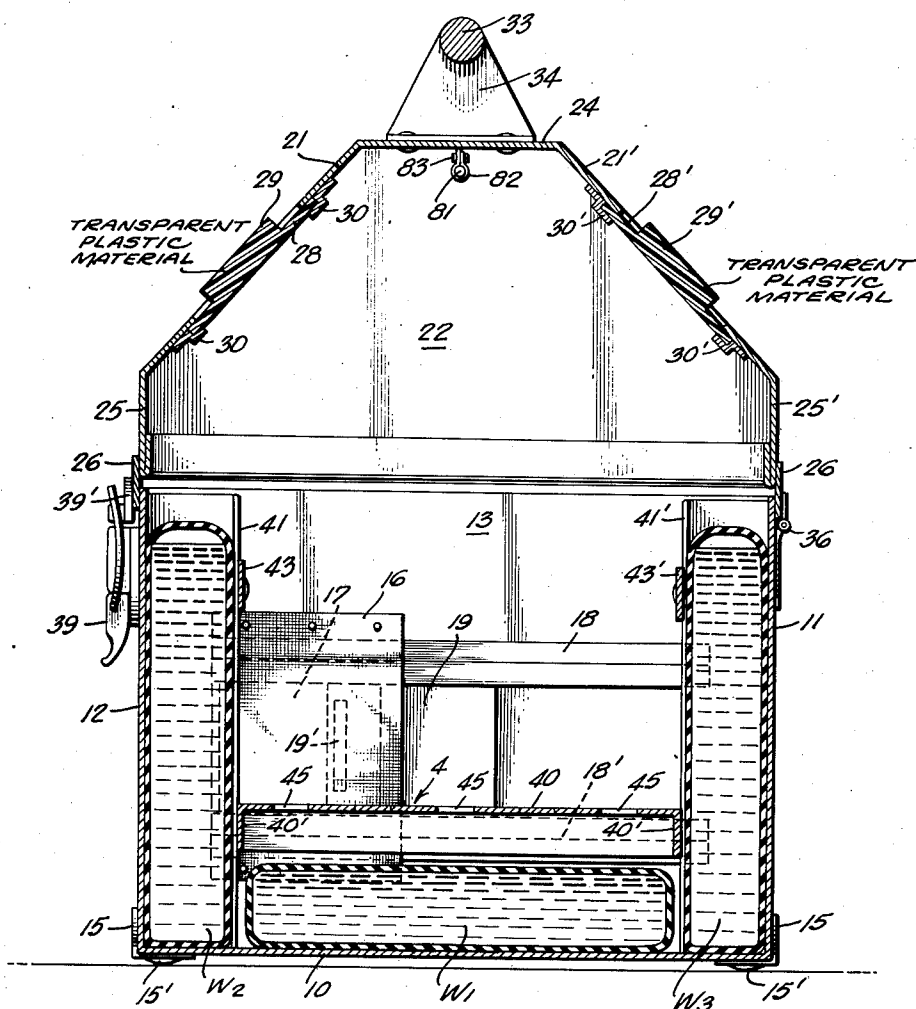
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3 Sheets-Sheet 3

Fig. 3.



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PORTABLE INFANT INCUBATOR

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7 Claims. (Cl. 128—1)

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This invention relates to a portable baby incubator which is particularly useful in the handling and treatment of prematurely born infants.

It is the object of the present invention to provide a portable baby incubator which is readily transportable from place to place and which may function as an infant's bed or ambulance for prematurely born infants, accommodating them for proper treatment from a time immediately following their birth to such a time when they are in a sufficiently healthy and mature state to be disposed in a conventional baby crib or bassinets.

It is a further object of the invention to provide a compact, rugged and economical portable baby incubator construction which may be carried easily and conveniently and disposed on the seat of an automobile, if need be, with no shock or vibration to the infant while maintaining the interior of the incubator at optimum temperature and humidity conditions for the benefit of the infant.

It is another object of the invention to provide a crib of sturdy construction which lends itself to rapid cleaning and effective sterilization.

It is a further object of the present invention to provide a portable baby incubator with a removable rack for supporting a small oxygen tank for feeding controlled amounts of oxygen into the incubator enclosure with adequate moisture in the gas which is most favorable to the breathing needs of the infant. The invention also makes provision for operating under controlled temperature conditions within the enclosure, which may be obtained by the use of hot water bottles or chemical water heaters, so that the benefits of the invention may be realized wherever an infant may be born and wherever hot water is available as an incident to the delivery operations.

It is another object of the present invention to provide an incubator construction having a plurality of openings provided with closures so that proper ventilating effects may be attained. Some of these openings are provided with transparent closures to enable the infant to be viewed at all times and are conveniently operated to open position when the infant requires attention. These openings are independent of and collateral to the full opening of the incubator when the infant requires more extensive attention.

It is a further object of the invention to provide a portable incubator construction which lends itself to the alternative use of the device as a crib or an ambulance for transporting the

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baby, with or without the oxygen supply attached thereto, whereupon a specially provided handle is employed in order to facilitate the lifting of the unit according to the difference in the center of gravity thereof under these different circumstances of use, with or without the oxygen tank attachment applied thereto.

Other objects and purposes will appear from the detailed description of the invention following hereinafter, taken in conjunction with the accompanying drawings; wherein

Fig. 1 is a perspective view of the portable incubator in accordance with the present invention viewed from the head end of the unit;

Fig. 2 is a longitudinal sectional view of the unit with certain parts in elevation;

Fig. 3 is a vertical sectional view along line 3—3 of Fig. 2;

Fig. 4 is a perspective view of the removable rack fitting within the main lower casing of the incubator; and

Fig. 5 is a front elevation of the detachable support for the oxygen tank which may be alternatively mounted on and removed from the head end of the portable incubator, as shown in Fig. 1.

In Fig. 1 is shown a portable baby incubator which may be formed of any suitable sheet material such as metal, fiber, plywood or the like, but which in the preferred embodiment of the invention is formed of sheet aluminum to render the unit light in weight and capable of easy and thorough cleaning and sterilization.

The main body of the incubator is formed of a lower rectangular box-like casing 1, the open top of which is adapted to be covered by a hood in the form of a gable-shaped closure 2 which is hinged along one of the sides of the casing 1. The casing 1 is formed by a bottom wall 10, side walls 11 and 12, end wall 13 at the foot of the unit and end wall 14 at the head end of the unit. Corner frames 15 are provided at each of the bottom corners of the casing to strengthen the same and are additionally fitted with rounded supports 15' of metal or rubber to permit the incubator to be placed on any surface without scratching or marring thereof. The walls are assembled as shown by any known fabricating processes and in the case of a metallic unit, the same may be integrated by means of rivets or by spot welding.

As clearly shown in Figs. 2 and 3, the end wall 13 is provided with an opening 17 and a piece of screening 16 is affixed to the inside wall of the casing over this opening. A slidable gate 19 is adapted to slide in horizontal guides 18 and 18'

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provided on the inner side of wall 13, and a handle 19', bent transversely from the plane of the gate 19, may be manipulated to vary the size of the portion of the opening 17 which is uncovered by the gate 19 as the same is shifted between the screening 16 and end wall 13 from completely closed position at the extreme left of its movement (Fig. 3) to its maximum open position at the extreme right. Thereby, the amount of circulating air within the enclosure can be accurately controlled in dependence upon the needs of the infant.

The gable-like closure 2 for covering the box-like casing 1 is formed by two end walls 22 and 23, top wall 24, two inclined side walls 21 and 21' and two vertical walls 25 and 25' extending downwardly from the inclined walls 21 and 21', respectively. A band 26 extends downwardly around the periphery of the closure to effect a close fit of the cover 2 upon the lower casing 1. A plurality of hinges 36 are connected between the band 26 and the side wall 11 of the casing 1 (Fig. 3) to permit a rotation of the closure 2 in a substantially complete arc of 180° so that access to the casing 1 may be had without hindrance from the closure at those times when the infant requires extensive handling and attention. A secure closure of the cover on the casing may be obtained by any suitable hasp fasteners of the type used on trunks and luggage. As shown in Fig. 1, hasp elements 39 on wall 12 of the casing cooperate with overlying units 39' on the band 26 of the closure.

Openings 27 are preferably provided in both inclined walls 21 and 21' of the closure adjacent the head end of the unit, and these openings may be closed by transparent slides 28 and 28' having handles 29 and 29', respectively, to permit a to and fro sliding of these closures along guide rails 30 and 30', respectively, mounted on the inner surfaces of the walls 21 and 21'. End stops 31 and 32 (Fig. 2), extending within the path of the transparent slides 28 and 28' serve to limit the extent of movement of these slides before the handles 29 and 29' strike the boundaries of the openings 27 and 27', respectively. The slides, and handles 29 integrated thereto, may be formed of methyl methacrylate resin or any other transparent plastics.

A circular opening 35 is provided in the end wall 23 of the closure 2 for the purpose of accommodating a plug 37 through which is threaded a piece of rubber tubing 68 for supplying oxygen to the interior of the closure as described in detail below, which is fed to a cone 38 which may be placed in proximity to the infant's face if desired.

A removable supporting rack 4 for the infant is adapted to be readily insertable into and removable from the casing 1. This rack, shown in perspective in Fig. 4, is formed of pairs of vertical angle upright supports 41—42 and 41'—42' along the opposite sides of the casing. A platform 40, which is preferably formed with downwardly extending flanges 40' along its four edges to impart strength and rigidity to the construction, is mounted between these vertical uprights and is spaced from the lower ends thereof a sufficient distance to accommodate a hot water bottle W₁ therebelow. A plurality of apertures 45 are formed in the platform 40 to facilitate the transmission of heat from the lower to the upper surface thereof. A horizontal bar 43 extends between the uprights 41 and 42 and another horizontal bar 43' extends between uprights 41' and 42'. These horizontal bars are longer than the

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platform 40 and only a little shorter than the length of the casing, to provide a space 48 at the foot end thereof (Fig. 2) for the accommodation of water bottles, clinical instruments or any other items necessary for the care of the infant when the device is used either as a transportable ambulance or as an incubator.

The space defined by the angular uprights 41 and 42 along the side wall 12 of the casing, is sufficient to accommodate a hot water bottle W₂ lying on edge and is prevented from tilting by the provision of the horizontal bar 43. The same accommodation is made for a third hot water bottle W₃ within the space defined by angular uprights 41' and 42' and the horizontal bar 43'. The bars 43 and 43' serve to space the platform 40 from the foot end of the casing 1, so that a pad covering on the platform 40 upon which the baby is placed, disposes the infant in position for periodic observation and attention through openings 27 and 27' and slidable closures therefor 28 and 28'. At the same time, the removable rack is in substantially fixed position within the casing in view of the external dimensions of the rack whether or not hot water bottles are disposed between the rack and the bottom and side walls of the casing, as shown in Fig. 3.

As shown in Fig. 5, a detachable bracket support 5 may be readily attached to the incubator when it is desirable that the infant breathe oxygen rather than ordinary air. This bracket, which is formed of a plane sheet 50 of aluminum, is provided with a reentrant hook projection 51 at the upper end thereof, which is adapted to be mounted over the upper edge of the end wall 14 of the casing 1. The swinging of the closure 2 over the casing 1 into the closed position of the unit as shown in Fig. 1, brings the band 26 in overlying relation to the plate 50 (Fig. 2) so that the bracket is fixedly attached to the unit without need for any other fastening expedients.

The plate 50 is provided with transverse flanges 52 along the sides and bottoms thereof to impart rigidity thereto. A support for a small oxygen tank of forty gallon capacity is formed by semi-circular bands 53 and 53' at different levels of the plate and a reinforcing strap 54 extends from the outermost point of band 53 downwardly to band 53' and thence horizontally at 55, whereat the same is riveted at 55' to the plate 50. A support of similar construction is formed on the left side of the plate 50 by semi-circular bands 56 and 56' spanned by a vertical band 57 and horizontal supporting band 58 which is riveted to the plate 50 at 58'. The latter support is adapted to carry a small jar 61 tightly covered with a rubber stopper 63. The jar may be filled with water 66 to leave an air space at the top, and a glass tube 62 extends to nearly the bottom of the water through an opening in the rubber stopper 63. An outlet adapter 70 for the oxygen tank 60 is mounted on the top of the oxygen tank by means of handle 71 and the exhaust of oxygen through this adapter may be controlled by valve 72. The oxygen issuing from outlet 75 passes through a piece of rubber tubing 76 connected with the glass tube 62 and the oxygen bubbles into the water through the outlet end of the tube 62. The oxygen rising therefrom is led from the space in the water bottle above the level of the water 66 through tube 67 which is connected by rubber tubing 68 which is guided to the plug 37 fitting within the opening of the wall 23 of the cover. The quantity of bubbles rising in the bottle 61 offers a measure of the

amount of oxygen being fed into the enclosure of the incubator and serves as a guide for the attendant to facilitate the proper administration thereof. In addition, the oxygen bubbling through the water imparts a desired degree of humidity to the gas being breathed by the infant within the enclosure.

When the condition of the infant is such that the administration of oxygen is not necessary, the plate 59 supporting the oxygen tank 60 and water bottle 61 may be removed readily from the top edge of wall 14 and the outlet end of tube 63 may be removed from the plug 37. Also, the plug 37 and hood 38 may be removed from the inside of the closure. Thereupon, the unit may be used as a simple device for transporting the infant or for taking care of it under controlled temperature and ventilating conditions with the use of atmospheric air.

In order to enable the unit to be handled conveniently and with certainty under the alternative conditions of use, with or without the supporting plate 5 and the oxygen receptacles adapted to be mounted thereon, a special handle mounting is provided. This handle consists of elongate member 33 mounted between upright brackets 34 extending upwardly from the top wall 24 of the closure 2, which permits a gripping of the unit anywhere along the elongate handle 33, depending upon the shifting center of gravity of the unit as a result of the optional attachment thereto of the oxygen tank assembly. When the latter is used, the end of the handle adjacent the head end of the unit is gripped, whereas without the oxygen tank the handle 33 is gripped near the other end thereof, or towards the center of the casing and cover.

The dimensions of the compact unit, which run about 19½" in length and 13" in width, with an over-all height of less than 20", provides a compact device which can be easily carried on the seat of an automobile on the side of a doctor or a nurse whenever there is need to rush an infant to the hospital, with certainty that the infant will be subjected to substantially uniform temperature conditions and to no harmful drafts or air currents. The unit is also of light weight, about 13½ pounds without the oxygen attachments, so that the same can be handled easily by a nurse, and units of lighter weight are attainable by the use of lighter gauge metallic sheets. The unit is sufficiently roomy to accommodate a twin set of infants when such a contingency arises.

The temperature of the water with which the hot water bottles are filled, which water is always available upon the delivery of infants, can be employed to control the temperature of the atmosphere within the enclosure which is desirably kept at about 90° to 100° F. and relative humidity of 60% to 65%. The temperature of the water placed in the bottles should preferably be about 140° F. which will maintain the temperature in the enclosure suitably warm for several hours, since tests have proven that under usual conditions of ambient temperature, it will take five hours for the temperature to drop to 83° and that nearly two hours elapse before the temperature drops below 90°. As an added precaution against harm to the infants, the water bottles may be enclosed in cloth or flanellette bags.

In order to provide a ready check on the temperature conditions within the incubator enclosure, a transparent window 80 of methyl methacrylate resin or the like may be provided

in the top 24 adjacent to the foot of the unit through which may be seen a thermometer 81 supported in the interior about an inch below the top. This thermometer is supported by brackets 82 mounted on the underside of top 24, and bolts 83 clamp the thermometer in place for ready removal thereof for purpose of replacement. The transparent window readily permits the temperature in the incubator to be noted by a nurse or attendant of the infant.

In such cases where chemical water heaters are available or desirable, such may be used in lieu of hot water bottles, as outlined above. In any case, the portable baby incubator and ambulance described above is independent of any sources of electrical energy which are not always available in rural areas where the need for the care of premature infants may arise, or in such cases where failure of electric power may take place as a result of unusual conditions.

While I have described my invention as embodied in a specific form and as operating in a specific manner for purposes of illustration, it should be understood that I do not limit my invention thereto, since various modifications will suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the annexed claims.

I claim:

1. A portable infant-incubator comprising a casing defined by a bottom, side and end walls, a removable rack fitted within said casing having a platform spaced from the bottom and sides of said casing for supporting an infant thereon, the spaces between the platform and casing adapted to accommodate a plurality of hot water bottles to warm the interior of said casings, a hood-shaped cover for said casing coextensive with the upper boundaries thereof hingedly mounted to the top thereof along one side for covering completely said casing, fastening means on the other side thereof for effecting a close fit of said cover on said casing, said cover having an opening in at least one side thereof and a transparent movable closure for said opening to permit access to the infant, and means for admitting oxygen into said casing for utilization by the infant.

2. A device as set forth in claim 1 wherein said removable rack is formed of a pair of angular uprights on each side thereof to define a space for accommodating a hot water bag in upstanding position, said platform extending between said uprights near the lower ends thereof to accommodate a hot water bottle therebelow and having a plurality of openings therein to facilitate the heat transfer from said water bottle, and a horizontal bar extending between each pair of uprights above the platform adapted to retain the upstanding water bags in place.

3. A device as set forth in claim 1 wherein said last-mentioned means comprises a screened opening at the lower portion of one of the end walls of said casing, and an adjustable closure therefor to control the flow of oxygen therethrough.

4. A portable infant-incubator comprising a casing defined by a bottom, side and end walls, a plate having a support for an oxygen tank, said plate being hooked over the top of one of the end walls for ready engagement therewith and disengagement therefrom, a hood-shaped cover for said casing coextensive with the upper boundaries thereof hingedly mounted to the top thereof along one side for covering completely said casing, fastening means on the other side thereof

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for effecting a close fit of said cover on said casing and simultaneously securing said plate adjacent to said end wall, said cover having an opening in at least one side thereof and a transparent movable closure for said opening to permit access to the infant, and means including an opening in said casing for leading the oxygen from the oxygen tank into the interior of said casing for utilization by the infant.

5 5. A portable infant-incubator comprising a rectangular box-like casing having a bottom, two sides, head and foot end walls, a removable rack fitted within said casing having a platform spaced from the bottom of said casing for supporting an infant thereon, a plate provided with racks for a small oxygen tank and a transparent bottle of water, said plate being hooked over the top of the end wall at the head of the casing, a gable-shaped cover for said casing coextensive with the upper boundaries thereof hingedly mounted to the top thereof along one side for covering completely said casing, fastening means on the other side thereof for effecting a close fit of said cover on said casing and simultaneously fastening said plate adjacent to said end, and the head end wall of said cover having an opening therein adapted to have tubing inserted therein for conducting oxygen into the interior of the incubator following the travel thereof from said tank through the water in said bottle through which it is bubbled.

6. A device as set forth in claim 5 wherein a

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long handle for the incubator is mounted on the top of the cover extending for at least half the length of the incubator from the head end thereof towards the opposite end to facilitate portability of the incubator despite the variable center of gravity thereof as a result of the selective attachment of the oxygen tank unit thereto.

7. A portable infant-incubator unit comprising a main lower casing for bedding the infant and a closure for said casing, a carrier for supporting a source of oxygen for the interior of said incubator, said carrier being removably secured to the exterior surface of one end of said unit, and a long handle for said unit mounted on the top of said closure and extending from said one end more than half way towards the opposite end of said unit to enable the grip therealong to be varied in dependence on the variation of the center of gravity of said unit with and without said carrier.

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