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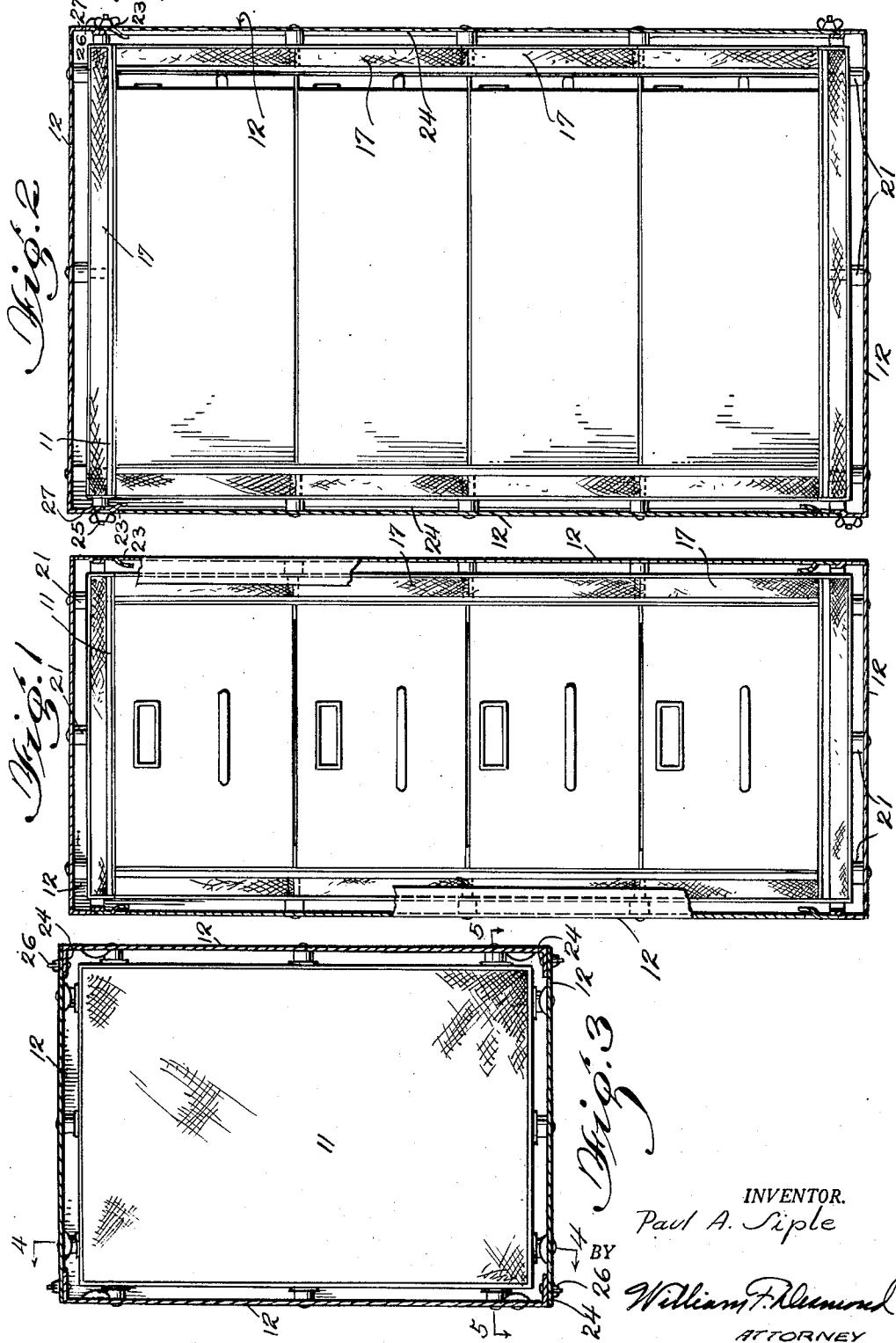
P. A. SIPLE

2,520,972

HEAT INSULATING COVER

Filed May 22, 1945

4 Sheets-Sheet 1



INVENTOR.
Paul A. Siple

William F. Remond
ATTORNEY

Sept. 5, 1950

P. A. SIPLE

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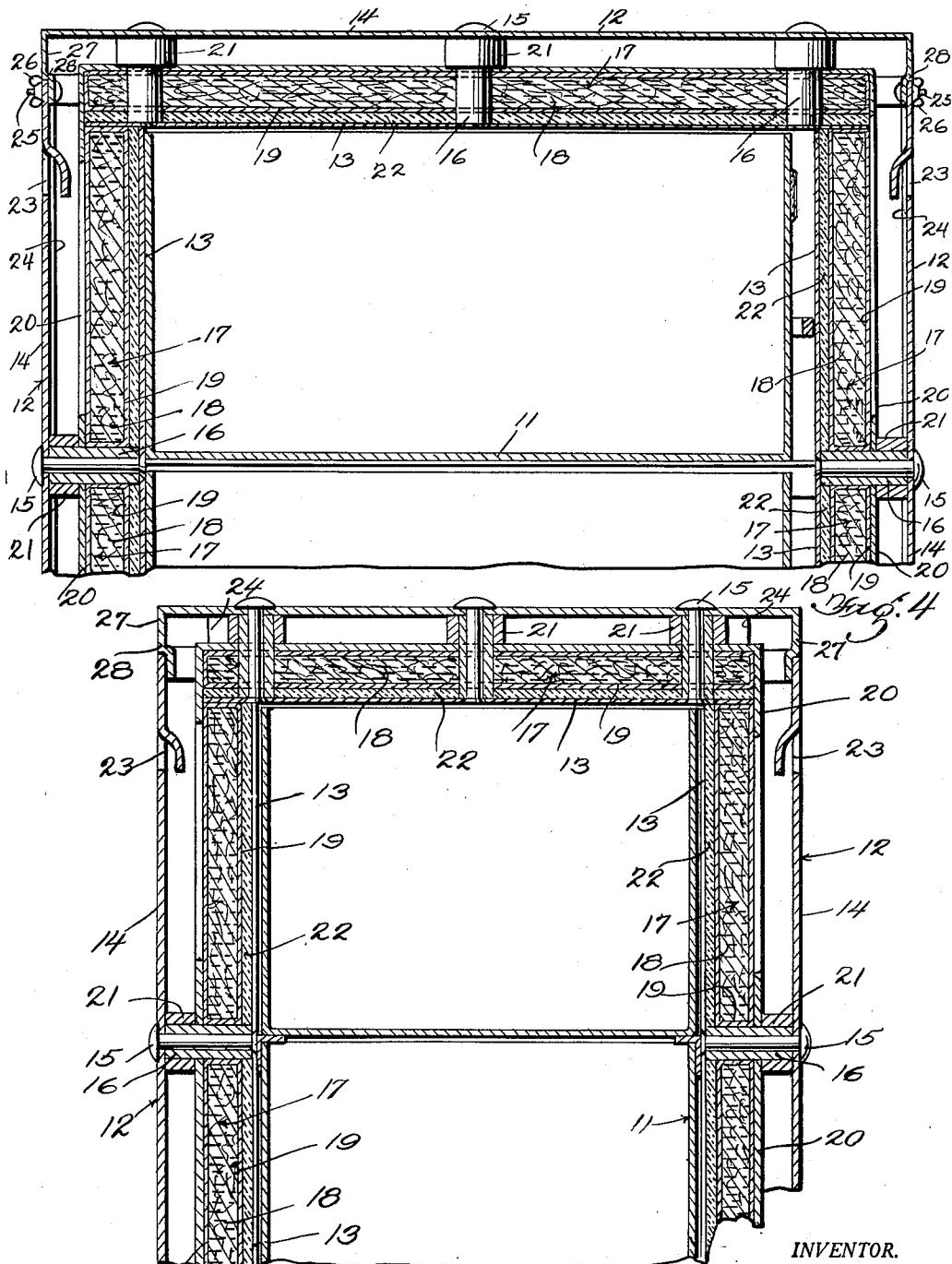


Fig. 5

BY Paul A. Siple

William F. Deenoud
ATTORNEY

Sept. 5, 1950

P. A. SIPPLE

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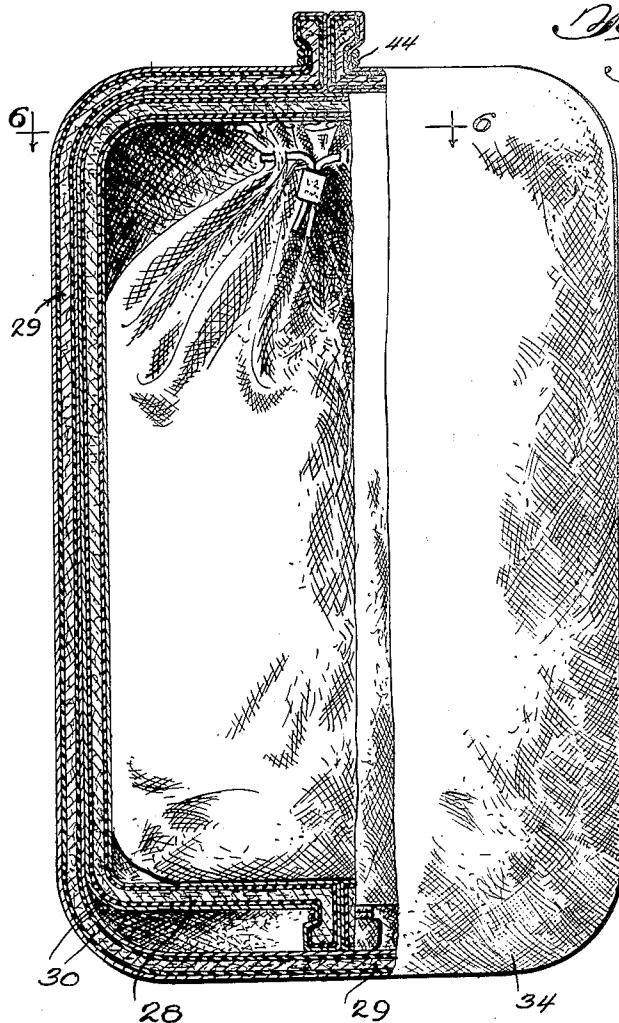


Fig. 6

Fig. 8

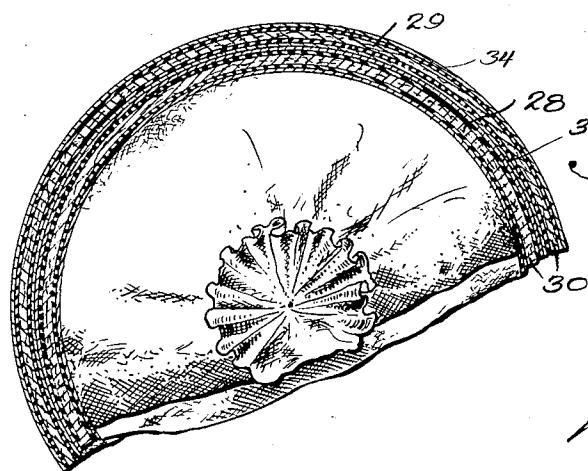
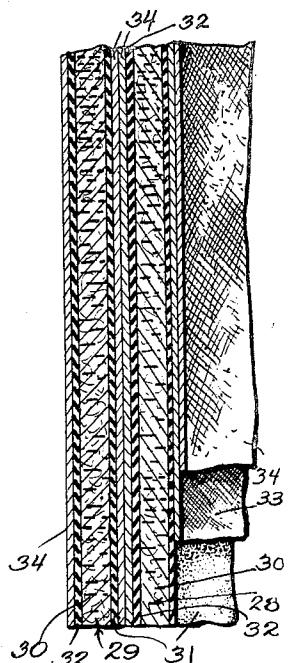


Fig. 7

INVENTOR.
Paul A. Sipple
BY
William F. Neumann
ATTORNEY

Sept. 5, 1950

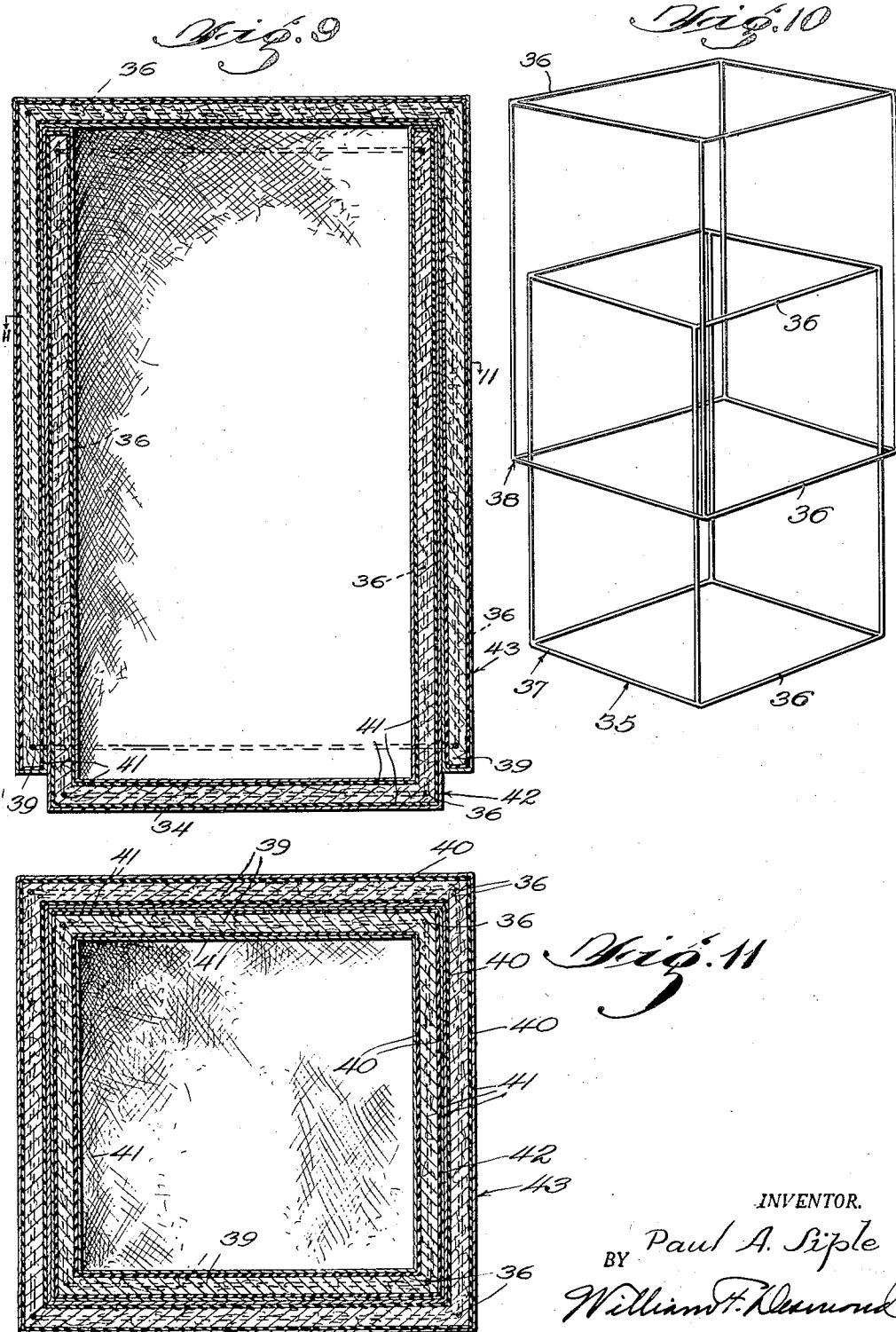
P. A. SIPLE

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HEAT INSULATING COVER

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4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

2,520,972

HEAT INSULATING COVER

Paul A. Siple, United States Army, Arlington, Va.

Application May 22, 1945, Serial No. 595,229

5 Claims. (Cl. 109—29)

(Granted under the act of March 3, 1883, as
amended April 30, 1928; 370 O. G. 757)

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The invention described herein, if patented may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

My invention relates to protective covers and more particularly to a cover for enclosing non-animate bodies of various sizes and shapes to protect them from flames and intense heat so constructed that it may be permanently or removably secured about the body and including means sealed within its walls for dissipating the heat therefrom under conditions of abnormal temperature.

In the past various means have been devised for protecting safes, file cabinets, mail pouches and other receptacles for containing or storing valuables of all kinds against heat and flames. In all of these covers the protection afforded is secured by thermally insulating the inner storage space from exterior heat, and various constructions have been devised for this purpose. The walls of the protective covers may be made from material of low heat conductivity, or a thermal insulating material may be disposed intermediate the inner and outer walls of the protective container, or a dead air space or spaces may be provided in these walls or various combinations of these constructions may be used. Such covers and containers are effective only to the extent that these specially constructed walls prevent conduction of heat inwardly, and in this respect they are often inadequate. Although flames may be prevented from reaching the interior compartments, nevertheless, so much heat is conducted through the walls that the objects or materials stored therein are scorched or damaged in other respects by the heat. The only means of preventing this is by increasing the thickness of the walls of the containers, but consideration of factors such as the space available or limits on permissible loads may limit the thickness of the walls. For example, pouches for carrying registered mail, air mail or valuable cargoes by train, ship or air express must not only be sturdy and compact but also light in weight so that the largest possible pay load can be carried on each trip. There is a practical limit to the permissible wall thickness in such containers or pouches which, if exceeded, destroys the usefulness of the container. The protective covers described and claimed in this application are particularly suitable, but not limited to use in such applications. As the description proceeds, it will be obvious that they are equally adaptable and effective for use in protecting stationary storage receptacles such as file

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cabinets, safes and storage boxes of all kinds. By making use of my invention it is possible to construct a heat insulating protective cover with relatively thin walls because I provide a vaporizable coolant sealed in the walls of the cover or container and releasable after a predetermined temperature is reached, for absorbing heat from the walls of the cover and dissipating it to the surroundings to prevent its transfer inwardly to the interior of the container. Thus, it is possible to provide ample protection with a relatively thin walled cover. It has been found that covers constructed in accordance with my invention are particularly suitable for use in protecting valuable

15 cargoes carried by airplanes because in the event the plane crashes and burns the fire, ordinarily, is of relatively short duration, but the heat generated is very intense. Sufficient coolant can be carried within the walls of my protective cover to prevent the transfer of heat therethrough for the duration of the fire. It is, therefore, an object of my invention to provide a new and improved heat insulating cover in which a coolant is provided in the walls of the cover for absorbing heat conducted into the walls and dissipating it to the surroundings after a predetermined temperature is exceeded.

20 Another object of the invention is the provision of a new and improved protective cover for normally stationary cabinets, safes and other receptacles for valuables which may be constructed in sections and dismountably secured about the receptacle to be protected to provide all around protection therefor.

25 Another object of the invention is the provision of the new and improved heat insulating cover which has a readily vaporizable substance having a high heat of vaporization non-escapably sealed within its walls at normal temperatures, but which is vaporized by abnormal external heat and as a vapor discharges outwardly from the walls carrying with it the absorbed heat of vaporization which is thereupon dissipated to the surroundings.

30 Another object of the invention is the provision of a new and improved heat insulating cover having laminated walls, including laminations which non-escapably retain a coolant therein at normal temperatures, but which upon heating of the walls above a predetermined temperature permits the escape of the coolant in vaporized form.

35 Another object of the invention is the provision of a new and improved heat insulating cover having outer wear resistant walls and having inner walls for non-escapably retaining a coolant

between the outer walls at normal temperatures, the exteriorly facing walls being weakened by abnormal external heat so that rupturing of these walls by the vaporized coolant is promoted and the vapor discharges through the outer walls thereby dissipating the absorbed heat of vaporization.

Another object of the invention is the provision of a new and improved heat insulating cover which is light in weight, durable and compact in construction, inexpensive to manufacture and which may be used in covering objects of various sizes and shapes.

These and other objects of the invention will become apparent from the following description and accompanying drawings in which, Figure 1 is a front elevational view of my improved cover secured on a file cabinet with the front panel removed to more clearly illustrate the construction and the manner in which my cover is mounted.

Figure 2 is a side elevational view of the protective cover shown in Figure 1 with a side panel removed.

Figure 3 is a top plan view partly in section, of the protective cover shown in Figure 1 with the top panel removed.

Figure 4 is a fragmentary sectional view taken on the line 4—4 of Figure 3.

Figure 5 is a fragmentary sectional view taken on the line 5—5 of Figure 3.

Figure 6 is a side elevational view partly in section showing a flexible heat insulating cover constructed in accordance with my invention.

Figure 7 is a partial top plan view partly in section, of the cover shown in Figure 6.

Figure 8 is a fragmentary sectional view showing the manner in which the walls of the cover shown in Figure 6 are constructed.

Figure 9 is a vertical sectional view showing a semi-flexible container constructed in accordance with my invention.

Figure 10 is a perspective view showing a skeleton for supporting the walls of the protective cover shown in Figure 9.

Figure 11 is a horizontal cross sectional view taken on the line 11—11 of Figure 9.

Referring to the drawings, in which similar characters of reference indicate similar parts throughout the several views, I have shown by way of illustration in Figures 1 to 5 a heat insulating cover for a file cabinet incorporating the principle of my invention. The file cabinet 11 is of standard construction and is surrounded by panels 12 which when assembled for a casing or housing completely enclose the cabinet. Each of these panels has inner and outer walls 13 and 14 respectively, of flat sheet metal of suitable thickness to provide a rigid self-supporting wall. The walls 13 and 14 are secured together in spaced relation by means of bolts or rivets 15 which carry a spacing sleeve 16 positioned thereon between the two walls for maintaining the walls in fixed spaced relation as shown in Figures 4 and 5. A plurality of thermal insulating pads 17 are secured in the space between panel walls 13 and 14, four pads of similar construction being shown in the side and end panels. Each of these pads consist of an inner layer of absorbent material 18 completely enclosed or jacketed by a layer of liquid and vapor impermeable material 19. The absorbent layer 18 is saturated with water before the impermeable jacket 19 is sealed about the pad so that each pad forms a unitary water jacket. The pads 17

are of such size that when placed in juxtaposed relation in the panel they completely overlie the inner wall thereof. Any material having high water absorbent properties such as Fiberglas cloth or wool may be used for the absorbent layer 18, and the impermeable jacket is made from a material impermeable to both liquid and vapor at normal temperatures, such as rubber or vinylite latex or any of the synthetic rubbers or plastics which are impermeable to both liquid and vapor. The pads in this form of the invention are not required to be flexible so the impermeable jacket 19 may be constructed from a rigid material if desired.

15 The bolts or rivets 15 are so spaced in the walls of the panel that they pass between adjacent pads 17 as shown in Figures 4 and 5, and the pads are held in place by a plurality of metal straps 20 extending from top to bottom of the panel. These straps have apertures through which the bolts 15 and sleeves 16 pass, and they are held in snug engagement with the outer face of the pads by means of spacing sleeves or blocks 21 secured on the bolts 15 over the spacing sleeves 16. These blocks 21 bear against the inner side of the outer wall 14 of the panel and the outer surface of the strap 20 as most clearly shown in Figures 4 and 5.

If desired a pad or layer of thermal insulating material 22 may be placed between the pads 17 and the inner wall 13 of the panel to prevent the transfer of heat from the pad 17 to the inner wall of the panel or to the walls of the cabinet, but this insulating layer is not absolutely essential in all cases because the temperature of the inner side of the pads 17 will rarely exceed the boiling point of water, and, except in unusual cases, this degree of temperature will not damage the contents of a file cabinet.

A plurality of vents 23 are provided in the outer walls 14 of each of the panels 12 to permit the escape of vapor from the interior of the panels. A vertically extending flange 24 is formed on each of the vertically extending edges of the outer walls 14 of the side panels of the cover by folding these edges inwardly through an angle of 90°. These flanges are secured to the outer edges of the outer walls 14 of the front and rear panels which extend beyond the edges of the inner walls of these panels to engage these flanges on the side panels. A plurality of bolts 25 are permanently secured in the flanges and engage in apertures adjacent the edges of the outer wall of the front and rear panels of the covering as shown in Figures 2 and 4. Wing nuts 26 are threaded on the outer ends of these bolts and, when tightened, secure the front and back panels to the side panels to form a housing having an open top and bottom.

60 The top and bottom panels of the covering are of similar construction to the side panels but the outer edges of the outer walls 14 of these panels are folded downwardly to form sides and ends 27 for these panels, and the free edges of these sides and ends are off-set inwardly as indicated at 28 in Figures 4 and 5 so that these edges of the top and bottom panels are receivable in the open top and bottom of the covering and snugly engage the edges of the outer walls 14 of the front, and side panels 12. If desired the off-set edges of the top and bottom panels and the adjacent edges of the vertically extending panels may be apertured for the reception of bolts for permanently securing the top and bottom panels to the vertically extending front, rear and side panels.

It will be apparent from this description that the panel construction which I have described provides a protective covering which may be quickly and easily installed about a cabinet or other storage receptacle or dismounted therefrom as desired, and when it becomes necessary to gain access to the interior, the front panel can be quickly removed. The construction described also permits ready dismantling of the separate panels so that the pads 17 may be replaced if that becomes desirable or necessary.

When the protective covering described above is subjected to abnormal heat the water in the pads 17 is vaporized and as the pressure in the pads increases the vapor ruptures the impermeable walls 19 of the pad and escapes to the space in the interior of the panel and from this space to the exterior through the vents 23 in the walls 14 of the panels. Escaping vapor carries with it the latent heat of vaporization absorbed by it in being vaporized and dissipates it to the surroundings. In this manner heat is carried from the walls of the cover and is prevented from being conducted inwardly through those walls, and, as a result, the interior compartment of the cover is maintained at a relatively low temperature.

If the walls of the pads 17 are constructed from a rigid material they are provided with vents which have stoppers adopted to be blown out by the vapor in the pad when its pressure exceeds a predetermined amount. Vents of this type may also be used if desired when the pads are provided with flexible impermeable walls, but rupturing of the impermeable walls will be facilitated by the action of heat because the heat tends to cause deterioration of these walls so that they are more easily ruptured. The absorbent layers 18 hold the liquid water after the impermeable walls are ruptured so that it does not leak from the pad.

For certain types of depositories for valuables such as safes or even in file cabinets a thermal insulating means constructed as above described may be built into the walls of the depository or cabinet. If this type of construction is applied to a safe the thermal insulating pads 17 are positioned in the walls of the safe under the outer armor plating of all of the walls including the door, and vents 23 are provided in those walls to permit escape of vapor. When the thermal insulating pads are built into a file cabinet an outer metallic shell is provided and the pads are secured in the space between the cabinet wall and the shell. A layer of thermal insulating material, similar to the layer 22, is preferably positioned between the walls of the cabinet and the pads and the drawers are provided with double front walls within which is inserted a heat insulating pad 17 and a thermal insulating layer.

In Figures 6 to 8, I have illustrated a form of my protective cover which has flexible walls and may be used to contain objects of various sizes and shapes or may be used for transporting valuables such as registered mail. This cover consists of two bags placed one over the other as illustrated in the drawings, but in many instances a single bag of this type will be sufficient. The double bag construction in addition to providing greater protection over the sides has the advantage of providing a permanently closed end of the bag over each end of the object.

In this form, the invention consists essentially of a plurality of sleeves having one end closed arranged one over the other in predetermined order to form an inner bag 28 and an outer bag 29. In Figure 8 I have shown a cross section

through the walls of these bags on a slightly enlarged scale. Each of the bags comprising this double cover includes an inner layer or sleeve 30 of any suitable water absorbent material similar to the absorbent material 18 used in the pads 17 of the modification first described. This sleeve is completely overlaid and underlaid by a layer of liquid and vapor impermeable material which forms an inner sleeve 31 and an outer sleeve 32 adapted to seal therein at normal temperatures the liquid coolant contained in the absorbent layer. A flexible material, similar to that previously described for use in the impermeable jacket 19, may be used in making these impermeable sleeves. The outer impermeable sleeve 32 of the inner bag 28 and both of the impermeable sleeves in the outer bag 29 are of reduced thickness with respect to the inner sleeve 31 of the inner bag 28 so that under conditions of external heat and internal pressure on these sleeves the thinner sleeves will rupture whereas the thicker inner sleeve 31 of the inner bag 28 remains whole and prevents vapor or liquid from reaching the space within the covering.

The inner bag 28 is provided with a sleeve 33 of thermal insulating material underlying the impermeable sleeve 31. This sleeve prevents the transfer of heat from the absorbent layer 30 of the inner bag 28 in cases where the heat is so intense or the period of exposure so long that the exterior heat penetrates the absorbent layer 30 of the inner bag 28.

The outer and inner surfaces of each bag are formed by sleeves 34 constructed from any durable wear resistant textile fabric. These sleeves protect the other layers of the bag from ordinary wear and from accidental damage by sharp objects.

In using this type of cover the objects to be protected are inserted in the inner bag and the open end thereof is drawn together and held in closed position by binding with a wire 44 or other non-combustible cord as shown in Figure 6. The inner bag is then inserted in the outer bag, openable end first, so that this end is overlaid by the permanently closed end of the outer bag and the open end of the outer bag is closed and secured in a manner similar to the inner bag. When this cover is subjected to abnormal temperatures the water in the absorbent layer 30 of the outer bag 29 begins to vaporize and at the same time the impermeable sleeves 31 and 32 of bag 29 are weakened by the heat. As the vapor pressure increases these impermeable sleeves are ruptured, and the vapor escapes outwardly through the outer wear resistant fabric sleeve 34. If the heat is so intense or the period of exposure so long that the absorbent layer 30 of the inner bag 28 becomes heated to the point where the vapor pressure increases sufficiently to rupture the outer impermeable layer 32 of this bag, then the vapor formed will pass outwardly through the outer bag and to the exterior and the heat carried by it is dissipated to the exterior. In this manner the interior of the covering is maintained in a cool condition.

The outer wear resistant fabric sleeve 34 and the outer impermeable sleeve 32 of the outer bag 29 will very likely burn off if the heat is intense, but this promotes rather than hinders the cooling action because it allows the vapor to escape more easily. The protected body will remain contained in the inner bag 28, fully protected by it, even though the entire outer bag burns off, but

this is not likely to occur in the fires ordinarily experienced.

It will be obvious that in some situations sufficient protection will be afforded when a single bag is used, and that other closure means may be provided for sealing the open ends of the bag.

In Figures 9 to 11 inclusive, I have shown a heat insulating cover of semi-flexible construction. In this form of the invention I provide a skeleton 35 formed from metallic bars or rods 36 which are secured together to form the outer lines of a rectangular shaped tray 37 and a cover 38 receivable over the tray. Walls of laminated construction are secured to the bars to form the sides and top and bottom of the completed cover. These walls include an absorbent layer 39 saturated with water and impermeable layers 40 which extend over all the surfaces of the absorbent layers 39 and along the edges thereof so that the water absorbed in the absorbent layers is non-escapably sealed therein at normal temperatures. The absorbent layer and the impermeable layers may be formed from any of the materials previously mentioned in connection with the similar layers in the other forms of the invention. The impermeable layers are preferably made of less thickness on the outwardly facing surfaces than on the inwardly facing surfaces or of a material more easily ruptured by heat so that these sides will rupture more easily than the inwardly facing sides when they are subjected to internal pressure by the vaporizing coolant.

To protect these layers from ordinary wear or from accidental damage a wear resistant layer 41 of textile fabric is provided completely jacketing the impermeable layer 40. In assembled relation a cover constructed as above described comprises a tray 42 and a cover 43 receivable over the tray as shown in Figure 9 and snugly engaging the sides of the tray. It should be obvious from the description given, that the container just described may be made in any size or shape desired and that when necessary, additional rods may be used at intermediate points in the skeleton to give greater rigidity to the framework.

This form of cover is maintained in a cool condition in a manner similar to that described with the other forms of the invention. The absorbed liquid in the layers 39 is vaporized by exterior heat and as the pressure increases and the walls 40 become weakened by the heat the vapor ruptures the outer walls 40 and escapes. In escaping to the surroundings, it dissipates to the exterior the latent heat of vaporization absorbed by it in vaporizing and thereby maintains the interior of the cover in a cool condition.

When covers of any of the insulating types mentioned above are to be used where the temperature drops below the freezing point of water it may be advisable to include an anti-freeze in the water to prevent its freezing. Various other modifications may be made in the invention to provide a heat insulating cover for particular objects or for use in special locations or for special purposes. For example, the tray and cover shown in Figures 9 to 11 may be provided with rigid outer walls instead of the textile fabric walls 41 as above described; or the thermal insulation of the last two modifications described may be obtained by using separate pads as in the first modification. The various specific structures described herein are illustrative only and are not intended to restrict the invention to any of the

particular forms described except as limited by the claims included herein.

What I claim as new and desire to secure by Letters Patent is as follows:

1. A flexible two piece heat insulating cover for protecting bodies of various sizes and shapes from external heat comprising inner and outer members adapted to be received one within the other, said members comprising spaced inner and outer sleeves, absorbent material contained in the space between said inner and outer sleeves, a coolant absorbed in said absorbent material, said coolant having a high heat of vaporization and being adapted to be vaporized when abnormal external heat is conducted into said space, inner and outer liquid and vapor impermeable sleeves in said inner and outer members for non-escapably sealing said coolant in said members at normal temperatures, said impermeable sleeves in said outer member and said outer impermeable sleeve in said inner member being of weakened construction with respect to the inner impermeable sleeve of said inner member to facilitate rupturing thereof under conditions of external heat and internal pressure, said vaporized coolant rupturing said weakened sleeves and escaping to the exterior, said escaping vapor dissipating to the exterior the absorbed heat of vaporization, thereby maintaining the interior of said cover in a cool condition, said members each having a permanently closed end and an open end adapted to be closed to form a bag completely enclosing the body to be protected, said permanently closed ends of said members being oppositely disposed when said members are placed on said body to provide a permanently closed surface over each end of said body.

2. A heat insulating protective cover comprising flexible laminated inner and outer walls disposed to form a confined space therebetween; absorbent material contained in said space; a coolant absorbed in said absorbent material, said coolant having a high heat of vaporization and being adapted to be vaporized when abnormal external heat is conducted through said outer wall, said outer wall being adapted to permit discharge of vapor therethrough, said vapor dissipating the absorbed heat of vaporization to the surroundings when escaping thereby maintaining the interior of said cover in a cool condition; a liquid and vapor impermeable lamination in said inner and outer walls for non-escapably sealing said coolant in said confined space at normal temperatures, said lamination in said outer wall being of weakened construction with respect to said lamination in said inner wall to facilitate rupturing thereof under conditions of external heat and internal vapor pressure, said cover having a permanently closed end and an open end adapted to be closed upon the contents to provide all around protection therefor.

3. A two-piece heat insulating cover comprising two interfitting laminated members of flexible material, each of said members having a permanently closed end and an opening facing in the direction of the closed end of the other member, and each of said members comprising spaced inner and outer flexible sleeves, a flexible absorbent material contained in the space within said inner and outer sleeves, said absorbent material being adapted to hold a liquid coolant having a high heat of vaporization and vaporizable when abnormal external heat is conducted into the space between said sleeves, liquid and vapor impermeable flexible laminations intermed-

diate said absorbent material and said sleeves for non-escapably sealing said coolant in said absorbent material at normal temperatures, at least one of said laminations being rupturable under conditions of external heat and internal vapor pressure whereby vaporized coolant may rupture said laminations and may escape to the exterior, said escaping vapor dissipating the absorbed heat of vaporization to the exterior, thereby maintaining the interior of said cover in a cool condition.

4. A two-piece heat insulating cover according to claim 3, wherein the outer laminations are of lesser thickness than the inner of said laminations, whereby rupturing of said outer laminations under conditions of abnormal heat is facilitated.

5. A heat insulating protective cover comprising flexible inner and outer walls disposed to form a confined space therebetween, a flexible absorbent material contained in the space within said inner and outer walls, said absorbent material being adapted to hold a liquid coolant having a high heat of vaporization and vaporizable when abnormal external heat is conducted into the space between said walls, said outer wall being adapted to permit discharge of vapor therethrough, said vapor dissipating the absorbed heat of vaporization to the surroundings when escaping thereby maintaining the interior of said cover in a cool condition, and liquid- and vapor-im-

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permeable flexible laminations intermediate said absorbent material and said walls for non-escapably sealing said coolant in said absorbent material at normal temperatures, at least one of said laminations being rupturable under conditions of external heat and internal vapor pressure, said cover having a permanently closed end and an open end adapted to be closed upon the contents to provide all around protection therefor.

PAUL A. SIPLE.

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