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# OPINION AND ORDER

This action for patent infringement arises under the patentlaws of the United States, Title 35 U.S.C. § 271, 281 et seq.The jurisdiction of this court is based on Title28 U.S.C. § 1338, andvenue lies in this district by virtue of Title28 U.S.C. § 1400(b).

This matter was tried to the court on February 5, 1968. Inaddition thereto, the court and counsel visited a steel mill inGary, Indiana, for the purpose of familiarizing the court with the pouring of steel molds and the use of the hot top inconjunction with the commercial product of the Carpenter patent. Subsequent to trial, counsel have prepared and submitted post-trial briefs along with proposed findings of fact and conclusions of law.

## THE PARTIES

Plaintiff, Oglebay Norton Company (hereinafter referred to as"Oglebay"), is a Delaware corporation with its principal place of business in the Hanna Building, Cleveland, Ohio. Defendant, Universal Refractories Corporation (hereinafter referred to as"Universal") is a Wisconsin corporation having its principal place of business at 9800 West Rogers Street, Milwaukee, Wisconsin.

## THE PATENT IN ISSUE

Oglebay is the owner of United States Letters Patent No.3,216,689 (hereinafter referred to as "Carpenter patent") issued to Oglebay on November 9, 1965, as assignee of Joel C. Carpenteron an application, Serial No. 233,949, filed on September 17,1962. The claimed invention relates generally to hot tops, butmore particularly to a multiple panel wrap-up unit for insertionin a reusable ingot mold hot top.

Hot tops are used by the steel industry in the casting of metalingots. Their function is to reduce or eliminate from the mainbody of a steel ingot the piping or shrinkage cavities that would otherwise be formed in the main body of the ingot as the steelpasses from the molten to the solid state.

Hot tops accomplish this desired result by providing areservoir (hereinafter referred to as a "sinkhead") at the upperend of the ingot mold, which sinkhead is insulated so that themolten steel in the sinkhead is kept molten while the steel in the mold solidified. Thus, during cooling and solidification of the steel in the mold, the hotter and more fluid steel in thesinkhead keeps feeding

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down into the main ingot body with theresult that the cavities are confined to the sinkhead which canbe discarded after solidification with a minimum loss of steel.

There are various types of hot tops employed by steelmakers, including a class known as "Adjustable Floating Hot Tops" which are made slightly smaller in cross section than the mold and areset into the upper end of the mold and supported on temporaryblocks that are removed immediately after the molten steel is poured so that the hot top floats with the molten steel during solidification. These adjustable floating hot tops include"Reusable" hot tops that can be used over and over for asubstantial number of heats but which require reconditioning and/or rebuilding to some extent for each successive pouring.

The Carpenter patent claims a multiple panel wrap-up unit forinsertion inside such a reusable hot top structure.<sup>1</sup> Ingeneral terms, this wrap-up insert unit consists of a pluralityof panel members which have a predetermined configuration andwhich are hingedly interconnected by a flexible means, such ascorrugated cardboard. This insert unit may be and is packaged andshipped in a flat position and then folded into a preselected,open-ended, hollow configuration for insertion into a reusablehot top so as to provide an insulating lining therefor. Thepanels of the insert unit are made of a material which weakenswhen subjected to the high temperature of molten steel so as tofacilitate removal of the hot top from the solidified sinkhead.The hot top is then rendered reusable by cleaningit out and inserting a new multiple panel insert unit.

More specifically, the hot top includes a permanent outercasing formed of cast iron having a central opening, preferablytapered, and provided with a refractory lining of relatively softinsulating brick (hereinafter referred to as "brick lining") that is in itself incapable of withstanding the heat of molten steel. In order to protect this brick lining against heat and mechanical damage, the hot top is provided with a panel insert unit whichincludes a plurality of heat collapsible panels formed of agranular refractory material (sandlike in appearance) bonded by aheat destructible binder. A flexible backing member (preferablycorrugated cardboard) is connected to the back sides of thesepanels. The panels are preformed to a particular shape and size, and when secured to this flexible backing member, they aredisposed in a side-by-side, spaced relation so that the entireunit may be shipped to the steel mill in a flat condition and readily wrapped up at the steel mill for insertion into there usable hot top casing. When the unit is wrapped up, the panelsmove from their side-by-side relation to edge-abutting positions with the edge surfaces of adjacent panels in area engagement. When inserted into the hot top casing, the cardboard backing is disposed between the back surfaces of the insulating (sandlike)panels and the insulating brick lining. When thus inserted into he hot top casing, a bottom refractory ring having a portionengageable with a portion of the bottom side of the insert unitis secured to the hot top casing to support the insert unittherein. When employed with a hot top having a tapered centralopening, the corrugated cardboard backing member and the panelsare suitably shaped, the panels having converging sides, so thatwhen wrapped up, the panels of the insert unit define a tapered pening through the hot top.

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Recited objects of the claimed invention are an improved method for emplacement of preformed hot top panel linings; improved methods for the packing, shipping, and assembly of such preformed panel linings; an improved means of venting the gases generated during the pouring of metal ingots; improved provisions for the stripping of the hot top from the ingot mold; and an improved veneer facing for the insulating lining of a hot top structure.

I find that all of these objectives of the claimed inventionwere in fact proved at trial with the exception of an improvedmeans of "venting the gases generated during the pouring of themetal ingots." There was much testimony about the effect of theburning of the corrugated cardboard, but I am satisfied that allof the claimed virtues of this effect were minor or incidental,were not contemplated by the inventor, and are of no realsignificance to the functioning of the Carpenter patent.

Claim 1 of the patent<sup>2</sup> recites the combination of a hot topcasing having acentral opening and a brick lining with a panel insert unit whichincludes a plurality of heat-collapsible refractory insert panelsand flexible material hingedly interconnecting the panels forrelative movement. The panels are composed of a refractorymaterial bonded by a heat-destructible binder to retard heattransmission. The flexible interconnecting material allows thepanels to be relatively moved from a side-by-side position where the adjacent edge surfaces face each other to an angularlyrelated position wherein the adjacent edge surfaces are in areacontact and define the opening in the casing.

Claim 2 is substantially the same as claim 1 except for therecitation that the casing has a tapered opening and the insertpanels are also tapered.

Claim 4 is substantially the same as claim 2 except that theflexible materialis recited as being corrugated cardboard, and the panels arerecited as having converging sides rather than being tapered.Claim 5 is similar to claim 4 except that the panels in theformer are not recited as having converging sides.

Claims 3 and 6 are identical to claims 2 and 5, respectively, except for the recitation of the refractory bottom ring forsupporting a panel unit.

Universal's Exhibit No. 34, reproduced here illustrates thefeatures<sup>3</sup> of the

claimed invention. This figure is a view partly in elevation and partly in section of a hot top constructed in accordance with the claimed invention and shown mounted in the open upper end of aningot mold (29). It discloses the upper (10) and lower (11)sections of the metal casing of the hot top; an integral inwardly extending canopy or flange (12) at the upper end of the metal casing (10); an integral inwardly extending lip or flange (13) atthe lower end of the metal casing (11); the insulating fire bricklining (21); sealing compound (28); flexible material (preferably corrugated cardboard) forming a backing sheet for the preformed panels (42); and the preformed panels consisting of

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anessentially self-sustaining refractory supporting layer (47) having integrated therewith on one side an exothermic facing layer (48).

The patent statutes, Title 35 U.S.C. prescribe threerequirements of patentability; namely, novelty, utility, andnonobviousness as set forth and defined in §§ 102 and 103. Thesole question for the court's determination in this particularaction, however, is whether claims 1 through 6 of the patent inissue are valid over the prior art.<sup>4</sup> More particularly,invalidity of the Carpenter claims is asserted on the ground thatthey do not meet the statutory requirement of nonobviousness setforth in § 103<sup>5</sup> which provides that a patent may not beobtained if the differences between the subject matter sought tobe patented and the prior art are such that the subject matter asa whole would have been obvious to a man having ordinary skill inthe art at the time the invention was made. Universal hasadmitted that if these claims are found by the court to be valid, they have been infringed by the defendant.<sup>6</sup>

The defense of obviousness having been raised, it becomesnecessary for this court (1) to determine the scope and contentof the prior art; (2) to ascertain the differences, if any,between the prior art and the claims at issue; and (3) todetermine the level of ordinary skill in the pertinent art at thetime of the claimed invention. Graham v. John Deere Co.,383 U.S. 1, 14, 86 S.Ct. 684, 15 L.Ed.2d 545 (1966).

#### SCOPE AND CONTENT OF THE PRIOR ART

Defendant has cited twenty-three prior art patents which itfeels indicate that the claimed invention was obvious in light of the scope of the prior art. The following patents are those that I deem most pertinent.

Mueller patent No. 3,039,158 discloses a reusable hot topstructure having an outer metal casing with a brick lining and avertically tapered opening for being positioned at the upper endof an ingot mold and a plurality of individual and separatetapered panels for insert therein which have converging sides. The individual panels are so shaped that when they are inposition within the outer metal casing, their edge surfaces aredisposed in a parallel relation with adjacent edge surfaces inengagement over a substantial area. These panels are composed of a refractory supporting layer and an exothermic facing layer. Inaddition, the exothermic layer is described as containing aheat-destructible binder. The exothermic layer forms the frontsurface and defines the tapered hottop opening; the refractory layer constitutes the back surfacewhich faces the brick lining of the metal casing. A notchedbottom ring is provided for supporting the individual panelinserts.

The British patent No. 776,290 discloses a reusable taperedhot top structure constructed to be supported at the upper end ofan ingot mold and having a brick lining and a plurality of individual and separate refractory insert panels which haveadjacent edge surfaces disposed in an abutting relation when thepanels are within the hot top casing so as to provide a heat andmechanical damage barrier for the brick lining. The suggested panel composition does not include heat destructible materials,but

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the patent does make mention of the possible inclusion of carbonaceous material which, if added in sufficient amounts, would render the panels friable or heat collapsible.

The Eayrs patent No. 2,361,386 discloses a single-use hot topstructure arranged to be positioned inside the upper end of aningot mold. This structure is not designed for use in a reusablehot top. It consists of a plurality of panels (part exothermicand part refractory) which are hinged together by a flexiblematerial, such as wire. This flexible means of connecting thepanels permits the assembly to be stored and shipped in a flatposition and then folded into an angularly related positionwherein the edge surfaces are in area contact, at which time theassembly is ready for use. The initial panel ingredients includea percentage of burn-out material, but this material is burnedout in the baking or maturing of the panels, a process whichoccurs in preparing the assembly for subsequent use as a hot top.

The Swedish patent (Wahlstrom) No. 142,479 is another patentwhich deals with hot tops as such and not insert units forreusable hot tops. It discloses both single-use and reusable hottop structures adapted to rest in the notched upper end of aningot mold. These assemblies consist of a plurality of individualinsert panels composed of a variety of materials.

One variation suggests that the panels consist of perforatedsheet metal. The side of the panel facing the ingot is coatedwith a refractory material having a heat-destructible binder. Theside of the panel facing the mold wall is painted with areflective substance, i.e., aluminum paint. When inserted, thepanels are bent towards the mold wall at their end sections, thusforming a closed air space between the mold and the panel whichincreases the insulating ability of the structure. After use themetal panels are cleaned and then recoated for further use.

Another variation discloses a panel backing consisting of corrugated cardboard, the inward side of which is coated with arefractory material having a heat-destructible binder so as tofill the areas between the corrugations. The crests of the corrugations on the other side contact the wall of the ingot moldso as to provide a relatively closed insulating air space. Apanel of such composition is in most cases completely lost aftera single use.

The French patent (Vayda) No. 1,215,009 discloses both areusable hot top assembly to be positioned at the upper end of aningot mold and a prefabricated ingot mold lining. Figures 1 and 2disclose a prefabricated lining to be positioned in the upper endof an ingot mold and consisting of one or more layers of corrugated cardboard, or a similar cellulose base material, impregnated with refractory material — with or without anadditional layer of exothermic material facing the wall of theingot mold. When the impregnated cardboard comes into contact with the molten metal it is carbonized, leaving a layer of carbonadhering to the wall of the ingot mold. This carbon layer, inturn, constitutes a barrier which reduces the loss of heatthrough the wall of the mold. The optional exothermic layer, through the production of additional heat, further reduces theoverall heat loss from the topof the ingot mold. While the disclosures suggest gluing thelining to the walls of the ingot mold, there is

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an indefinitereference to "another element" which could be folded togetherduring manufacture and later unfolded and suspended from theupper rim of the mold by means of metal straps.

Figures 3 through 7 disclose corrugated cardboard (eitherunimpregnated or impregnated with refractory material) formedinto one or more envelopes containing exothermic materialcombined with a binder. The carbonizing of the cellulose baseenvelope will again produce a carbonized layer which provides auniform development of the heat being produced by the enclosedexothermic material. The heat is also developed over a longerperiod of time. This variation may also be glued to the walls of the ingot mold or suspended from the upper rim of the mold bymeans of metal straps. The envelope or envelopes may be used toline either a hot top assembly or the upper end of the ingot molditself.

Figures 8 and 9 disclose a prefabricated ingot mold liningconsisting of one or more bands of corrugated cardboard, orsimilar cellulose base material, impregnated with refractorymaterial and covered with exothermic plates placed side-by-sideon the surface of the cardboard facing the mold wall. This"flexible belt of elements placed side by side" may be eitherglued to the walls of the ingot mold or suspended from the upperrim of the mold by means of metal straps.

The British patent No. 832,555 discloses an insert unit foruse in unlined hot tops, or risers of ingot molds, including aplurality of long narrow strips of either refractory orexothermic material, or a composite of the two, mounted on aflexible means — wires or a strip of flexible fabric, asbestos, or the like — which may be mounted in a flat position forshipment or storage and arranged in a circular fashion forinsertion into a hot top. The insert may be bent into an arc withthe strips facing either toward or away from the wall of the hottop, depending on whether the strips are spaced apart or mountedcontiguously on the flexible material. In another variation, thestrips may be mounted on the flexible support so that they arecapable of movement along the length of the support. This has theadvantage that any degree of curvature likely to be required inpractice can be accommodated by the one flexible material, thelength of the curve being set by the length of the flexiblesupport used and the strips being moved along the wire intocontiguous relationship so that an unbroken curve of the materialis obtained.

The De Maison patent No. 3,106,756 discloses, for use eitheras a single use hot top or as a single use liner for the metalcasing of a hot top, preformed refractory mineral wool bats withor without wire mesh backings. These bats may be long enough tobe bent into the proper shape and bound with wire or steel bandsto form a single-use hot top or a liner for a reusable hot top,or they may be in the form of a plurality of smaller panels sothat a plurality of panels may be assembled to form the hot topor may be assembled into a metal shell or casing. The De Maisonclaims also show a reusable hot top structure in which the metalcasing of the hot top is formed of a plurality of plates of expanded metal mesh, or plates of sheet metal, hinged togetherand having a single mineral wool bat fastened to the innersurfaces of the shell so that the whole structure can be wrappedup to form a hot top.

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Universal also relies upon Oglebay's prior art wet mud process.Since the early 1930's Oglebay has manufactured and sold reusablehot tops under the trade name "C & D Hot Tops," which hot tops inthe form originally introduced and sold consisted of a hollowcasing of cast iron within which is a reusable hard refractorylining (not brick) having an average life of 30 to 40 heats.Attached to the bottom of the casing by suitable wire springclips is a refractory bottom ring which protects the bottom endof the casing and which must be replaced after each heat.Extending between the bottom ring and the innersurface of the ingot mold are sheet metal wiper strips, whichalso must be replaced after each heat and which prevent themolten steel from rising between the ingot mold and the hot top at the desired level in the upper end of the mold, and removal of these blocksafter pouring of the ingot renders the hot top full floating.

At least as early as 1950, Oglebay began the manufacture and sale of another form of reusable hot top under the trade name "Low Volume C & D Hot Top" in which the hard refractory liningused in the original "C & D Hot Top" was replaced by a layer of lightweight insulating brick having higher heat insulating value. The use of lightweight insulating brick in Oglebay's "Low VolumeC & D Hot Top" increased the insulating value of the hot topresulting in greater thermal efficiency and enabling thesteelmakers to increase the yield from the ingots, but this lightweight porous brick, when subjected to molten steel, would have had a useful life of only one or two heats and was not of itself practical from a cost standpoint.

The lightweight porous brick was therefore provided with aprotective lining emplaced in the hot top in the form of a wetmud approximately one-half inch in thickness extending over theentire interior surface of the insulating brick lining from thebottom ring to the upper end of the hot top. The wet mudprotective lining is of a composition (including refractory andheat-destructible materials) such that when thoroughly dried, itforms a monolithic protective veneer strong enough to preventpenetration of the molten steel and of sufficient thickness toprovide a temperature drop to a value which the insulting brickcould withstand for thirty to thirty-five heats.

This protective veneer or lining and the bottom rings withstandonly a single use, and, accordingly, it is necessary for thesteelmaker to recondition the hot tops after each use by cleaningthe spent veneer from the hot top, applying a new bottom ring, applying a new coat of veneer-forming mud, and thoroughly dryingthe remade hot top to remove the moisture from the veneer. Thereare, however, inherent difficulties in the use of the wet mudprocess such as the time and labor required to recoat theinsulting brick, the danger of nonuniform coating if done byhand, the expense of the complicated machinery necessary forreapplying the wet mud automatically, and the necessity of properly and thoroughly drying the wet mud before reusing the hottop.

## DIFFERENCES BETWEEN THE PRIOR ART AND THE PATENT IN SUIT

It is apparent from my study of the prior art references and the testimony of the expert witnesses

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concerning the scope of such prior art that while the individual elements of the Carpenter claims are embodied in one or more of the prior artreferences, no one prior art reference cited by the defendant discloses all of the elements of any one of the Carpenter claims. Nor does the prior art disclose or even suggest the use of these individual elements as part of a wrap-up insert unit forprotecting the brick lining of a reusable hot top. I have also concluded that none of the prior art references provides anywherenear as satisfactory a solution to the problems of the hot top industry as does the Carpenter patent.

Mueller Patent No. 3,039,158. This patent was the culmination fresearch done by Mueller during 1952-53 as an employee of Oglebay's research and development department. The objective of Mueller's research was to eliminate the problems associated with Oglebay's previously developed wet mud process for reconditioninghot tops. Mueller attempted to develop a new method that would substitute for the wet mud veneer a plurality of precast and properly shaped panels that could be manufactured for individualinsertion and fitting into a hot topcasing so as to provide a mechanical and heat damage protectivebarrier for the porous brick lining of the metal casing.

Although Mueller's objective was the same as that of Carpenter, the Mueller patent No. 3,039,158 differs from claims 1 through 3of the Carpenter patent in two respects. Mueller teaches the useof individual panel inserts; it does not disclose the flexible interconnection of such panels so as to form an integral wrap-uppanel insert unit such as is embodied in the Carpenter claims.

Second, the use of a heat-destructible binder is limited in theMueller claims to the exothermic panel layer. Although theevidence indicates that Mueller tested panels composed of refractory material combined with a heat-destructible material, the Mueller patent does not disclose a heat-destructible binderas part of the refractory layer. In fact, Mueller concluded that the problems which he had encountered with his panels could not be solved merely by varying the panel composition.

Claims 4 through 6 of the Carpenter patent are furtherdistinguishable from the Mueller disclosures in that claims 4through 6 specifically suggest the use of corrugated cardboard asthe flexible interconnecting material.

The Mueller patent has never been commercially adopted becauseof the structure's inadequacies — awkwardness of insertion, leakage between panels, and unsatisfactory stripping<sup>7</sup> characteristics. In short, Carpenter succeeded where Muellerfailed.

The British patent No. 776,290 may be similarly distinguished from the Carpenter patent in that the British patent No. 776,290 also does not disclose a wrap-up insert unit, nor does it teachin any manner the flexible interconnection of the individual panel inserts by means of corrugated cardboard or other flexiblematerial. A further distinction would appear to be the specific reference in the Carpenter claims to the use of a panel composition which includes a heat-destructible binder. While the British patent does mention the possibility of altering the panel composition "[w]here desirable \*\*\* to

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include coke braise orequivalent carbonaceous material," this single reference, in andof itself, cannot be said to specifically disclose the use of apanel composition that includes a heat-destructible binder.

The Eayrs patent No. 2,361,386, unlike the Carpenter patent,pertains to a single-use hot top. In fact, only Mueller patentNo. 3,039,158, British patent No. 776,290, and Oglebay's priorwet mud process pertain to a refractory lining designed toprotect the brick lining of a reusable hot top casing.<sup>8</sup> Asingle-use hot top is of more basic construction, and its component parts are discarded (for hot top purposes) after asingle pouring. Such a structure has neither an outer metalcasing nor a porous refractory lining, and therefore the Eayrspatent is not concerned with the problems of protecting the bricklining of a reusable hot top from damage due to excessive heat orinadequate stripping. Nevertheless, the Eayrs patent does teachthe use of flexible means to connect individual refractorypanels. It does not suggest, however, that corrugated cardboardbe used as the flexible material. Also, unlike the panelsdisclosed in the Carpenter claims, the Eayrs panels, when readyfor use, do not include heat collapsible materials or aheat-destructible binder.

The Swedish patent (Wahlstrom) No. 142,479 teaches the use of individual insert panels to form either a single-use or reusablehot top structure adapted to rest in the notched upper end of aningot mold. The claimed invention does not pertain to a wrap-upinsert lining designed to protect the brick lining of a reusablehot top. Nonetheless, Wahlstrom does disclose a panel composition consisting of a refractory material having a heat-destructiblebinder as well as the use of corrugated cardboard as the backingmaterial for such panels. On the other hand, the Wahlstromdisclosures do not suggest the mounting of several panels on asingle piece of corrugated cardboard — or that if so mounted suchpanels should be so spaced and shaped as to permit wrapping up of the cardboard to form an insert liner with the edges of thepanels in area contact. Nor do the Wahlstrom disclosures suggestthat corrugated cardboard be used to serve any purpose other thanto provide a corrugated back face and a reinforcement for therefractory material of each single panel.

Figures 1, 2, 8, and 9 of the French patent (Vayda) No.1,215,009 differ from the Carpenter patent in that they disclose a lining for use in the upper end of an ingot mold itself — not alining for use in a reusable hot top. Figures 3 through 7 indicate a lining that may be used in either the upper end of aningot mold itself or in a reusable hot top without a refractorybrick lining.

It is not clear from the Vayda patent as to whether thestructures shown in figures 1 and 2 employ one continuous liningelement or separate lining panels. If the former is the case, impregnated cardboard, while flexible enough to be bent along the incumference of the mold, is not flexible enough to be bent orfolded at the angles necessary to render the lining a wrap-upinsert without cracking or breaking the backing material. If the latter is the case, the invention discloses separate panels and not an integral wrap-up insert unit. Figures 1 and 2 may befurther distinguished from the Carpenter disclosures in that neither of these figures indicate that the refractory material includes a heat-destructible binder. Figure 2 also differs from Carpenter in that the exothermic layer in figure 2 lies between the corrugated cardboard and the ingot wall, while in Carpenterthe exothermic layer is

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positioned between the refractory layerand the molten steel.

The disclosures corresponding to figures 3 through 7 of theVayda patent refer to both a single envelope and a plurality of envelopes. In the latter case, the disclosures do not make itclear whether the plurality of envelopes are joined in any mannerprior to their insertion in the ingot mold. If the liningconsists of a single envelope, and even if the inner side of the envelope is not impregnated, as suggested in one variation, theimpregnated outer surface of the single envelope, like the continuous lining element of figure 1, would appear incapable of constituting a wrap-up unit due to the relative inflexibility of such an element. Likewise, if the lining consists of several unconnected envelopes, the invention does not disclose an integral wrap-up unit. If, on the other hand, the individual envelopes are joined in some undisclosed manner, and such undisclosed joinder were sufficiently flexible, then such avariation on the invention could constitute an integral wrap-up unit. In any event, however, none of the variations of figures 3 through 7 indicate that the refractory material used to impregnate the cardboard contains a heat-destructible binder.

Figures 8 and 9 of the Vayda patent disclose a "flexible belt" or lining for insertion in an unlined hot top assembly and consisting of exothermic plates mounted on corrugated cardboardwhich has been impregnated with a refractory material. This configuration, however, differs from the Carpenter disclosures inmany respects. The cardboard backing disclosed in Carpenter isnot impregnated and, therefore, is more flexible than theimpregnated backing disclosed in Vayda. In fact, the latter, while constituting a "flexible" backing, is not flexible enough that it could be bent at the angles necessary to render the structure awrap-up lining without breaking or cracking the lining itself.Second, the Carpenter cardboard backing is interposed between therefractory lining of the hot top casing and the outer orrefractory layer of the plates. In Vayda, by comparison, thecardboard backing is attached to the front or inner face of theplates so that it is directly exposed to the molten steel when he ingot is poured. Third, the panels in Vayda do not include arefractory layer. While the cardboard is impregnated with arefractory material, there is no indication that this materialincludes a heat-destructible binder. Fourth, while the disclosures corresponding to figures 8 and 9 of Vayda disclose that the exothermic plates are to be positioned on the cardboardbacking in a side-by-side position, the disclosures do not indicate whether the plates are so arranged that when inserted in he ingot mold the adjacent edges of the panels will be in areacontact so as to prevent any leakage of the molten steel.

The British patent No. 832,555 is intended for use in acylindrical, unlined hot top assembly or in the riser of an ingotmold. As such, it is not concerned with the problem of protecting the brick lining of a reusable hot top assembly as is disclosed in the Carpenter patent.

The British patent, while illustrating the use of flexiblematerial to join individual refractory and/or exothermic strips, does not suggest the use of corrugated cardboard as a flexible backing material. Moreover, while in figures 4 and 5 of the British patent the strips are arranged so as to be in single edgeabutment when in position for use, the strips are not arranged so as to provide area contact

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between the adjacent edges of thestrips regardless of which way the supporting web is bent. Thislack of area contact would render the British disclosureinadequate for protecting the brick lining of a hot top casing asis found in the Carpenter patent.

Furthermore, unlike the Carpenter disclosures, the Britishpatent discloses neither the use of a refractory material with aheat-destructible binder in the strips or panels nor an insertunit for use in a tapered hot top assembly.

The De Maison patent No. 3,106,756 discloses the use of aflexible or hinged backing for the mounting and support of refractory panels or lining. It makes this disclosure, however, not in the context of an insert unit designed to protect therefractory lining of a reusable hot top, but rather in connection with either a single-use hot top or a lining for a single-use hottop.

The Carpenter patent may be further distinguished in that DeMaison does not disclose the use of corrugated cardboard as aflexible backing material or the inclusion of a heat-destructiblebinder in the refractory material, whatever its form. Nor does DeMaison disclose a tapered unit, or panels with converging sides, or panels with area contact between the adjacent edges of thepanels when placed in position for use.

The differences between the Carpenter patent and Oglebay'sprior wet mud process that has been cited by Universal arereadily apparent. The wet mud process does not involve the use ofpanels of any kind; it does not, therefore, teach the flexible interconnection of panels; nor can the application of aprotective wet mud lining be said in any way to constitute the insertion of a prefabricated wrap-up insert lining.

# LEVEL OF ORDINARY SKILL IN THE ART AT THE TIME OF THE PATENT INISSUE

In determining the obviousness or nonobviousness of the claimed invention, the court is required to place itself in the position f a hypothetical person having ordinary skill in the hot top artat the time of the claimed invention. Goodyear Tire & Rubber Co.v. Ray-O-Vac Co., 321 U.S. 275, 64 S.Ct. 593, 88 L.Ed. 721(1944); Gass v. Montgomery Ward & Co., 387 F.2d 129 (7th Cir.1967); Walt Disney Productionsv. Fred A. Niles Communications Center, Inc., 369 F.2d 230,234-235 (7th Cir. 1966).

Design of hot tops and their various functional elements isprimarily the province of the research and developmentdepartments of companies which supply hot tops to the steelindustry. Persons so employed are, without doubt, skilled in theart. While the laborers and supervisors who work with hot topsacquire a degree of familiarity with their functions and shortcomings, when it comes to determining the level ofordinary skill in the pertinent art, it would appear that inthis instance we must restrict ourselves to that class in theindustry whose primary objective is the research and development of the pertinent art. As a result, our hypothetical person, whilenot necessarily a patentee, possesses those educational andtechnical skills ordinarily found in persons working in

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theresearch and development departments of the hot top industry. Ourhypothetical man will also possess a high degree of practical experience with the subject matter of his research.

In addition to such technical and practical expertise, a manskilled in the art is chargeable with knowledge of all of theprior art references in the field in which he is working and alsoof all devices in the field which have been in prior public use —L.S. Donaldson Co. v. LaMaur, Inc., 299 F.2d 412 (8th Cir. 1962)— and this is true whether or not he specifically knew of theexistence of such prior art devices. Walker v. General MotorsCorp., 362 F.2d 56, 60 (9th Cir. 1966); Armour ResearchFoundation v. C.K. Williams & Co., 280 F.2d 499 (7th Cir. 1960);Hobbs v. Wisconsin Power & Light Co., 250 F.2d 100 (7th Cir.1957).

Thus, the man having ordinary skill in the hot top art is onewith the educational background and experience normally found in the members of the industry's research and developmentdepartments and a familiarity with all prior art devices, bothpatented and otherwise. It is against this standard of knowledgeand skill that the obviousness or nonobviousness of the Carpenterinnovation must be determined.

Having thus determined the scope and content of the prior art, ascertained the differences between the prior art and the claimsat issue, and determined the level of ordinary skill in thepertinent art at the time of the claimed invention, it nowbecomes necessary for the court to rule on the issue of obviousness.

#### PRESUMPTION OF VALIDITY

Our determination begins with Title 35 U.S.C. § 282 which declares:

"A patent shall be presumed valid. Each claim of a patent (whether in independent or dependent form) shall be presumed valid independently of the validity of other claims; dependent claims shall be presumed valid even though dependent upon an invalid claim. The burden of establishing invalidity of a patent or any claim thereof shall rest on the party asserting it."

Since there is a presumption which attaches to a Patent Officegrant, the party alleging the invalidity of a patent has theburden of proof which he must establish by clear and cogentevidence. Ortman v. Maass, 391 F.2d 677 (7th Cir. 1968); WaltDisney Productions v. Fred A. Miles Communications Center, Inc.,369 F.2d 230, 234 (7th Cir. 1966); Copease Mfg. Co. v. AmericanPhotocopy Equipment Co., 298 F.2d 772, 777 (7th Cir. 1961);Artmoore Co. v. Dayless Mfg. Co., 208 F.2d 1, 3 (7th Cir. 1953).

But Universal contends that the Carpenter patent is notentitled to this statutory presumption of validity becausepertinent prior art references were not cited or considered bythe Patent Office. In so doing, Universal relies on that line of authority which holds that there is little, if any, presumption of validity as against relevant prior art not shown to have been considered by the Patent Office.<sup>9</sup> Howe v.

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General Motors Corp., 401 F.2d 73(7th Cir. 1968); Novo Industrial Corp. v. Standard Screw Co.,374 F.2d 824 (7th Cir. 1967); T.P. Laboratories, Inc. v. Huge,371 F.2d 231 (7th Cir. 1966); Skirow v. Roberts Colonial House, Inc.,361 F.2d 388 (7th Cir. 1966).

The Patent Office records contain no express reference to Mueller patent No. 3,039,158 or British patent No. 776,290, patents which this court has found to constitute a part of therelevant prior art.

As the court concluded earlier, the individual elements of theCarpenter claims are embodied in one or more of the prior artreferences, but no one prior art reference discloses acombination which contains all of the elements of any one of theCarpenter claims. Where such is the case, it cannot be said thatany one prior art reference is more pertinent than another, forto the extent that prior art references disclose elements of theCarpenter combination not disclosed in the other references, theymay be said to be equally pertinent. Rather, it would appearlogical to conclude that a combination patent is not entitled to presumption of validity as against uncited prior art whichdiscloses elements of the claimed combination not to be found in the Patent Office references of record, as shown to have beenconsidered by the Patent Office.

A comparison of Mueller patent No. 3,039,158 and British patentNo. 776,290 with the prior art references cited or considered bythe Patent Office reveals that these two patents not onlydisclose elements of the Carpenter combination not found in thePatent Office references, but also disclose combinationscontaining a greater number of the elements comprising theCarpenter combination than any of the combinations contained in the Patent Office references. Therefore, this court is of theopinion that the Carpenter patent is not entitled to apresumption of validity as against Mueller patent No. 3,039,158 and British patent No. 776,290. In so holding, the court believesthat its ruling is consistent with recent authority in this area.See Howe v. General Motors and related authorities cited, supra.

As to Oglebay's contentions that Mueller patent No. 3,039,158 and British patent No. 776,290, or the subject matter thereof,was in fact considered by the Patent Office, the fact thatMueller patent No. 3,039,158 is classified in Class 22, Subclass147, the same class and subclass that the examiner searched andin which he found every one of the United States patents which hecited, does not give rise to an inference that the examinerstudied the Mueller patent and discarded it as adding nothing tothe prior art which he chose to cite. On the contrary, theSeventh Circuit Court of Appeals has made it clear that "there isno presumption that a patent is valid as embodying an inventionover pertinent prior art not cited or considered by the PatentOffice. \* \* \* There can be no presumption that the examinerreviewed and discarded it. It is more likely that he missed it."A.R. Inc. v. Electro-Voice, Inc., 311 F.2d 508, 512-513 (7th Cir.1962). See Milton Manufacturing Co. v. Potter-Weil Corp.,327 F.2d 437 (7th Cir. 1964.)<sup>10</sup>

Nor does the court agree with Oglebay's contention that certainstatements in the Carpenter application constitutea disclosure of these two patents. Rather, the court believes that these general

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references as to what is shown in the priorart fall far short of suggesting the specific constructions andteachings of Mueller patent No. 3,039,158 and British patent No.776,290.

#### OBVIOUSNESS

While combinations of prior art obvious to one skilled in theart are not patentable, a combination of old elements in a mannerthat is unobvious to one skilled in the trade and which produces a new and useful result may be patented. Graham v. John Deere,383 U.S. 1, 86 S.Ct. 684, 15 L.Ed.2d 545 (1966); Ortman v. Maass,391 F.2d 677 (7th Cir. 1968); Welsh Co. v. Chernivsky,342 F.2d 586 (7th Cir.), cert. denied 382 U.S. 842, 86 S.Ct. 68, 15L.Ed.2d 83 (1965).

Defendant argues that it would have been obvious to a manhaving ordinary skill in the hot top art in 1962(1) to make thepanels of either Mueller or British patent No. 776,290 heatdestructible as taught by Oglebay's own wet mud process or bySwedish patent No. 142,479 which teaches a panel consisting of arefractory material bonded by a heat-destructible binder andmounted on corrugated cardboard; (2) to use flexible materials, as shown by any one of Eayrs No. 2,361,386 (flexible wire), French (Vayda) No. 1,215,009 (flexible corrugated cardboard), British No. 832,555 (wire, fabric, asbestos, or the like), or DeMaison No. 3,106,756 (flexible metal tape, hinges), to hingedlyinterconnect such individual and separate panel members for usenot as a hot top as is the teaching of these prior art referencesbut as a lining for a reusable hot top; and (3) to specificallyachieve such joinder by means of flexible corrugated cardboard astaught by the French (Vayda) No. 1,215,009 patent, or as inferredfrom the use of cardboard panel backing in the Swedish(Wahlstrom) No. 142,479 patent.

In essence, defendant seeks to invalidate the Carpenter patentby establishing the existence of the various elements of theCarpenter combination in the prior art (relying primarily onprior art pertaining to hot tops as such and not to linings forreusable hot tops), and then modifying and realigning theseestablished elements in accordance with the teachings ofhindsight to arrive at the Carpenter combination. But as has beenfrequently stated and as found in Eversharp, Inc. v. Fisher PenCo., 204 F. Supp. 649, 662-663 (N.D.Ill. 1961):

"In order for one to defeat a meritorious patent it is not enough to pick out isolated features in earlier prior art patents, combine them in one particular way with hindsight acquired only from the patent under attack, and then say that no invention would have been involved in selecting those particular features and combining them in the particular way in which the patentee did."

It is my opinion, after an extensive examination of each of theprior art references considered in light of the expert testimonyand after comparing each of the Carpenter claims to the teachingsof such prior art, that none of the prior art patents relied onby Universal, singly or considered together, disclose or teachthe combinations of elements called for in claims 1 to 6 of theCarpenter patent in suit, and that these claims define newcombinations of elements which were not obvious to one havingordinary skill in the art at the time the invention was made.Although the prior art suggests all

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of the individual elements which make up the Carpenter combination, the prior art does not disclose or even suggest the use of these individual elements aspart of a wrap-up insert unit for protecting the brick lining of a reusable hot top. The prior art fails to render the claimed invention invalid as obvious because the prior art does not suggest the Carpenter combination itself. Matherson-Selig Co. v.Carl Gorr Color Card, Inc., 301 F. Supp. 336 (D.C.N.D. Ill. 1967).

As was recently stated in National Dairy Products Corp. v.Borden Company,394 F.2d 887, 892 (7th Cir. 1968) [citing Zegers v. Zegers, Inc.,365 F.2d 156, 159 (7th Cir. 1966), cert. denied 385 U.S. 948, 87S.Ct. 320, 17 L.Ed.2d 226 (1966)]:

"`\* \* the fact that the solution to a problem is simple, or appears so, when viewed in retrospect, does not mean the solution was obvious when it was made, and \* \* \* courts must guard against the exercise of hindsight in assessing the obviousness of a given improvement in the art.""

As a further but secondary consideration, I have taken intoaccount the steel industry's long-felt but unsolved need for ahot top assembly which would provide a high degree of heatinsulation, low cost, simplicity of handling and installation atthe steel mills, prefabrication, economy and safety in shipping, i.e., minimal breakage, and satisfactory operation duringpouring, solidification, and stripping of the ingots. Graham v.John Deere Co., 383 U.S. 1, 36, 86 S.Ct. 684, 15 L.Ed.2d 545(1966); Rex Chainbelt, Inc. v. General Kinematics Corp., 363 F.2d 336 (7th Cir. 1966).

Recognition of this overall problem for many years immediatelypreceding the Carpenter invention is expressed in variouslanguage of the following United States patents: De Maison No.3,106,756; Daley No. 2,890,504; Marburg No. 3,026,585; Cooper No.2,869,191; Edmonds No. 2,925,637; Nouveau No. 2,841,843; NouveauNo. 2,821,000; and in the following foreign patents: Swedish(Wahlstrom) No. 142,479; British No. 776,290; British No.832,555; and French (Vayda) No. 1, 215,009 — all cited byUniversal.

The evidence indicates that none of the prior art referencesmade any significant impression on the art or ever resulted in acommercially practical solution to the industry's problem. Whilecommercial success is not necessary for a patent to constituteprior art, lack of it in this case does tend to indicate that asolution to the problem was not obvious to those working in theindustry in and prior to 1962. Rex Chainbelt, Inc. v. GeneralKinematics Corp. supra. More specifically, the solution was noteven obvious to the members of Oglebay's own research anddevelopment department who, despite prior experimentation, didnot hit upon the Carpenter combination. Mueller, for example,despite years of research concluded that panels should beinserted into the hot tops by a mandrel and, further, thatstripping problems could not be overcome merely by varying thecomposition of the panels, but that a separate coating ofgraphite or the like would be necessary to achieve satisfactorystripping. Thus, as was the case in National Dairy Products Corp.v. Borden Company, 394 F.2d 887, 890 (7th Cir. 1968), "despitethe knowledge and skill of" Mueller and his co-workers "theirexperiments led them away from the" Carpenter structure.

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In contrast to the failures of the prior art, the Carpenterwrap-up insert unit filled the long existing need. It provides awrap-up insert unit that can be manufactured and shipped as aunit, that can be stacked for shipment in a flat condition onpallets with little waste space, that is self-protective againstmechanical damage during shipping and handling without thenecessity of other resilient packing material, that can bequickly wrapped up and easily inserted into a hot top having aninsulating brick lining, that protects the brick lining againstleakage of steel and against heat and mechanical damage, that reduces the total time required to recondition a hot top forsubsequent use from a period of about 4 to 5 hours to a period ofabout 30 minutes, thus effecting a substantial saving in labor, and that provides for stripping of the hot top from the ingotwithout damage to the insulating brick lining or delays caused bysticking of the lining to the sinkhead of the ingot.

The foregoing opinion sets forth my findings of fact and conclusions of law in accordance with Rule 52, Federal Rules of Civil Procedure. The plaintiff is requested to draft thenecessary order for judgment for the plaintiff and against the defendant on the question of patent validity inaccordance with this opinion and submit it to this court for mysignature after having it approved as to form by the defendant.

1. The Carpenter disclosures (column 2, lines 30-36) and thetestimony of Mr. Fishleigh, plaintiff's expert witness, bothindicate that the claimed invention could also function as aone-use hot top if the panels were to be made thicker.

2. The claims of the patent read as follows:

"1. A hot top structure comprising a hot top casing having acentral opening therethrough, a refractory lining in said casing, a panel insert unit for providing a protective heat andmechanical damage barrier between a mass of metal in the hot top and the refractory lining in the hot top casing, said panelinsert unit including a plurality of heat-collapsible refractoryinsert panels having front sides defining adjacent wall portions of the opening through said casing and back sides disposed so asto face said refractory lining, said insert panels being of arefractory material bonded by a heat-destructible binder andretarding heat transmission to the insulating refractory lining of the casing, flexible material hingedly interconnecting saidinsert panels for relative movement from relative positionswherein the panels are disposed in side-by-side relationship withadjacent edge surfaces of the panels facing each other toangularly related positions wherein the panels are disposed with adjacent edge surfaces thereof in area contact and forming the insert unit.

"2. A hot top structure including a panel insert unit forforming a facing layer for the refractory lining of a hot topcasing having a vertically tapered central opening therethroughto provide a protective heat and mechanical damage barrierbetween a mass of metal in the hot top and the interior lining ofthe hot top casing, said panel insert unit comprising a plurality fheat-collapsible refractory tapered insert panels having frontsides for defining adjacent wall portions of the opening throughsaid casing and back sides to be disposed so as to face saidrefractory lining, said insert panels being of a refractorymaterial bonded by a heat-destructible binder and retarding heattransmission to the insulating refractory lining of the casing,flexible material hingedly interconnecting said tapered insertpanels for relative movement from relative positions wherein thetapered panels are disposed in side-by-side relationship withadjacent edge surfaces of the tapered panels facing each other toangularly related positions wherein the panels are disposed with the

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adjacent edge surfaces thereof in area contact and forming atapered insert unit.

"3. A hot top structure as defined in claim 2 further includingmeans for supporting said tapered panel insert unit in the hottop casing including a bottom refractory ring having a portionengageable with a portion of the underside of said insert unit.

"4. A panel insert unit for emplacement in a hollow hot topstructure to be supported at the upper end of an ingot mold andfor location in a tapered hot top structure so as to define atapered opening through the hot top structure and provide aprotective heat barrier therefor, said panel insert unitcomprising a plurality of insert panels having front sides fordefining portions of the tapered opening through the hot topstructure and back sides, a flexible corrugated cardboardconnected to the back sides of said insert panels so as to bedisposed between the panels and said hot top structure when saidunit is emplaced therein, said insert panels having convergingsides with the adjacent sides of adjacent insert panels beingpositioned in a parallel relation to each other when connected,said cardboard interconnecting said insert panels for relativeangular movement from relative positions wherein the panels aredisposed in a side-by-side relationship to edge abuttingpositions with adjacent edge surfaces of the panels in engagementover a substantial area substantially throughout the length of the edges, said insert panels being comprised of a refractoryinsulating material and a heat-destructible binder and saidcardboard being adapted to provide a venting space between saidinsert panels defining said tapered opening and said hot topstructure.

"5. In a hot top including a hollow hot top structure to besupported at the upper end of an ingot mold, the improvement comprising a multiple panel insert unit providing a protective heat barrier for the hot top structure and comprising a plurality of insert panels having front sides defining portions of acentral opening through the hot top structure and back sides facing the hot structure, a flexible corrugated cardboard connected to the back sides of the insert panels and disposed between the insert panels and the hot top structure and interconnecting said insert panels for relative angular movement from relative positions wherein said panels are disposed in aside-by-side relationship with adjacent edge surfaces of the panels facing each other to edge abutting positions with adjacentedge surfaces of the panels in engagement over a substantial areasubstantially throughout the length of the edges, said panels being comprised of a refractory insulating material and aheat-destructible binder and said cardboard functioning toprovide a venting space between said insert panels and the hottop structure.

"6. In a hot top as defined in claim 5, a bottom refractoryring having a portion engageable with a portion of the undersideof the insert unit for supporting the insert unit in the hot topstructure."

3. Variations of the claimed invention provide that the insertunit (composed of 47 and 48) may be positioned inside of flange(12) or have one edge under the flange (12) in engagement with the surface thereof or the underside of flange (12) may be grooved to receive the top of the insert unit.

4. Final Pretrial Stipulation No. 34.

5. Title 35 U.S.C.

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"§ 103. Conditions for patentability; non-obvious subject matter

"A patent may not be obtained though the invention is notidentically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matteras a whole would have been obvious at the time the invention wasmade to a person having ordinary skill in the art to which saidsubject matter pertains. Patentability shall not be negatived by the manner in which the invention was made. July 19, 1952, c.950, § 1, 66 Stat. 798."

6. Final Pretrial Stipulation No. 24.

7. Stripping problems arise when sufficient sticking occursbetween the sinkhead and the brick lining of a hot top so thatforceful removal of the hot top may be required which istime-consuming and often causes damage to the brick lining of thehot top or sometimes to the ingot itself.

8. With regard to this and other prior art references, I willdistinguish between a structure designed to function as a liningfor a reusable hot top and an assembly which itself constitutes abot top. In so doing, however, I am nonetheless mindful thatthere exists an element of equivalency as between these two types of structures.

9. Failure to call the attention of the Patent Office tononanticipatory, prior art or prior art no more pertinent thanthat already cited to the Patent Office does not, however, constitute a fraudulent representation before the Patent Office.Canaan Products, Inc. v. Edward Don & Co., 273 F. Supp. 492, 501(N.D. Ill. 1966).

10. Canaan Products, Inc. v. Edward Don & Co., 388 F.2d 540(7th Cir. 1968), affirming 273 F. Supp. 492, 501 (N.D. Ill. 1966), may be distinguished on the ground that the lower court'sconclusion was limited to prior art patents "called to theattention of" the Patent Office.