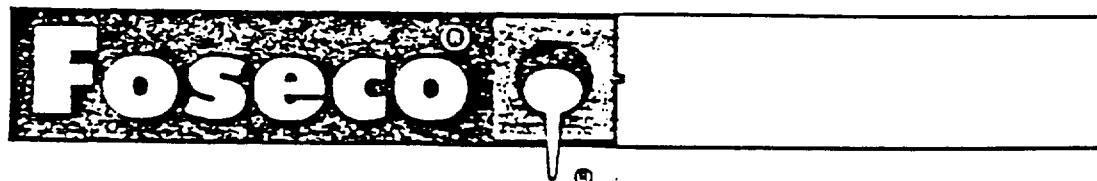


The **Profax**
US Pat Nos 3066069 - 3072981
SYSTEM
of Hot Topping

**PRODUCES
BETTER
INGOTS**

From

For



THE FOSECO "PROFAX" TWO OR FOUR PIECE SLAB ASSEMBLY
FOR USE IN SLAB TYPE SQUARE AND RECTANGULAR BIG-END-
DOWN MOLDS.

During the past few years important changes have taken place in requirements for flat rolled products and plate products. Larger ingots have been made to meet the demands of consumers for larger coils of aluminum killed deep drawing steel. At the same time consumers of plate product have found the economics and the metallurgy of big end down molds acceptable. One of the major factors aiding these changes was the introduction of Foseco's "Feedex" * exothermic two side hot top. As pioneer of the exothermic hot top, Foseco, Inc., continually search for improved methods of hot topping.

Early in 1963, Foseco, Inc. saw the advantages that the "Profax" hot top would have over the exothermic hot top. Some of the advantages of the "Profax" hot top have been listed. The following is a more detailed explanation of the use and the benefits to be derived from the use of the "Profax" hot top on slab type ingots.

The fact that a 3/4 inch thickness of refractory insulating material can produce sound ingots of high quality is the characteristic of "Profax". The low density of "Profax" has made possible simple, compact packaging and storage. A typical example is the "Profax" hot top for a 30" x 65" mold. A 42" x 60" pallet holds 60 hot tops; a truckload will hold 480 hot tops and when shipped two pallets high, 960 hot tops can be shipped per truckload. By stacking the pallets two high, 120 hot tops can be stored in an area 42" x 60". Note Figure 9.

* Registered Trade Mark.

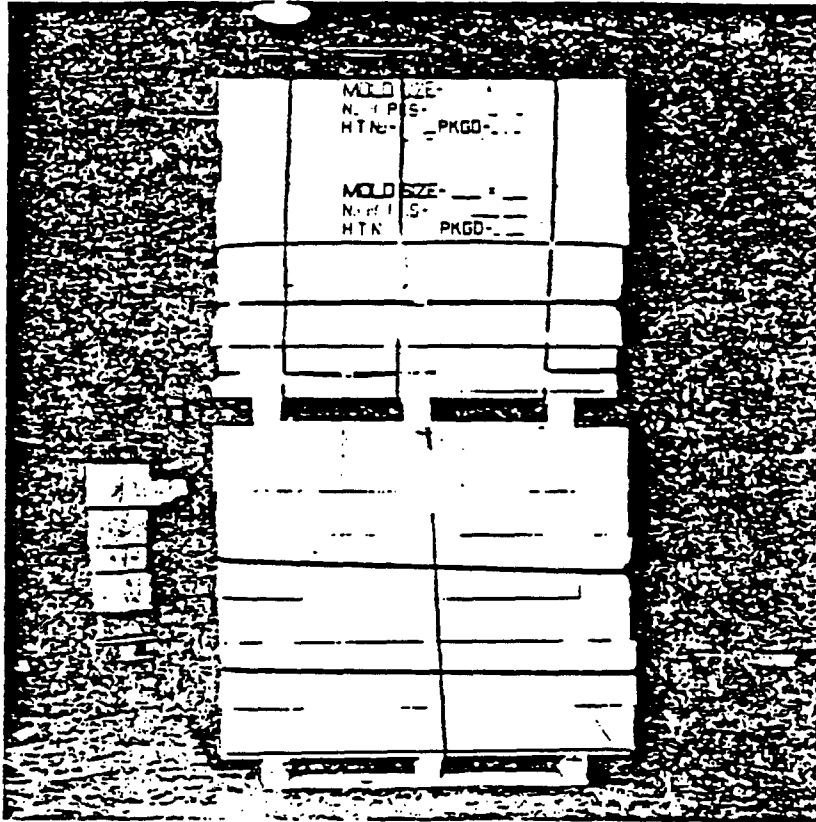


Figure 9

Compact shipping and storing of "Profax" hot tops. Each pallet contains 60 hot tops for a 30" x 65" mold. Pallets are stacked two high with ease and safety. 120 hot tops can be stored in an area 42" x 60".

Because of the small space required for a large number of hot tops and their ease of installation, the "Profax" hot top can be put into the mold at the pouring platform if desired. The rapidity of installation is such that the pouring platform is not tied up for any great length of time. Twenty of the 30" x 65" "Profax" tops can be set by two men in about 30 minutes without the use of a crane. Note figures 10 through 14.



Figure 10

First step in the installation of "Profax" hot tops in a 26" x 59" big-end-down mold. Sections of oxygen lance are put through the hangers so as to carry and also to suspend the hot top in position in the mold.

Easily inserted hangers are made of varying lengths so as to locate hot top at desired depth in mold.

Note one man is able to easily carry the entire hot top which weights 55 pounds.

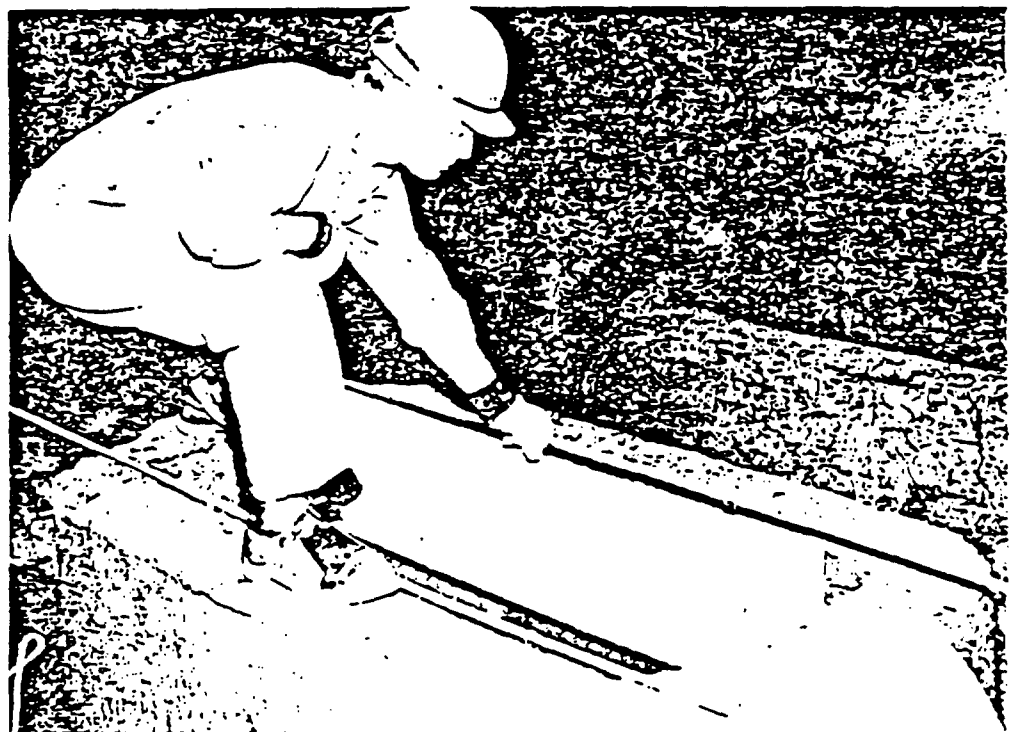


Figure 11

Locating "Profax" hot top slabs against mold walls. In shops where rigid safety precautions are taken, a light weight walk is placed between the molds for added safety.

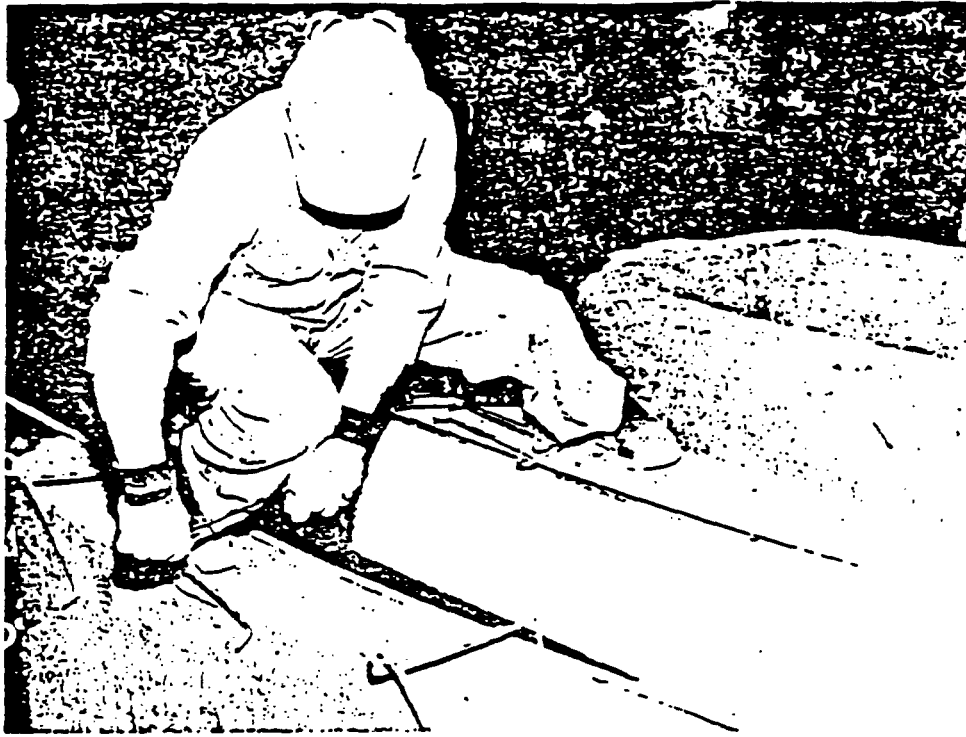


Figure 12

Putting spring clips in place - the clips hold the hot top firmly against mold wall to prevent metal penetration behind the hot top and also assures that the top can not float out of mold during pouring. It's imperative to have clean mold walls so that the "Profax" fits tightly against the mold wall. Where "Profax" is used regularly on a particular mold, the hot top area is kept clean by the "Profax" top itself and this area of the mold does not need any mechanical cleaning between heats.

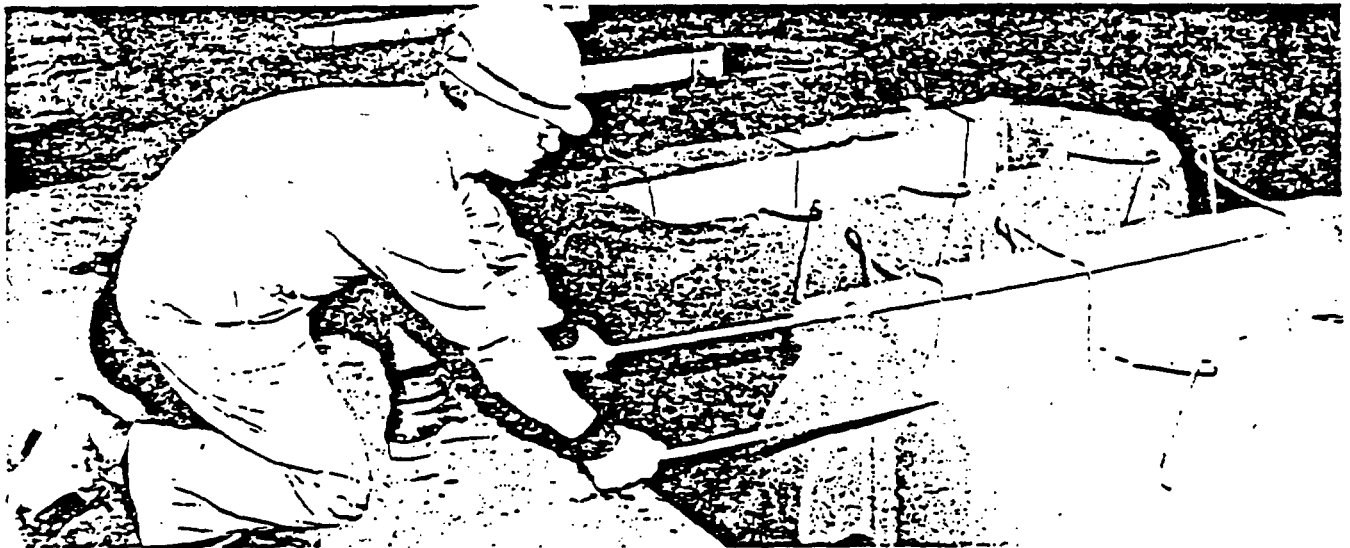


Figure 13

The last step in the "Profax" hot top preparation is to remove the lifting or suspending rods; since the rods are not needed during tracking or pouring, they are saved and used over again. The hot top is held so firmly in place by the spring clips that they can be tracked over the roughest of tracks without disturbing or harming the "Profax" hot top.

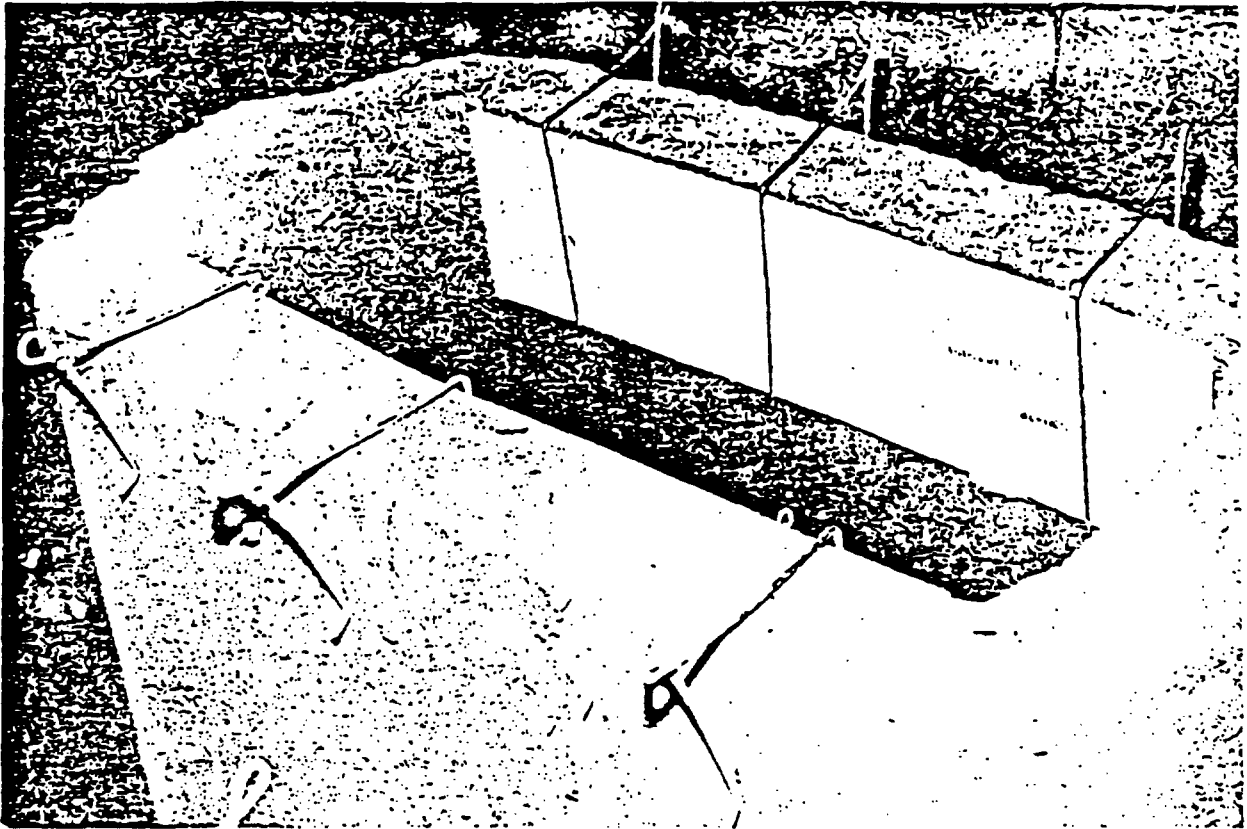


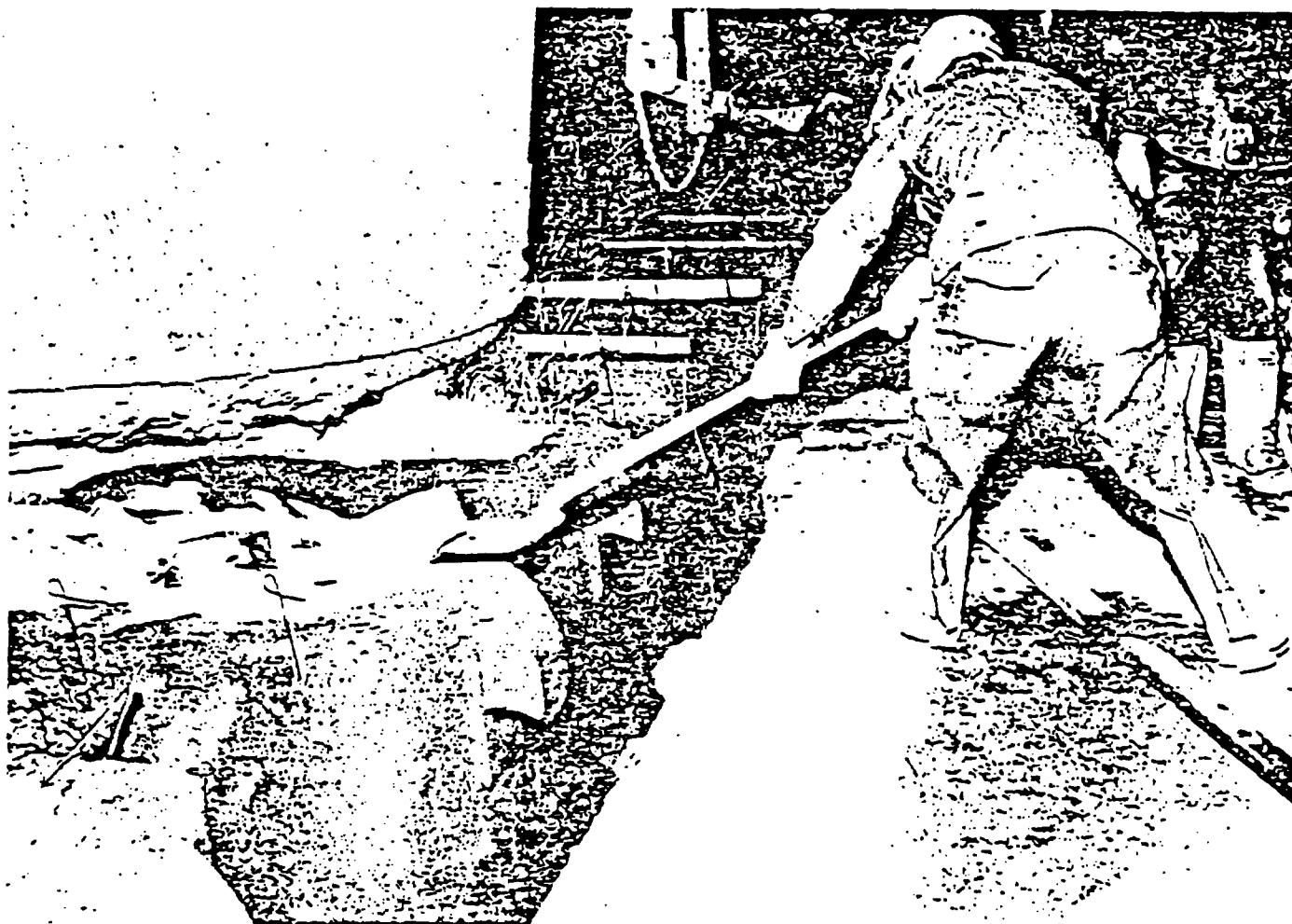
Figure 14
Fully assembled "Profax" 2-slab hot top ready for use. Care must be taken to assure that the spring clips are making tight contact at the bottom of the pads so as to hold the "Profax" pads firmly against the mold wall.

The installation of the "Profax" hot top is clean; the surfaces of the "Profax" are hard and not friable, and, as a result, no foreign debris falls into the mold during installation. The cleanliness of the "Profax" is such that no vacuuming of the mold is necessary after assembly; this is an important advantage when putting hot tops in place at the pouring platform.

The strength and rigidity of the finished hot top assembly is such that the molds can be tracked without damaging or altering the position of the hot tops in the molds.

The "Profax" hot top can be set at varying heights in the mold to give a predetermined ingot weight.

As soon as the hot top is filled, Foseco "Ferrux 107" is added on top of the hot top metal to provide the necessary insulation. "Ferrux 107" has been especially compounded for use with "Profax" hot tops and no other topping compound has been found that will produce as consistent results of high yields of segregation free steel. The importance of following a prescribed hot top covering practice cannot be over-emphasized. The proper amount of "Ferrux 107" and its method of addition is recommended by Foseco and for optimum results this practice should be followed. Note Figure 16 and 17.



Adding "Ferrux 107" top covering to the filled hot top - the addition is made as soon as possible after the hot top is full so as to prevent heat loss. A carefully followed top covering practice outlined by Foseco engineers must be adhered to for maximum results.

In such instances a special type spring clip is used to hold the top in place.

An important advantage of the "Profax" hot top is the fact that the ingot and the hot top can be filled with a full stream and no shut-off or slow-down of the stream is necessary. Because of its tapered bottom edge which is characteristic to "Profax", there is practically no up-thrust from the rising metal. This eliminates entrapment of slag and inclusions as so often happens when conventional thick hot tops are used. Because of the fewer number of shut-offs per heat there is less chance of having a leaking or running stopper; but, even in the case of a full running stopper, no damage is caused to the ingot. Note Figure 15.

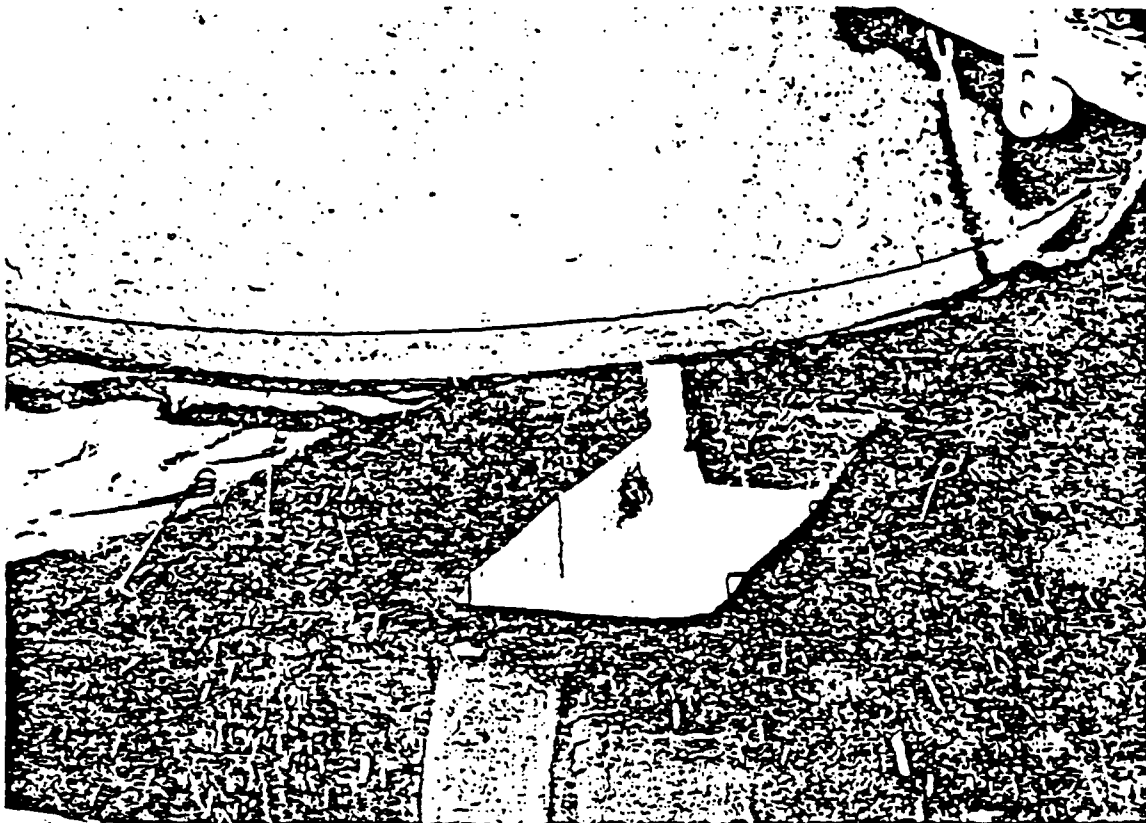


Figure 15

"Profax" hot tops are poured straight up with a full stream without halt or slowdown until the hot top is full - this cuts down on the number of shut-offs per heat and helps prevent leaking or running stoppers.



Figure 17

"Profax" hot topped ingots after the hot topping process is complete. In this case, "Profax" boards were put on top of an exothermic topping compound cover. Until the development of "Ferrux 107", this was the only method to obtain maximum results with "Profax" hot topping. The use of "Ferrux 107" assures maximum results and also is less costly than the duplex top covering method as shown.

"Profax" hot topped ingots can be moved immediately after pouring if the pouring bay is needed for another heat. The timing of the move is important as delaying it too long will cause ingot pattern with "Profax" hot top use just as with any other hot topping method. The ingots should be moved carefully to prevent metal spillage. Even though the "Ferrux 107" top cover crust may be broken by the move, it will weld together again and provide excellent insulation.

At stripping, the "Profax" hot top leaves very little debris. A large portion of the "Profax" hot top is consumed during the solidification period and only a small amount of light weight powder remains that falls easily from the hot top area at stripping. There is less clean-up at the stripper with "Profax" than from any other hot top and there is little or no carry-over of refractory into the soaking pit. Note Figure 18.



Figure 18

"Profax" hot topped ingot after stripping. "Profax" has stripped completely free of the hot top metal with very little debris present. Note the very slight shoulder on the ingot and the absence of hot top material at the junction between the hot top and the body of ingot, and also the very flat feed produced by the "Profax" hot topping method.

The practically shoulderless "Profax" ingot provides many advantages to the rolling mill operator. During rolling, the small shoulder disappears without any roll-over after a couple of passes through the mill. The slab has all the appearances of an open-topped ingot on the surface. Because there is no adhering refractory there is no flying debris. There are no rolled-in surface inclusions from the "Profax" hot top and it is impossible to tell by visual inspection where the hot top junction was located except in rare instances when light metal flashing gets behind the "Profax" when dirty molds are used. Even in the case where some metal flashing is rolled into the surface of the ingot, the scab can easily be removed by hot scarfing as it contains no refractory. See Figure 19 and 20.

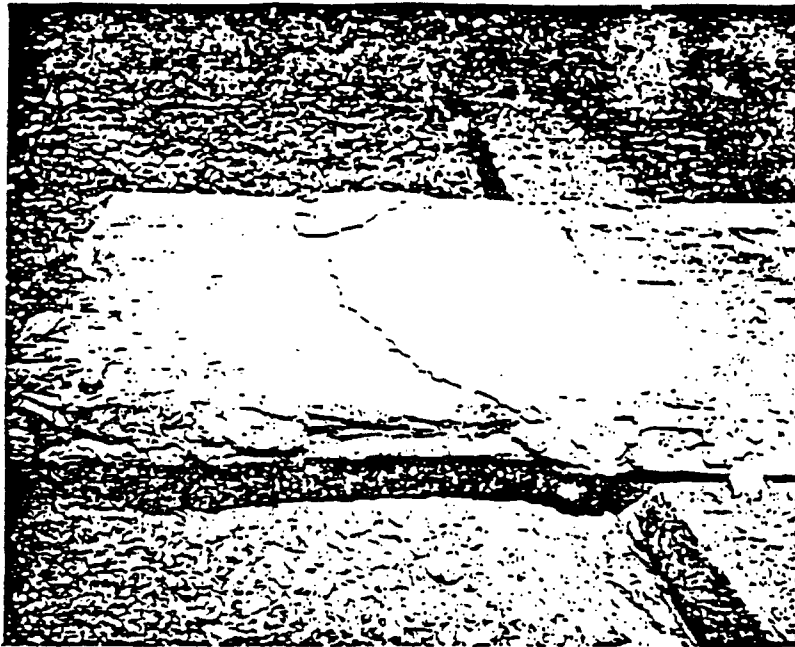
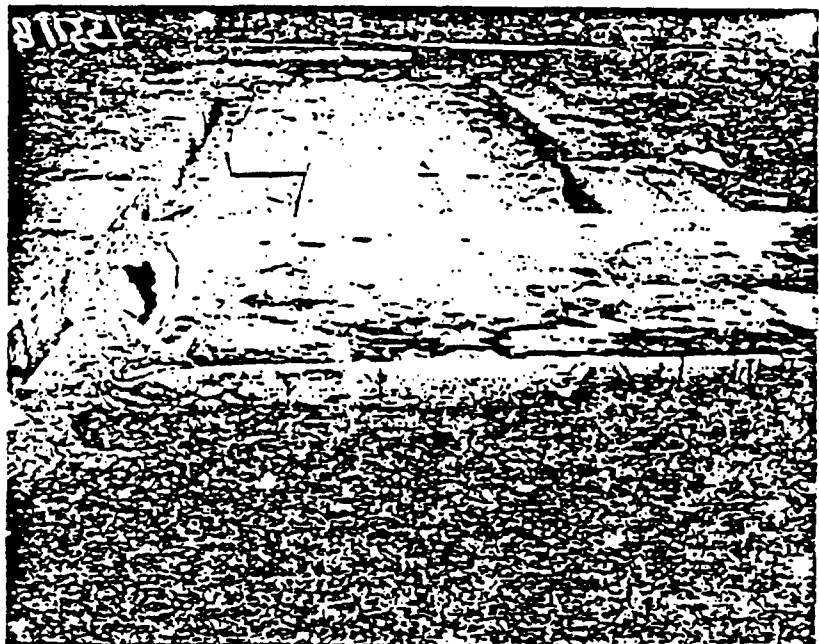


Figure 19

Slab produced from ingot made with a conventional hot top. Note over-roll of hot top junction and poor side surface even below the hot top junction. Top discard from this slab was over 7 feet long.

Figure 20

Slab produced from same type ingot as that shown in Figure 19 but using "Profax" hot top. Note good surface and absence of hot top joint demarcation. Sound product was made with a top cut of only $3\frac{1}{2}$ feet. The surface in the head metal area is as good as that of the body of the ingot.



The steelmaker should metallurgically study the head metal of the "Profax" topped ingots. This head metal is as clean and as free of segregates as the body of the ingot. Except for about 3 1/2% top discard, the head metal is superior to much of the metal in the center third of a conventionally topped ingot. Head metal can now be used as prime product with much higher yields because:

- 1.) There is no defective hot top junction metal due to rolled-in inclusions or scabs
- 2.) The head metal is metallurgically sound.

Most users of "Profax" take advantage of this. See Figures 21 through 24.



Figure 21

Longitudinal macro-etch through the hot top portion of a 24" wide big-end-down ingot hot topped with "Profax", .45 carbon steel. Note absence of both carbon and non-metallic segregation.

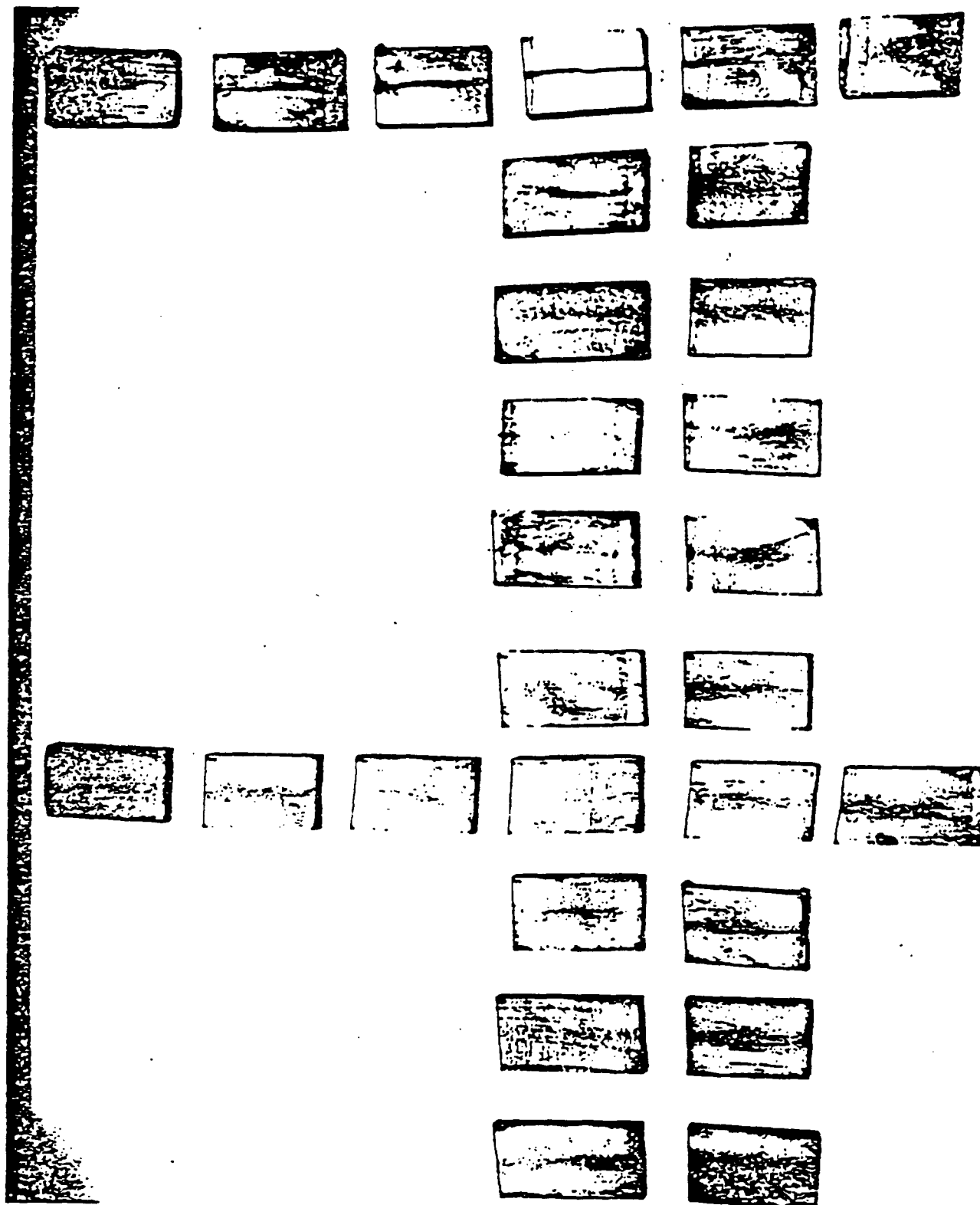
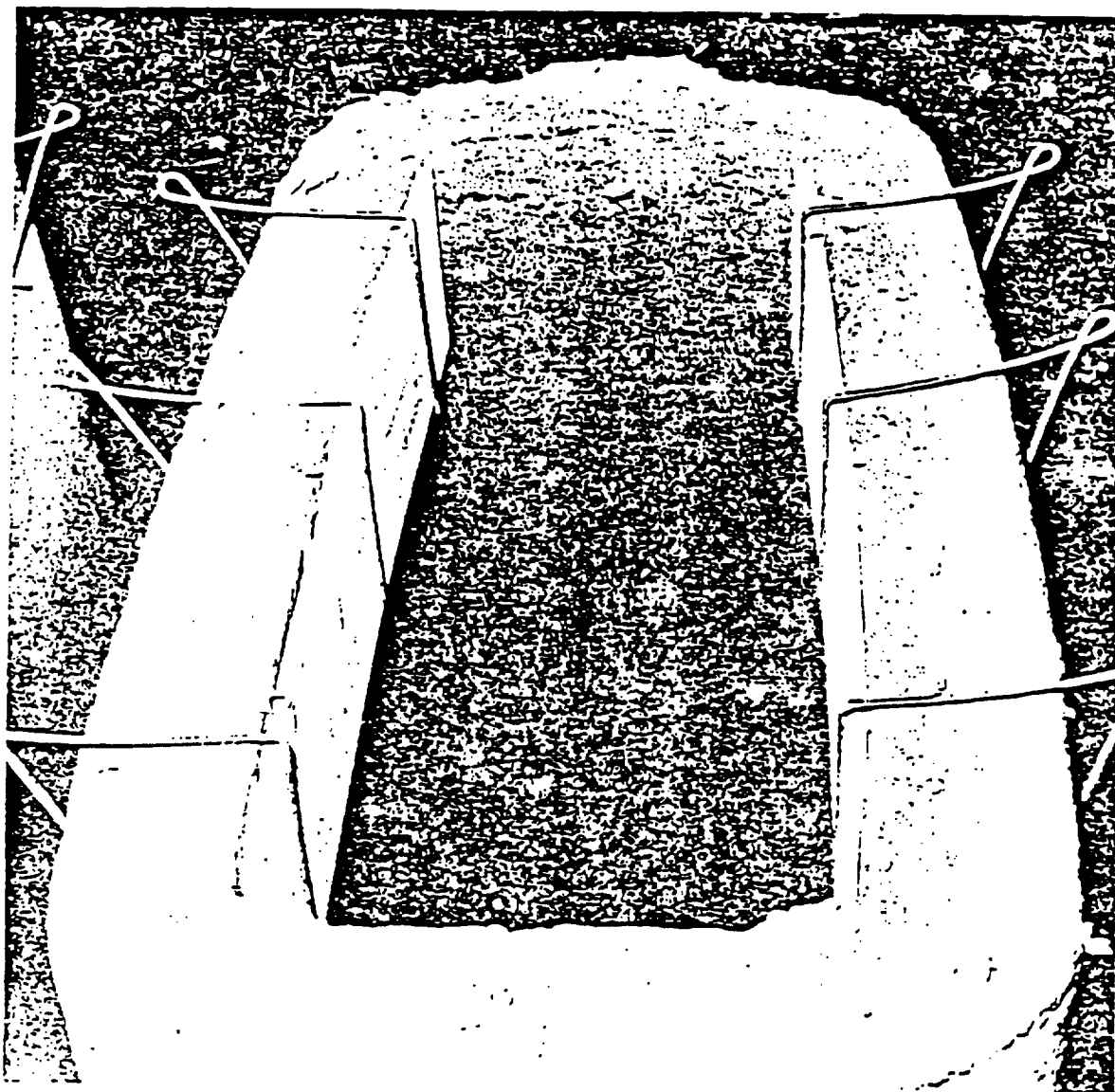


Figure 24

Transverse macro-etch sections taken from the center of top discards of slabs of aluminum killed deep drawing steel made in 29 x 56 x 85 ingots using "Profax" hot tops. In every case the steel is sound at the 85% ingot level and also up to the 94% ingot level. With well controlled "Profax" hot topping practice a total of 7% top discard will assure sound metallurgically acceptable high quality steel.



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