

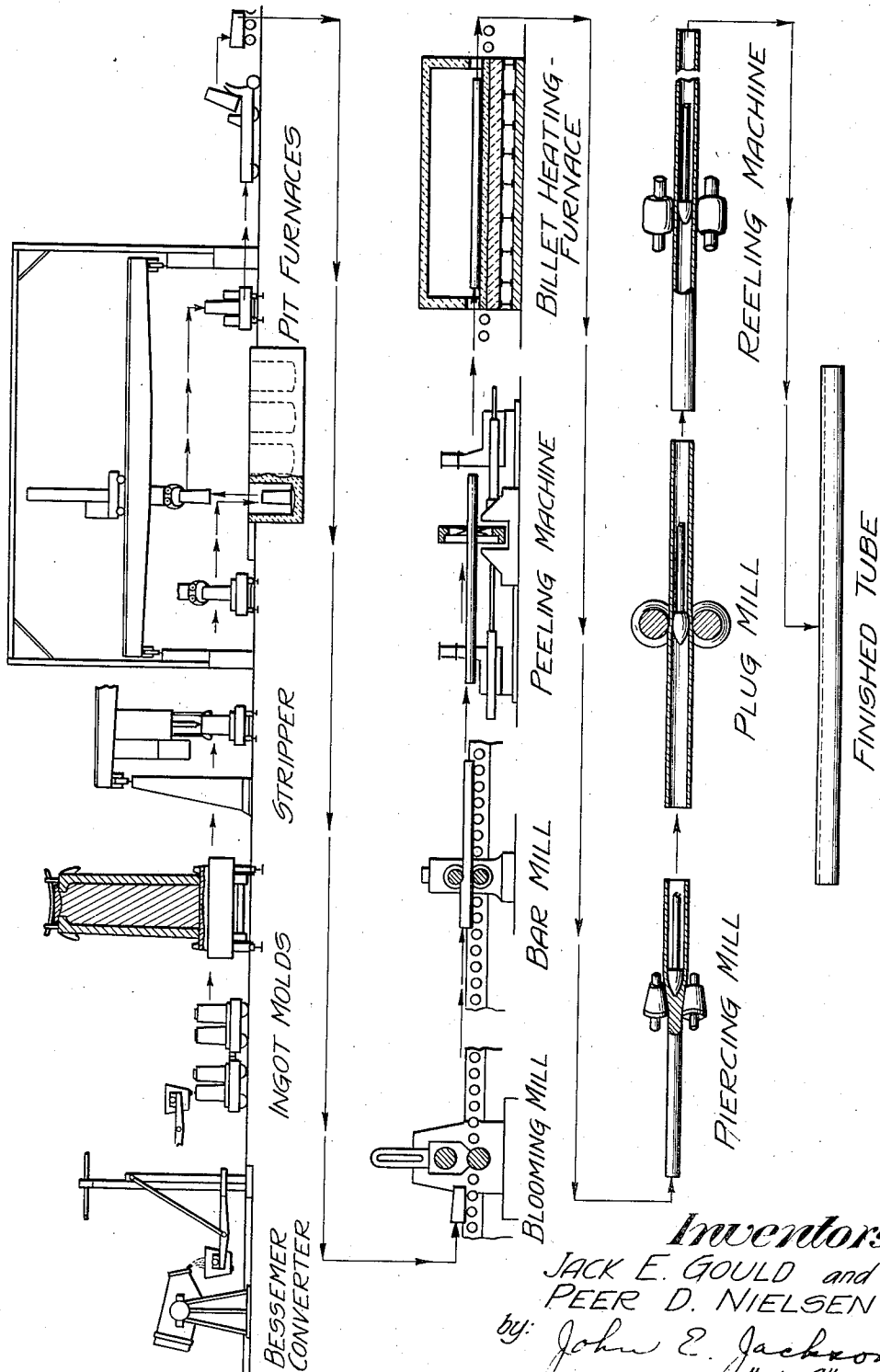
Aug. 6, 1940.

J. E. GOULD ET AL

2,209,968

MANUFACTURE OF BESSEMER STEEL SEAMLESS TUBES

Filed May 2, 1938



Inventors:
JACK E. GOULD and
PEER D. NIELSEN,
by: *John E. Jackson*
their Attorney.

UNITED STATES PATENT OFFICE

2,209,968

MANUFACTURE OF BESSEMER STEEL
SEAMLESS TUBES

Jack E. Gould and Peer D. Nielsen, Lorain, Ohio,
assignors to National Tube Company, a cor-
poration of New Jersey

Application May 2, 1938, Serial No. 205,625

7 Claims. (Cl. 29—156)

This invention relates to seamless tubes, one of the objects being to manufacture seamless tubes from Bessemer steel so as to effect commercially practical yields. Other objects may be inferred from the following disclosure.

According to the invention, molten pig iron is blown in a Bessemer converter to produce a steel of the desired analysis. The converter may be operated in the usual manner. The most satisfactory analysis of steel from the standpoint of high yields of acceptable tubes is within the range of from .07 per cent. to .14 per cent. carbon, not more than .08 per cent. phosphorus, not more than .05 per cent. sulphur and a manganese content of from .30 per cent. to .60 per cent. Steels analyzing other than this may be found satisfactory, but difficulty may be experienced when working them into tubes by the seamless method.

This steel is not chemically killed but is of the oxidized or rimming type. However, its degree of oxidation is controlled so that, when cast into ingot molds, it neither rises nor falls any appreciable distance in the molds during the time it remains open.

Bottle-neck molds are used, the described steel being cast into these molds and capped as soon as possible after casting to mechanically kill the steel, whereby to prevent further gas evolution or rimming. Since the steel is not of the rising type, it must be poured sufficiently high in the molds to provide contact between the ingot steel and the caps so that the latter can properly perform their function of freezing a crust of steel over the ingot tops. The resulting ingots are relatively free from piping, such as is common to killed steels, or metalloid segregation of the character evidenced by rimmed steels. Most satisfactory results are obtained when the pouring or casting temperature of the steel is within the range of from 2950 degrees to 3010 degrees Fahrenheit.

The casting temperature range given above appears to be a critical factor in obtaining satisfactory results. Furthermore, only steel which pours with the described mold action is consistently satisfactory.

After casting, the molds are stripped from the ingots and the latter placed in soaking pits, this being done as soon as possible after casting and, therefore, while the steel is very hot. The ingots should be charged in the soaking pits in not more than one hour after casting and there heated for not more than four hours, the heating being done to adjust the ingot temperatures to from 2350 degrees to 2450 degrees Fahrenheit.

The ingots, having had their temperatures equalized throughout and adjusted to within the just mentioned range, are rolled as soon as possible. In other words, rolling should be started not much more than four hours after the steel is initially charged into the soaking pits and not much more than five hours after casting.

The ingots are rolled in a blooming mill and then through a bar mill to produce the round billets necessary for piercing. The conventional rolling practice may be followed. The round billets are then peeled on a lathe to remove approximately 4 per cent. by weight from their outside, this peeling being done mechanically by knives and any defects remaining on the billets after peeling being removed by chipping or other suitable means of conditioning.

Subsequently the billets are reheated to temperatures of from 2125 degrees to 2225 degrees Fahrenheit. The reheated billets are then advanced into a pass defined by a plurality of rolls, pierced, whereby successive increments are formed by the successive roll contacts, and worked in such a manner that the several dimensional values of each of their so formed elementary length increments are in substantially geometric progression. More specifically speaking, the reheated billets are rendered tubular by following the principles disclosed by Patent No. 2,017,388, granted October 15, 1935, to Bryant Bannister.

The resulting tubes made from Bessemer steel by following the various steps herein described are substantially free from seams and cracks and have relatively low metalloid surface layers while being otherwise relatively free from extreme metalloid segregation, the low metalloid layers being extremely thin as compared to the remainder of the steel. Commercial yields of such tubes have been as high as 85 per cent. of the weight of the billets, it following that the object of the invention is attained.

The various steps disclosed herein are illustrated by the accompanying drawing. In this drawing the various steps are identified by legends, it being understood that conventional equipment may be used in carrying out these steps.

We claim:

1. A method of producing seamless tubes from Bessemer steel, including controlling the degree of oxidation of molten Bessemer steel so that when cast in ingot molds it rims without rising or falling any appreciable distance in the molds, casting said steel in ingot molds, mechanically

killing the same by capping it, and producing the seamless tubes from the resulting ingots by rolling said ingots into billets and piercing said billets by passing them through a seamless tube piercing mill.

2. A method of producing seamless tubes from Bessemer steel, including controlling the degree of oxidation of molten Bessemer steel so that when cast in ingot molds it rims without rising or falling any appreciable distance in the molds, casting said steel in ingot molds and mechanically killing the same by capping it, and producing the seamless tubes from the resulting ingots by rolling said ingots into billets and piercing said billets by passing them through a seamless tube piercing mill, said steel being cast while at a temperature of from 2950 degrees to 3010 degrees Fahrenheit.

3. A method of producing seamless tubes from Bessemer steel, including controlling the degree of oxidation of molten Bessemer steel so that when cast in ingot molds it rims without rising or falling any appreciable distance in the molds, casting said steel in ingot molds and mechanically killing the same by capping it, and producing the seamless tubes from the resulting ingots by rolling said ingots into billets and piercing said billets by passing them through a seamless tube piercing mill, said steel being cast while at a temperature of from 2950 degrees to 3010 degrees Fahrenheit and said ingots being removed from the molds and placed in the soaking pits not later than one hour after casting.

4. A method of producing seamless tubes from Bessemer steel, including controlling the degree of oxidation of molten Bessemer steel so that when cast in ingot molds it rims without rising or falling any appreciable distance in the molds, casting said steel in ingot molds and mechanically killing the same by capping it, and producing the seamless tubes from the resulting ingots by rolling said ingots into billets and piercing said billets by passing them through a seamless tube piercing mill, said steel being cast while at a temperature of from 2950 degrees to 3010 degrees Fahrenheit and said ingots being removed from the molds and placed in the soaking pits not later than one hour after casting, said ingots being heated in the pits to rolling temperatures of from 2350 degrees to 2450 degrees Fahrenheit.

5. A method of producing seamless tubes from Bessemer steel, including controlling the degree of oxidation of molten Bessemer steel so that when cast in ingot molds it rims without rising or falling any appreciable distance in the molds, casting said steel in ingot molds and mechanically killing the same by capping it, and producing the seamless tubes from the resulting ingots by rolling said ingots into billets and piercing said billets by passing them through a seamless

tube piercing mill, said steel being cast while at a temperature of from 2950 degrees to 3010 degrees Fahrenheit and said ingots being removed from the molds and placed in the soaking pits not later than one hour after casting, said ingots being heated in the pits to rolling temperatures of from 2350 degrees to 2450 degrees Fahrenheit and in not more than four hours rolled into round billets adapted for subsequent piercing.

6. A method of producing seamless tubes from Bessemer steel, including controlling the degree of oxidation of molten Bessemer steel so that when cast in ingot molds it rims without rising or falling any appreciable distance in the molds, casting said steel in ingot molds and mechanically killing the same by capping it, and producing the seamless tubes from the resulting ingots, said steel being cast while at a temperature of from 2950 degrees to 3010 degrees Fahrenheit and said ingots being removed from the molds and placed in the soaking pits not later than one hour after casting, said ingots being heated in the pits to rolling temperatures of from 2350 degrees to 2450 degrees Fahrenheit and in not more than four hours rolled into round billets adapted for subsequent piercing, said billets being mechanically peeled to remove small proportions of their surfaces and pierced by means of a seamless tube piercing mill.

7. A method of producing seamless tubes from Bessemer steel, including controlling the degree of oxidation of molten Bessemer steel so that when cast in ingot molds it rims without rising or falling any appreciable distance in the molds, casting said steel in ingot molds and mechanically killing the same by capping it, and producing the seamless tubes from the resulting ingots, said steel being cast while at a temperature of from 2950 degrees to 3010 degrees Fahrenheit and said ingots being removed from the molds and placed in the soaking pits not later than one hour after casting, said ingots being heated in the pits to rolling temperatures of from 2350 degrees to 2450 degrees Fahrenheit and in not more than four hours rolled into round billets adapted for subsequent piercing, said billets being mechanically peeled to remove small proportions of their surfaces, reheated to temperatures of from 2125 degrees to 2225 degrees Fahrenheit and rendered tubular by advancing each billet into a pass defined by a plurality of rolls, piercing the billet, whereby successive increments are formed by the successive roll contacts, and working the pierced billet in such a manner that the several dimensional values of each of its elementary length increments so formed are in substantially geometric progression.

JACK E. GOULD.
PEER D. NIELSEN.