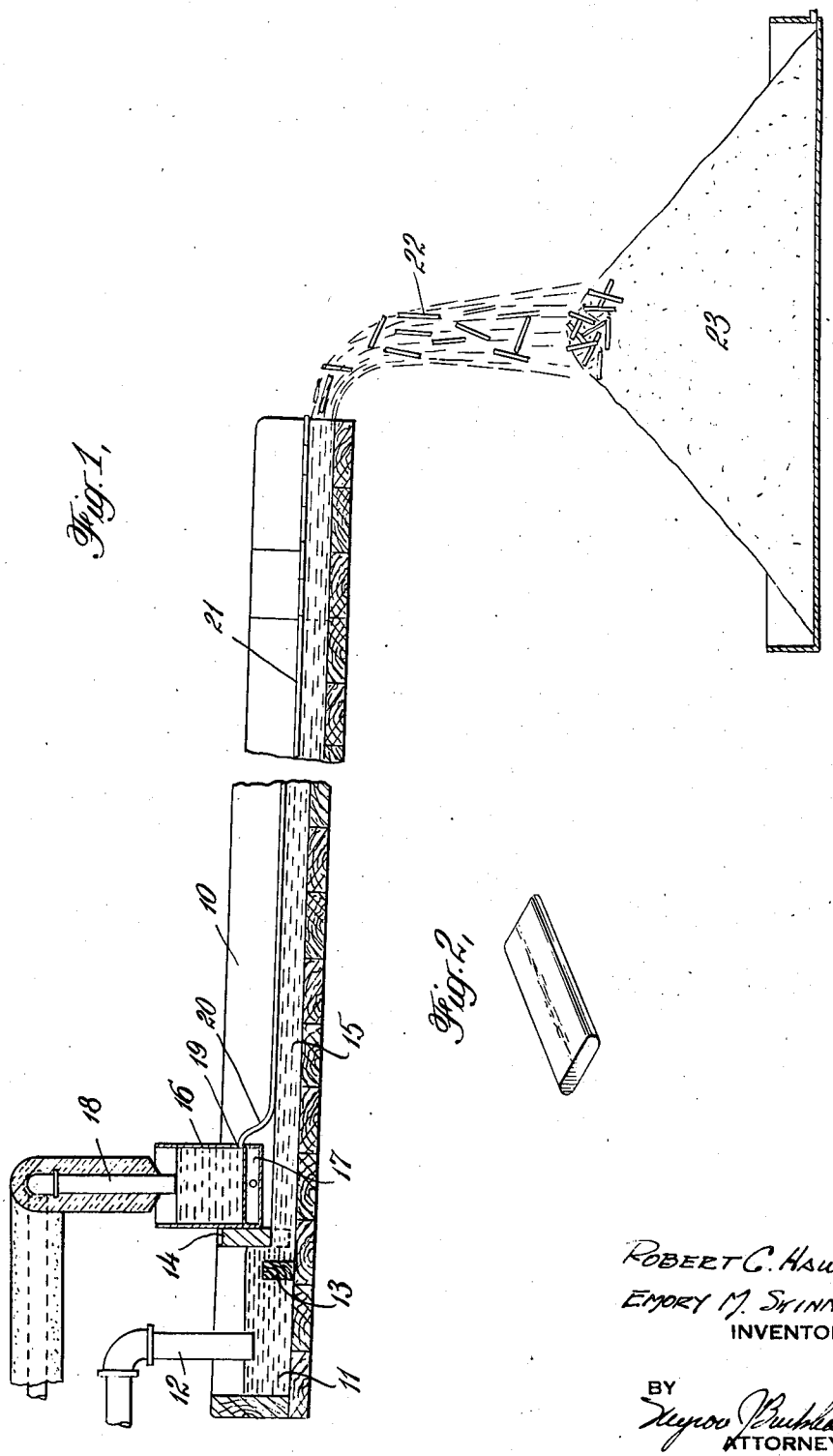
Feb. 16, 1943. R. C. HAWKS ET AL 2,311,389

METHOD AND APPARATUS FOR HANDLING ASPHALT

Filed July 31, 1941 2 Sheets-Sheet 1



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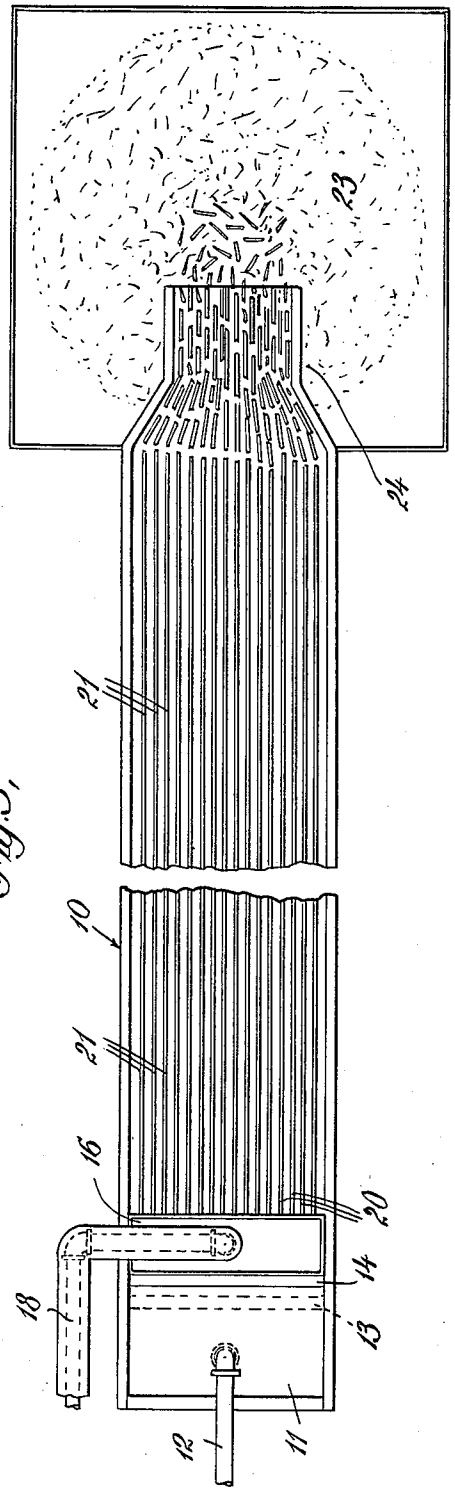

Fig. 3.

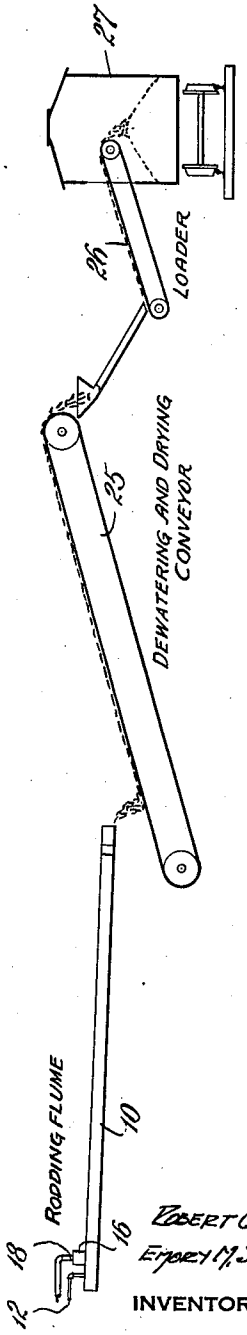

Fig. 4.

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METHOD AND APPARATUS FOR HANDLING ASPHALT

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Application July 31, 1941, Serial No. 404,812

3 Claims. (Cl. 83—91)

This invention has to do with a method for handling high melting point asphalts to produce said asphalts in convenient physical form for further use and handling.

Formerly, high melting point asphalts were run into light steel containers while fluid and allowed to solidify therein prior to shipment. Before use the container was cut apart and removed from the solid asphalt, or rather expensive hot rooms to melt the asphalt were used. This practice of light metal containers still is used to some extent. Recently, the similar use of heavy paper containers into which the hot asphalt is poured has largely replaced this older practice. The paper containers must still be broken from the asphalt and disposed of, and many of the objections to the older form of package still obtain. Most users of high melting point asphalts pulverize the asphalt or at least reduce it to small sizes before melting down for use. The oldest method, that of allowing the asphalt to solidify in an open pit, or "pitch-bay," breaking it into lumps, and shipping those lumps still prevails, but is open to many objections. Partially crushing those lumps, for example to pass a 1½" grizzly, gives a product more nearly in the form desired by the usual purchaser, but due to the brittle nature of the asphalt, this crushing gives rise to a large percentage of fines, usually not acceptable to the purchaser, and the handling of the product is a dirty, inconvenient, and costly job.

This invention has for its object the provision of a method whereby high soft point asphalts may be processed into a finished product form of small dimensions, generally free from fines, capable of convenient handling in bulk form without undue further breakage.

The invention is based upon the discovery that if hard asphalt, melted, but below a certain temperature limit, be fed in small streams upon a rapidly but quietly flowing stream of water, that smooth walled rods of small dimension may be formed, and that these rods may be broken readily into short pieces, to give a small size asphalt product ready for final crushing and substantially free from fines.

In order to understand this invention, reference is now made to the drawings attached hereto.

In the drawings, Figure 1 shows in diagrammatic section a side view of the apparatus used, in its simplest form. It consists of a sloping flume 10, some sixty or eighty feet long and about six feet in width, at the upper end of which there is a water distributing chamber 11 into which water is discharged by pipe 12, with weir board 13 and flash board 14 serving to distribute that water into a rapidly flowing even sheet 15, passing down the flume at a rather rapid rate, but with a substantially undisturbed surface, i. e., without ripples of substantial size. The flash board 14 is preferably adjustable in order that flow of water may be controlled by regulating the clearance between the lower edge of the board and the bottom of the flume to compensate for other operating variables or adjust conditions to a particular operation. Downstream from the water box 11 there is an asphalt distributor box 16, having a double bottom 17, which serves as a steam chest for heat control purposes. This asphalt distribution box is supplied with hot asphalt by insulated pipe 18 and is provided upon its downstream side with a plurality of orifices 19, each about ⅜" in diameter, from each of which a stream of asphalt 20 is deposited upon the flowing sheet of water 15. Each asphalt stream so deposited forms a ribbon 21 upon the surface of the water, and as it moves forward is chilled thereby, first forming a smooth outer skin and then solidifying internally. The flume 10 is of sufficient length that by the time the asphalt ribbon has arrived at its downstream end the heat of the asphalt is so reduced that asphalt particles in a pile, without further cooling, will not again melt together. At this temperature, the rods are quite brittle, and, in falling with the water from the end of the flume, are broken into short rods 22. The general dimension of the asphalt pieces produced by this method, using the equipment shown, are about as follows: Section, oval; thickness about ⅛"; width, about ½"; length about 1–2 inches; surface, smooth except for a few shrinkage wrinkles upon upper surface. Such a particle is shown, approximately full size, in Figure 2. Returning to Figure 1, at the downstream end of the flume 10, the asphalt pieces may conveniently be allowed to collect in a pile 23 in a drainage pit below the flume end, from which pile they may be removed from time to time, as by a power shovel. The water drained away from the pile may be recirculated to again pass through the flume. To assist positively in discharge and breakage of the rods, the downstream end of the flume may be somewhat constricted, to give a turbulence at this point, which may be seen clearly at 24 in Figure 3, which is a plan view of the simple form of the device.

In commercial practice, this development per-

mits of the direct handling of asphalt from reducing stills to cold, dry, solid, small size material, loaded in freight cars in bulk for shipment. No other method of handling asphalt of which we have knowledge is so capable. Referring to Figure 4, the rodding flume **10** is seen to discharge upon a dewatering and drying conveyor **25** which is of sufficient length to assure complete drainage and which may be equipped, if desired, with air blasts near its discharge end to completely dry the product. This conveyor discharges to a loader **26** which places the finished material within a freight car **27**.

Certain limitations prevail in the design of the apparatus and in its operation to accomplish the method.

The flume should be so designed as to give a rapidly and quietly flowing sheet of water from about one to four inches in depth. In practice a fall of about one inch per foot has been found to be quite acceptacle. The width is not limited except as by such difficulties as may be had in getting a uniform sheet of water and keeping it uniformly flowing until such time as the rods of asphalt may have hardened sufficiently so as not to cohere upon contact. The lineal velocity of the water sheet thus gotten will be from about 1 to about 2 feet per second. Distribution of the water may be gotten readily in flumes of usual width by the arrangement of overflow dam and inverted weir or flashboard shown. Without the inverted weir or flashboard, the water sheet will tend to form a central ripple or wave longitudinal of the flume. A flume six feet in width, having a grade of one inch per foot, handling 500 gallons per minute of water, is found to provide a satisfactory water sheet. The length of the flume is that necessary to cool the asphalt to such a point that the broken rods will not re-cohere when piled together. This will depend somewhat, of course, upon the temperature of the asphalt and of the water. In general, with 70° water and about 400° asphalt, sixty or seventy feet of flume will be sufficient. The length of the flume depends to a large extent on the temperature of the water available. Thus comparable effects may be obtained with warmer water by using a longer flume. The constriction at the end of the flume is optional but advisable. A six foot flume may be conveniently constricted to four feet of width.

The asphalt handling equipment consists merely of a distributing box to which hot asphalt is discharged. This box may be steam jacketed or steam bottomed, to prevent cooling and deposition of asphalt therein. It must be placed close to the surface of the water sheet so that the falling streams of asphalt are not broken up. The streams of asphalt are produced by holes in the downstream side of the box. The streams should be large enough to not break up upon hitting the water, and sufficiently small to give a quickly cooled rod. We have found 3/8" diameter holes to be suitable. They should be closely spaced for space and water conservation, but far enough apart to prevent their streams from colliding after hitting the water. We have found 1½" centers to be convenient.

We have found the temperature of the asphalt to be of major importance in operating after this method. It should be heated sufficiently to be fluid, but should be below about 400° F. since at temperatures of the range and above it is hot enough to vaporize water on contact disrupting the rod or at best giving a porous product which cannot be dried effectively. With 240° F. soft point asphalt we have found a temperature of asphalt of about 375° F. to be satisfactory. This temperature, while always below 400° F., will vary somewhat for best operation, depending upon the hardness of the asphalt. With increase of temperature above the melting point, the rods tend to become smaller in cross section, due to decrease in fluid viscosity. This should be avoided by keeping temperature fairly low.

Conditions: i. e. asphalt inlet temperature, water temperature, and flume length; should be so controlled as to give an asphalt sufficiently cooled so that the pieces will not re-cohere from softening due to internal heat after discharge. This will also vary somewhat with the hardness of the asphalt, with a final asphalt temperature of about 125°–150° F. for 240° F. soft point asphalt being sufficient. From this standpoint the use of the dewatering conveyor **25** in a set up such as Figure 4 is preferable to the piling of pieces shown in Figure 1, for the asphalt pieces can be further cooled completely on such conveyor.

Operating and construction details upon a commercial equipment are of interest.

Flume:	
Width	6'—0"
Length	60'—0"
Width at constricted end	4'—0"
Grade	1" per 12"
Water:	
Quantity	500 g. p. m.
Temperture—in	75° F.
Temperature—out	83° F.
Lineal velocity ft./second	1.1 to 1.6
Asphalt:	
Grade	240° F. soft point (R. & B.)
Temperature—in	378° F.
Quantity tons/hour	10

With this operation, as above outlined, rod-form asphalt, as described, may be continuously produced at a high commercial rate. With this operation only a very minor loss in fines is experienced, far less than in any crushing or bulk handling operation known to use. Due to the smooth skin of the rod-like fragment, very little difficulty is had with dewatering and drying, and the product is readily reduced below 3% total moisture.

We claim:

1. Apparatus for reducing molten asphalt to small pieces comprising means defining an elongated sloping fluid channel sharply constricted transversely at the lower end thereof, fluid supply means to supply a smooth stream of cooling fluid to the upper end of said channel, asphalt supply means below said fluid supply means to discharge upon said stream a plurality of horizontally spaced streams of molten asphalt, said channel being of sufficient length below said asphalt supply means to permit the molten asphalt to become brittle by cooling through heat exchange with said cooling fluid before the same reaches the constricted portion of the channel.

2. The method of reducing fluid asphalt of high melting point to the form of small pieces comprising flowing the asphalt at a temperature above its melting point and below about 400° F. in a stream upon the surface of a smoothly flowing stream of water to cool the asphalt and

form a rod-like moving band of asphalt, continuing such flow of water with the asphalt on the surface thereof as a rod to cool the rod to brittleness, inducing turbulent flow of the stream of water below the point at which the rod becomes brittle to thereby break the rod into short lengths while retaining said asphalt on the surface of the water stream and separating water from the short rod-like pieces of asphalt after such breaking.

3. The method of reducing fluid asphalt of high melting point to the form of small pieces comprising flowing the asphalt at a temperature above its melting point and below about 400° F. in a stream upon the surface of a smoothly flowing stream of water to cool the asphalt and form a rod-like moving band of asphalt, continuing such flow of water with the asphalt on the surface thereof as a rod to cool the rod to brittleness, maintaining concurrent flow of asphalt and water below the point at which the rod becomes brittle while sharply restricting the stream of water to thereby induce turbulence therein and break the rod into short lengths while retaining said asphalt on the surface of the water stream and separating water from the short rod-like pieces of asphalt after such breaking.

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