2 Sheets--Sheet 1.

J. L. STEWART.
Petroleum-Still.

No. 162,965. Patented May 4, 1875.

Fig. 1

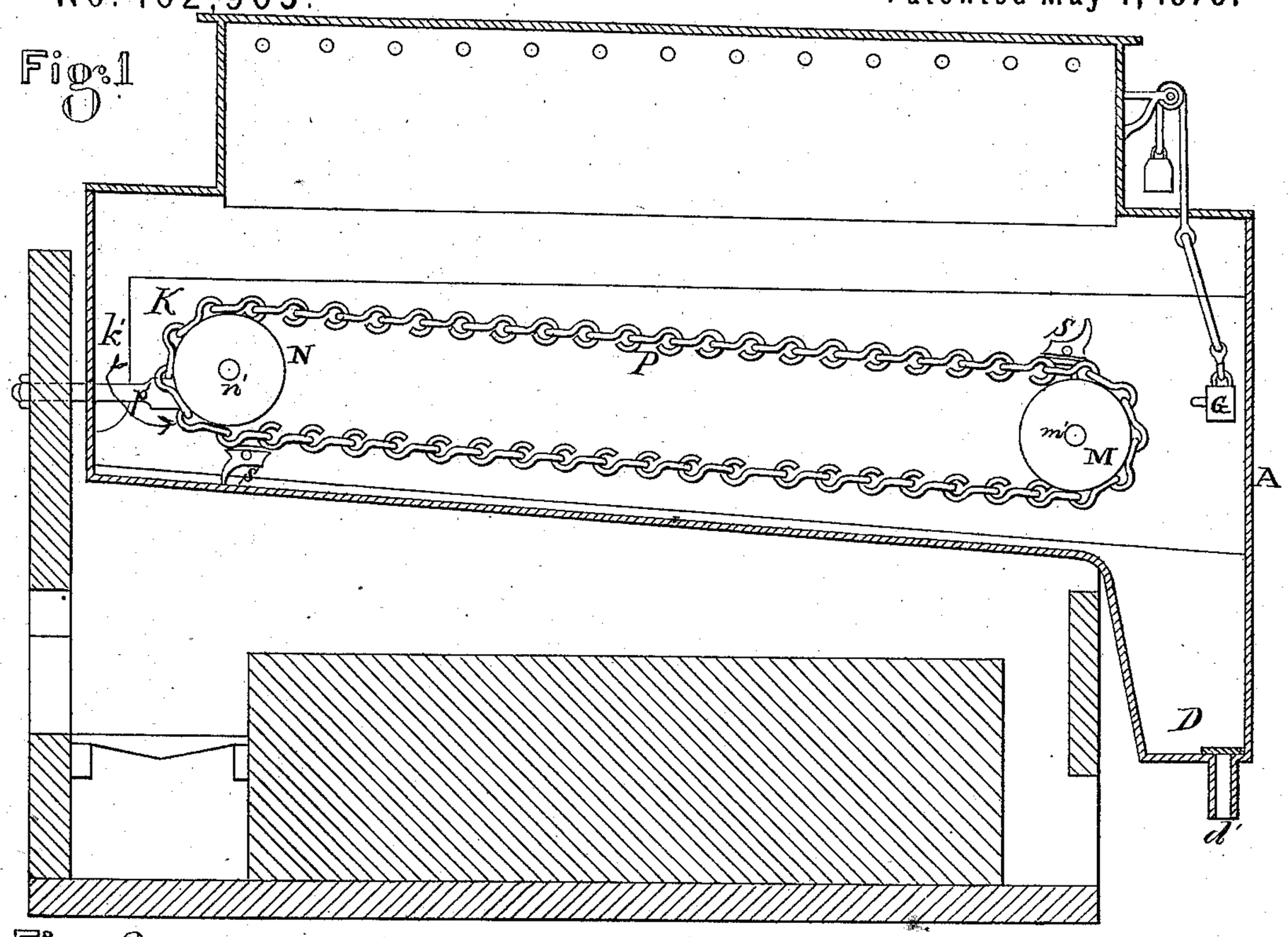
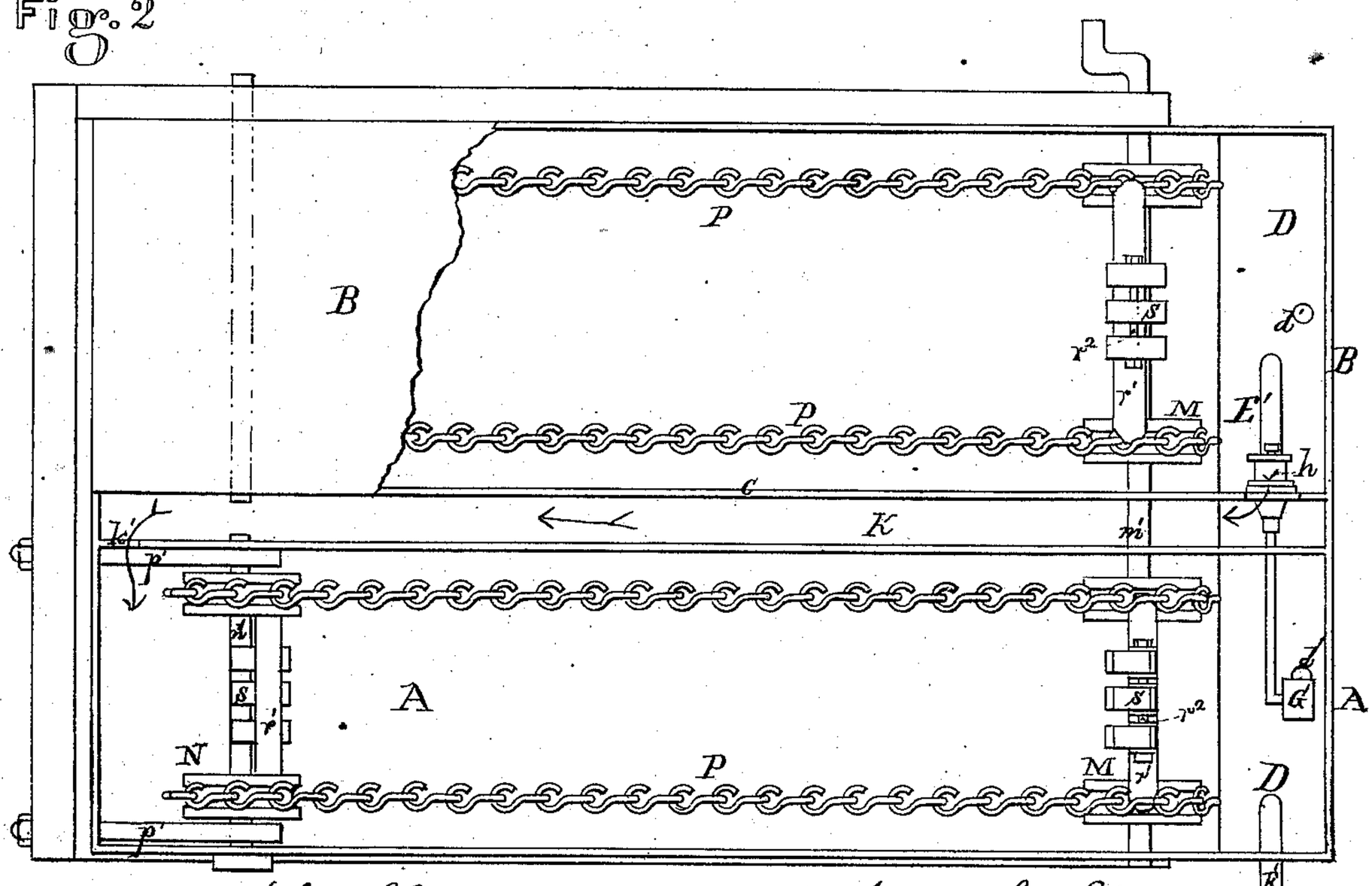


Fig. 2



Witnesses { John F. Grant
D. L. Shivers

John L. Stewart
per Edw^d Brown
Attorney.

2 Sheets--Sheet 2.

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Fig. 3

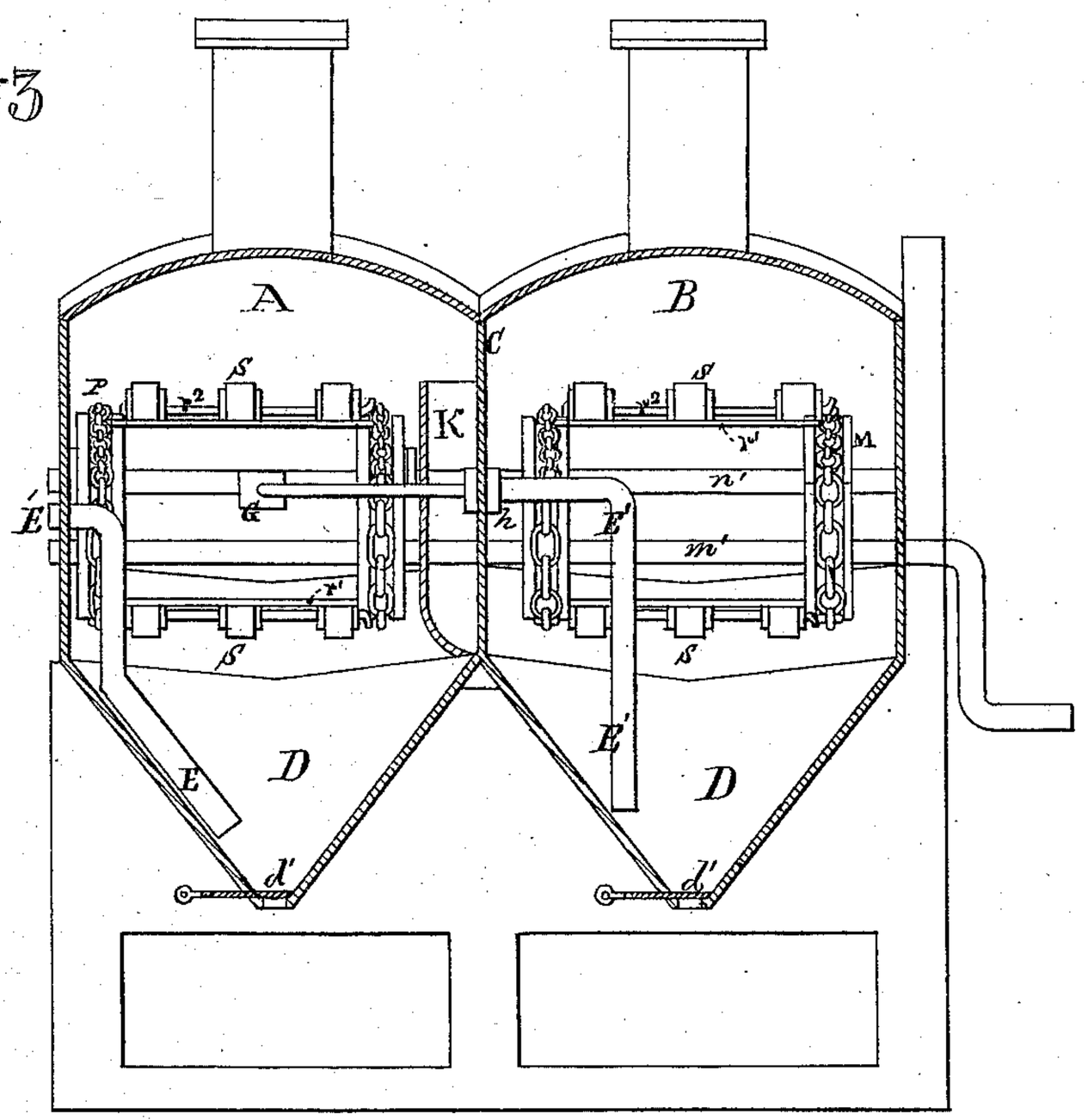


Fig. 4

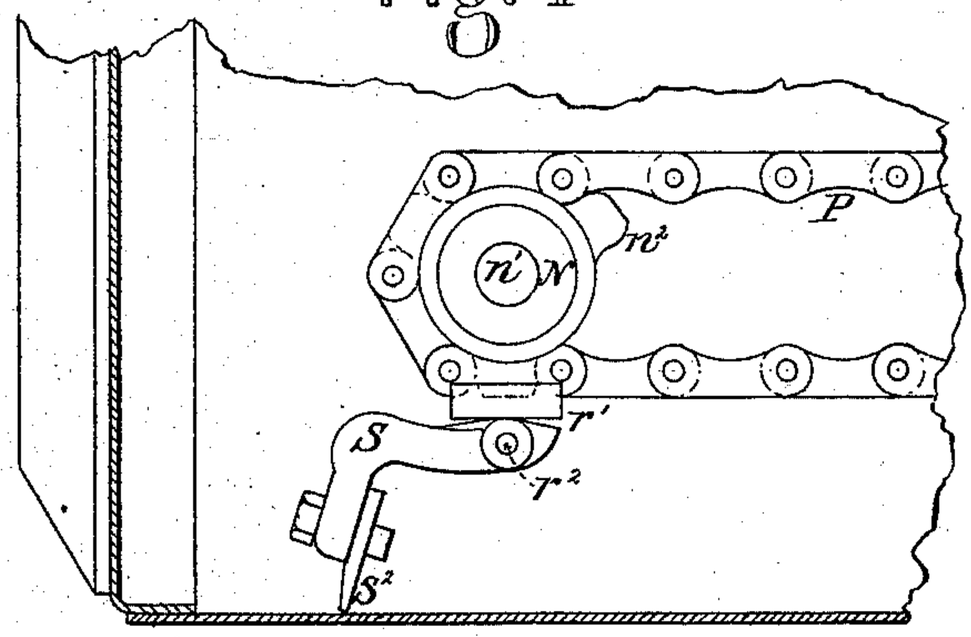


Fig. 5

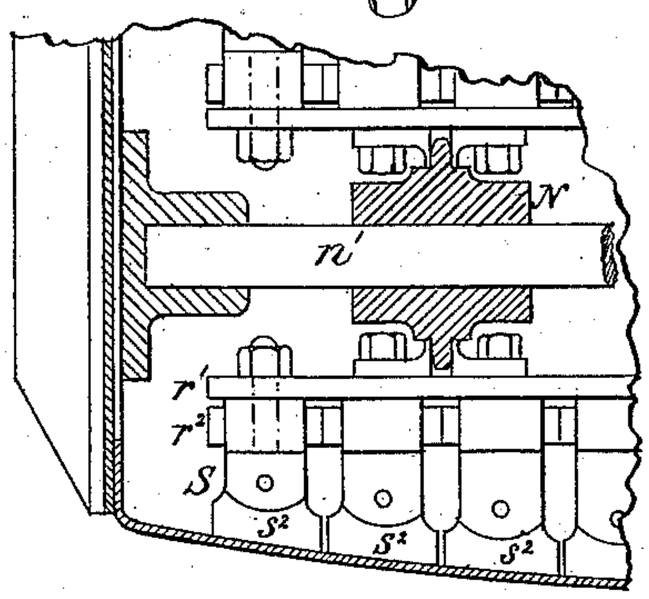
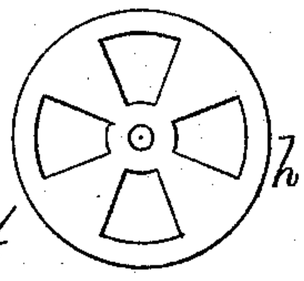


Fig. 6



Witnesses { John F. Grant.
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UNITED STATES PATENT OFFICE.

JOHN L. STEWART, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN PETROLEUM-STILLS.

Specification forming part of Letters Patent No. **162,965**, dated May 4, 1875; application filed August 8, 1874.

To all whom it may concern:

Be it known that I, JOHN L. STEWART, of Philadelphia, State of Pennsylvania, have invented a Petroleum-Still, of which the following is a specification:

My invention relates to improvements in the construction of apparatus for the continuous distillation of oils of different density from a compartment-still, or several stills connected together.

This I accomplish by dividing one still into two, three, or more compartments or sections, so that each compartment having separate fires can be heated to the necessary temperature to suit the density of the oil contained therein, and make oil of a different specific gravity from each compartment. These compartments are provided with scrapers secured to endless chains, which are mounted on shafts driven by power. These scrapers remove all sediment and paraffine oil from the bottom of each compartment, into a receptacle at the back end, thereby obviating the necessity of having to stop to clean out the stills. Overflow-pipes are so arranged in combination with self-acting valves controlled by floats, as to carry off the heavy oil from the bottom of one still into the next contiguous still, and thereby maintain constantly the proper level of oil in each compartment.

My invention consists in the combination, with a compartment-still for continuous distillation, of communicating pipes and automatic regulating-valves, whereby the oil in each still is maintained at a proper level; also, in the combination, with a compartment-still for continuous distillation, of a pipe or trough conveying the oil from the rear pocket of one still to the front end of the next still; also in making the said pipe as a conduit or lining along the side of the still, to form a lining of running oil between each compartment, and thereby prevent the temperature of one compartment being affected to any great extent by that of the next; also, in the combination, in a compartment-still for continuous distillation, of scrapers arranged on endless chains; also, in the particular construction of the scrapers, and the mode of connecting them to the chain; and, also, the general combination of parts which go to form the continuous scraping arrangement.

Figure 1 is a longitudinal section through the still. Fig. 2 is a plan. Fig. 3 is an end view of the interior. Figs. 4 and 5 show details of the chain-drum and scrapers slightly modified. Fig. 6 shows the face of the butterfly-valve.

A B are the compartments of the still, separated from each other by the dividing-plate C riveted water-tight. These two compartments, or it may be three, four, or five of them, are set in brick-work. The bottom of each inclines downward toward the rear end and terminates in a funnel-shaped receptacle, D, which has an outlet, d^1, at the bottom, above which is fitted a valve, d^2, through which the tar and refuse are discharged whenever it may be desirable. The heavy oil passes from the bottom of the receptacle D of compartment B, through the pipe E^1, into compartment A. At the outlet of pipe E^1 is a butterfly-valve, *h*, the face of which is seen in Fig. 6. The outlet from each of these pipes is about six inches lower than the level of the oil in the compartment from which it takes its supply. This difference of level tends to produce a current through the compartments from the first toward the final still where the tar is discharged. It also serves to overcome any slight difference of pressure in each still, due to unequal firing. The level of the oil in each still is regulated by a float, G, operating the butterfly-valve *h*. The oil as it passes from this pipe E^1 flows into the trough K, and thence to the front of the still, where it mixes with the main body of the oil in the compartment A, through the opening k^1, at or near the top of the trough. A pipe will answer to convey the oil to the front of the still when the stills are separate, but the trough K answers better in a compartment-still, as a lining between one compartment and the next.

I will now describe the plan for scraping the bottom of the still.

M N are grooved pulleys mounted on shafts m^1 n^1. The shaft m^1 passes through all the compartments to the outside of the still, and is turned by power. The shaft n^1 turns in sliding bearings at each end, so that the tension of the chain P can be adjusted by the screws p^1 p^1, which pass out of the front of the still. To the chain P are hinged the hooked scrapers S upon cross-bars R^1, by means of rods R^2.

These scrapers have a T-shaped end, which is placed at such a distance from the bars R^1, as to permit of a small motion, and allow the scrapers, by their own weight, to accommodate themselves to the bottom of the still. In Figs. 4 and 5 these details are shown enlarged and modified. The chain P is made curved, to fit the pulley N, which is made with projecting pins n^2. r^1 are the cross-bars; r^2, the rods; S, the scrapers with removable ends of chilled iron S^2. Any of the usual chains and pulleys used for this purpose may be employed, provided the bar r^1 can be secured upon the chain. By turning the shaft m^1 the scrapers traverse the bottom of the still and remove all the sediment into the funnel-shaped end D, from whence it and the heaviest of the oil is withdrawn through the pipe E′.

I will now describe the operation of my improved process of distillation: First, the benzine can be removed from the crude oil before entering the first compartment, or it can be used in the crude state direct from the tanks, the depth of the oil in each compartment being regulated by a float and butterfly valve. When run by ordinary crude oil the first compartment B is heated sufficiently to remove all the benzine. The heavier oil, settling to the bottom of the funnel-shaped receptacle at the back end, is conducted, by pipe E′, into trough K in the adjoining compartment, which trough conducts the oil to the surface of the forward end of the same. This compartment is heated sufficiently to distill the lightest portion of what is termed the burning-oil. The heavier product, again deposited in the pocket, as above, is removed in like manner to the surface of the third compartment, which is heated to the proper temperature to distill the heavier portions of the burning-oil. The heavier paraffine-oil and sediment are in like manner deposited, and removed in the same way to the fourth compartment, which is heated to the high temperature necessary to crack the heavy oils, or, more properly speaking, it is subjected here to a destructive distillation, so that the oil distilled over, is lighter in gravity on account of the portion of carbon deposited in the still. This carbon, in the form of tar, is scraped into the receptacle and drawn off at pleasure. Destructive distillation is only carried on in the last compartment, into which the heavy oil and refuse are finally deposited. These separations can be increased to any number by increasing the number of compartments.

It is well known to refiners of petroleum that unless the heavy oil contained in crude petroleum undergoes this destructive distillation, it will not burn properly in lamps, as the capillary attraction will not carry it up the wick. Neither will it make what is termed a standard white oil.

As the destructive distillation requires a certain temperature, it is evident that continuous distillation cannot be carried on successfully in a single still, as the lighter-gravity oils which are continually fed in distill at a comparatively low temperature, and their vapors carry over the heavy oils mechanically, as is proved by the temperature to run such a still being too low to break the heavy oil. Each of the compartments to my stills is worked independently of the other, excepting the feeding of the heavy oils from one to the other. As the compartments are run by separate fires, each can be heated to any desired temperature. The oil, as it passes along the trough K from pipe E′, serves as a lining between the two compartments, protecting in a large degree the temperature of one compartment from being affected by the temperature of the other.

By this plan of passing the heaviest oil from receptacle D of one section, B, of the still, into the next section, A, and so on to the last compartment in which destructive distillation only takes place, the level of the oil being automatically regulated by a float and valve, and provision being made for removing the coke and sediment from the bottom of the last still, I am able to keep the still in continuous operation and distill a different grade of oil from each compartment.

What I claim is—

1. In a series of stills operating in conjunction for the continuous distillation of petroleum into products of various specific gravities, the combination of the said stills A B, the overflow-pipes E′ E, and the automatic regulating-valves *h*, substantially as herein described.

2. In a series of stills operating in conjunction for the continuous distillation of petroleum into products of various specific gravities, the combination of the said stills A B, the overflow-pipes E′ E, the automatic regulating-valves *h*, and scrapers upon endless chains, substantially as herein described.

3. The combination of the scrapers S, the rods r^2, the cross bars r^1, and the chain P operating in a petroleum-still, as herein described.

4. The combination of the endless chain P, and the L-shaped scrapers S hinged and having a limited movement upon the chain, substantially as herein described.

5. The L-shaped scraper S hinged and having a limited movement, as and for the purpose described, in combination with the chilled-iron points S.

6. In a compartment, A, operating with others for the continuous distillation of petroleum, the combination of the trough K conveying the overflow from the pipe E′, and discharging it upon the surface of the oil at the front of the still, as herein described.

JOHN L. STEWART.

Witnesses:

EDWD. BROWN,

N. H. JARMAN.