D. T. CROXTON.

SLAG HANDLING TABLE.

APPLICATION FILED DEC. 21, 1907.

934,998.

Patented Sept. 28, 1909.

3 SHEETS—SHEET 1.

Fig. 1.

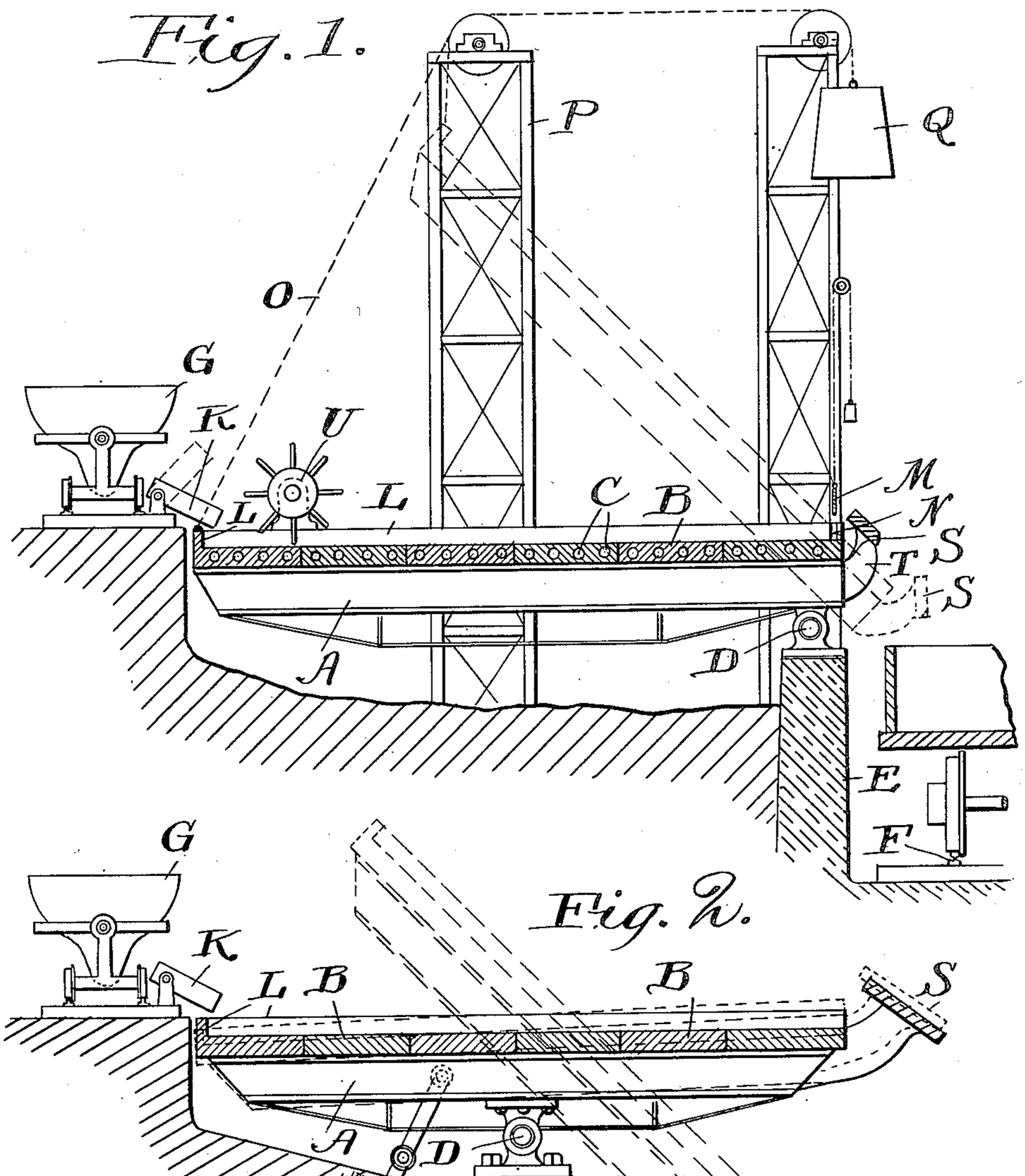

Fig. 2.

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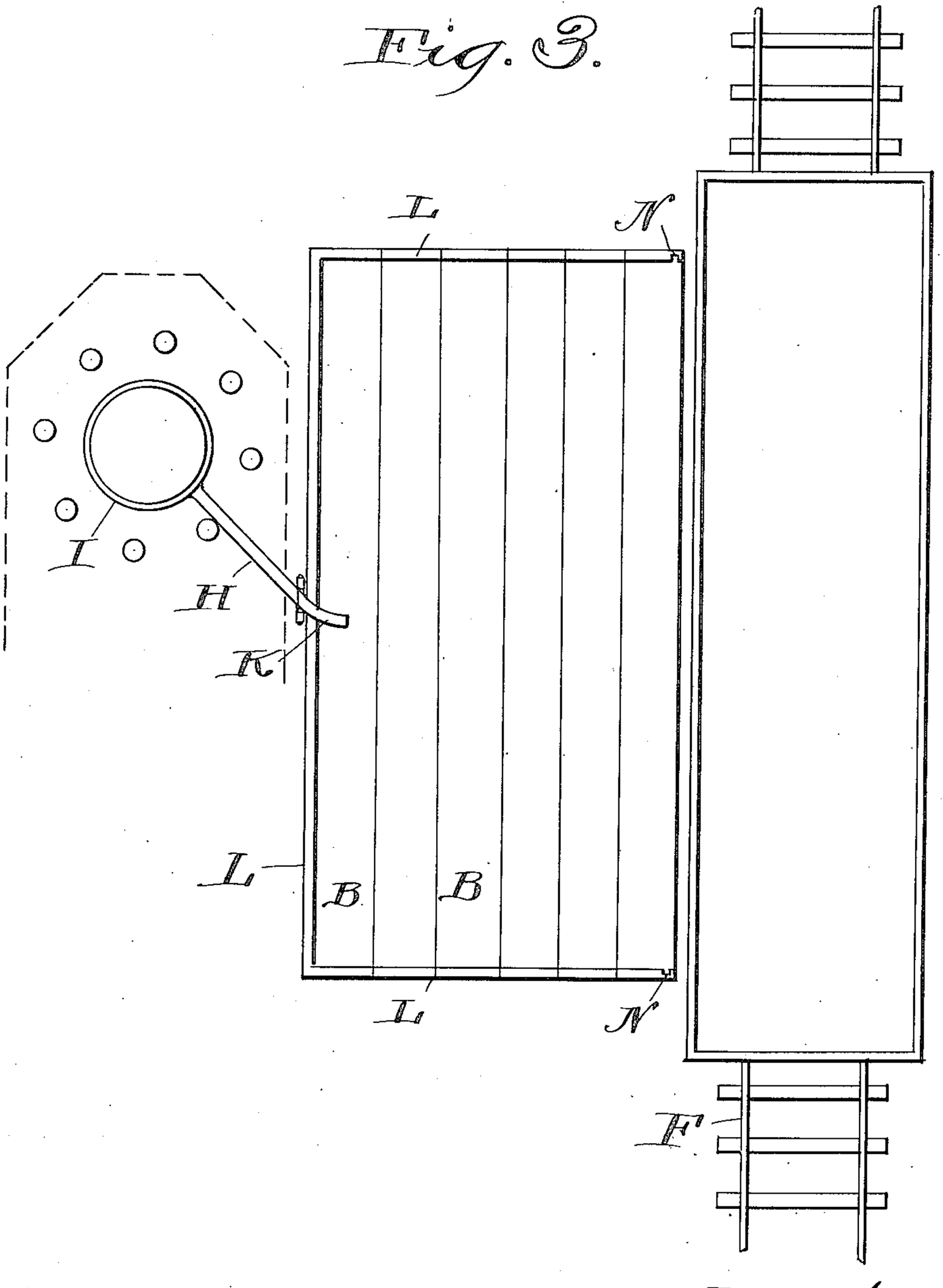
3 SHEETS—SHEET 2.

Fig. 3.



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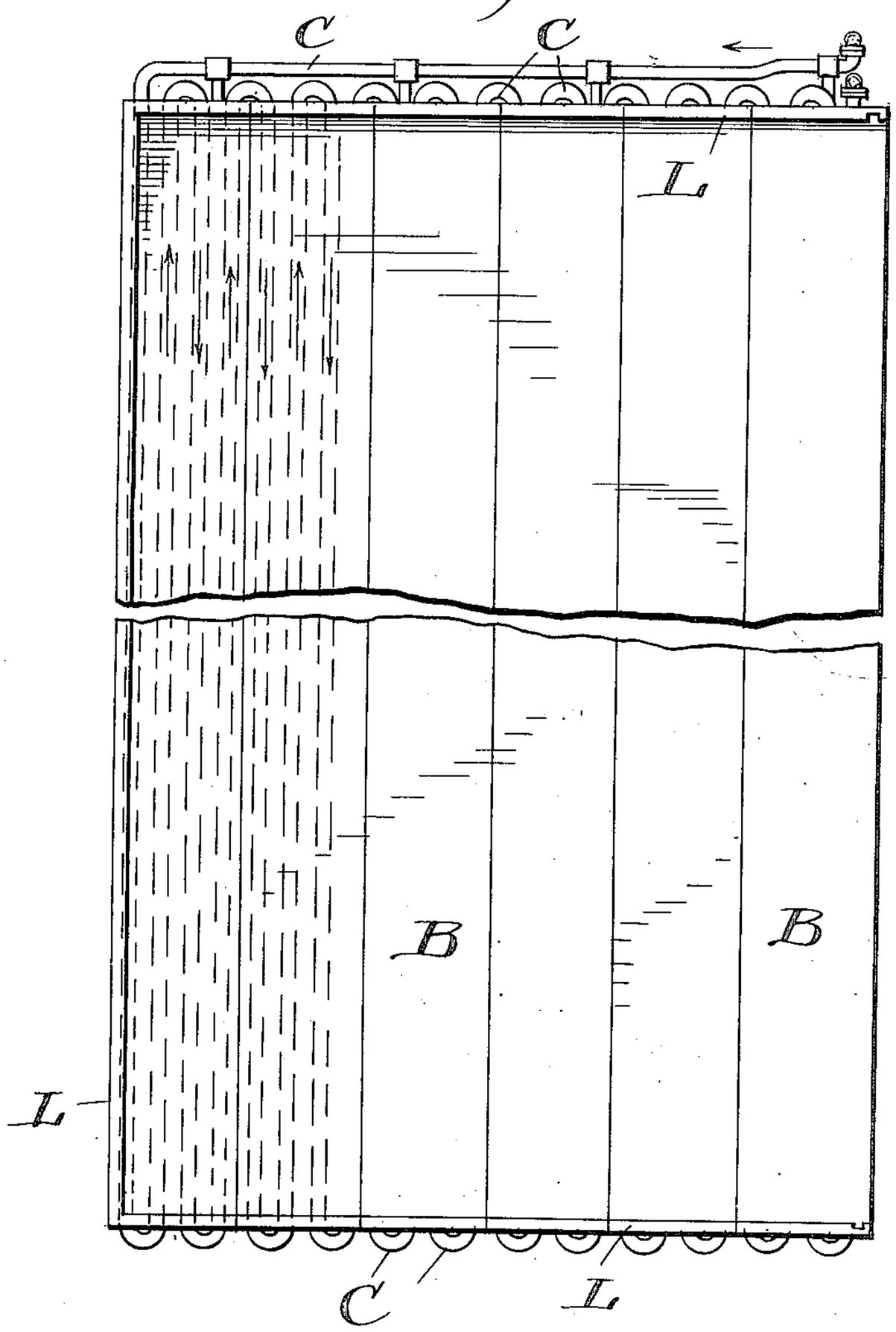
3 SHEETS—SHEET 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

DAVID T. CROXTON, OF CLEVELAND, OHIO.

SLAG-HANDLING TABLE.

934,998. Specification of Letters Patent. Patented Sept. 28, 1909.

Application filed December 21, 1907. Serial No. 407,487.

To all whom it may concern:

Be it known that I, DAVID T. CROXTON, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Slag-Handling Tables, of which the following is a full, clear, and exact description.

The present invention relates to apparatus for handling slag in large quantities and placing the slag in such condition that it not only may be readily disposed of, but also may become a source of revenue and profit.

More particularly the invention relates to an apparatus in the form of a pivotally swung, tilting cooling table adapted to receive slag in large quantities from ladles, or directly from the blast furnace, and after cooling the mass of slag in a layer of the desired thickness, to deliver the material in proper condition to the receiving cars or conveyers by which the cooled and solidified slag is delivered to the market or any desired point.

In the prior art there are known a number of methods and machines designed to take care of the slag obtained from the blast furnace which vary widely both in their objects and the manner in which it is sought to attain these objects. It is, of course, a common practice to granulate the slag by permitting the molten stream to flow from the slag bogie, or from a blast furnace runway, into a stream of water, and while this may be necessary for economical handling in certain plants, such granulated material is ordinarily without commercial value and is a source of expense rather than revenue, if it becomes necessary to remove it from the immediate locality.

There have been designed a number of rotary cooling plates having mechanical scrapers for removing the slag therefrom, and there have also been designed a number of traveling belts with or without small troughs or pans thereon for receiving the molten slag as the carrier travels under the ladle or as the ladle may travel over the carrier. While it might be possible, with such last described apparatus, to obtain the solidified slag in masses of the proper thickness to give the slag commercial value, nevertheless the mechanism necessary to operate these molding or casting machines is complicated and intricate, easily disarranged and not clean cut in their operation, besides being unable to handle the vast amounts of slag with anything like sufficient rapidity. I am also aware that it has been proposed to use small trunnioned pan or trough molds capable of making small individual blocks of slag, but which must be inverted for the purpose of delivering the molded block into the receptacle. While these molds, of course, would permit the slag to solidify in blocks of the proper thickness for commercial purposes, nevertheless such molding machines as these must, of course, not only be mounted in such manner as either to travel under the ladle or to permit the ladle to travel thereover, but must also be supported in a frame work overhanging the receiving cars so that they may be properly inverted for the molded slag to drop therefrom, an installation which is expensive and highly undesirable for many other reasons.

Notwithstanding the existence of the above enumerated designs of apparatus in the literature of the prior art, they are not made use of in practice to any extent owing to the objections above noted. As a matter of fact, it is at the present day a common practice, when it is desired to obtain the slag in some commercial condition, such, for instance, as may be suitable for railway ballast, to prepare large plots of ground to receive the molten slag as it is dumped from the ladle and permit it to cool thereon as soon as the layer has been made of the proper depth. After this larger cake of slag is cooled, a body of laborers is put upon the job with hand tools for the purpose of breaking the slag up into such fragments, after which it is shoveled into railway cars or other suitable conveyers. It is, further, frequently necessary to spray the casting ground with water in order to cool it sufficiently for the laborers to travel over. By this means the casting ground becomes so saturated with moisture that the slag thereafter poured onto it will become frothy and porous, owing to the steam, generated by its heat, passing up through it. Yet, notwithstanding this laborious and expensive method of handling slag, it is the prevailing practice and one which is preferred to the use of all of the slag casting machines now known.

The apparatus which I have invented, and which forms the subject of this application,

is not only exceedingly simple in its construction and in its manner of operation, so that it does not present any possibility of getting out of order as do those traveling mechanisms above referred to but it is capable of receiving and taking care of the slag no matter how rapidly or suddenly it may be dumped thereon from either the ladle or the furnace, and is so constructed that there is no chance for overflow streams or drippings interfering with or clogging the movable parts thereof, as is the case with many prior mechanisms. Further, it is unnecessary with my cooling table to sustain the same over the track-way along which the open top cars for receiving the solid slag travel, thus avoiding all interference with the travel of any other sort of car along that same track-way. This is a very important point, since this objection to the use of the invertible molds would prevent their use even if they were capable of handling rapidly flowing slag, or large quantities of it suddenly dumped thereon.

It has been one of my purposes in constructing my table to so arrange it that it may, if desired, be capable of receiving and cooling in layers of proper thickness, different quantities of slag, the quantity of which often varies according to the size or number of the slag bogies. Further, it has been my purpose to provide means whereby the solid sheet of slag, as it is slid from the table to the freight cars, may be automatically broken so as to be distributed and make a properly adjusted load, instead of sliding into the car in one large unbroken sheet.

The above and other useful objects it will be seen are obtained by the apparatus described in the following specification, reference being had to the accompanying drawings:

Figure 1 is an elevation partly in section showing a form of my invention in which the tilting table with water cooled floor is hinged at its forward end to a suitable stationary support, the position of the table and its adjunctive parts in discharging position, being shown by the dotted lines. Fig. 2 is a similar view showing a modified form of table, the floor of which is not water cooled, the table being provided with a hydraulic engine for determining the inclination thereof. Fig. 3 is a plan showing the relation of the parts where the table receives its slag directly from the blast furnace through a run-way instead of from a slag bogie or ladle. Fig. 4 is a detail plan showing the table and the water cooling connections therefor.

Of the various figures, the cooling table will be seen to be suitably constructed of a supporting frame work of I beams A having a floor of iron slabs for blocks B which may be provided with suitable water cooling pipes C and connections, as shown in Figs. 1 and 4, or which may not be water cooled as shown in Fig. 2. This table which is suitably pivoted or hinged as at D to a stationary support E, is suitably located about the plant adjacent to the track-way F for the freight cars or other receiving conveyers by which it is desired to transport the solidified slag. The slag is delivered onto the table either by means of a slag bogie G running on an adjacent track-way, or by means of a run-way H leading directly from the blast furnace I. A suitably pivoted receiving trough K may be interposed between the run-way or the ladle and the table for the purpose of delivering the molten slag from the former to the latter, the trough being pivoted so as to be swung out of the way when the table is tilted to discharge the cooled slag.

The table itself, which is preferably rectangular in form, is provided with retaining boundaries or walls L upon three sides thereof, the delivery side being left open without any fixed boundary. On the delivery side, however, I preferably provide a sliding or removable gate M capable of being retained in position by guiding slots N, or other suitable means, when it is desirable to employ the same. This sliding gate may be properly counterbalanced, as shown in Fig. 1, so as to be easily drawn away when it is desired to discharge the layer of cold slag from the table.

For the purpose of operating the table and controlling the angle of inclination, which is a desirable feature even when receiving the hot slag, as will be pointed out below, I provide any suitable hoisting or load lifting means, for example, that shown in Fig. 1, wherein a cable O, tower P and counterweight Q are employed with any suitable means, not shown, for drawing the cable upward; or as shown in Fig. 2, I may employ a hydraulic engine R, or any two or more of these devices, such as the situation may demand.

I find it a desirable feature to locate, at the discharge side of the table, a deflector or breaker S which should extend along the width of the discharge side and may be supported by any suitable brackets T attached to the I beams of the table frame. As the heavy sheet of slag slides down the table and strikes this breaker or deflector, which is inclined at an acute angle to the table, the deflector will cause the edge of the sheet to bend downward owing to the heavy pressure back of the latter, and the sheet will thus be broken off at its forward edge as it slides into the car.

In order that I may, if desired, start the sliding of the slag from the table somewhat in advance of that angle of inclination at which the sliding would normally take place,

I may provide a breaking or cracking device such as a rotatable roll U with spikes thereon, as shown in Fig. 1, which may be supported in trunnions at each end by the frame work of the table. This device is intended to be used only to prevent the slag from sticking to the table by reason of its friction until the table has reached the angle at which the entire charge, amounting to many tons, would rush from the table with a great velocity. With this breaker the cracking of the slag and the delivery thereof may be started at a small inclination of the table. It will be observed that in this structure, I may incline the table backward or toward the pouring spout, if I desire, and this is an advantage both when it is desired, for any reason, to entirely omit the removable gate on the discharge side, and when it is desired to cool less than the quantity of slag which would cover the table to the proper depth for making a salable ballast.

By tilting the table backward toward the pouring spout, as shown in dotted lines in Fig. 2, so that the discharge edge is elevated, it will be obvious that the sliding gate may be omitted because the discharge edge may be brought to the same level with the upper edge of the rear retaining side or wall of the table, and thus a layer of slag may be poured and properly retained and cooled on the table and discharged therefrom without the use of the removable gate on the discharge side, and this layer will for the most part be of suitable thickness, although it will be tapered in form and reduced to a taper at the apex of the wedge. Nevertheless, the main portion of the layer will be of such thickness as to be suitable for ballast purposes. This is, as above stated, an advantage when it is desired for any reason, such as an increased rapidity or ease of operation to dispense with the removable gate, or when the quantity of molten slag to be cooled would be insufficient to cover the entire table to a proper depth for making a sufficiently thick product.

From the above description it will be seen that the objects which I desire to accomplish have been attained by my invention and it will be possible to handle any quantity of slag which may be delivered from the furnaces with an exceedingly small force of laborers without the use of complicated or expensive machinery, without the danger of overflowing streams or drippings in any way interfering with the operating parts, with means for controlling the layer of slag so that it shall result in a profitable commercial product, with ease and rapidity with the minimum of operating force, and with the elimination of every possible interferences with the track or road-way of the freight cars into which the slag is dumped. These and many other advantages obviously accrue from the structure which I have devised to solve the difficult problem of handling slag in a manner to prevent a loss or to produce an actual revenue or profit.

Having thus described my invention, I claim:

1. In combination, a slag cooling table pivotally mounted on a stationary support and operating mechanism for tilting said table and controlling the inclination thereof.

2. In combination, conveying means for molten slag, conveying means for solid slag, a cooling table interposed between the two said conveying means and pivotally connected to a stationary support, said table located in position to receive the molten slag from the conveying means therefor and to deliver the solid slag to the conveying means therefor when inclined toward the latter and positively operating mechanism for inclining said table.

3. In combination, a slag cooling table pivotally mounted on a stationary support, and mechanism for tilting the table toward one side to discharge the slag, the table being free from retaining obstruction on the discharge side, but having retaining walls on the other sides thereof.

4. In combination, a slag cooling table pivotally mounted upon a stationary support, and means for tilting the table toward one side for discharge, said table being adapted to receive a removable gate on its discharge side, and provided on the other sides with retaining walls.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

DAVID T. CROXTON.

Witnesses:
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H. R. SULLIVAN.