J. R. CAMPBELL.

METHOD OF WASHING COAL.

APPLICATION FILED JUNE 23, 1908.

945,692. Patented Jan. 4, 1910.

3 SHEETS—SHEET 1.

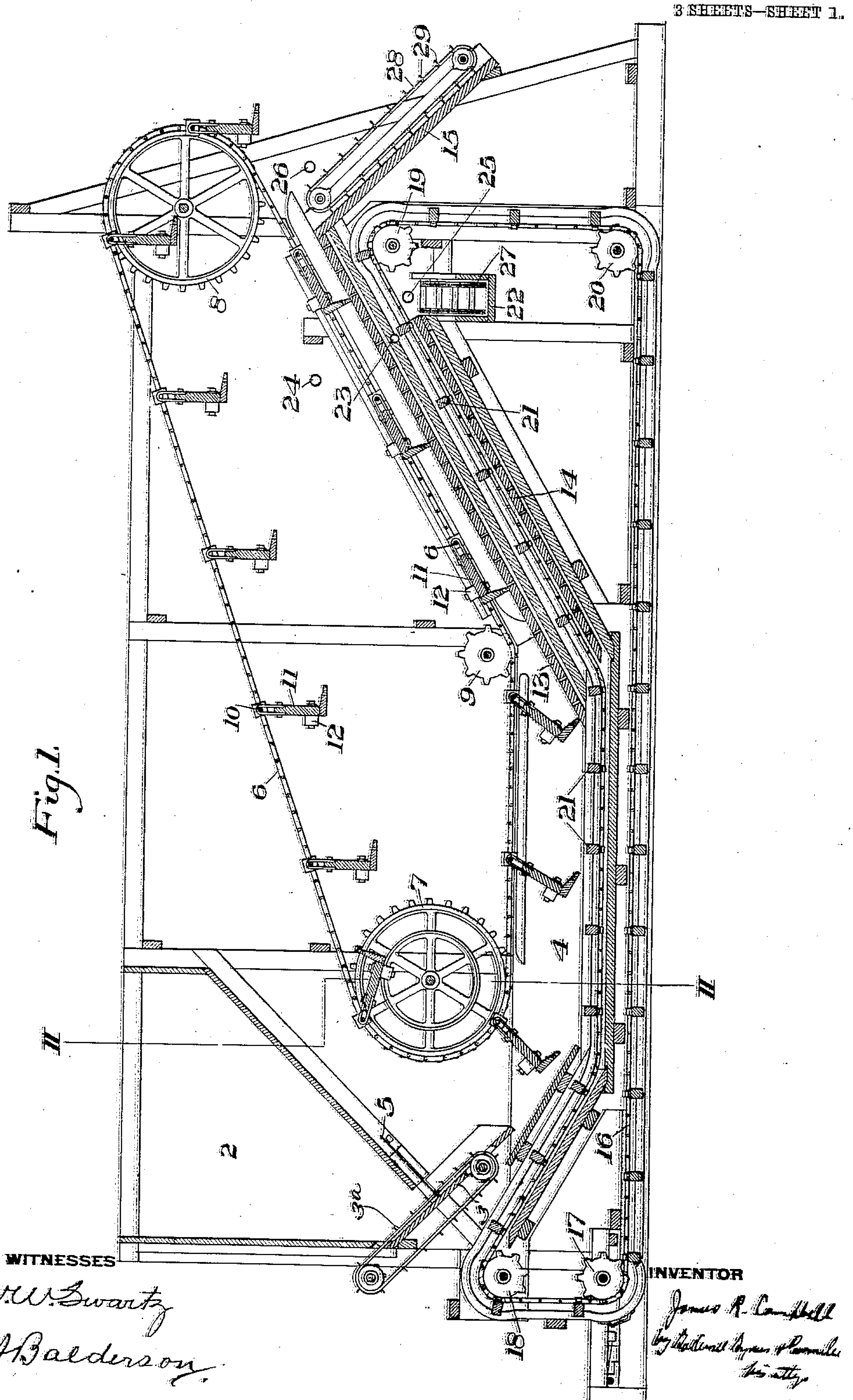

Fig. 1.

WITNESSES

W. W. Swartz

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3 SHEETS—SHEET 2.

Fig. 3.

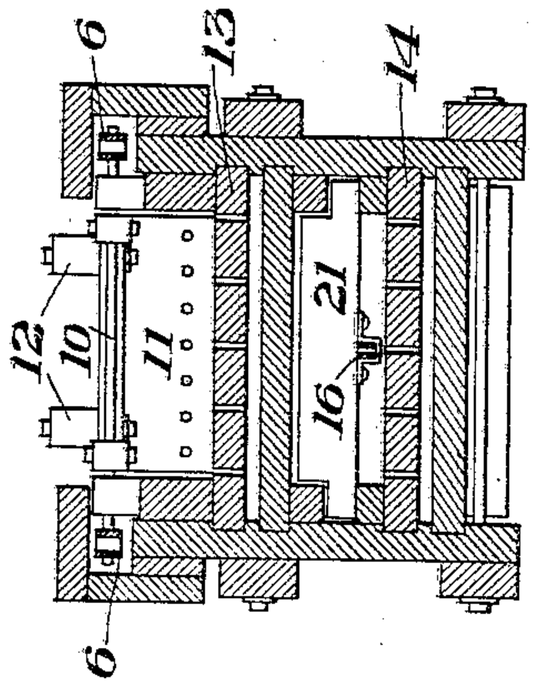
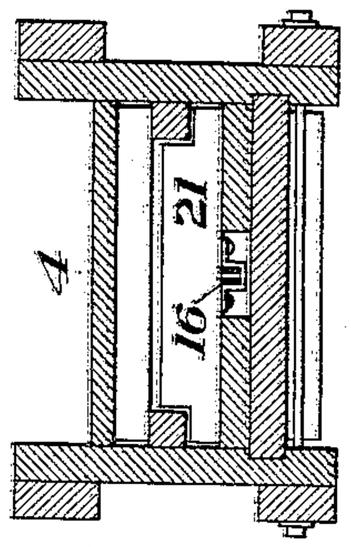


Fig. 4.



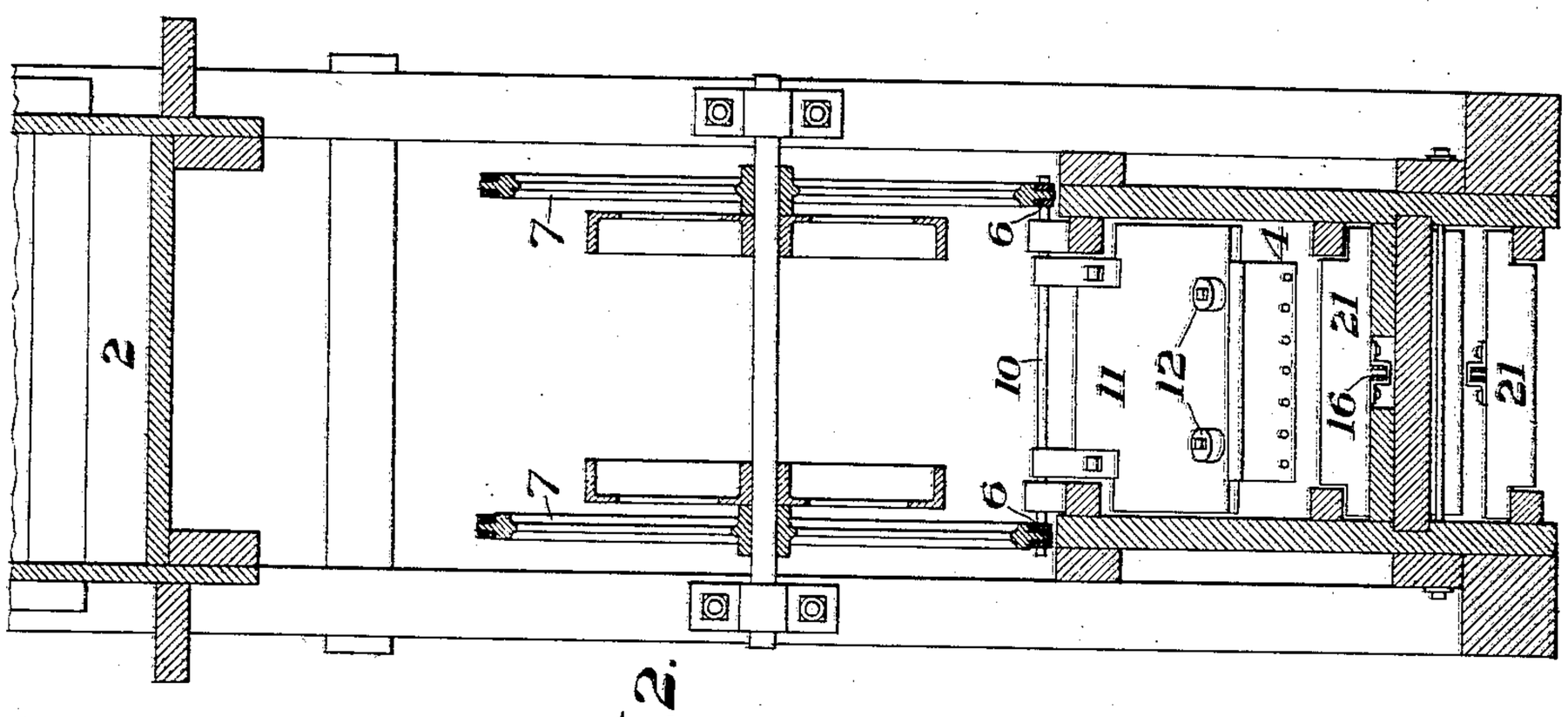


Fig. 2.

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3 SHEETS—SHEET 3.

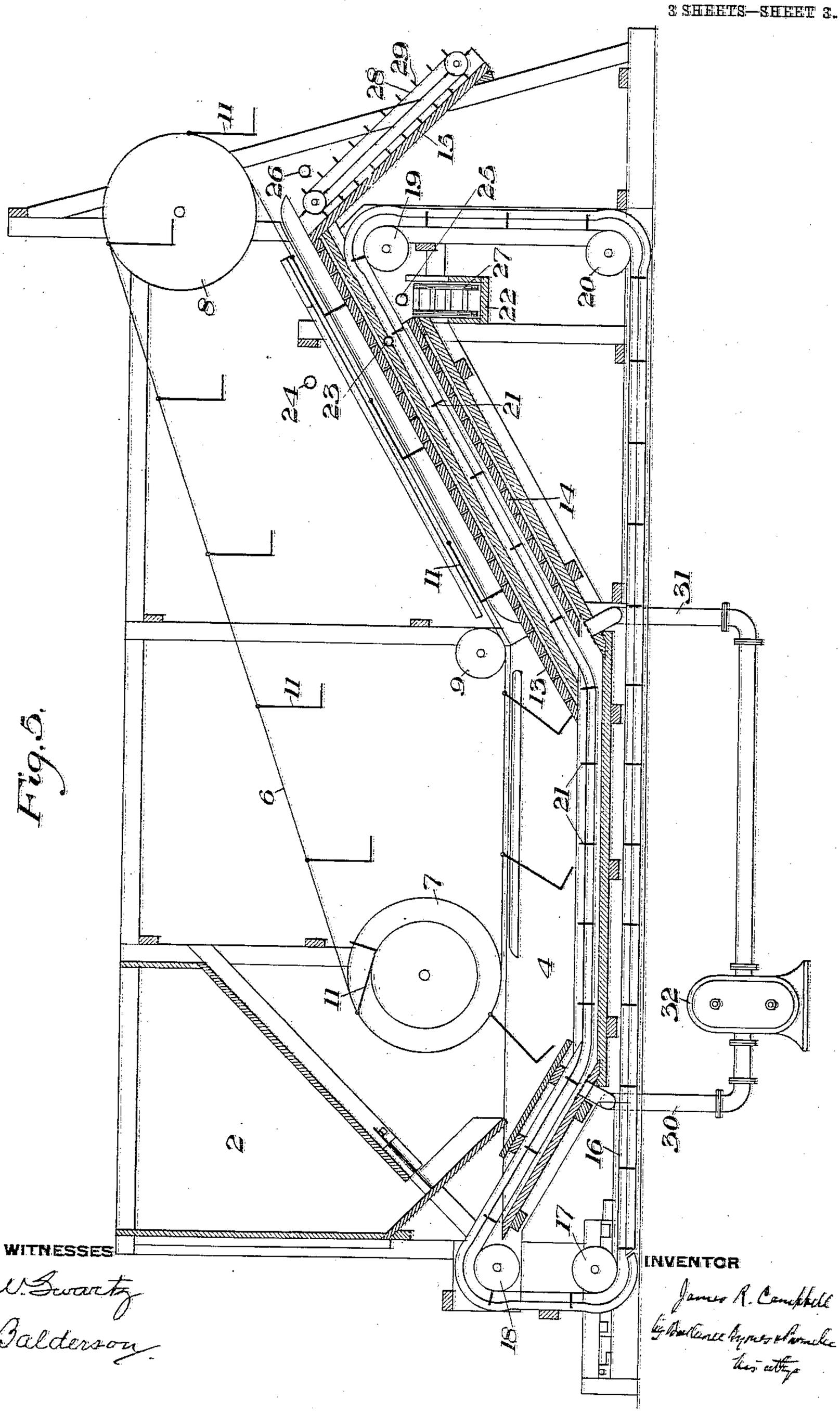

Fig. 3.

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UNITED STATES PATENT OFFICE.

JAMES R. CAMPBELL, OF SCOTTDALE, PENNSYLVANIA.

METHOD OF WASHING COAL.

945,692. Specification of Letters Patent. Patented Jan. 4, 1910.

Application filed June 23, 1908. Serial No. 439,934.

To all whom it may concern:

Be it known that I, JAMES R. CAMPBELL, of Scottdale, in the county of Westmoreland and State of Pennsylvania, have invented a new and useful Method of Washing Coal, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal section showing one form of apparatus for carrying out my invention; Fig. 2 is a section on the line II—II of Fig. 1; Figs. 3 and 4 are details; and Fig. 5 is a diagrammatic view of a modification.

My invention relates to the washing of coal to free it from impurities, which has heretofore been done in jig washers.

My invention consists in employing in the washer a liquid of greater specific gravity than water. If a quiet pool is employed, the gravity of the liquid should be greater than that of the coal. If the liquid is forced or circulated within the tank, its specific gravity may be less than that of the coal, but must always be greater than that of the water.

In carrying out my invention, the coal is broken into the desired size and fed into the tank containing the solution, the specific gravity of which will depend upon the size of the coal and its gravity. The solution may consist of the chlorids of calcium, zinc or sodium or any other solution which will be comparatively inexpensive and will not act upon the coal deleteriously. In this tank, the coal proper will be buoyed up in a solution, while the impurities, in the form of slate, iron pyrites, etc., will sink to the bottom. The coal and impurities are then removed separately from the tank and the operation is preferably continuous.

In the drawings, in which I have shown one form of apparatus, 2 designates the coal bin or receptacle, having chute 3, leading into the tank 4, containing the washing solution. The feeding of the coal may be regulated by the hand slide 5 or by the conveyer 3^a on the chute 3 which leads from the coal receptacle to the tank.

The tank is provided with means for removing the buoyed up coal and the impurities which settle at the bottom. In the form shown, the coal conveyer consists of sprocket chains 6, passing around suitable sprocket wheels 7, 8 and 9, and having cross bars or rods, 10, on which are pivoted the flights 11. These flights are preferably perforated and may be weighted, as shown at 12, to assist in carrying out the coal. At the exit end of the tank, it is provided with two inclined floors 13 and 14, one above the other, the upper coal flights moving over the upper floor to carry the coal to the discharge chute 15. Each of these inclined floors preferably consists of a perforated wood bottom with another bottom below it which may be either metal or wood, and which leads back the solution dripping from the coal and impurities.

The impurities may be carried out by sprocket chains 16, moving over sprocket wheels 17, 18, 19, and 20, and having transverse flights 21. These flights carry the slate and impurities up along the lower inclined bottom and drop it into the side discharge chute 22.

In order to reduce or prevent the carrying out of the solution with the coal and slate to which it adheres, I may employ blast pipes 23 and 24, over the upper end portions of the inclined floors. The steam or air may be driven through lower perforations in these pipes and serves to overcome the capillary attraction between the solution and the lump material, causing the solution to drop back through the double floor and pass back into the tank. I may also employ a recovery system for the solution, in which case, I preferably provide water spray pipes 25 and 26, over the outlet chutes for the coal and impurities. In this case also I preferably employ conveyers 27 and 28, having flights 29 which regulate the descent of the lump material and enable the water to wash the same more effectually. This water will then be collected and concentrated, preferably by waste heat from coke ovens, or in any suitable way. This recovered material may then be added to the solution in the tank and be again used in further coal washing operations.

In the operation of the device, the coal is preferably fed continuously into the tank and the coal proper being buoyed up, will be carried by the upper inclined floor, while the heavier impurities will sink through the solution to the bottom and be carried out over the lower inclined floor to the discharge chute. If the air or steam blast pipes are employed this will serve to drive back the solution and prevent its waste. If the wash-

ing recovery system is used, the water will be collected from the chutes and pass to a recovery system.

In Fig. 5, I show a form wherein the liquid in the tank is circulated through pipes 30 and 31, leading to and from a pump 32, which may be of the centrifugal type. If this system is used, the current may be used to carry the coal along to the outlet and the liquid may be of less specific gravity than the coal, inasmuch as the current will aid in the buoying up action. In the same way, the solution may be forced in through the bottom to aid in the buoying action.

In practice, I have found that the apparatus will work efficiently with coal from one-fourth to one-half inches in size, though, of course, any size may be used, the specific gravity of the liquid being correspondingly varied. The average specific gravity of the coal treated by me is about 1.34, while the specific gravity of slate is 2.7, and that of iron pyrites about 6. It will therefore be seen that an efficient and thorough separation is obtained.

Many changes may be made in the apparatus employed as well as in the method without departing from my invention, since I consider myself the first to use a solution heavier than water and not acting deleteriously on the coal in buoying up the coal in the washing operation.

I claim:

1. The method of separating coal from heavier impurities consisting in immersing the impure coal in a solution heavier than water and not containing acids having a deleterious effect upon the coal, to separate the coal and impurities, removing the separated materials independently, impinging a blast of gaseous fluid pressure upon the separated materials removed from the solution to remove any solution clinging thereto, and then spraying the separated materials with water and finally recovering the solution removed from the materials after being separated; substantially as described.

2. The method of separating coal from heavier impurities consisting in passing the impure coal into a tank containing a solution heavier than water, simultaneously removing the coal and impurities from different levels in the tank and impinging a blast of gaseous fluid pressure upon the separated coal to overcome capillary attraction of and remove solution clinging thereto and passing the removed solution back into the tank; substantially as described.

3. The method of separating coal from heavier impurities which consists in immersing mixed coal and impurities in a tank containing a solution heavier than water, simultaneously removing the separated coal and impurities separately from different levels in the tank, washing the removed solid materials to remove solution clinging thereto and impinging a blast of gaseous fluid pressure on the washed coal to remove fluid clinging thereto and passing the removed solution and fluid back into the tank; substantially as described.

In testimony whereof, I have hereunto set my hand.

JAMES R. CAMPBELL.

Witnesses:
W. H. CLINGERMAN,
W. H. GLASGOW.