

W. S. CARPENTER.
 APPARATUS FOR EXHAUSTING COAL DUST FROM COAL BREAKERS.
 APPLICATION FILED OCT. 21, 1908.

945,375.

Patented Jan. 4, 1910.

3 SHEETS—SHEET 1.

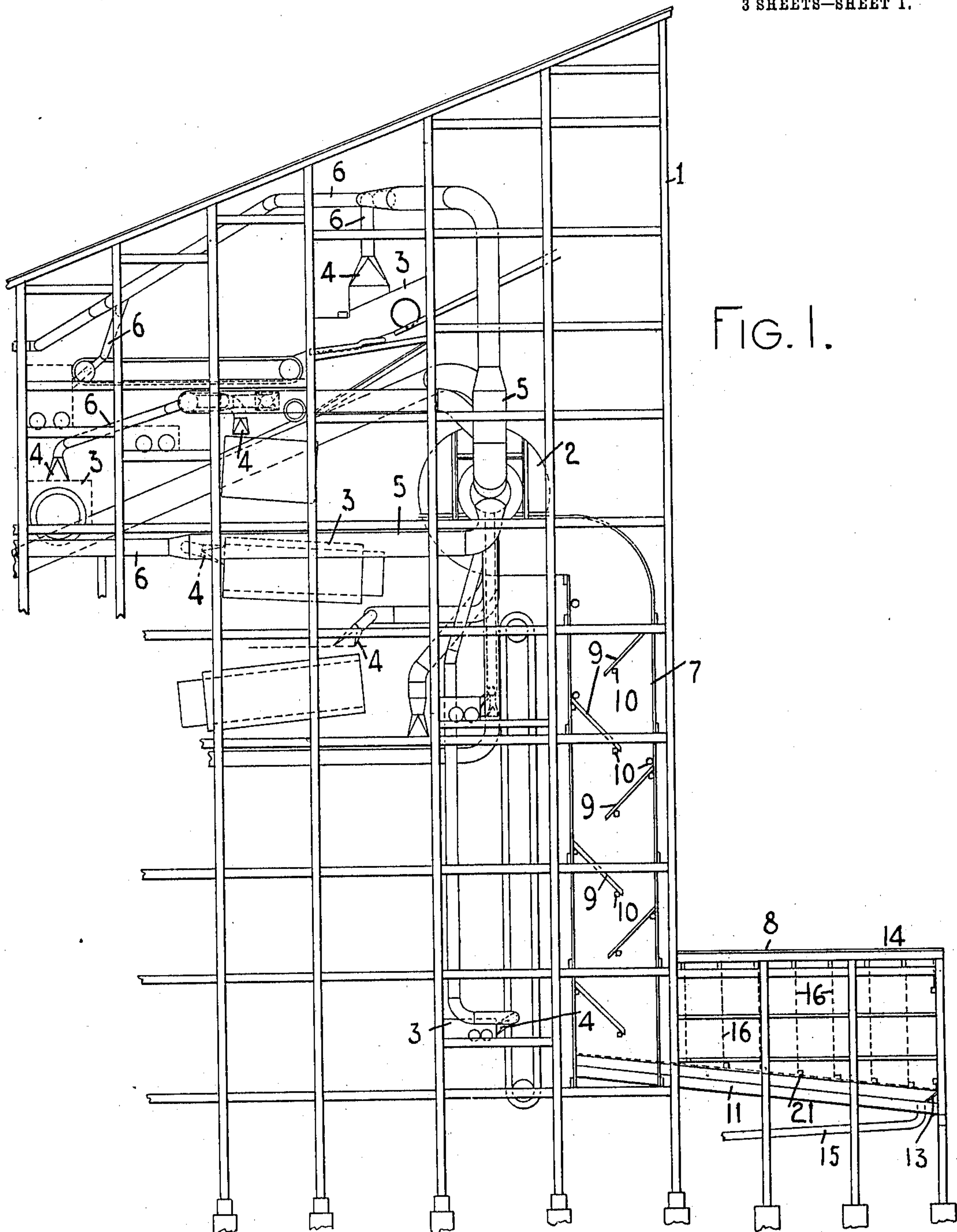


FIG. 1.

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FIG. 2.

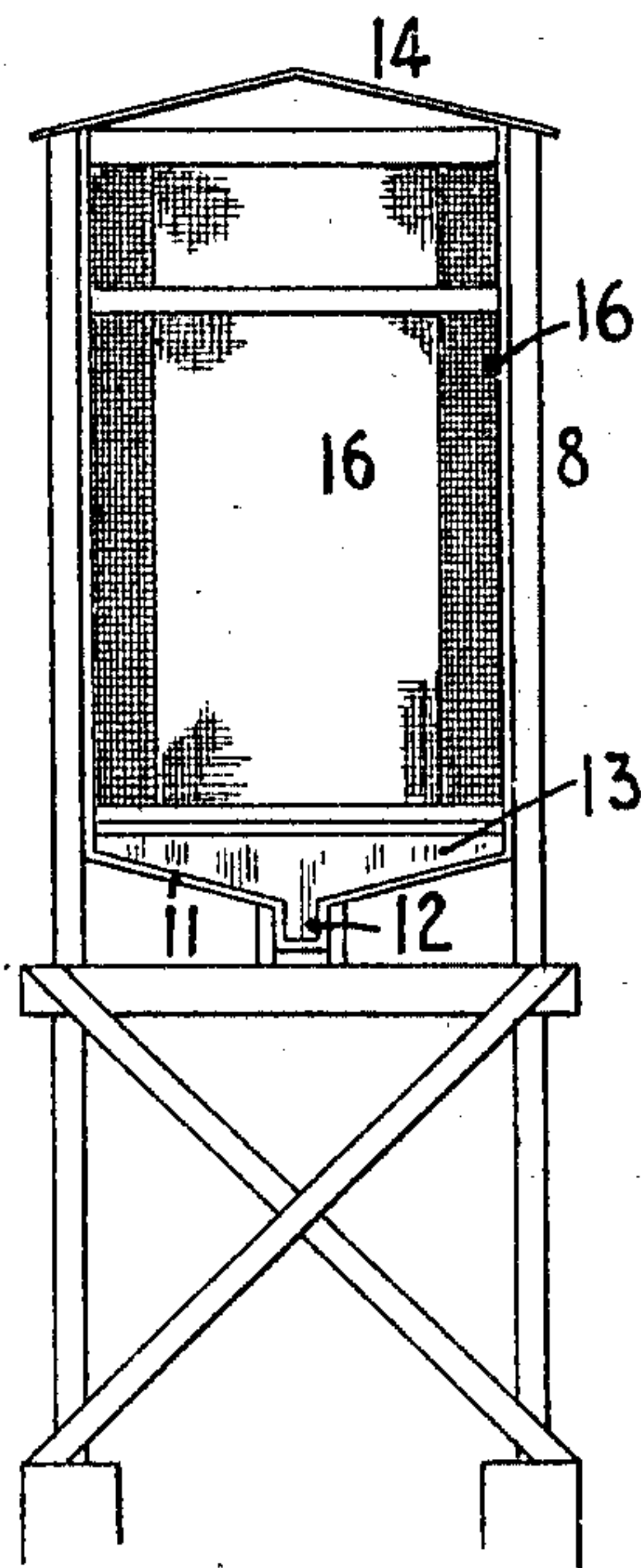
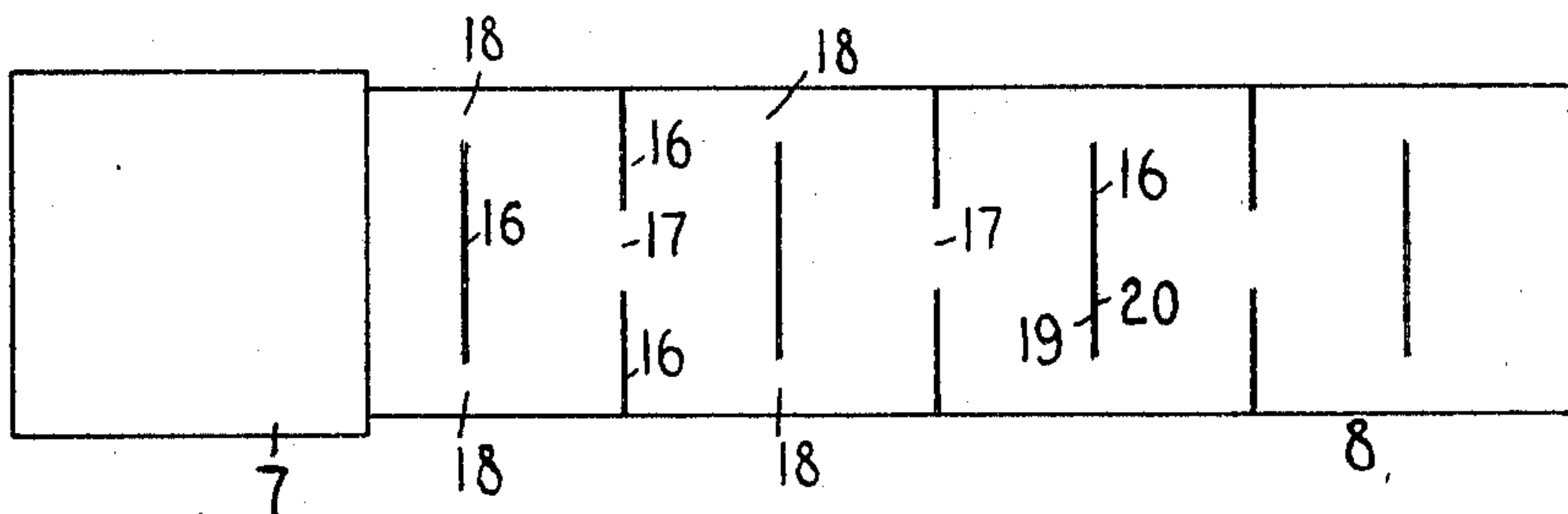


FIG. 3.



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3 SHEETS—SHEET 3.

FIG. 4.

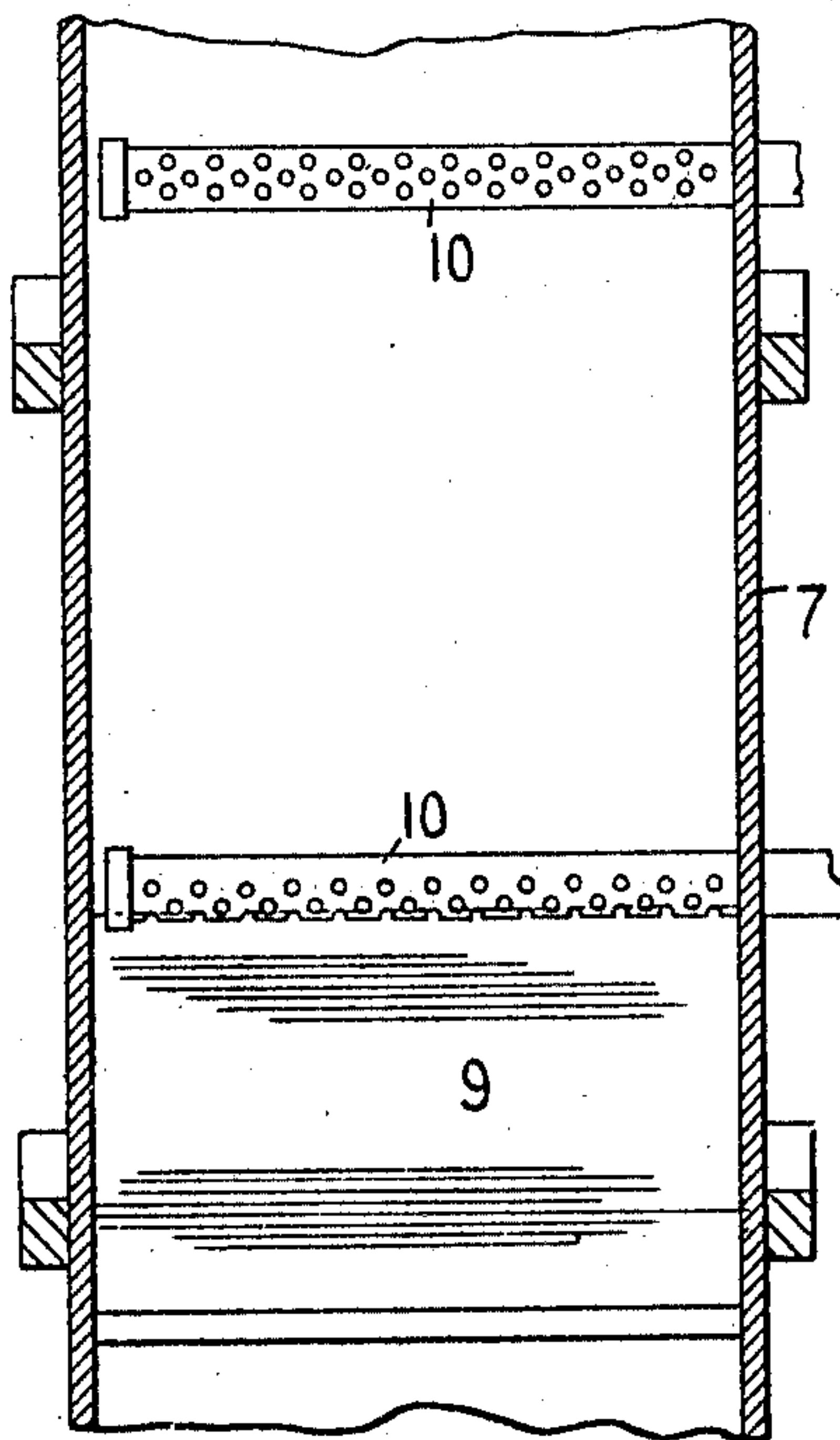
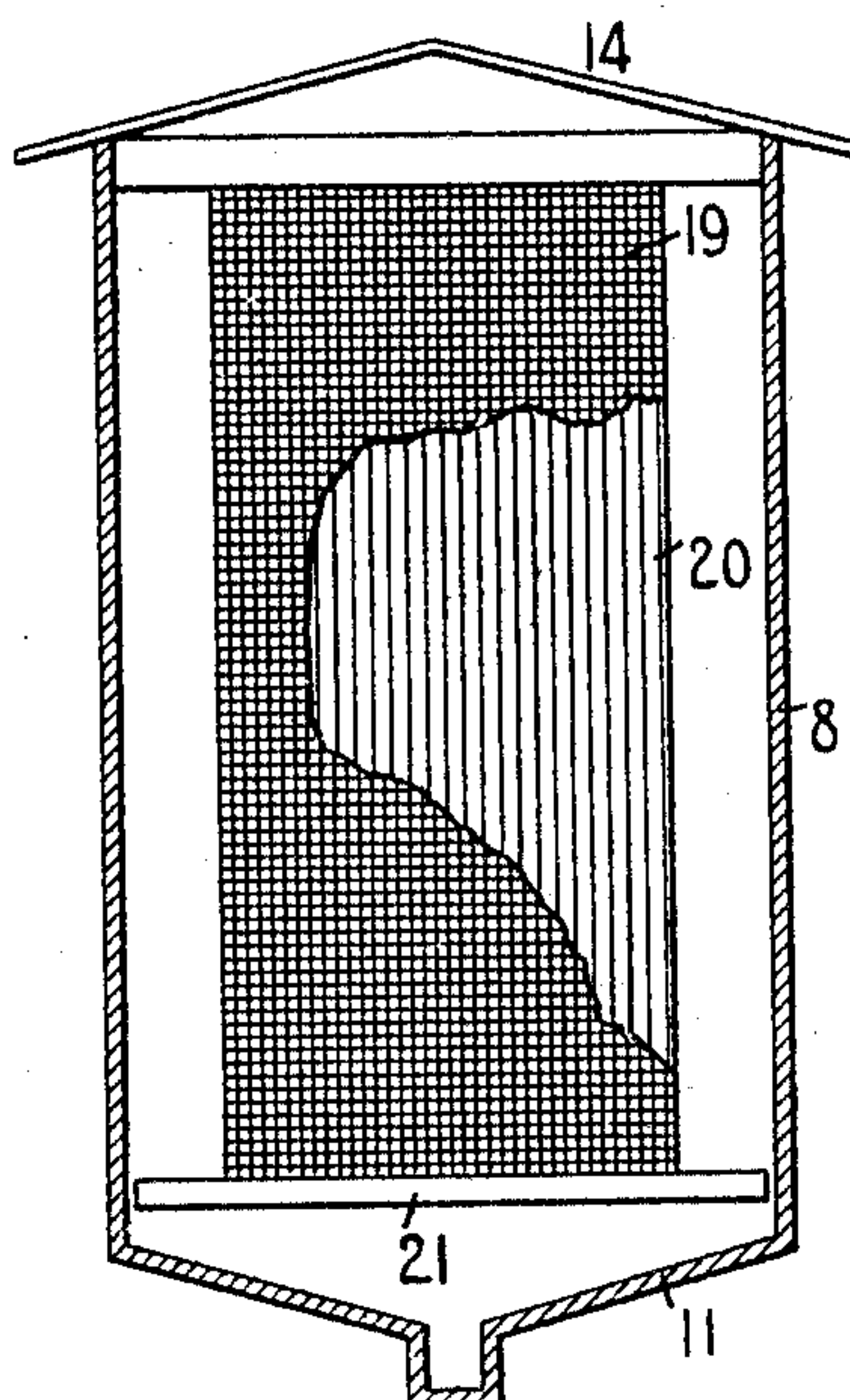


FIG. 5.



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APPARATUS FOR EXHAUSTING COAL-DUST FROM COAL-BREAKERS.

945,375.

Specification of Letters Patent.

Patented Jan. 4, 1910.

Application filed October 21, 1908. Serial No. 458,809.

To all whom it may concern:

Be it known that I, WALTER S. CARPENTER, a citizen of the United States, and a resident of Wilkes-Barre, in the county of Luzerne and State of Pennsylvania, have invented a certain new and useful Improvement in Apparatus for Exhausting Coal-Dust from Coal-Breakers, of which the following is a full, clear, and exact description, reference being made to the accompanying drawings, forming part of this specification.

This invention relates to improvements in apparatus comprising a fan and other co-operative appliances, including a system of pipes through which dust may be drawn by the fan, the object of the invention being both to adapt such apparatus to exhaust coal-dust from a coal-breaker, and to combine with apparatus constructed for that use means for condensing and collecting the exhausted coal-dust so that it shall not be expelled in clouds from the breaker to be blown about by the wind and scattered on the ground and buildings in the vicinity.

The invention consists of apparatus comprising any or all of the combinations hereinafter described and specified in the claims.

On the accompanying sheets of drawings, on which like reference-numerals designate like parts in different views, Figure 1 is a broken sectional elevation of a coal-breaker equipped with apparatus embodying the invention; Fig. 2, an end view of the part shown at the right and near the bottom of Fig. 1; Fig. 3, a diagrammatic plan of the interior of this part; Fig. 4, a sectional detail illustrating certain features of the apparatus on an enlarged scale, the section being on a vertical plane at right angles to the plane of Fig. 1; and Fig. 5, a face-view of a cloth-faced screen from which a piece of the cloth has been torn, and a cross-section of the casing of which an end view is shown in Fig. 2.

The use of this apparatus applied to a coal-breaker enables the breaker to be kept light and fairly clean and to contain plenty of clear and pure air, thus facilitating the operation of the breaker under conditions favorable to the health of those who work in it, and relieves those who live near it of the great annoyance and damage caused by clouds of coal-dust such as a coal-breaker commonly emits. The apparatus also bene-

fits pecuniarily the owners of the breakers to which it is applied, and the owners of the mines from which the coal treated by these breakers is obtained, and benefits finally the consumers of the coal.

As the construction of a breaker 1, the character and arrangement of the machinery which it contains, and the operations which are performed on the coal that passes through the breaker, are all well known, it is regarded unnecessary to illustrate them otherwise than diagrammatically or describe them specifically. The fan, 2, is to be located preferably within the breaker and near its taller end and farther from the bottom than from the top of the building. The fan of apparatus now in use is twelve feet in diameter and makes one hundred and forty revolutions a minute. The elevators, dumps, rolls, shakers, screens, picking-tables, spirals, chutes, and other dusty parts of the plant are covered with housings 3 on which are hoods 4, these housings and hoods being made of galvanized steel and as nearly airtight as possible, and the housings comprising removable sections to allow access to the interior of the housings so that the parts of the works covered thereby may be inspected, cleaned and repaired conveniently. The system of pipes comprises trunk-pipes 5 which are connected with the fan 2, and branches 6 which are connected with the hoods 4. These pipes are made of galvanized steel, all joints being soldered to render them airtight. When the fan is operated dust and air are drawn through the system of pipes from the various machines and parts of the breaker, to which the pipes extend, and are blown by the fan into the separator which constitutes the means for condensing and collecting the coal-dust. This separator comprises an upright hollow shaft 7, connected at its upper end with the fan or blower, and a casing constituting a lateral extension 8 whose interior forms a chamber or passage communicating with the shaft 7. This shaft, which is preferably rectangular in cross-section, may be either within the building, as it is shown, or outside of the building. It contains a series of inclined deflectors 9, and is provided with fluid-inlets 10 through which sprays of water and steam may be injected into it. The edges of the deflectors, except their lower edges, fit tightly against and are attached to the

walls of the shaft 7. The bottom 11 of the extension is inclined downward from the shaft 7 and in the bottom is a channel 12 which extends from end to end thereof and to which the bottom slopes from its lateral edges, and next to the outer end of the extension is a dam 13 which fits closely against the bottom and in the channel 12. The outer end of the extension is open between the top 14 thereof and the dam 13. In the bottom, near the dam 13, is an aperture in which is secured one end of a discharge-pipe 15.

The extension 8 contains an air-filter, which is impervious to wet coal dust, and which preferably is composed of a set of vertical screens, made, arranged and supported as herein described. These screens 16 are suspended from the top 14 of the extension 8 in three rows, represented in Fig. 3, there being a row contiguous to each side of the extension and a central row. The screens of the lateral rows are arranged in pairs and between the inner edges of the screens of each of the pairs is a space 17. Each screen of the central row is wider than the spaces 17 and overlaps screens of the other rows, and between its lateral edges and the sides of the extension are spaces 18. The upper edges of the screens are close to the top and their lower edges are close to the bottom of the extension, so that the screen next to the shaft 7 of the separator is the shortest and each of the others is longer than the screen next to it and between it and the lower end of the shaft 7. These screens have cloth faces 19, preferably burlap, and backs 20 of wire-netting or canvas, and have wood cross-bars 21 at their lower edges.

The coal-dust and air exhausted from the breaker are blown by the fan through the shaft or condenser 7 and into the extension or collector 8, and are moistened by steam and water injected into the condenser through the fluid-inlets, the deflectors causing the air and dust to absorb the moisture quickly. As the moist dust is driven against the screens 16 it adheres to them, and the dust and moisture are filtered from the air by the screens and the wet dust or slush drops or flows from them to the bottom of the collector, from which this slush flows into the discharge-pipe 15, while the clean air is expelled from the outer end or mouth of the collector and separator. The screens absorb some of the moisture and this fills or tends to fill the minute pores of the screens. The arrangement of the screens, which has been described, enables the air and dust to pass through the condenser rapidly and the dust to be condensed and collected quickly. The air flows through the condenser at a high velocity, and as the direction of the current changes when it strikes a screen the dust is impelled against the screens successively. The slush may be conveyed by the

pipe 15 to a bore-hole and be allowed to flow through this into an abandoned part of a mine, or may be used for filling or grading or making embankments, or may be dried and converted into a commercial product useful in foundries instead of plumbago for dusting molds. This product is also useful for other purposes. The fresh and clear air that flows into the breaker as the dusty air is drawn out not only promotes the health and comfort of the men and boys who work there, but also enables them to see plainly what they do, and so renders it easy for them to operate the machinery in a proper manner, to pick the coal thoroughly, to save much coal which ordinarily would be dumped on the culm-banks with slate and other refuse, to discover promptly "break-downs" which it is usually hard to find while the works are in operation, to avoid accidents, to work by day without lanterns or lamps which are not only expensive but dangerous because they are liable to set the building afire, and to do quickly and well work of every kind that is commonly done by them. It is feasible, therefore, to operate a breaker with a smaller force than formerly was required to operate it. The removal of the dust from the breaker also lessens the daily wear of belts, ropes, machinery and other apparatus, and renders the coal prepared for market comparatively clean, thus benefiting both the producer and consumer of the coal, and enables very dry coal to be treated so that coal can be mined from veins which it has been considered impracticable to work because so much dust would be generated in passing the coal through a breaker, and renders the use of wet shakers unnecessary and so enables the cost of pumping water therefor to be saved.

Obviously the utility of the invention depends largely on the means above described for collecting the coal-dust or reducing it to sediment, since it would be inexpedient to use the rest of the apparatus alone. To the separator, therefore, is to be attributed much of the benefit derived from exhausting the coal dust from a breaker, as well as that which persons who live or own property near the breaker derive from the operation of this apparatus.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. Apparatus for exhausting coal-dust from coal-breakers and treating the exhausted coal-dust and air, said apparatus including a high-power fan, and a separator including a condensing compartment and a collecting compartment, the condensing compartment containing fluid-inlets, and the collecting compartment being between the other compartment and the mouth of the separator and containing a suitable quantity

of porous air-filtering material effective to collect the finest particles of coal-dust, and the separator having a slush-outlet at the bottom of the collecting compartment, and the fan being adapted to force a current of commingled air, coal-dust and water at a high velocity against said filtering material, substantially as described.

2. Apparatus for exhausting coal-dust from coal-breakers and treating the exhausted coal-dust and air, said apparatus including a high-power fan, and a separator including a condensing compartment and a collecting compartment, the condensing compartment containing fluid-inlets, and the collecting compartment being between the other compartment and the mouth of the separator and containing a suitable quantity of porous air-filtering material absorptive to water and effective to collect the finest particles of coal-dust, and the separator having a slush-outlet at the bottom of the collecting compartment, and the fan being adapted to force a current of commingled air, coal-dust and water at a high velocity against said material, substantially as described.

3. Apparatus for exhausting coal-dust from coal-breakers and treating the exhausted coal-dust and air, said apparatus including a high-power fan, and a separator including a condensing compartment and a collecting compartment, the condensing compartment containing fluid-inlets, and the collecting compartment being between the other compartment and the mouth of the separator and containing a set of screens having minute pores and effective to collect the finest particles of coal-dust, and the separator having a slush-outlet at the bottom of the collecting compartment, and the fan being adapted to force a current of commingled air, coal-dust and water at a high velocity against said screens, substantially as described.

4. Apparatus for exhausting coal-dust from coal-breakers and treating the exhausted coal-dust and air, said apparatus including a high-power fan, and a separator including a condensing compartment and a collecting compartment, the condensing compartment containing fluid-inlets, and the collecting compartment being between the other compartment and the mouth of the separator and containing a set of vertical screens having minute pores and effective to collect the finest particles of coal-dust, and the separator having a slush-outlet at the bottom of the collecting compartment, and the fan being adapted to force a current of commingled air, coal-dust and water at a high velocity against said screens, substantially as described.

5. Apparatus for exhausting coal-dust from coal-breakers and treating the exhaust-

ed coal-dust and air, said apparatus including a high-power fan, and a separator comprising an upright condenser and a collector, the condenser being connected at the top with the fan and provided with fluid-inlets, and the collector consisting of a casing forming an extension of the condenser at the lower end of the latter and having a slush-outlet and containing a set of screens having minute pores, the fan being adapted to drive a current of commingled air, coal-dust and water at a high velocity against said screens, substantially as and for the purpose described.

6. Apparatus for exhausting coal-dust from coal-breakers and treating the exhausted coal-dust and air, said apparatus including a high-power fan, and a separator comprising an upright condenser and a collector, the condenser being connected at the top with the fan and provided with fluid-inlets, and the collector consisting of a casing forming an extension of the condenser at the lower end of the latter and containing a suitable quantity of porous air-filtering material, this extension having at the bottom an inclined channel and a slush-outlet, said channel extending under said material, and the fan being adapted to drive a current of commingled air, coal-dust and water at a high velocity against said material, substantially as and for the purpose described.

7. Apparatus for exhausting coal-dust from coal-breakers and treating the exhausted coal-dust and air, said apparatus including a high-power fan, and a separator comprising an upright condenser and a collector, the condenser being connected at the top with the fan and provided with fluid-inlets, and the collector consisting of a casing forming an extension of the condenser at the lower end of the latter and containing a suitable quantity of porous air-filtering material, the bottom of said extension being inclined downward from the condenser, and the fan being adapted to drive a current of commingled air, coal-dust and water at a high velocity against said material, substantially as and for the purpose described.

8. Apparatus for exhausting coal-dust from coal-breakers and treating the exhausted coal-dust and air, said apparatus including a high-power fan, and a separator including a condensing compartment and a collecting compartment, the condensing compartment containing fluid-inlets, and the collecting compartment being between the other compartment and the mouth of the separator and containing a set of fine screens attached to and suspended from the top of said collecting compartment, and the separator having a slush-outlet at the bottom of the collecting compartment, and the fan being adapted to force a current of com-

mingled air, coal-dust and water at a high velocity against said screens, substantially as described.

9. The combination with apparatus comprising a fan, for exhausting coal-dust from coal-breakers, of a separator connected with the fan and including an upright condenser and a collector, the condenser being provided with fluid-inlets, and the collector consisting of a casing forming an extension of the condenser at the lower end of the latter and containing a set of dust-collecting screens pervious to air, said screens being attached to and extending downward from the top of said casing and being arranged in three rows and each screen of the central row overlapping screens of the other rows, as shown and described.

10. The combination with apparatus comprising a fan, for exhausting coal-dust from coal-breakers, of a separator connected with the fan and including an upright condenser and a collector, the condenser being provided with fluid-inlets, and the collector consisting of a casing forming an extension of the condenser at the lower end of the latter and containing a set of dust-collecting screens attached to and extending downward from the top of said casing, said screens having cloth faces and having cross-bars at their lower edges.

11. The combination with apparatus comprising a fan, for exhausting coal-dust from coal-breakers, of a separator connected with the fan and including an upright condenser and a collector, the condenser being provided with fluid-inlets, and the collector consisting of a casing forming an extension of the condenser at the lower end of the latter and containing a set of dust-collecting screens pervious to air, the bottom of said casing being inclined downward from the condenser, and the screen next to the condenser being the shortest and each of the others being longer than the screen next to it and between it and the condenser.

12. Apparatus for exhausting coal-dust from coal-breakers and treating the exhausted coal-dust and air, said apparatus including a high-power fan, and a separator comprising an upright condenser and a collector, the condenser being connected at the top with the fan and provided with fluid-inlets, and the collector consisting of a casing forming an extension of the condenser at the lower end of the latter and having a slush-outlet and containing a set of screens having minute pores, the faces of the screens being in planes that cut the top and bottom of the casing, and the fan being adapted to drive a current of commingled air, coal-dust and water at a high velocity against said screens, substantially as and for the purpose described.

13. Apparatus for exhausting coal-dust

from coal-breakers and treating the exhausted coal-dust and air, said apparatus comprising housings covering parts of the works of a coal-breaker, a system of pipes, a fan, said system of pipes being connected with said housings and fan, and a separator connected with the fan and comprising a casing containing a suitable quantity of porous air-filtering material, the separator being provided with fluid-inlets between the fan and said material, and having a slush-outlet at the bottom of the casing, and the fan being adapted to drive a current of commingled air, coal-dust and water at a high velocity against said material, substantially as and for the purpose described.

14. Apparatus for exhausting coal-dust from coal-breakers and treating the exhausted coal-dust and air, said apparatus comprising housings covering parts of the works of a coal-breaker, a system of pipes, a fan, said system of pipes being connected with said housings and fan, and a separator connected with the fan and including an upright condenser and a collector, the condenser being provided with fluid-inlets, and the collector consisting of a casing forming an extension of the condenser at the lower end of the latter and containing a set of upright screens having minute pores, and the fan being adapted to drive a current of commingled air, coal-dust and water at a high velocity against said screens, substantially as and for the purpose described.

15. Apparatus for exhausting coal-dust from coal-breakers and treating the exhausted coal-dust and air, said apparatus comprising housings covering parts of the works of a coal-breaker, a system of pipes, a fan, said system of pipes being connected with said housings and fan, and a separator connected with the fan and including an upright condenser and a collector, the condenser being provided with fluid-inlets, and the collector consisting of a casing forming an extension of the condenser at the lower end of the latter and containing a set of fine upright screens suspended from the top of said casing, the fan being adapted to drive a current of commingled air, coal-dust and water at a high velocity against said screens, substantially as and for the purpose described.

16. Apparatus for exhausting coal-dust from coal-breakers and treating the exhausted coal-dust and air, said apparatus comprising housings covering parts of the works of a coal-breaker, a system of pipes, a fan, said system of pipes being connected with said housings and fan, and a separator connected with the fan and including an upright condenser and a collector, the condenser being provided with fluid-inlets, and the collector consisting of a casing forming an extension of the condenser at the lower end of the latter and containing a set of dust-collecting

5 screens pervious to air, the bottom of the casing being inclined downward from the condenser, and the screens being attached to and suspended from the top of said casing and the screen next to the condenser being the shortest and each of the others being longer than the screen next to it and between it and the condenser.

10 17. Apparatus for exhausting coal-dust from coal-breakers and treating the exhausted coal-dust and air, said apparatus including a high-power fan, and a separator including a condensing compartment and a collecting compartment, the condensing compartment containing fluid-inlets, and the
15 collecting compartment being between the other compartment and the mouth of the separator and containing a set of air-filtering screens having cloth faces and effective
20 to collect the finest particles of coal-dust, and the separator having a slush-outlet at the bottom of the collecting compartment, and the fan being adapted to force a current of commingled air-coal-dust and water

at a high velocity against said screens, substantially as described. 25

18. Apparatus for exhausting coal-dust from coal-breakers and treating the exhausted coal-dust and air, said apparatus including a high-power fan, and a separator
30 comprising a casing containing a set of air-filtering screens arranged in rows, the screens of one row overlapping those of another row, and the separator being provided with fluid-inlets between the fan and said screens,
35 and having a slush-outlet, and the fan being adapted to drive a current of commingled air, coal-dust and water at a high velocity against said screens, substantially as and for
40 the purpose described.

Signed a Wilkes-Barre, in the county of Luzerne and State of Pennsylvania, this fifteenth day of October, 1908.

WALTER S. CARPENTER.

In presence of—

JOHN P. POLLOCK,
CLAIRE JOHNSTON.