

No. 890,876.

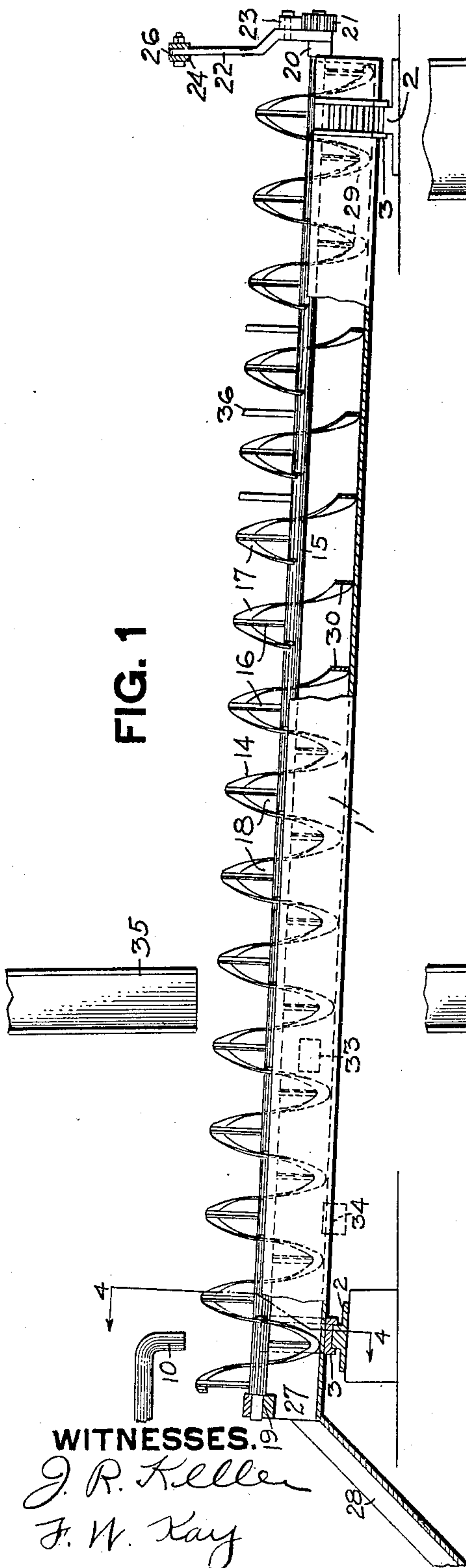
PATENTED JUNE 16, 1908.

W. L. SCAIFE.

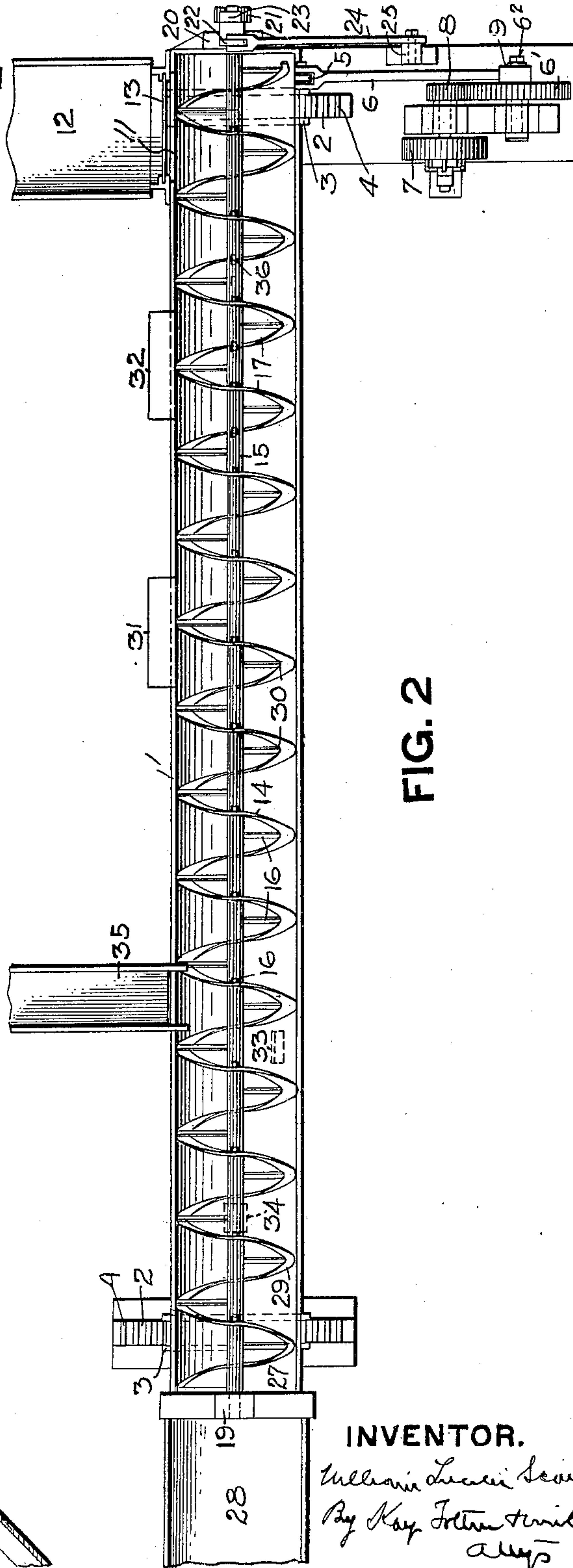
COAL AND ORE WASHER OR CONCENTRATOR.

APPLICATION FILED JULY 28, 1906.

2 SHEETS—SHEET 1.



WITNESSES.
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F. W. Kay



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2 SHEETS—SHEET 2.

FIG. 3

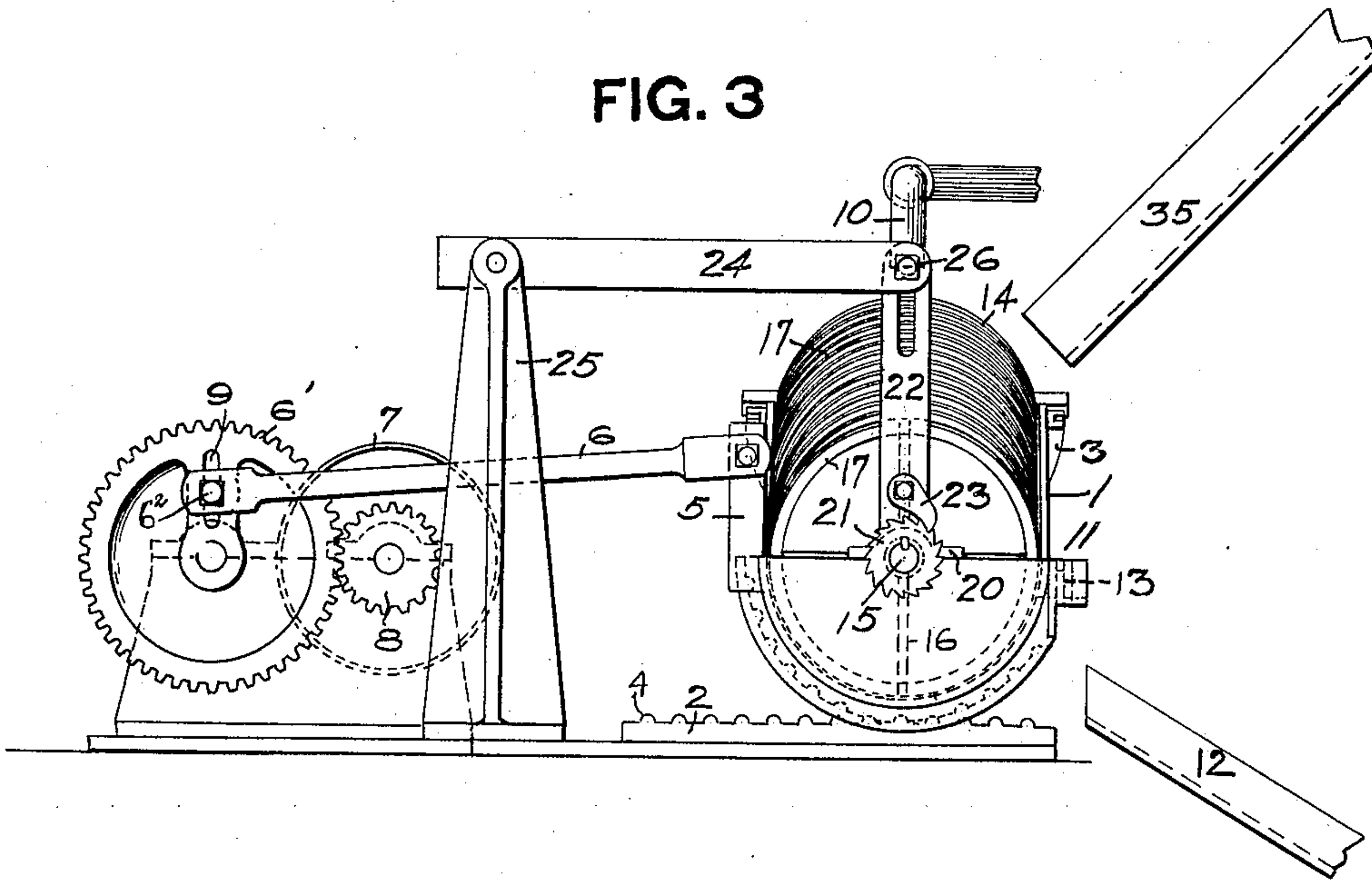


FIG. 4

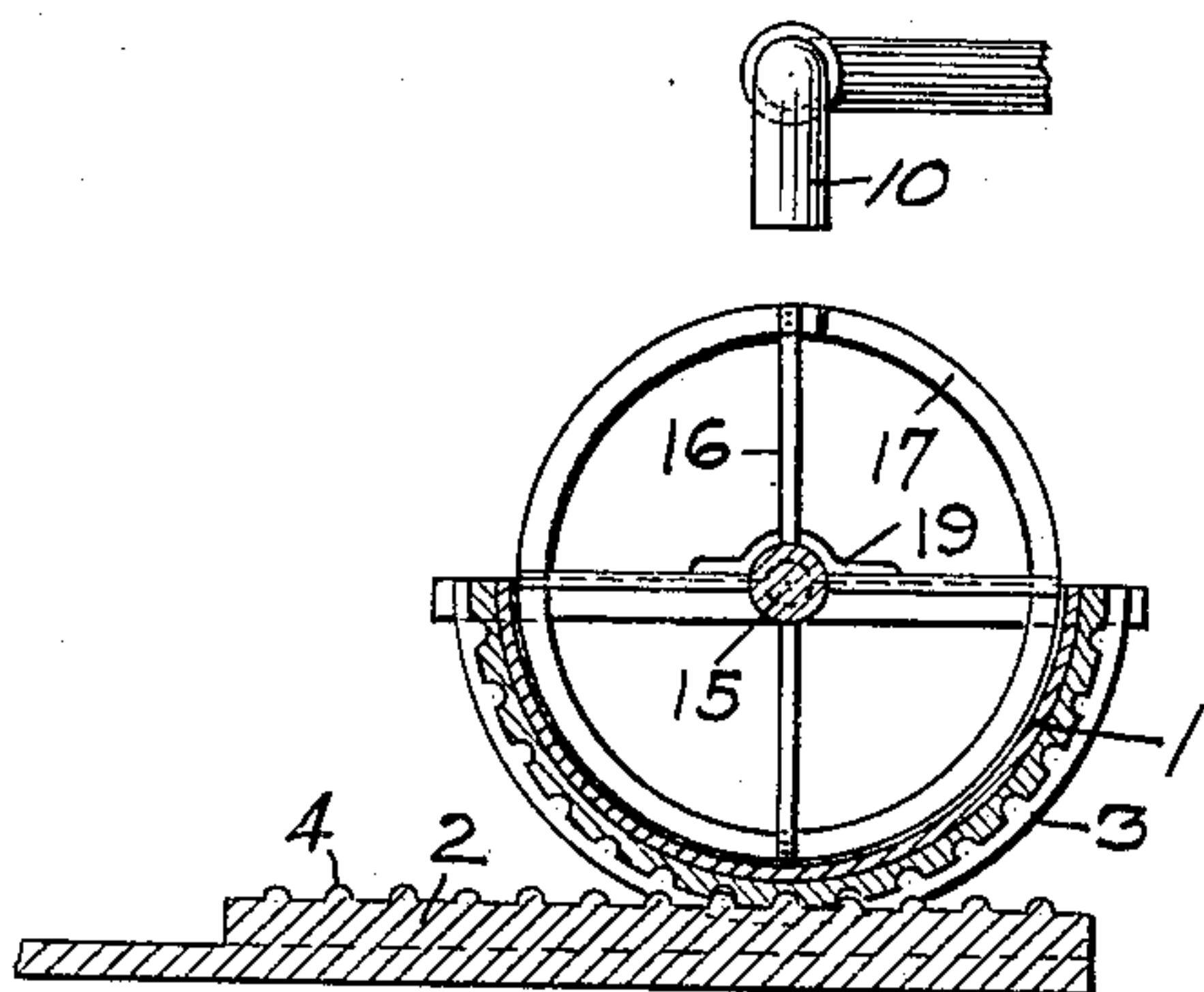
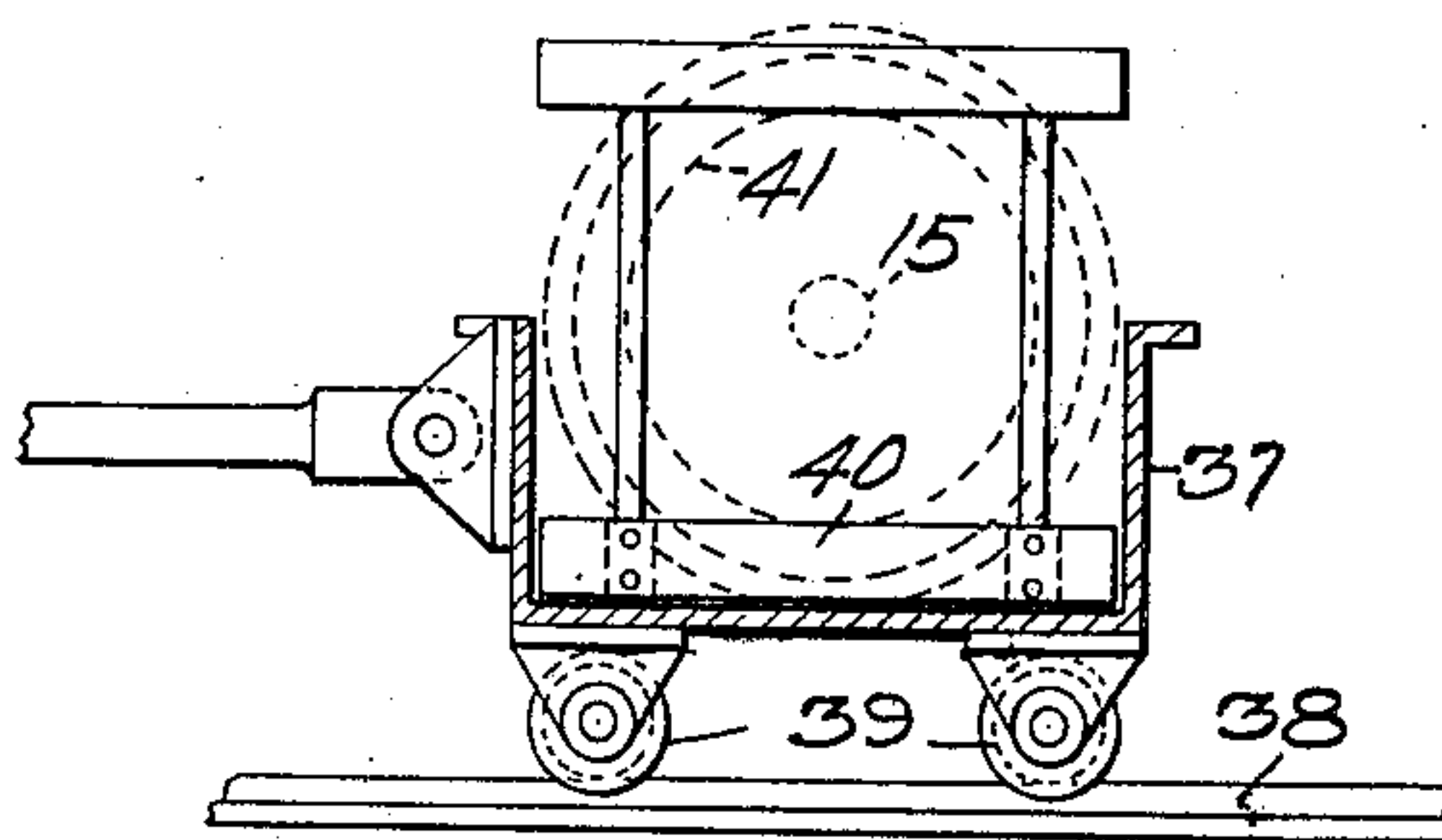


FIG. 5



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UNITED STATES PATENT OFFICE.

WILLIAM LUCIEN SCAIFE, OF ALLEGHENY, PENNSYLVANIA.

COAL AND ORE WASHER OR CONCENTRATOR.

No. 890,876.

Specification of Letters Patent.

Patented June 16, 1908.

Application filed July 28, 1906. Serial No. 328,182.

To all whom it may concern:

Be it known that I, WILLIAM LUCIEN SCAIFE, a resident of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Coal and Ore Washers or Concentrators; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to coal washers and like separators used for separating slate and other impurities from the coal, for separating impurities from ores, or for like purposes. Its object is to provide a coal or ore washer which is automatic in its action, that is, one in which the coal or lighter matters are continuously discharged from the washer at one point and the slate or other heavier matters are discharged continuously at another point.

It comprises, generally stated, a trough bodily movable to and fro transverse to its longitudinal axis, with a conveyer supported longitudinally in the trough and partaking of its transversely reciprocating movement, the said conveyer being constructed so as to furnish a series of dams or riffles to aid concentration, and also to act as a carrier for the heavy concentrates.

In its preferred form the invention comprises the employment of an inclined trough resting on rockers so that it is reciprocated with a rocking motion, and what might be termed a ribbon spiral conveyer mounted therein and adapted to be turned in such direction as to carry the slate or heavier materials, which fall to the bottom of the trough, toward and discharge them from the upper end of the trough, while the coal or lighter materials travel through the spiral ribbon conveyer, to be discharged at the lower end of the trough.

In the accompanying drawing Figure 1 is a side view, partly broken away, illustrating my invention; Fig. 2 is a top or plan view thereof; Fig. 3 is an end view; Fig. 4 is a cross section on the line 4—4 Fig. 1; and Fig. 5 is a cross section of a modification embodying the invention.

While my invention may be developed in different forms, I have illustrated the form which is believed to be most desirable and

will describe the same. The trough 1 is semi-cylindrical as shown, and is mounted to rock or swing on the tracks 2, being guided thereon by the flanges 3 on the trough. In order to provide for the regular swinging or rocking motion of the trough, one or both of the tracks 2 are provided with one or more teeth 4 meshing into suitable seats formed to receive the same between the guide-ways 3. To impart the desired rocking motion to the trough, I employ the pitman 6 connected to a vertical standard 5 extending up from one side of the trough and to the crank 6² operated by any suitable power mechanism, such as the pulley 7, and the pinion 8 meshing with a gear wheel 6¹ carrying the crank 6². Any suitable means for adjusting the pitman 6 upon the crank wheel 6¹ so as to vary the stroke of the trough, such as by means of the slide 9, may be employed. The trough may be provided with any desired number of discharges, at any suitable points, for the lighter and the heavier materials, and the intermediate grades.

As shown in the drawing the trough 1 is inclined, and is arranged to receive water at its upper end through a pipe 10 and to discharge at its lower end, it being preferred that it shall be provided with a side discharge 11 for reasons hereafter described, the side discharge 11 leading to a chute 12. In the side of the trough leading to this chute is a vertically adjustable gate 13 mounted to slide on the face of the trough and so regulate the height of the discharge. This gate may be adjusted and held in any suitable way. The preferred form of longitudinal conveyer within the trough is as above stated a spiral or screw conveyer, and is what might be termed a ribbon spiral conveyer, that is to say, the sections of the conveyer form a practically continuous spiral ribbon extending from one end of the trough to the other, leaving a central space within the conveyer for the travel of the lighter particles as carried down by the current of water. This conveyer 14 as illustrated, consists of the central shaft 15 having arms extending out therefrom and supporting the spiral ribbon 17, leaving the space 18 within the spiral conveyer for the passage of the water current and the lighter materials car-

ried in suspension. The conveyer is mounted at each end of the trough as in bearings 19 20, and it is adapted to swing with the trough as it is rocked from side to side. 5 The necessary longitudinal feeding action of the conveyer along the trough may be produced in any suitable way. As a simple method I prefer to place on the shaft 15, outside of the bearing 20, the ratchet wheel 10 21. I also mount on the said shaft the bar or lever 22 on which is mounted the pawl 23, which engages the said ratchet wheel 21 and so prevents the turning of the shaft in one direction. The ratchet lever 22 is pivoted at its upper end to the link 24, which 15 in turn is mounted at the upper end of the standard 25, such construction permitting the swinging of the spiral conveyer with the trough as the trough is rocked in either 20 direction, while the ratchet 21 and pawl 23 permit the conveyer to turn with the trough as the trough rocks in one direction, but compel the conveyer to turn within the trough as the trough rocks in the other direction, so as to cause the longitudinal feeding 25 action of the conveyer through the trough, as above described. The speed of longitudinal feed can be regulated in any suitable way, such as by adjusting the joint 30 26 between the pawl bar 22 and the link 24, and for this purpose I have shown an ordinary slide adjustment.

It will thus be seen that the spiral portion or spiral ribbon of the conveyer provides 35 within the trough a series of movable dams, over which the lighter materials must be carried in passing down to the discharge 11, and by means of which the heavier materials are separated and carried gradually 40 to the other end of the conveyer, that is, up the incline, to the discharge 27 leading into the chute 28. Other discharges are indicated at 31 and 32, at the side of the trough for the lighter materials, or the discharge opening 33 and 34 for the heavier 45 materials. It will be noticed that the spiral wings of the ribbon conveyers are of different depths in different parts of the washer. That is to say, that the spiral ribbons at 29 are shallower than the spiral ribbons at 30. This can be arranged in the construction of conveyer by the building up of the different ribbon sections. In this way I am enabled even with a conveyer 55 forming with what might be termed a series of movable dams, to provide dams of different depths and so regulate the action of the conveyer, providing, for example, for catching the heavier particles of slate or ore close to the point of entrance, such as at the feeding 60 chute 35 which is placed some little distance from the upper end of the trough. The shallower dams serve to give more perfect and complete separation of the materials in

the lower part of the conveyer. The feeding 65 chute 35 is located a short distance from the upper end of the conveyer, in order to provide a short portion of the washer in which any of the lighter materials carried past the feeding chute can be thoroughly washed before the heavier materials are discharged. 70 The location of this chute may be varied to suit the materials to be separated.

In the above description it will be apparent that the main features of the invention are 75 the employment of a trough having a lateral movement to and fro transverse to its longitudinal axis, and a conveyer supported longitudinally in the trough and partaking of this transversely reciprocating movement, 80 and constructed so as to furnish a series of transverse dams or riffles to aid in concentrating, and also to act as a carrier for the heavier concentrates. Such lateral rocking movement transverse to the axis of the trough 85 causes a surging from side to side of the materials or of the materials and water contained in the trough, giving a peculiar movement by which the material is more easily thrown into suspension, permitting the heavier materials 90 to drop to the bottom and be carried in one direction by the conveyer, while the lighter materials are more easily held in suspension and pass with the water current to the other end of the washer. The lateral reciprocation of 95 the trough leads to the surging of the water from side to side within the trough; and this aids materially in holding the lighter material in suspension, and in separating the heavier materials from the lighter materials. At the 100 same time the conveyer within the trough while partaking of the transversely reciprocating movement of the trough itself, and the arms 6, supporting the ribbon spiral, act in connection with the water surging from side 105 to side of the trough to open up the material and aid in its separation. If additional agitation of the materials is desired, fingers 36 may be secured to the main shaft between the flights or wings at any desired points in the 110 washer. As the coal washer is rocked in one direction, the spiral conveyer therein turns with it, as the pawl does not engage with the ratchet when the trough moves in that direction. But when the trough moves back- 115 wardly in the opposite direction, the pawl engaging therewith holds the ratchet arm of the conveyer from lateral movement, and so causes the longitudinal feed of the heavier materials through the conveyer. These 120 conveyers, as above set forth, act as movable dams or riffles, the water and coal held in suspension flowing through the conveyer toward the lower discharge opening, the heavier materials being caught by the flights or wings of 125 the conveyer and held thereby and gradually pushed forward toward the upper end of the conveyer and discharged therefrom into the

chute 28. The apparatus thus has a peculiar operation which fits it for the separation of any light and heavy materials of any suitable size or bulk, the only requirement being that they be brought to proper size for separation, the coal being brought to the proper size for separating out the slate, &c., or the ore for the washing out of its impurities. As the materials to be separated pass through the washer, they are carried from side to side by the surging of the water current and the lateral reciprocation of the trough and the conveyer transverse to the longitudinal axis of the trough, and are caused to flow over or be caught by the wings of the conveyer, while these same wings, together with their supporting arms, act to stir the materials and lead to practically perfect separation thereof.

As above stated, I prefer to make the discharge at the lower end of the conveyer at the side thereof. It is so constructed because under the surging of the water caused by the rocking or lateral movement of the conveyer the lighter materials will naturally be lifted over the movable gate and discharged therefrom while held in suspension, a discharge capable of more perfect regulation being thus provided.

The modification shown in Fig. 5 illustrates another form of the invention. The trough 37 is reciprocated on a track 38 supported on rollers 39. The longitudinal conveyer illustrated is formed of blades 40 sliding within the trough and carried slowly through the same by any suitable mechanism. With this same trough so reciprocated the spiral conveyer above described may also be employed, and this is illustrated in dotted lines as shown at 41. In case it is employed with an angular trough as shown, the heavier particles will fill up the corners of the trough and the conveyer will operate in connection with the trough as so filled in, acting in the manner described in connection with the other figures. The apparatus may, if desired, for separating or concentrating or grading certain materials, be operated with other fluids than water, or be operated dry or without any fluids, such as in the grading of sand or gravel, and the separating of heavy materials from sand.

What I claim is:

1. In apparatus for washing or concentrating coal, ores, etc., the combination of a trough bodily movable to and fro transverse to its longitudinal axis, and a conveyer supported longitudinally in the trough and partaking of its transversely reciprocating movement and forming a series of transverse dams or riffles.

2. In apparatus for washing or concentrating coal, ores, etc., the combination of a trough mounted to rock bodily to and fro

transverse to its longitudinal axis, and a conveyer supported longitudinally in the trough and partaking of its transversely reciprocating movement and forming a series of transverse dams or riffles.

3. In apparatus for washing or concentrating coal, ores, etc., the combination of a trough bodily movable to and fro transverse to its longitudinal axis and a revolving spiral ribbon conveyer supported longitudinally therein and partaking of its transversely reciprocating movement and forming a series of dams or riffles within the trough.

4. In apparatus for washing or concentrating coal, ores, etc., the combination of a trough mounted to rock bodily to and fro transverse to its longitudinal axis, and a revolving spiral ribbon conveyer supported longitudinally therein and partaking of its rocking motion and forming a series of transverse dams or riffles within the trough.

5. In apparatus for washing or concentrating coal, ores, etc., the combination of a trough bodily movable to and fro transverse to its longitudinal axis and a revolving spiral ribbon conveyer supported longitudinally therein and partaking of its transversely reciprocating movement and forming a series of dams or riffles within the trough, said spiral conveyer having wings formed of different depths.

6. In apparatus for washing or concentrating coal, ores, etc., the combination of a trough bodily movable to and fro transverse to its longitudinal axis, and a conveyer supported longitudinally in the trough and partaking of its transversely reciprocating movement and forming a series of transverse dams or riffles, said trough having discharge openings located at different points in its length.

7. In apparatus for washing or concentrating coal, ores, etc., the combination of a trough bodily movable to and fro transverse to its longitudinal axis, and a conveyer supported longitudinally in the trough and partaking of its transversely reciprocating movement and forming a series of transverse dams or riffles, said trough having a discharge opening at the lower end located at the side thereof.

8. In apparatus for washing or concentrating coal, ores, etc., the combination of a trough mounted to rock bodily to and fro transverse to its longitudinal axis, and a conveyer supported longitudinally in the trough and partaking of its transversely reciprocating movement and forming a series of transverse dams or riffles, said trough having an arm extending above the same, and a reciprocating pitman connected to said arm.

9. In apparatus for washing or concen-

trating coal, ores, etc., the combination of a
trough bodily movable to and fro transverse
to its longitudinal axis and a revolving spiral
ribbon conveyer supported longitudinally
5 therein and partaking of its transversely
reciprocating movement and forming a series
of dams or riffles within the trough, said
spiral conveyer having fingers extending out

from its main shaft between the flights of the
conveyer.

10

In testimony whereof I the said WILLIAM
LUCIEN SCAIFE have hereunto set my hand.

WILLIAM LUCIEN SCAIFE.

Witnesses:

F. W. WINTER,
M. D. VOGEL.