

No. 720,883.

PATENTED FEB. 17, 1903.

O. H. BURDEN & T. F. ADAMS.
AMALGAMATOR.

APPLICATION FILED APR. 10, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.

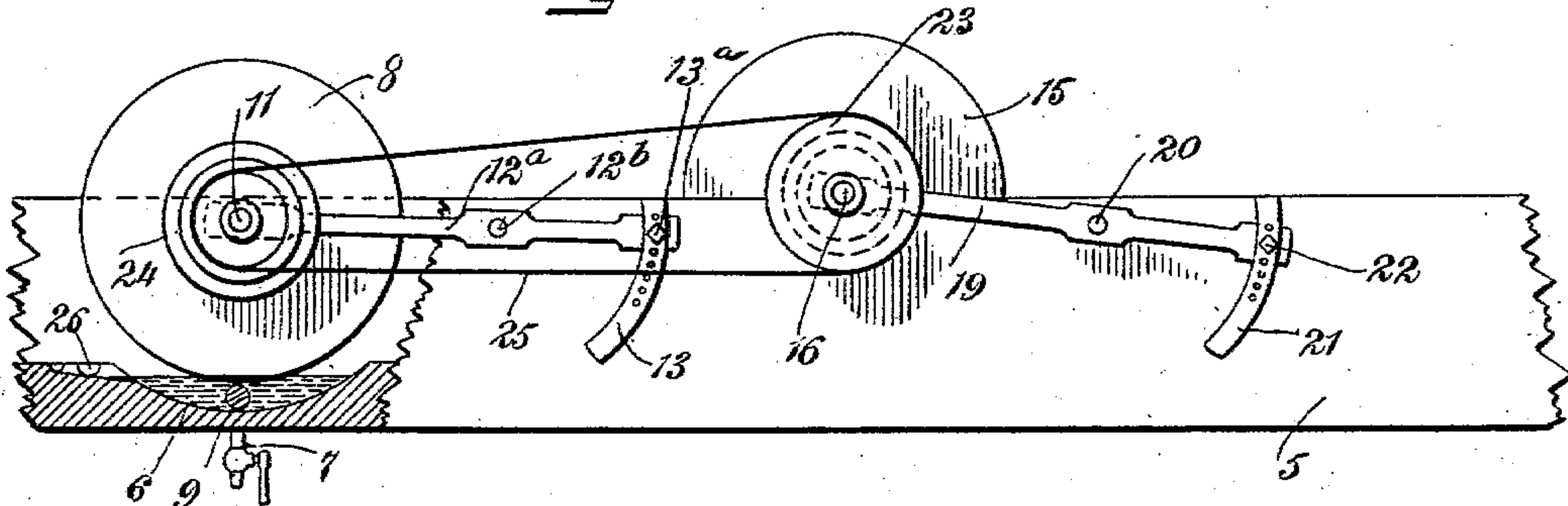


Fig. 2.

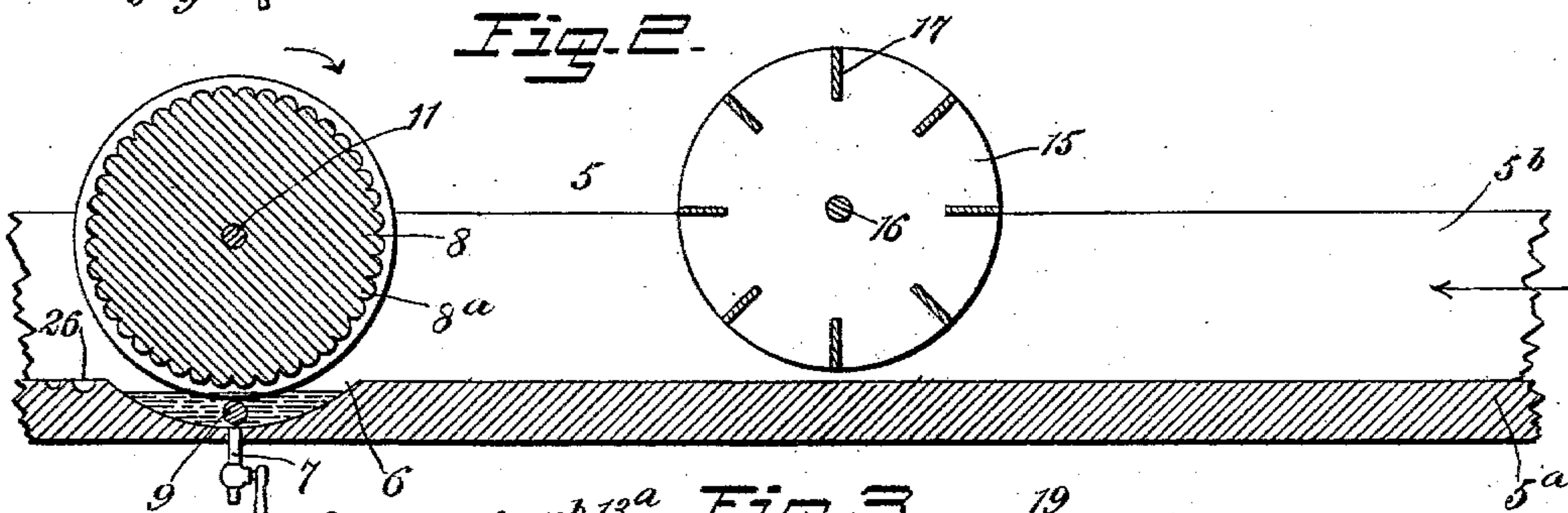


Fig. 3.

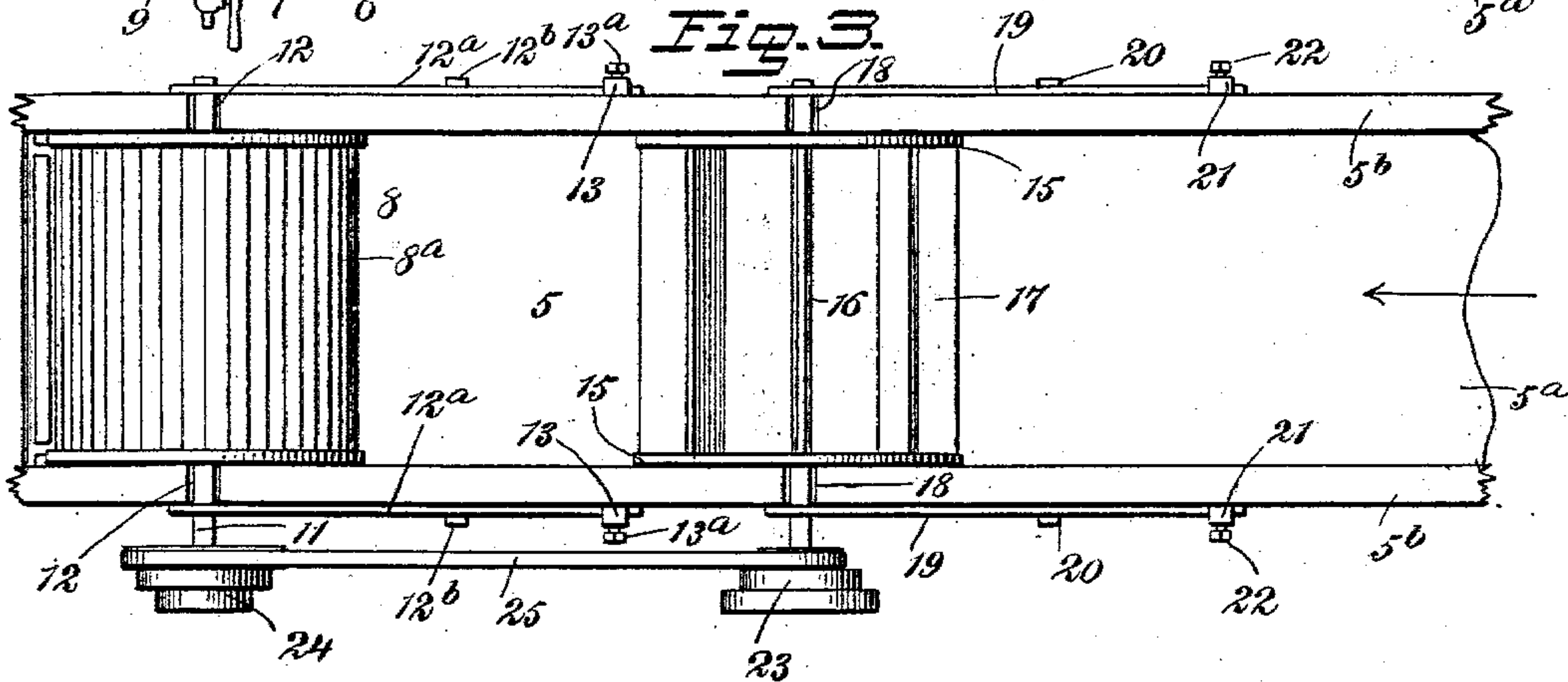
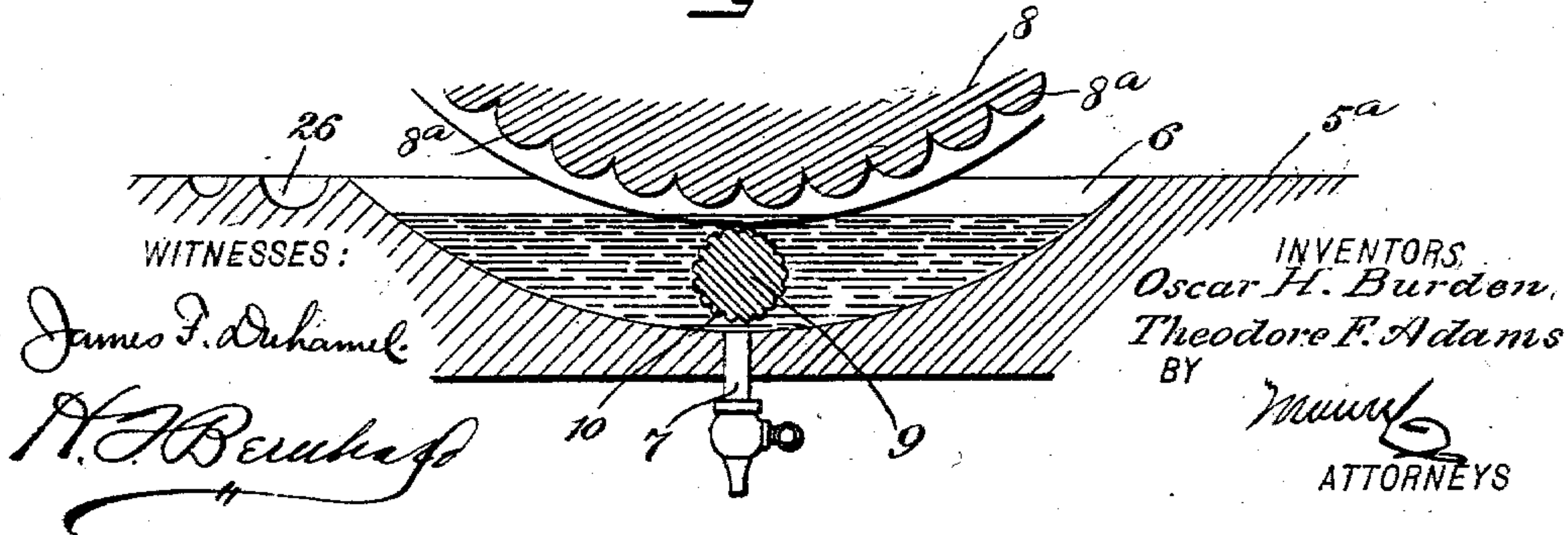


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 5.

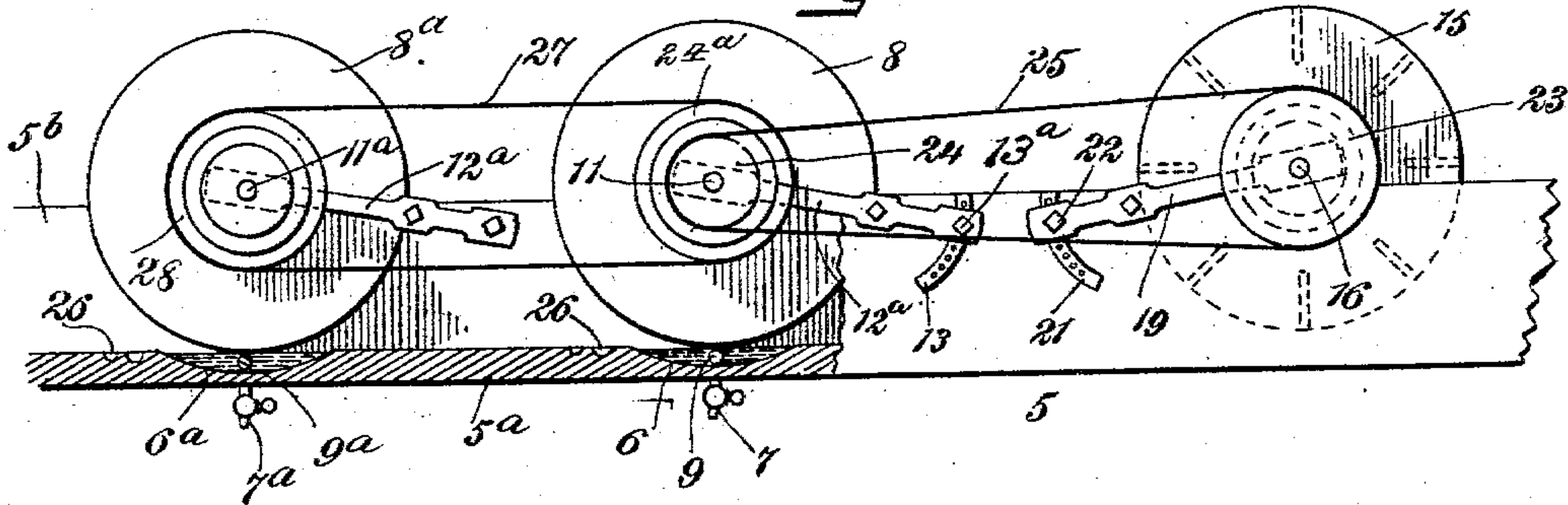
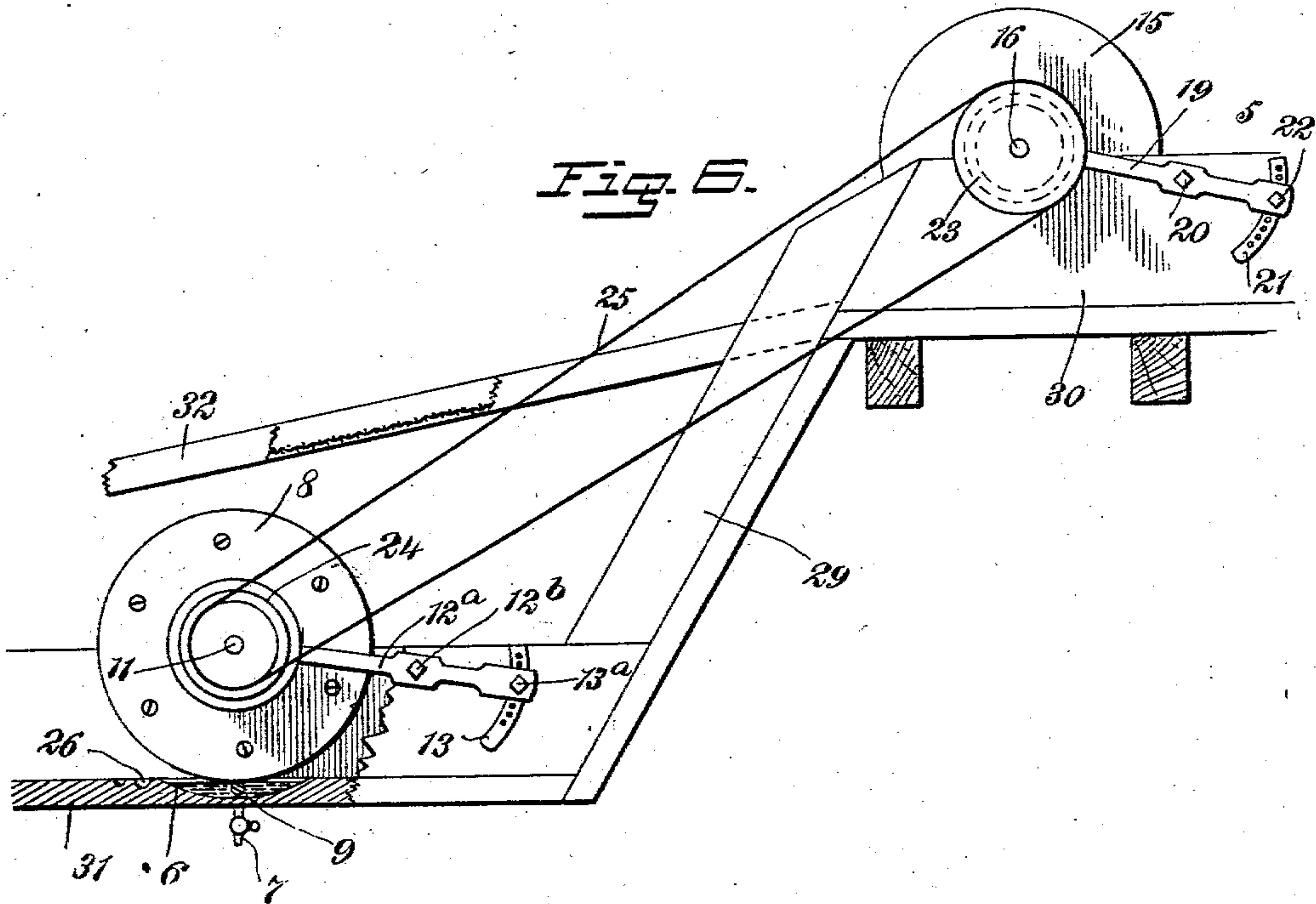


Fig. 6.



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UNITED STATES PATENT OFFICE.

OSCAR HERBERT BURDEN AND THEODORE FRIEDERICH ADAMS, OF KASLO,
CANADA.

AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 720,883, dated February 17, 1903.

Application filed April 10, 1902. Serial No. 102,225. (No model.)

To all whom it may concern:

Be it known that we, OSCAR HERBERT BURDEN and THEODORE FRIEDERICH ADAMS, subjects of the King of Great Britain and residents of Kaslo, in the Province of British Columbia and Dominion of Canada, have invented new and useful Improvements in Amalgamators, of which the following is a full, clear, and exact description.

Our invention relates to improvements in ore-amalgamators, by which gold or other precious metals may be thoroughly and economically collected and separated from sand, gravel, and other earthy substances.

One object of the invention is to provide the apparatus with means by which the stream of ore-bearing sand and gravel may easily be reduced to a thin layer or stratum during its passage through the sluice-box.

A further object that we have in view is to thoroughly impregnate the layer of ore-bearing sand with mercury at the time that the layer attains its greatest attenuation, whereby the metallic particles of ore may thoroughly become amalgamated with the quicksilver.

Further objects of the invention are to simplify and cheapen the construction, to provide for adjustment of the power and pressure wheels, and to make provision for collection of any amalgam which by centrifugal force may be thrown beyond the main pressure wheel or roll.

With these ends in view our invention consists in the combination, construction, and arrangement of parts which will be hereinafter fully described, and the actual scope of the invention will be defined by the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation, partly broken away and in section, of a portion of a sluice way or box equipped with amalgamating devices of our invention. Fig. 2 is a longitudinal sectional elevation thereof. Fig. 3 is a plan view of the parts shown by Figs. 1 and 2. Fig. 4 is an enlarged vertical section illustrating the means whereby the stream of sand may be mechanically attenuated and the

quicksilver or mercury is adapted to be thoroughly commingled with the sand at the period of its greatest attenuation; and Figs. 5 and 6 are side elevations, partly broken away and in section, illustrating other embodiments of our invention.

We will first proceed to describe the embodiment of our invention illustrated by Figs. 1 to 4, inclusive, and thereafter to explain the constructions shown, respectively, in Figs. 5 and 6.

5 designates the sluice way or box, which may be of any suitable construction and arranged in an inclined position, so that a stream of water will carry mineral-bearing sand or gravel through the sluice-box in a well-known manner for the purpose of subjecting the sand or gravel to the amalgamating action of a bath of quicksilver. The sluice-box herein shown consists of a bottom 5^a and the raised side walls 5^b, and in the bottom of the sluice-box is provided a trough or pocket 6, the latter arranged at a suitable point in said sluice-box. This trough may be formed by cutting a pocket in the bottom 5^a, as shown by Figs. 1, 2, and 4. If desired, the trough may be formed of metal or other material and set in the bottom of the sluice-box. The trough extends transversely across the sluice-box, and it is equipped with a drain-cock 7, through which the mercury contained in the trough may be conveniently drawn off at any time. This trough lies below the plane of the bottom, and it is adapted to be filled or charged with a suitable quantity of mercury, the latter filling the trough up to the level indicated more clearly by Fig. 4.

In connection with the mercury-containing trough or pocket we employ a pair of coacting rolls, (indicated by the numerals 8 9,) one of said rolls being wholly submerged or immersed in the mercury-bath, while the other roll is adapted to dip into the bath. These two rolls serve important functions in our amalgamator, and they coöperate with a view to attenuating the stream of sand and gravel and to forcing the mercury into the attenuated layer of sand and gravel, so as to more thoroughly amalgamate the mineral-bearing ore and the mercury.

The two rolls 8 9 are greatly disproportion-

ate, as shown by Figs. 1, 2, and 4, and the smaller roll 9 is idly mounted within the trough or pocket 6, so as to be free to rotate therein and to lie below the level of the bath.

5 This small roll 9 is provided with roughened working surfaces, which are preferably formed by a series of longitudinal corrugations, (indicated at 10 in Fig. 4,) and the corrugated working face of the roll is adapted to lift the
10 mercury and to practically force it through the mineral-bearing stream of sand.

The large roll 8 is supported on a shaft 11, so as to be disposed transversely across the sluiceway, and this shaft is journaled in suitable bearings 12, which are provided on the
15 levers 12^a, the latter being fulcrumed at 12^b on the raised sides 5^b of the sluiceway. The rear ends of these levers are slidably received in the guide-plates 13, which are fastened to
20 the sides of the sluiceway and are provided with perforations, as shown by Fig. 1, and said levers are adjustably connected to the perforated guide-plates by means of pins 13^a, whereby the levers may be adjusted, so as to
25 raise or lower the large corrugated roll with relation to the bath contained in the pocket or trough 6. This large roll is also provided with an active surface, which is formed, preferably, by a series of longitudinal corruga-
30 tions, forming the series of ribs 8^a, and said corrugated surface of the roll is arranged to dip into or to sweep close to the bath, as indicated by Figs. 2 and 4, whereby a thin or narrow space is left between the opposing corrugated
35 surfaces of the coacting rolls 8 9.

The stream of water and sand or gravel is adapted to pass or flow through the sluiceway in the direction indicated by the arrow in Figs. 2 and 3, and the momentum of the
40 flowing stream of water is utilized to actuate a power-wheel, which is preferably situated toward the head end of the sluiceway, said power-wheel serving as a means for positively rotating the large pressure-roll 8. The power-
45 wheel may be of any suitable construction; but as shown by the drawings it consists of disks 15, mounted on a shaft 16 and equipped with paddles 17. The shaft of this paddle-wheel is journaled in bearings 18, which are
50 secured to the adjustable levers 19, said levers being fulcrumed at 20 to the sides of the sluiceway and adjustably secured to the latter. The rear ends of said levers are fitted movably in the perforated guide-plates 21
55 and adapted to be secured thereto by means of pins 22, whereby the levers may be adjusted to raise and lower the paddle-wheel with relation to the bottom of the sluice-box.

The shaft 16 of the power-wheel is provided
60 at one end with a pulley 23, and the shaft 11 of the large roll 8 is provided with a similar pulley 24. The two pulleys are arranged in alinement, and they are connected operatively together by means of an intermediate endless
65 belt 25, the latter serving to transmit the motion of the power-wheel to the roll 8 and to

positively drive the latter within the sluiceway.

The current of water flowing through the sluiceway is adapted to carry the sand and
70 gravel through said sluiceway at a certain rate of speed. We have discovered that this stream of sand or gravel can be thinned or attenuated by propelling the large roll 8 at a
75 peripheral speed exceeding the rate of the speed of the current of sand, gravel, and water. The gearing 23 24 25 between the power-wheel and the roll 8 is so proportioned that the said roll 8 will be driven at a pe-
80 ripheral speed exceeding the speed of the current which turns the paddle in the sluiceway. We are aware that other forms of gearing than the belt or pulley type herein shown may be adopted; but the essential
85 feature of this part of our invention is the provision of a suitable motor mechanism adapted to propel the roll at a peripheral speed exceeding that of the current.

The operation of our invention, as thus far described, will be readily understood. The
90 current of water flowing through the sluiceway carries sand and gravel in the direction of the arrow, and the water operates the paddle-wheel so as to rotate the same, which in turn propels the gearing and the large corru-
95 gated roll 8. The stream of sand and gravel is carried by the flowing water over the pocket containing the mercury-bath, and the sand passes through the space between the opposing active faces of the coöperating rolls
100 8 9. The submerged roll 9 is driven or rotated on its axis by the friction between the sand and the positively-driven roll 8, and the speed of the roll 8 makes it act on the sand or
105 gravel in such a way as to reduce the thickness or attenuate the sand. This attenuation in the stream of the sand takes place at the time that the roll 9 becomes effective in impregnating the sand and gravel with the mercury, and
110 this operation tends to more thoroughly effect the amalgamation of the mercury and the metallic particles of ore.

The speed of the positively-driven roll 8 may sometimes have the effect of throwing the
115 amalgamated substance beyond the pocket 6 by centrifugal action, and to save the amalgamated substance we have provided a series of collecting-pockets 26, the same being disposed in the bottom 5^a across the sluiceway and beyond the roll 8, which turns in
120 the direction of the arrow shown by Fig. 2.

Although we have shown the apparatus as having one mercury-pocket and a single set of coöperating rolls in active relation to this
125 pocket, we do not limit ourselves to the employment of one pocket and one set of rolls. In Fig. 5 the sluiceway is equipped with a series of mercury-pockets, (indicated at 6
6^a,) having drain-cocks 7 7^a. In the pocket 6^a is disposed the smaller roll 9^a, which lies
130 immediately below the large roll 8^a, while the rolls 8 9 have coöperative relation to the

pocket 6. The roll 8 is driven by gearing from the power-wheel, as shown, and this roll has a pulley 24^a somewhat larger than the pulley 24 and arranged to receive a belt 27, the latter extending to the pulley 28, which is provided on the shaft 11^a of the large roll 8^a. The two rolls 8 8^a are thus positively driven, and the material passing through the sluiceway is subjected to the action of the series of amalgamating devices.

In Fig. 6 we have represented the sluiceway as having the inclined portion or dip-section 29, so that one section of the sluiceway will occupy an elevated position, as at 30, with relation to the other section 31 of the sluiceway. The power-wheel and the parts associated therewith are supported in the upper section 30 of the sluiceway; but the amalgamating devices are disposed in co-operative relation to the lower section of said sluiceway. The amalgamating devices consist of the mercury-containing pocket or trough and the two rolls having the arrangement and construction heretofore described. The advantage of locating the amalgamating device below the horizontal plane of the motor device resides in the employment of a screen of any suitable character, (indicated at 32,) said screen extending from the elevated section 30 of the sluiceway and adapted to carry off the large stones or pieces of rock, which may be transported through the sluiceway by the action of the current of water.

It should be noted that the collecting-pockets 26 are situated close to the trough or chamber 6, so as to return the collected mercury back to the trough 6. This end may be secured in any suitable way either by allowing the mercury in the collecting-pockets to overflow back to the trough 6 or by making the pockets communicate with the trough.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. An amalgamator, comprising a sluiceway having an amalgam-reservoir, ore-attenuating mechanism situated in the sluiceway and having revoluble members of different sizes disposed in co-operative relation to each other, and means for driving the larger of said revoluble members at a peripheral speed exceeding the rate of flow of water and auriferous material through the sluiceway.

2. An amalgamator, comprising a sluiceway having an amalgam-reservoir, a set of co-operating attenuating-rolls disposed in the sluiceway and one of said rolls housed in the amalgam-reservoir, and means for positively driving another roll of said set.

3. An amalgamator, comprising a sluiceway having a reservoir-pocket, a set of ore-attenuating rolls of different sizes, the smaller roll of said set being housed in the reservoir-pocket, and the larger roll being disposed in the sluiceway and in co-operative relation to

the smaller roll, and means for driving one of said rolls.

4. An amalgamator comprising a sluiceway having a mercury pocket or trough, and a set of attenuating-rolls, one of which is immersed or submerged in a mercury-bath within said pocket or trough.

5. An amalgamator comprising a sluiceway having a mercury pocket or trough, and a set of attenuating-rolls, each having a roughened active surface and disposed in co-operative relation to said trough, one of said rolls being immersed in the trough, and the other of said rolls adapted to be positively driven.

6. An amalgamator, comprising a sluiceway having an amalgam-pocket, a pair of co-operating attenuating-rolls, one of which is immersed in a bath of said pocket and the other is disposed in the sluiceway, means for driving the last-mentioned roll, and collecting-pockets arranged in the sluiceway beyond the rolls and adapted to collect matter which may be centrifugally thrown by said roll beyond the amalgam-pocket.

7. An amalgamator, comprising a sluiceway having an amalgam-trough, a set of attenuating-rolls, one of which is immersed in mercury contained in said trough, and the other roll is disposed in the sluiceway and in co-operative relation to the immersed roll, and a current-wheel disposed in the sluiceway and operatively geared to that roll of the set which also lies in the sluiceway.

8. An amalgamator, comprising a sluiceway having an amalgam-trough, a set of attenuating-rolls, one of which is immersed in mercury contained in said trough, means for suspending the other roll of the set in the sluiceway and for adjusting the same to different positions relative to the immersed roll, and means for positively driving the suspended and adjustable roll.

9. An amalgamator, comprising a sluiceway having an amalgam-trough, a set of attenuating-rolls provided with corrugated active faces and disposed in co-operative relation, one of said rolls being immersed in mercury contained in the trough, and arranged to be driven by the other roll, the latter being disposed in the sluiceway, and means for driving said last-mentioned roll.

10. An amalgamator, comprising a sluiceway having an amalgam-trough, a set of attenuating-rolls of different sizes and provided with corrugated active surfaces, the smaller corrugated roll of said set being immersed in mercury contained in said trough and the larger corrugated roll lying in the sluiceway and in co-operative relation to the smaller roll, and means for driving the larger corrugated roll.

11. An amalgamator, comprising a sluiceway having a series of amalgam-troughs, a series of sets of attenuating-rolls, each set having an idle roll immersed in mercury con-

tained in one of said troughs and the other roll of each set lying in the sluiceway and in coöperative relation to the immersed roll, and means for driving the rolls of the sets that
5 are contained in the sluiceway.

12. An amalgamator, comprising a sluiceway having sections lying at different elevations and connected by an inclined section, an amalgam-trough in the lower section of
10 the sluiceway, a set of attenuating-rolls, one of which is immersed in mercury contained in the trough, and the other roll disposed in the lower section of the sluiceway and in co-

operative relation to the immersed roll, a current-wheel in the elevated section of the
15 sluiceway, and gearing between the current-wheel and that of the set which lies in the lower section of the sluiceway.

In testimony whereof we have signed our names to this specification in the presence of
20 two subscribing witnesses.

OSCAR HERBERT BURDEN.

THEODORE FRIEDERICH ADAMS.

Witnesses:

CHARLES W. MCANN,

NEEL T. MACKEY.