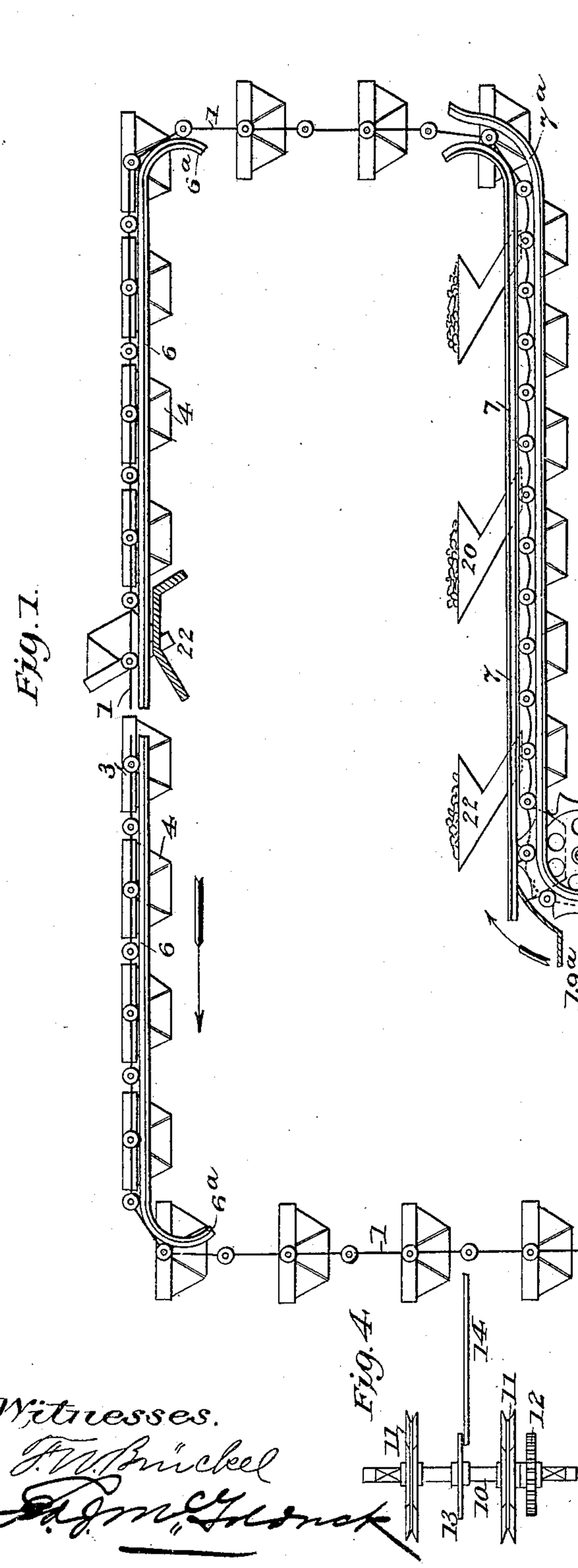
No. 620,298. Patented Feb. 28, 1899.

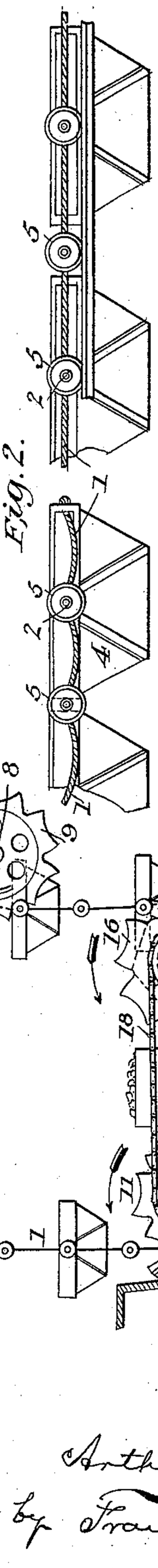
A. J. FRITH.

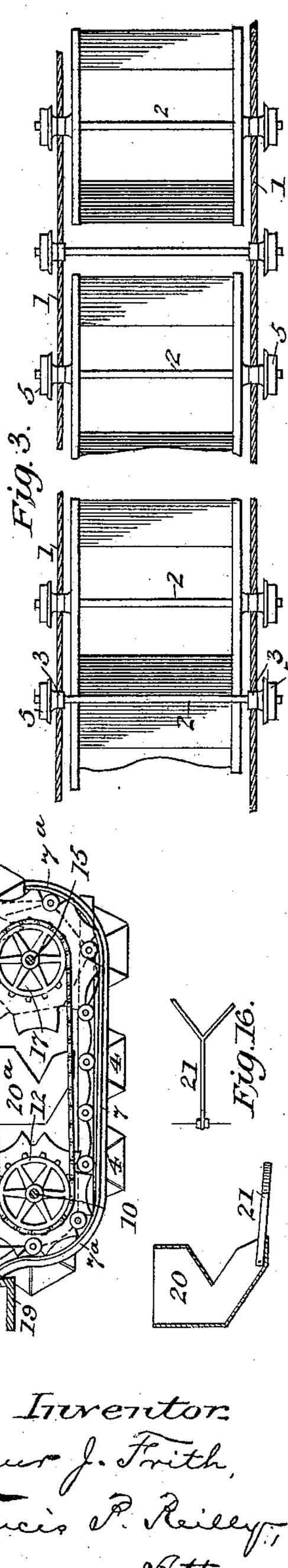
BUCKET CONVEYER.

(Application filed Dec. 21, 1896.)

(No Model.) 4 Sheets—Sheet 1.







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No. 620,298. Patented Feb. 28, 1899.

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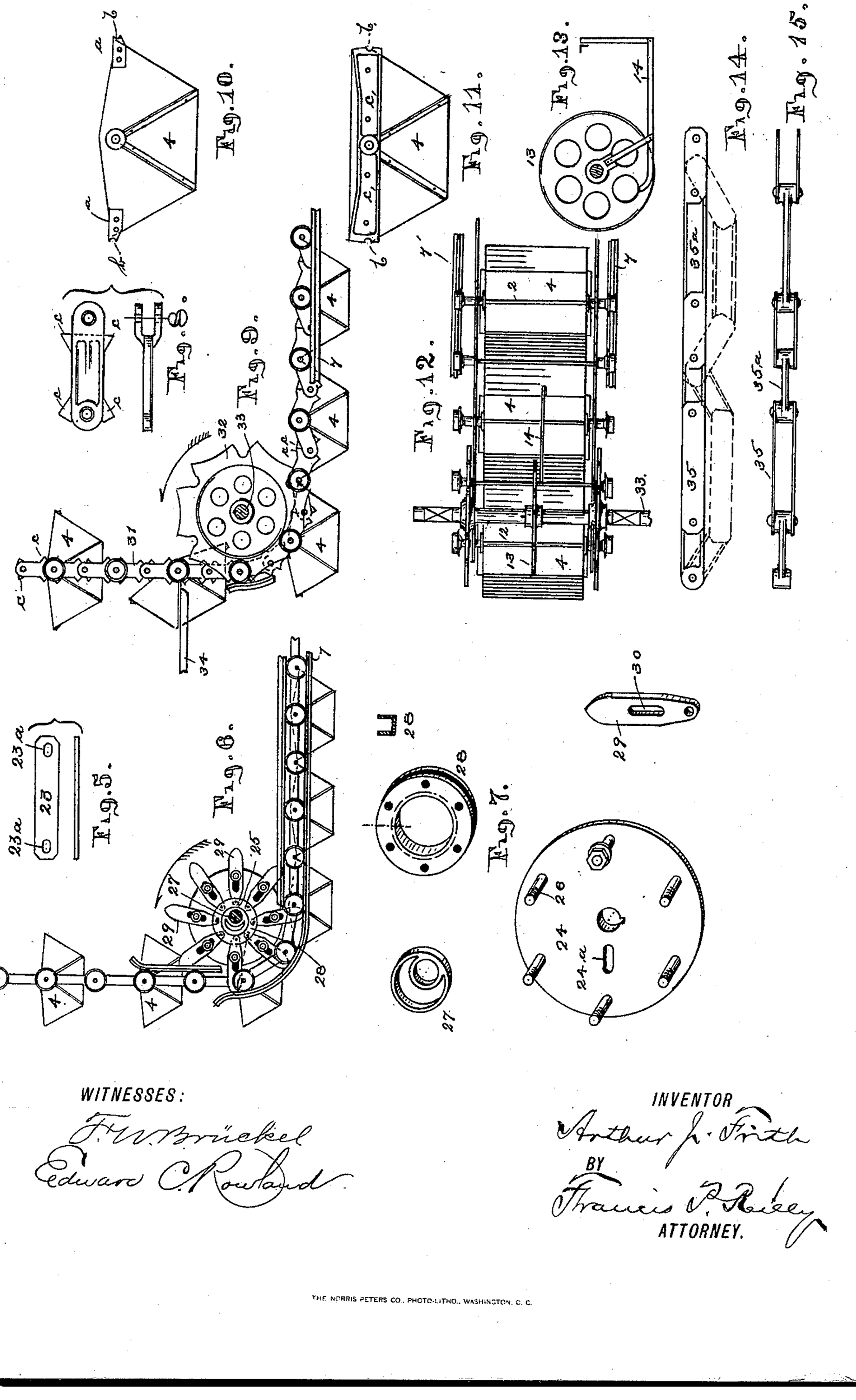
BUCKET CONVEYER.

(Application filed Dec. 21, 1896.)

(No Model.) 4 Sheets—Sheet 2.



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No. 620,298. Patented Feb. 28, 1899.

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BUCKET CONVEYER.

(Application filed Dec. 21, 1896.)

(No Model.) 4 Sheets—Sheet 3.

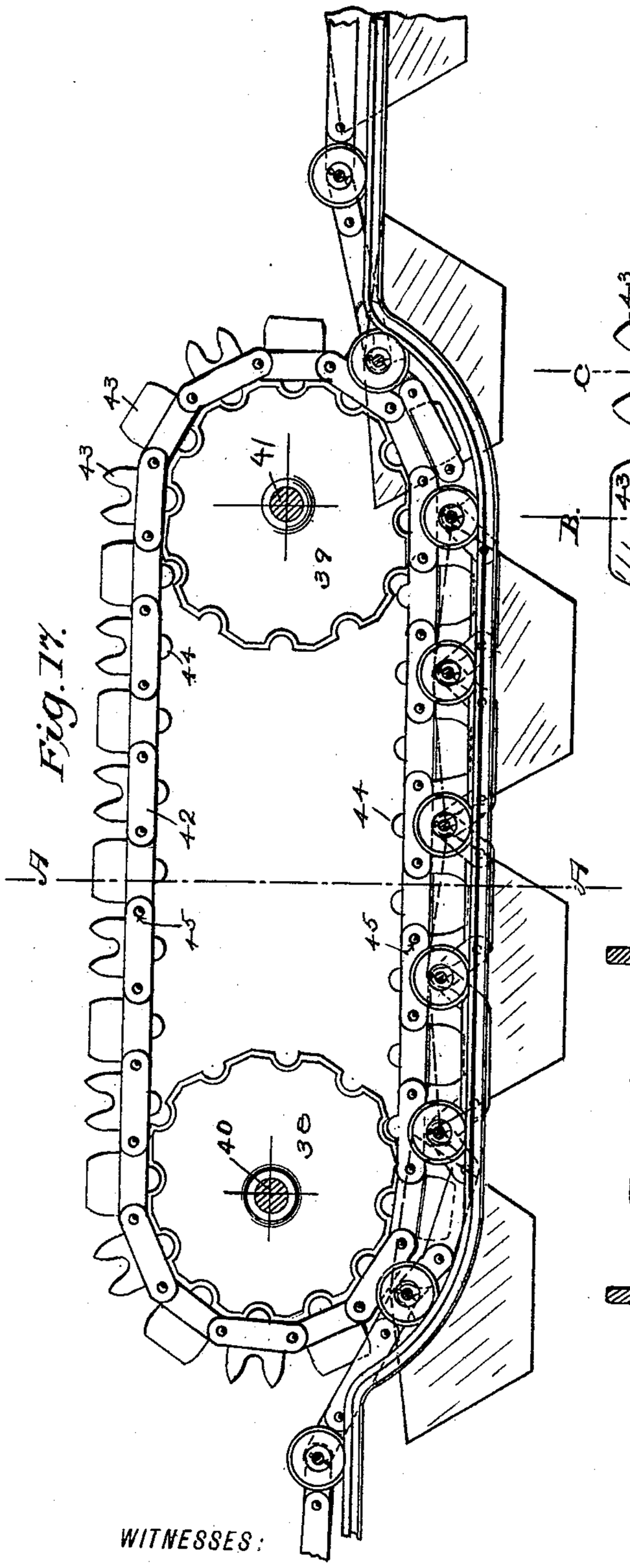

Fig. 17.

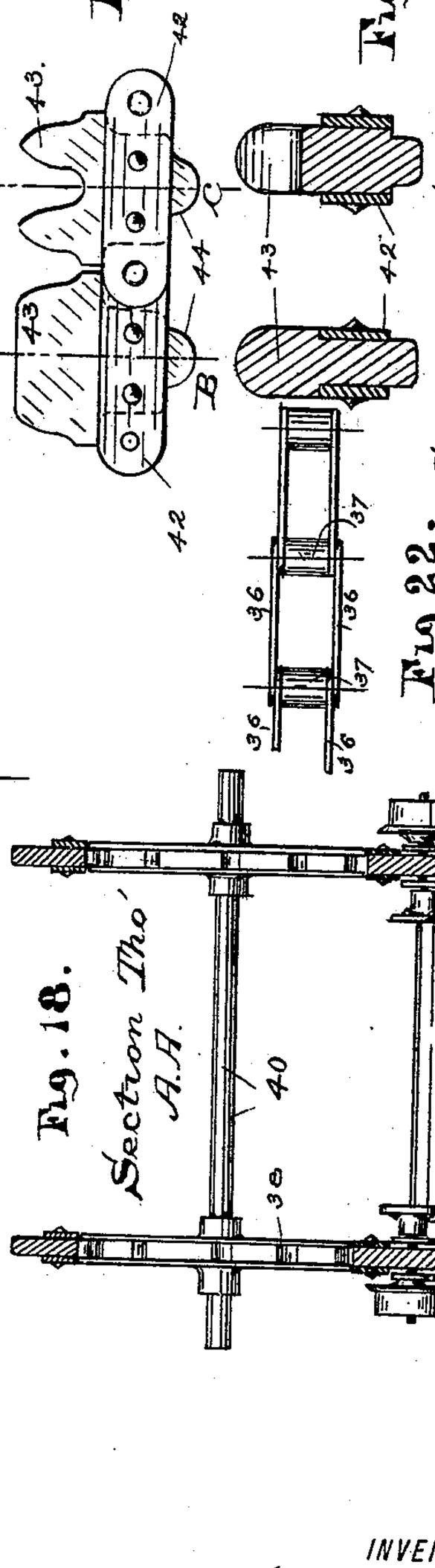

Fig. 19.

Fig. 21.

Fig. 20.

Fig 22.

Fig. 18.

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(Application filed Dec. 21, 1896.)

(No Model.) 4 Sheets—Sheet 4.

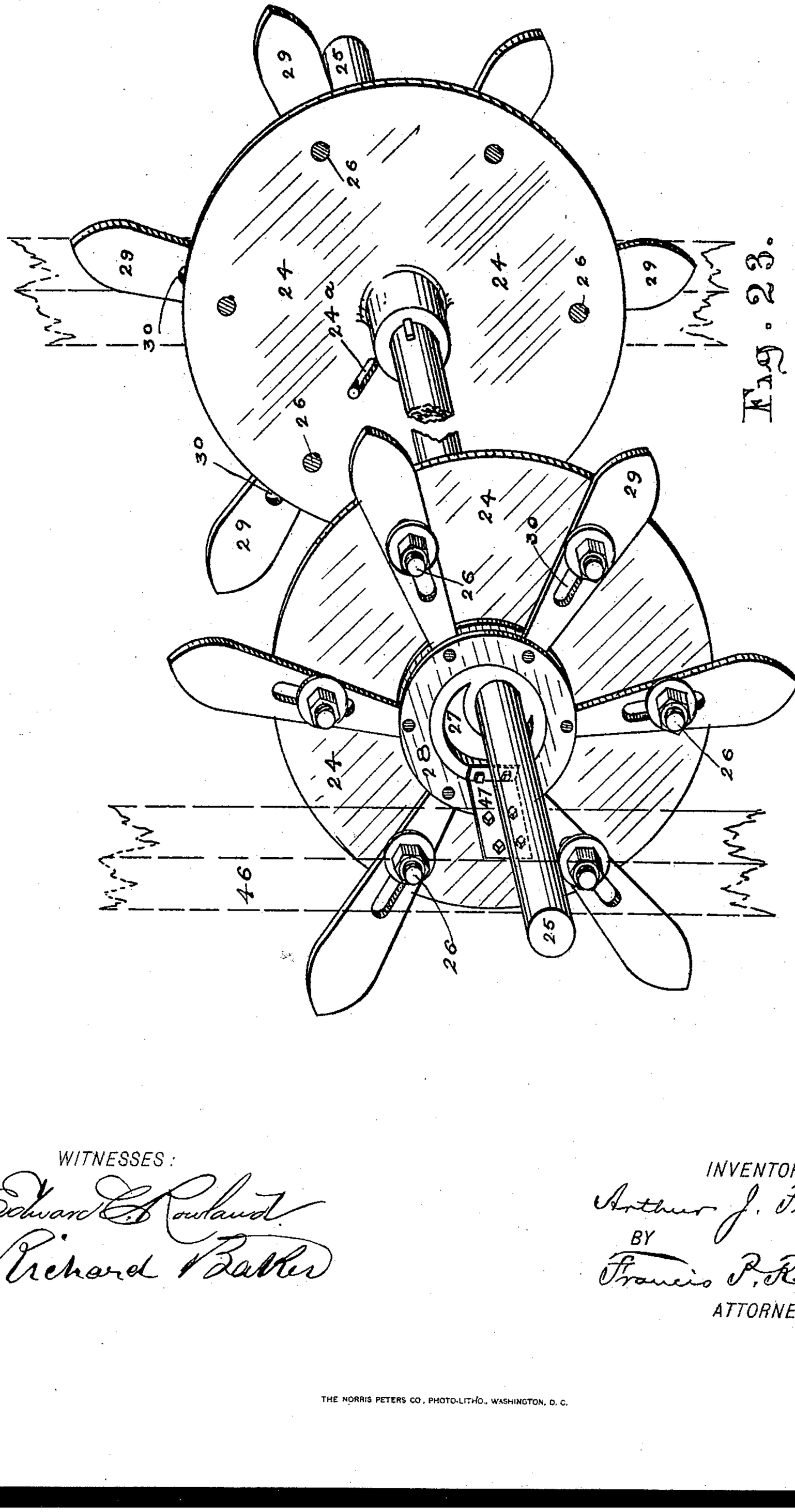

Fig. 23.

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UNITED STATES PATENT OFFICE.

ARTHUR J. FRITH, OF NEW YORK, N. Y.

BUCKET CONVEYER.

SPECIFICATION forming part of Letters Patent No. 620,298, dated February 28, 1899.

Application filed December 21, 1896. Serial No. 616,440. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR J. FRITH, of the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Bucket Conveyers, which invention is fully set forth and illustrated in the following specification and accompanying drawings.

The object of this invention is to provide a bucket conveyer which may be loaded with material from a hopper or chute without the intervention of a loading device and without the interposition of shields or other devices between the buckets.

The invention will first be described in detail and then set forth in the claims.

In the accompanying drawings, Figure 1 shows in sectional side elevation a gravity bucket conveyer embodying my invention. Fig. 2 shows in sectional side elevation, upon an enlarged scale, a portion of the conveyer shown in Fig. 1, illustrating different positions assumed by the gravity-buckets. Fig. 3 is a view in plan of Fig. 2. Fig. 4 is a view in plan of a portion of the mechanism shown in Fig. 1, illustrating details of construction hereinafter described. Figs. 5, 6, and 7 illustrate a portion of a modified form of conveyer also embodying my invention. Figs. 8, 9, and 12 illustrate portions of another form of conveyer embodying my invention, Fig. 12 being a view in plan of Fig. 9. Figs. 10 and 11 illustrate two forms of gravity-buckets which may be used in the conveyer. Fig. 13 illustrates a detail of construction hereinafter described. Figs. 14 and 15 illustrate in side elevation and plan, respectively, another form of chain which may be employed in the conveyer. Fig. 16 illustrates a brush or scraper which may be secured to a hopper or chute, as hereinafter described. Fig. 17 shows in side elevation another modification of my invention. Fig. 18 is a vertical section taken through Fig. 17 at the line A A. Fig. 19 illustrates a portion of a chain 42 employed in Fig. 17. Figs. 20 and 21 are vertical sections taken through Fig. 19 at the lines B B and C C, respectively. Fig. 22 is a view in plan of a portion of the conveyer-chain 36 shown in Fig. 17. Fig. 23 illustrates in perspective, upon an enlarged scale, the driving mechanism shown in Figs. 6 and 7, the conveyer being omitted.

In said figures the several parts are respectively indicated by reference numbers and letters, as follows:

Referring first to Figs. 1, 2, 3, and 4, the endless conveyer is composed of two parallel wire ropes 1, between which are suspended, by means of shafts or pivots 2 and suitable clamps or stops 3, a series of gravity-buckets 4. Each alternate shaft 2 passes through the center of a bucket, and all of said shafts are provided with wheels 5, which run upon upper and lower tracks 6 7, carried in the framework of the conveyer, suitable curved guide-rails 6^a 7^a being provided at the corners of the conveyer. The buckets 4 when in normal position are not in contact with each other, but are spaced apart. Each bucket has secured to its front and rear ends a casting *a*, Fig. 10, provided with a groove *b*, for the purpose hereinafter described. Instead of these two small castings a larger casting *c'*, provided at each end with a groove *b*, may be secured to the bucket, as shown in Fig. 11.

Suitably mounted in the framework of the conveyer is a shaft 8, carrying at each end a sprocket-wheel 9. Said shaft may be operated by a steam-engine or from any other suitable source of power, and the sprocket-wheels 9 drive the conveyer by engaging with the axles 2. Mounted in the framework of the conveyer also is a shaft 10, Figs. 1 and 4, carrying a pair of band sprocket-wheels 11, each of practically the same diameter as the driving-sprocket 9. Said shaft also carries a chain-wheel 12 and a revolving circular guide 13, Figs. 4 and 13, the latter being secured to the shaft by a key, set-screw, or any other suitable means. A horizontal guide-bar 14 is also loosely hung from said shaft, as shown in Fig. 13. A shaft 15, mounted in the framework of the conveyer, carries a pair of sprocket-wheels 16 (of greater diameter than the wheels 9 11) and a chain-wheel 17. An endless chain 18 connects the chain-wheels 12 and 17. A guide or projection 19 is located in proximity to the wheels 11 and in the path of travel of the empty buckets for the purpose of guiding said buckets, as hereinafter described.

One or more hoppers or chutes 20 may be located at any suitable point or points above the lower track 7, upon which the conveyer travels, so that the material to be conveyed may be delivered from any source or sources of supply through said hoppers or chutes into the buckets as they travel beneath the hoppers. If desired, a brush or scraper 21 may be located in front of one or more of the hoppers 20 and pivoted thereto, as shown in Fig. 16, for the purpose of leveling the material in the buckets, as hereinafter described.

Any suitable overturning mechanism may be located at the point 22 or elsewhere in the bucket's line of travel, so as to effect the unloading of the buckets.

The operation of the conveyer, constructed as above described, is as follows: Assuming that motion be imparted to the driving sprocket-wheel 9, so as to cause it to move in the direction of the arrow, the empty buckets, spaced apart, will, as they pass from the vertical to the horizontal, be forced toward each other, as shown in Fig. 1, in consequence of the fact that all the slack in the conveyer is thrown into its lower line of travel. As said buckets ascend vertically they will come in contact with the guide or projection 19[a] and will be thrown into such a position that when forced toward each other the groove *b* on the forward end of one bucket can engage the shaft or axle 2, the similar groove on the rear end of the preceding bucket also engaging said shaft. As the buckets continue to approach each other said grooves will engage said shafts and the buckets will be locked together, forming a continuous conveyer, with no spaces between the buckets. While in this position the buckets are loaded with material from the hoppers or chutes 20, located above the buckets, the material passing from the hoppers directly into the buckets without the intervention of a loading mechanism. As the buckets continue to travel they pass, loaded, from beneath the hoppers or chutes, ascend the vertical path of the conveyer, and pass upon the upper tracks 6. The buckets, as they pass from the lower tracks 7 to the vertical path of the conveyer, will be released from pressure and will be spaced apart with the conveyer under tension throughout the line of the conveyer until they again pass to the lower level for reloading after having been unloaded by contact with the overturning mechanism 22. The brush or scraper 21 in front of the hopper or chutes will serve to level the material in the buckets and to remove and sweep into the buckets any material which may lodge upon the shafts 2 while the buckets are in contact with said shafts.

If it be desired to load the buckets at another and lower level than the driving-wheel 9, the mechanism above described located at the lower left-hand corner of Fig. 1 may be employed. With this arrangement the empty bucket as it descends the vertical path of the conveyer will come in contact with the guide or projection 19, and the bucket will be thrown into such a position that the groove *b* on its forward end will engage the axle 2 as the travel is continued, said axle being also engaged by the groove on the rear end of the preceding bucket.

In order to prevent the front end of a bucket from tilting up and to insure the engagement of the groove *b* with the axle 2, the guide 13 14 is provided. The front end of the bucket enters under the circular guide 13 and then passes under the horizontal guide 14, Figs. 4 and 13, said bucket being thus guided in its proper path of travel. The sprocket 16 is driven from the conveyer and transmits the tension of the conveyer to the sprocket 11, thus allowing slack to occur in the chain between the two sprocket-wheels 11 16. As said sprocket-wheels 11 16 revolve their sprocket-teeth engage the axles or shafts 2 and the buckets 4 will be forced toward each other and locked in a continuous series, the grooves *b* engaging the shafts 2, as above described. While in this position the buckets may be loaded with material from a hopper or chute 20[a]. They then pass loaded from the horizontal track 7, assume their normal condition, spaced apart, and ascend the vertical path of the conveyer.

It is evident that the mechanism just described may be located at any other point in the conveyer's line of travel at which it may be desired to load, or may be entirely omitted if it be desired to load only on the ordinary lower tracks 7.

In Figs. 5, 6, and 7 a modification of my invention is shown, in which the conveyer instead of being constructed with a wire rope is constructed with an endless chain composed of a series of flat parallel links 23, Figs. 5 and 6, between which the buckets 4 are suspended by the axles or shafts 2. Said shafts pass through elongated holes or slots 23[a] in the ends of said links. For driving this form of conveyer I prefer to employ the mechanism shown, which is a modification of the Whitworth quick-return motion, the parts of which are shown detached in Fig. 7 and assembled in Figs. 6 and 23. A pair of plates 24 are fixed upon a shaft 25 and are provided with a series of projecting pins 26. Mounted upon the shaft 25 also and fixed to some part of the framework is an eccentric 27, surrounded by a grooved ring 28, driven from the plates 24 by a pin passing through a slot 24[a]. Pivoted to the ring 28 are a series of arms 29, provided with slots 30, engaging the pins 26 in the plates 24. If motion be imparted to the driving-shaft 25 by a steam-engine or other motor, the revolution of said shaft through the plates 24 and arms 29 will drive the conveyer, said arms engaging the axles or shafts 2. It will be evident that as the pins revolve around the shaft-center and the pitch-circle of the arms revolves around the eccentric-center the velocity of the arms 29 at the pitch-circle will vary as their pins approach or recede

from the eccentric-center, and as the unloaded buckets descend the vertical path of the conveyer and pass upon the lower horizontal tracks 7 the relative pitch distance of the arms 29 lessens gradually to allow the links 23 to slip in their grooves 23ª and pass from a condition of tension to that of compression, at the same time closing up the space between the buckets and bringing their grooved lips in contact with the shafts 2, forming a continuous series of buckets. The buckets are then loaded, as above described for Fig. 1, and when the loaded buckets pass to the vertical path of the conveyer the links 23 will be released from pressure and the conveyer will resume its normal condition of tension with buckets spaced apart.

In Figs. 8 and 9 my invention is shown applied to a conveyer having another form of endless chain. This chain 31 is composed of a series of short links forked at one end, as shown in Fig. 8, and provided with projections *c*. A driving sprocket-wheel 32 is secured to a shaft 33, the teeth of said sprocket-wheel engaging the axles or shafts 2 of the conveyer. If the shaft 33 be rotated by a steam-engine or other motor, the sprocket-wheel 32 will drive the conveyer by engaging the shafts 2, and the empty buckets as they descend the vertical path of travel of the conveyer will come in contact with a guide 34 and will be thrown into such a position that the grooves *b* on the buckets will engage the shafts 2, as above described in referring to the preceding figures. The buckets are also guided and prevented from buckling by the circular guide 13 and horizontal guide 14, (shown in Fig. 13 and hereinbefore described,) said circular guide being secured to the shaft 33, as clearly shown in plan in Fig. 12. As the buckets continue to travel and pass upon the lower tracks 7 they will be brought toward each other and in contact with the shafts 2 by reason of the bending of the chain between the shafts until the stops *c* engage each other. A continuous series of buckets will thus be formed upon the lower tracks 7 and the buckets are there loaded, as above described. When the loaded buckets pass from said tracks and ascend the vertical path of travel of the conveyer, the links of the chain 31 will be straightened and the conveyer will resume its normal condition with buckets spaced apart.

In Figs. 14 and 15 is shown another form of chain which may be employed in the conveyer. This chain is constructed with a series of long links 35, composed of two flat parallel plates, and with alternate shorter solid links 35ª. The operation of the conveyer when this chain is employed is substantially the same as above described for Fig. 1, the positions assumed by the links 35 35ª when the buckets have been forced toward each other being indicated by the dotted lines in Fig. 14.

Figs. 17 to 22, inclusive, show another modified form of conveyer embodying my invention, the arrangement therein shown being adapted to be substituted for that shown at the lower left-hand corner of Fig. 1. The conveyer-chain which I preferably employ with this arrangement is composed of links formed by parallel flat plates 36, having hubs 37 on their pivots, as shown in Figs. 18 and 22. The device now to be described may be located at any point in the conveyer's line of travel at which it may be desired to load the buckets, a portion of the track at the point selected being depressed and curved, as shown in Fig. 17, the shape of this curve depending upon its location in the conveyer. A pair of band sprocket-wheels 38 39 are mounted, respectively, upon shafts 40 41, and passing around said sprocket-wheels is an endless loading-chain 42, composed of links made up of flat parallel plates. To each link, between its plates, is secured a tooth 43, each provided on its inner end with a lug 44, registering with the grooves of the sprocket-wheels 38 39.

The operation of the conveyer constructed as above described is as follows: If motion be imparted to the conveyer by driving mechanism, so as to drive it in either direction, the chain 36 as it enters upon the curve at one end will be engaged by the teeth 43 on the endless chain 42, some of said teeth entering the links of the chain 36 between its parallel plates and the others engaging and spanning the hubs 37 of said chain. The pitch of the teeth 43 of the chain 42 when passing around the sprocket band-wheels 38 39 corresponds to the links of the chain 36 when extended; but when the chain 42 passes from its curved to its straight path of travel the pitch distance lessens to that of the chain 42, corresponding to the bucket-spacing when brought in contact, and hence as the conveyer continues to travel the buckets will become loaded in continuous series and propelled in this condition until they press from the other end of the depressed curve. While the buckets are in contact with the shafts 2, they are loaded, as above described.

It will be observed that in the forms of conveyer shown in Figs. 1 and 14 the buckets push each other on the lower levels, while in the forms shown in Figs. 6 and 9 the pressure passes through the chain itself. In the form shown in Fig. 17 neither the buckets nor the chain push, but the pull of the chain 36 passes from the conveyer through the loading-chain 42, and the buckets while in contact are each propelled at the proper distance. The wheels 38 39, Fig. 17, instead of being made sprocket-wheels may be made mere band-wheels, in which case the projections 44 on the teeth 43 would be omitted. The distance between said wheels may also be increased, if desired. For example, the wheel 38 may be located at one lower corner of a conveyer and the wheel 39 at the other lower corner and connected by the chain 42,

in which case the special form of depressed curved track would be unnecessary.

The driving mechanism shown in Figs. 6, 7, and 23 may be employed in any of the forms of conveyer herein described, or in any other form of conveyer in which the use of such a driving mechanism would be desirable. Thus, for example, said driving mechanism may, if desired, be employed to drive the conveyer shown in Figs. 17 to 22 and may be used in addition to the mechanism shown in said figures. Should these two mechanisms be used in one conveyer, they would be located at different points in the conveyer's line of travel, and the spaces between the buckets would be thereby closed at each of these points. The buckets of the conveyer could thus be loaded at two different points in the same manner as the conveyer shown in Fig. 1.

It is obvious that while the grooves *b* (shown on the buckets 4 in Figs. 2, 9, 10, and 11) are not necessary in all the forms of conveyer shown, they may, if desired, be used in other conveyers than those shown in said figures. For example, they may be employed in the conveyer shown in Figs. 17 to 22, if deemed advisable.

By the method herein described of operating endless conveyers all shields or other devices between the buckets may be dispensed with, and the material to be conveyed may be delivered from a hopper or chute directly into a continuous series of buckets at the loading point or points without the intervention of loading mechanism.

It is evident that in this form of conveyer the speed of the conveyer-chain when extended is greater than when the buckets are close together. The point of variation will naturally be at the driving mechanism, and it is advantageous that this change of speed should be made without shock. This object is accomplished in Figs. 1 and 9 by selecting such diameter of sprocket-wheel that the chord distance of the conveyer between the axles when passing over the sprocket is nearly identical with the shaft distance of the conveyer when the buckets are in contact. By this means the speed of the conveyer is continuously varied without violence. In Fig. 6 the same object is attained by having the pitch distance of the driving-arms slowly decrease, allowing movement in the link-slots to take place gradually, as described.

I do not confine myself to the precise constructions shown, as it is evident that they may be varied to accomplish the desired object without departing from my invention.

I do not herein claim, *per se*, the special form of driving mechanism shown in Figs. 6, 7, and 23, the same being claimed in an application filed by me on the 10th day of August, 1897, bearing Serial No. 647,770.

Having thus fully described my invention, I claim—

1. In a conveyer, the combination with a series of gravity-buckets, spaced apart, of means for causing said buckets to approach each other a predetermined distance while passing the loading-point, and prevent escape of material during the time required to effect the loading of a bucket.

2. In a conveyer, the combination of a conveyer-chain; gravity-buckets suspended from said chain and spaced apart; a hopper or chute located above the lower horizontal path of travel of the conveyer; and means for causing said buckets to approach each other a predetermined distance while passing beneath said hopper or chute, and prevent escape of material during the time required to effect the loading of a bucket.

3. A bucket conveyer provided with a series of non-telescopic gravity-buckets, and means whereby the portion of said series at the loading-point may be rendered practically continuous to prevent escape of material during the time required to effect the loading of a bucket, the remainder of the series being spaced apart.

4. In a conveyer, the combination of endless flexible connections; gravity-buckets suspended between said connections by supporting-shafts; track-wheels upon said shafts; track-rails for said wheels; and means for causing said connections to yield a predetermined distance at the loading-point of the conveyer, and close the spaces between the buckets during the time required to effect the loading of a bucket; whereby escape of material between the buckets is prevented during the loading operation.

5. In a conveyer, the combination of endless flexible connections; gravity-buckets, supporting-shafts for said buckets; intermediate shafts between the buckets; track-wheels upon said shafts; track-rails for said wheels; a hopper or chute; and means for causing said buckets to approach each other a predetermined distance and engage said intermediate shafts, while passing beneath said hopper, during the time required to effect the loading; whereby escape of material between the buckets is prevented during the loading operation.

6. In a bucket conveyer, the combination of an endless conveyer-chain; buckets suspended from said chain; chain-wheels; supporting-shafts for said wheels; and a bucket-spacing chain passing around said chain-wheels and provided with teeth for engaging said conveyer-chain, and bringing the buckets toward each other.

7. In a bucket conveyer, the combination of an endless conveyer-chain; buckets suspended from said chain; a track provided with a curved depressed portion; chain-wheels mounted upon shafts above said depressed track; and a loading-chain passing around said chain-wheels, and provided with teeth for engaging said conveyer-chain.

8. In a bucket conveyer, the combination of an endless conveyer-chain, composed of flat links provided with hubs on their pivots;

buckets suspended from said chain; chain-wheels; supporting-shafts for said wheels; and a bucket-spacing chain passing around said chain-wheels, and provided with teeth for engaging said conveyer-chain and bringing the buckets toward each other.

9. In a bucket conveyer, the combination of endless flexible connections, a series of buckets suspended between said connections, and each provided with a groove, as *b*, at each end, and means adapted to be engaged by said grooves, for the purposes set forth.

10. In a bucket conveyer, the combination of a series of buckets; supporting axles or shafts for said buckets; endless flexible connections; and a series of shafts between said buckets; each bucket being provided with a grooved lip or projection at each end for engaging said intermediate shafts.

11. In a bucket conveyer, the combination of a series of traveling buckets; a horizontal supporting-shaft located adjacent to the loading-point; and a revolving circular guide secured to said shaft and adapted to engage the buckets, for the purposes set forth.

12. In a bucket conveyer, the combination of a series of traveling buckets; a horizontal supporting-shaft, located adjacent to the loading-point; a revolving circular guide secured to said shaft; and a horizontal guide loosely hung from said shaft; for the purposes set forth.

13. In a bucket conveyer, the combination of a series of buckets, each provided with a groove, as *b*, at each end; a series of intermediate shafts between said buckets, for engaging the grooves thereon; and a guide or projection located in the vertical path of travel of the empty buckets, for the purposes set forth.

14. In a bucket conveyer, the combination of a series of traveling buckets; a guide or projection located in the path of travel of the empty buckets; a horizontal shaft adjacent to the loading-point; and a revolving circular guide secured to said shaft, for the purposes set forth.

15. In a bucket conveyer, the combination of a series of traveling buckets; a guide or projection located in the vertical path of travel of the empty buckets; a horizontal shaft adjacent to the loading-point; a circular guide secured to said shaft; and a horizontal guide loosely hung from said shaft.

16. In a bucket conveyer, the combination of a series of buckets, each provided with a grooved lip or projection at each end; a series of intermediate shafts between said buckets; a guide or projection located in the vertical path of travel of the empty buckets; a shaft adjacent to the loading-point; a circular guide secured to said shaft; and a horizontal guide loosely hung from said shaft.

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