

No. 620,510.

Patented Feb. 28, 1899.

E. E. SLICK.

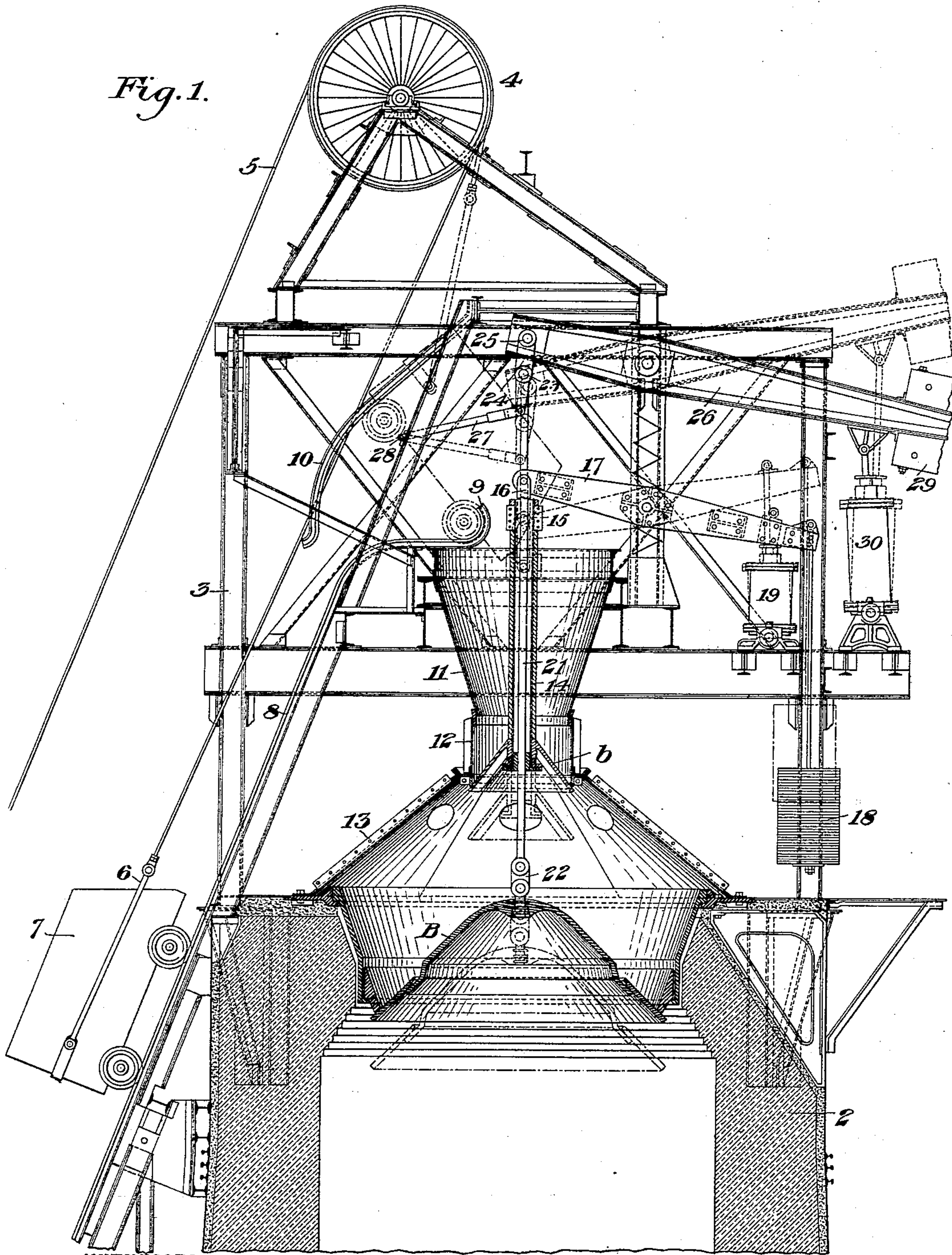
BLAST FURNACE FEEDING APPARATUS.

(Application filed Nov. 1, 1898.)

(No Model.)

5 Sheets—Sheet 1.

Fig. 1.



WITNESSES

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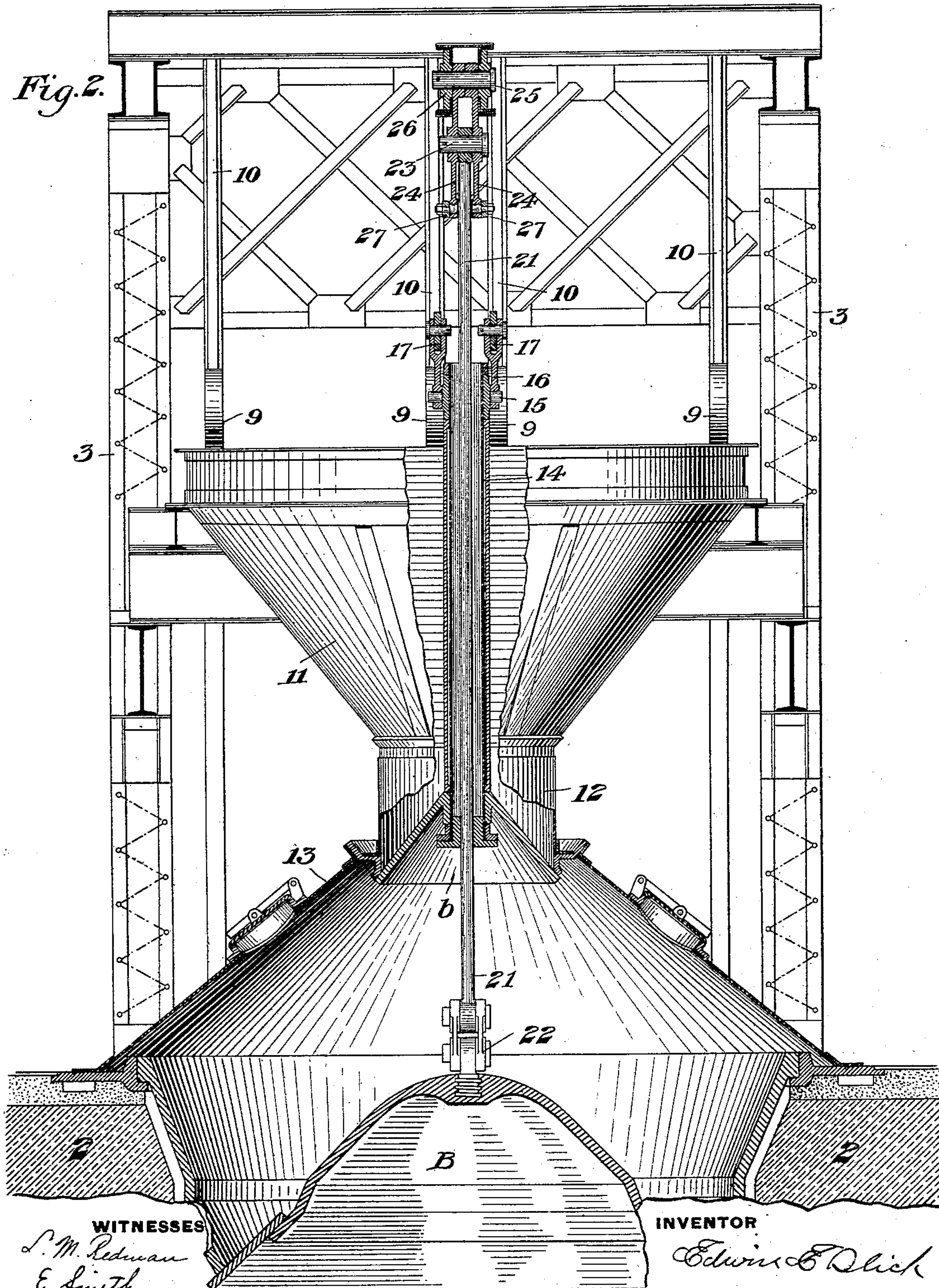
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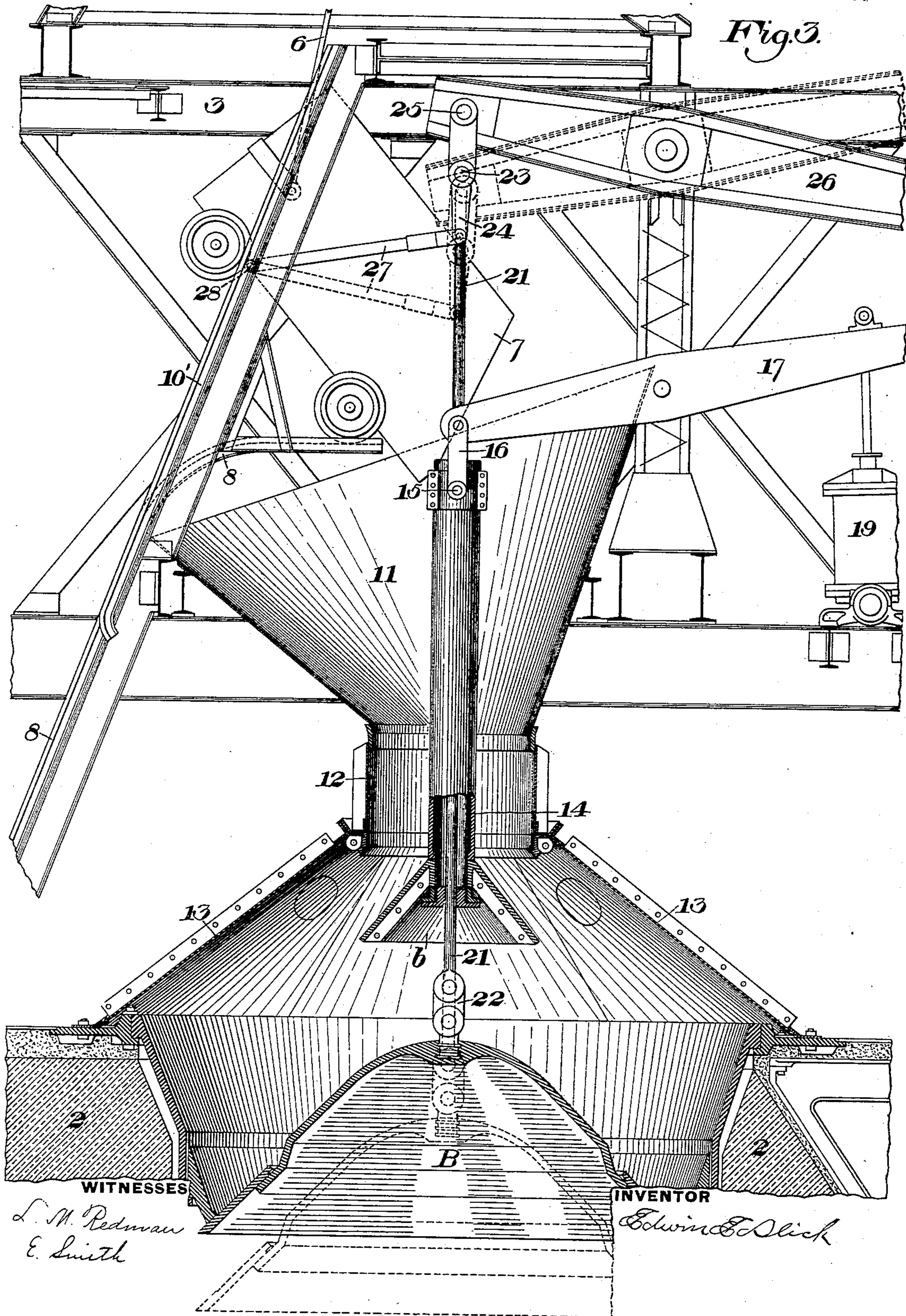
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Fig. 3.



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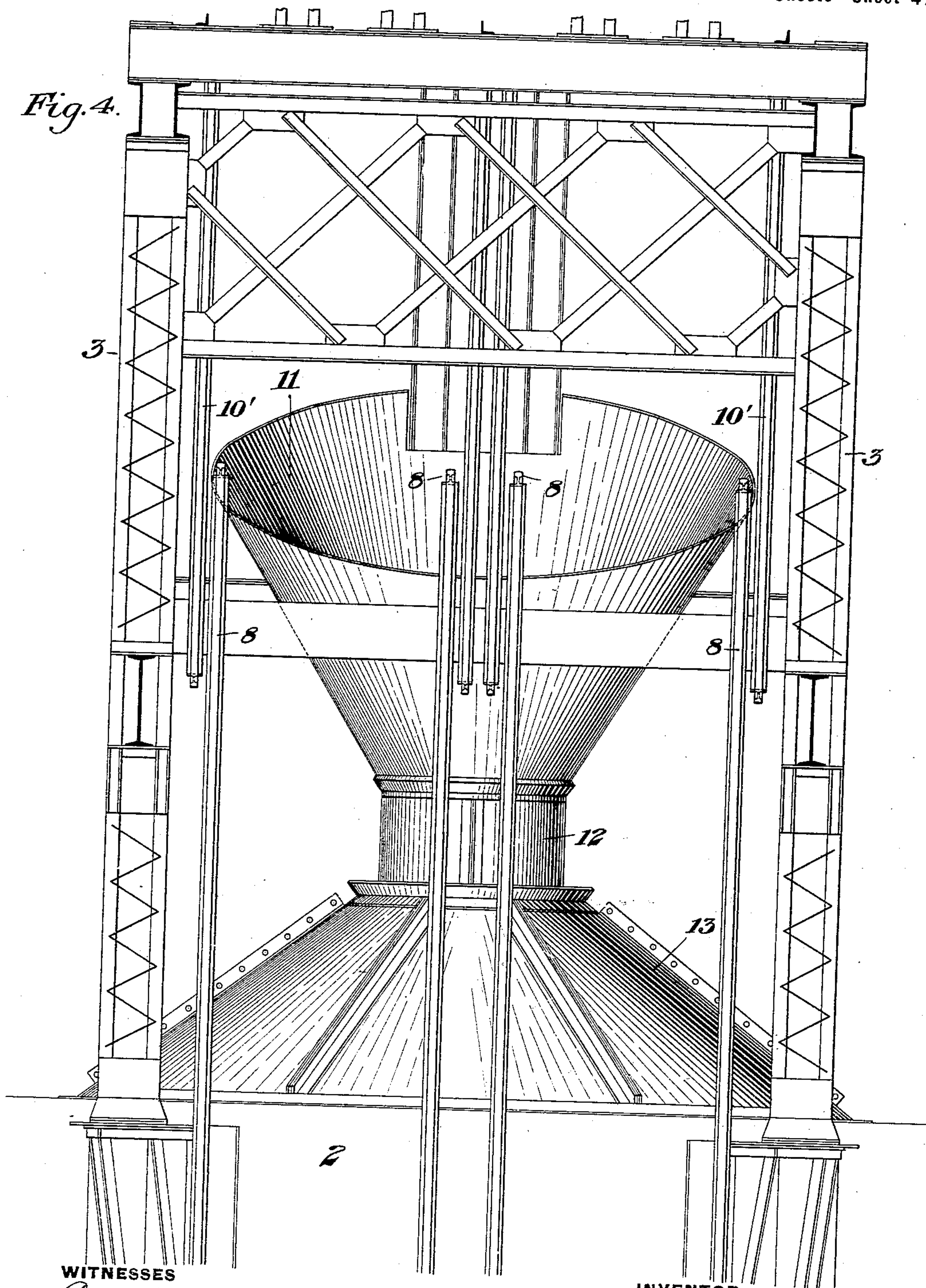
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Fig. 4.



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Fig. 5.

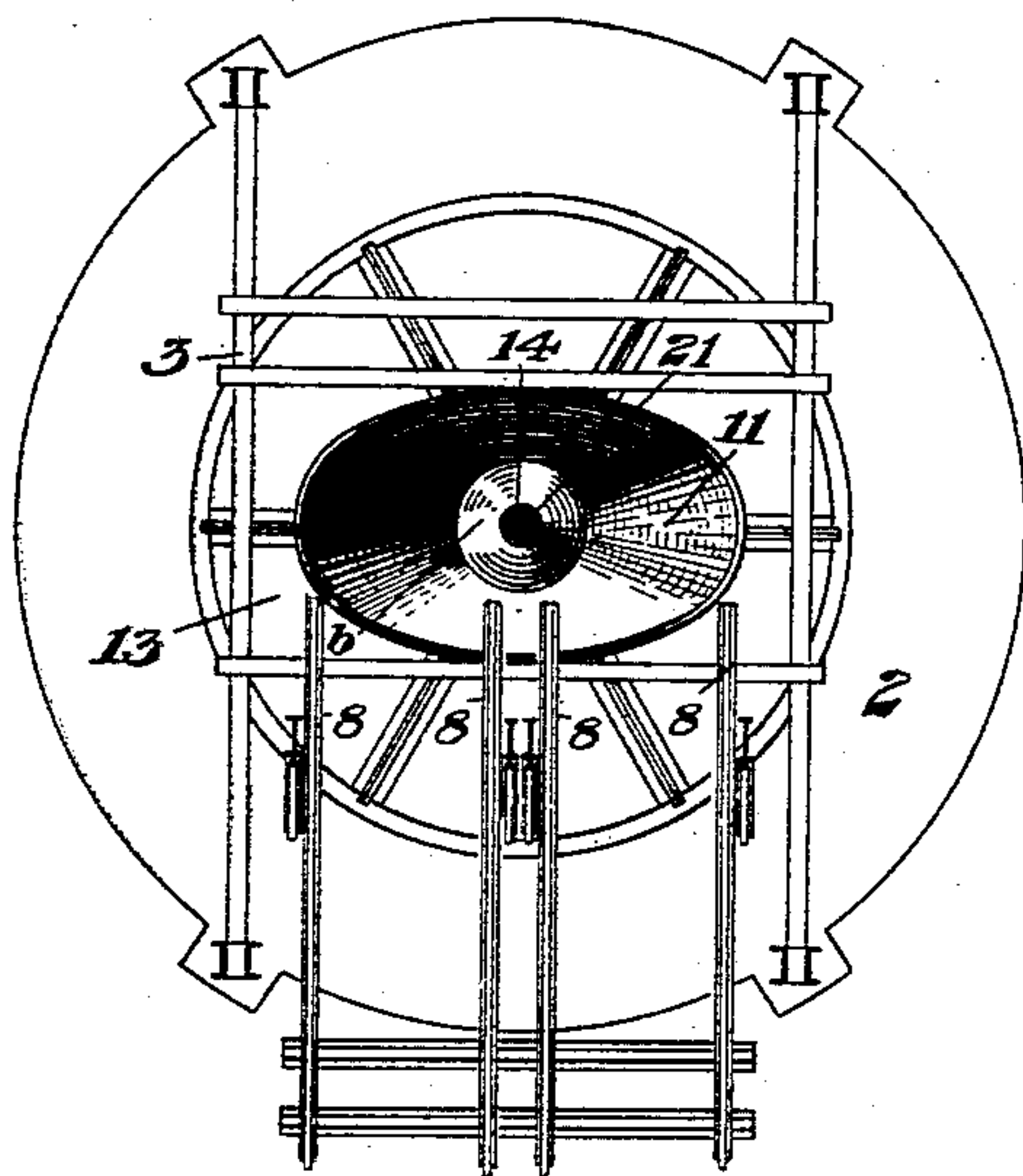


Fig. 7.

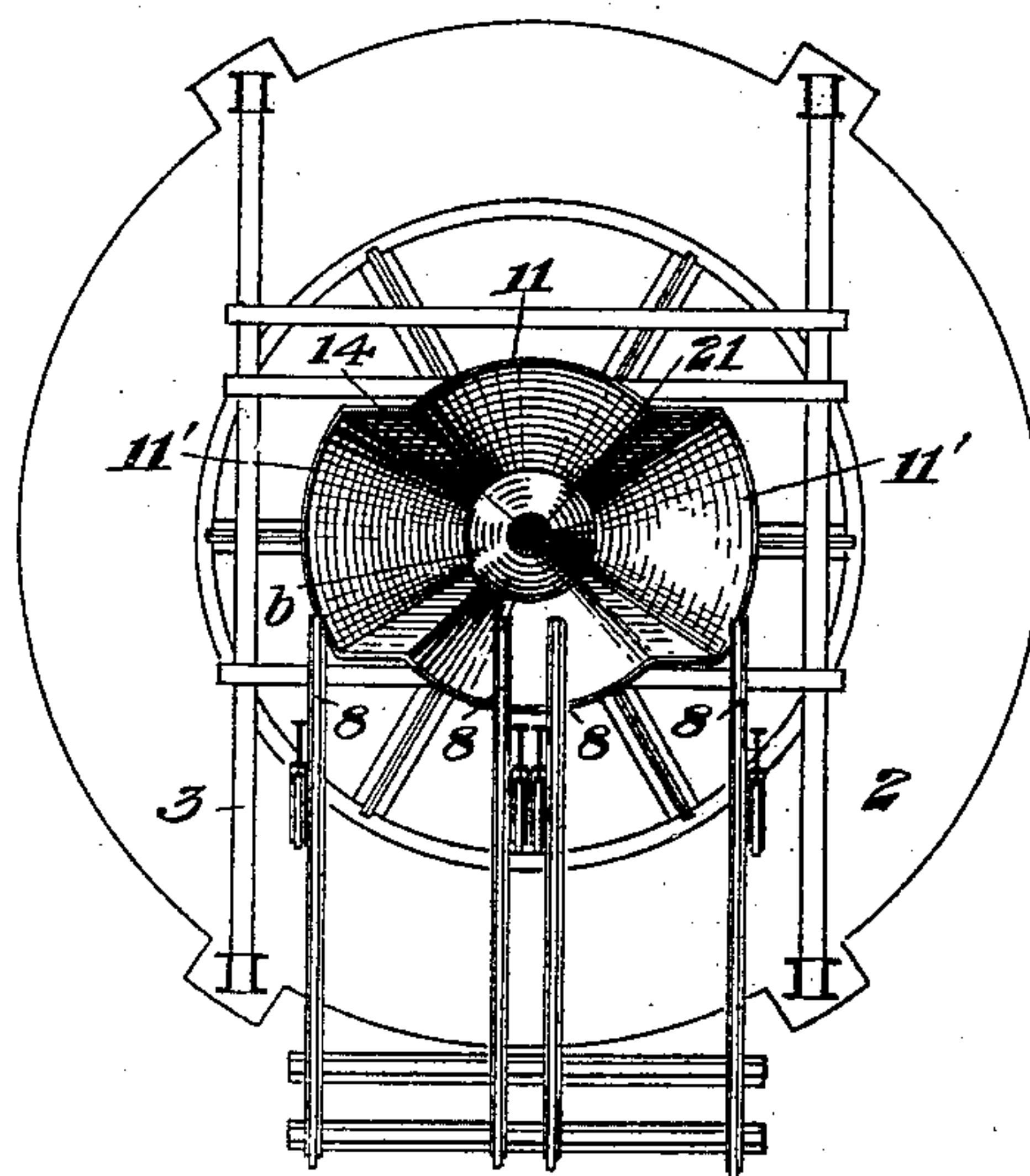
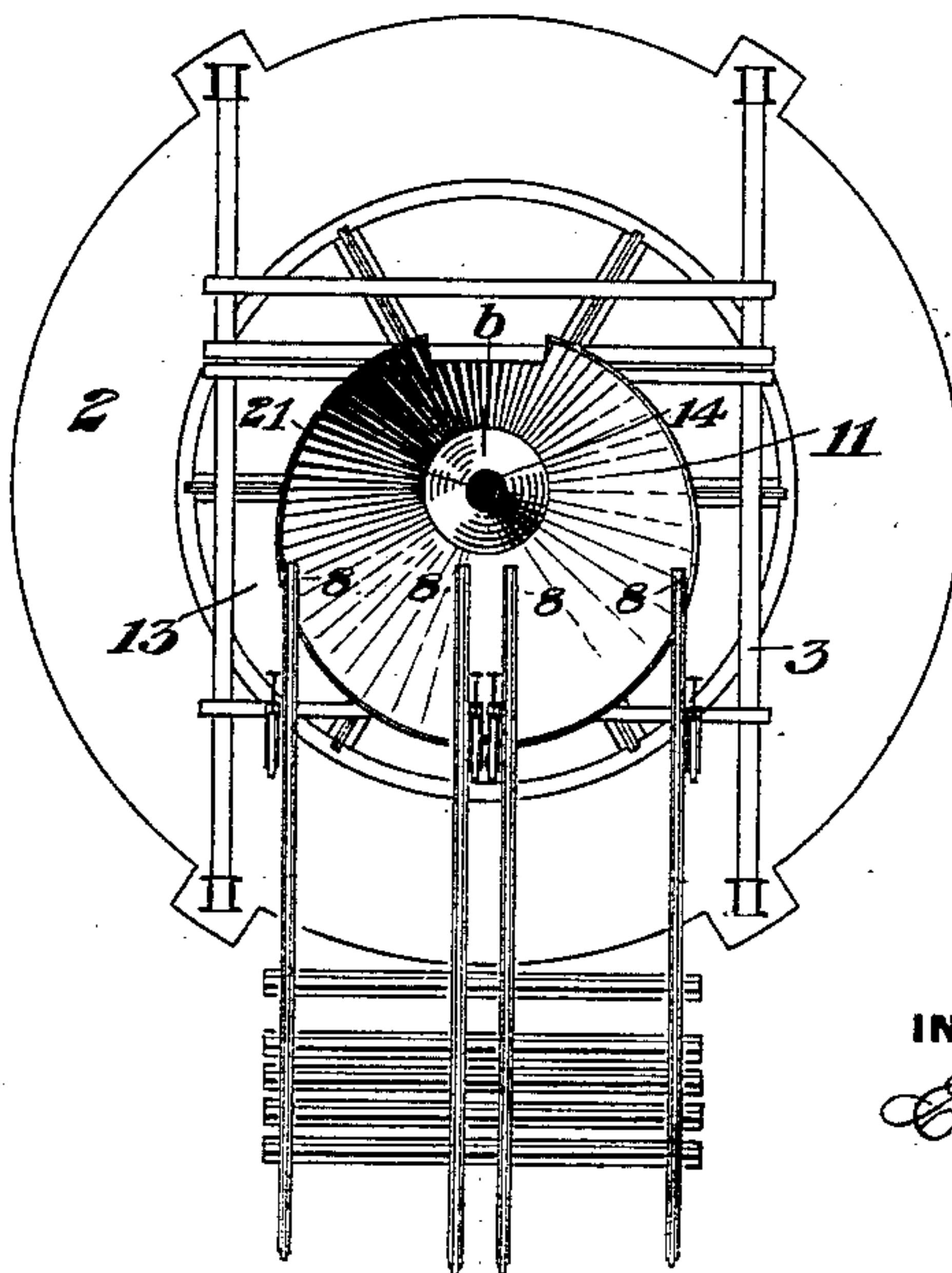


Fig. 6.



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EDWIN E. SLICK, OF BRADDOCK, PENNSYLVANIA.

BLAST-FURNACE-FEEDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 620,510, dated February 28, 1899.

Application filed November 1, 1898. Serial No. 695,170. (No model.)

To all whom it may concern:

Be it known that I, EDWIN E. SLICK, of Braddock, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Blast-Furnace-Feeding Apparatus, 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 side elevation, partly in section, of the upper portion of a blast-furnace provided with my improved apparatus; and Fig. 2 is an enlarged side elevation, partly broken away and taken at right angles to that of Fig. 1. Fig. 3 is a side elevation, partly in vertical section, on the same scale as Fig. 2, showing the same construction of main hopper and throat as in Fig. 2, but showing a supplemental hopper of conical form, the supplemental hopper of Fig. 2 being elliptical in horizontal section. Fig. 4 is a front elevation of Fig. 3, omitting the skip and bell-operating mechanism. Fig. 5 is a top plan view of the elliptical supplemental hopper shown in Figs. 1 and 2, details of construction of the framework being omitted. Fig. 6 is a top plan view of the conical supplemental hopper shown in Figs. 3 and 4; and Fig. 7 is a like view of a supplemental hopper of modified construction, the same having a middle portion of general conical outline with winged extensions.

The object of my invention is to provide an improved apparatus for hoisting and feeding stock to blast-furnaces adapted to afford a better and more uniform distribution of the charge than has heretofore been obtained.

In Figs. 1 and 2 of the drawings, 2 represents the blast-furnace, having mounted on the top a framework 3, at the upper end of which is mounted a hoisting-wheel 4, over which the hoisting-rope 5 extends from the drum to a swinging bail 6, which is pivoted to the rear portion of a wheeled skip 7. The skip-wheels travel upon the rails 8 of an inclined track which leads from the bottom of the furnace to the frame at its top, and at the upper ends the rails are bent horizontally toward the center of the furnace and terminate in curved stops 9, which engage and hold the front wheels of the skip. 10 are guides for the rear wheels of the skip, these guides

being in the form of rails, along which the wheels pass and which prevent the skip from tipping sidewise from its true position.

The constructions just described are duplicated, as shown in the drawings, so as to afford two tracks, leading to the top of the furnace, and two skips, which may be operated alternately in the manner customary in hoisting apparatus when two cars or skips are used. The reason for thus duplicating the apparatus is to accommodate the supply of stock to the large output of modern blast-furnaces.

The skips dump into a chute or hopper 11, mounted centrally above the charging-bell and suitably supported on the framework, as shown. As there are two skips, the tracks of which are close together, the supplemental chute or hopper 11 should be of proper width to extend in front of the tracks between each of the outermost rails. For this purpose I may use either a conical hopper of large diameter at its upper end, as shown in Figs. 3, 4, and 6, or a hopper elliptical in horizontal section, with its longer axis extending transversely to the tracks, as in Figs. 1, 2, and 5, or a hopper with winged extensions or chutes 11', as in Fig. 7. Any of these equivalent constructions will accomplish this end and will afford terminal facilities of sufficient area for the reception of the material discharged from the two skips.

If desired, my improved apparatus instead of being used with two skips may be operated with one skip of large capacity.

At the lower end of the chute or hopper 11 is a throat or funnel 12, with a substantially vertical wall secured to the central portion of the annular casing 13 of the furnace and closed by a bell 14, which is secured to the lower end of a tube 14. The throat or funnel is preferably not of substantially greater diameter at its base than the bell and extends above the top of the bell, so that when the stock is poured into the hopper it will slide down the inclined sides thereof and at its base will drop into the throat 12. The throat will thus become filled up with stock around the bell and when the bell is dropped the stock will be discharged uniformly into the hopper below. I believe I am the first to use in a furnace having a lower bell and hopper an

upper chute or hopper having inclined sides down which the stock will slide and having at its base a throat or funnel into which the stock will drop upon an upper bell at the lower part thereof. The stock is thus distributed in a mass completely surrounding the upper bell instead of being collected merely on one side of a hopper, as is apt to be the case with constructions such as have been in common use heretofore. I intend to make broad claims to such throat with the chute or hopper and in addition thereto make specific claim to the construction just described.

The tube 14 at its upper end is provided with projecting trunnions 15. These trunnions are hung in depending bearings carried by yokes 16, pivoted to the forked front end of a lever 17, which is fulcrumed upon the frame, as shown, and the outer end of which is normally held in depressed position by a counterweight 18. The lever is swung to open the bell *b* by a single-acting cylinder 19, which is pivotally mounted upon the frame, as shown, and the fluid-supply for which is controlled from the engine-room.

The charging-bell B of the furnace is carried by a rod 21, to which it is secured by a pivoted link 22, this rod extending centrally through the tube 14 and pivoted at its upper end to a pin 23. The pin 23 is pivoted within the central portions of links 24, which at their upper ends are pivoted to a pin 25 in the end of a lever 26, while to projecting pins at the lower ends of these levers are pivoted forked arms of a swinging link 27, pivoted between two channels at 28. The lever 26 is provided at its rear end with a counterweight 29, and is swung to lower the charging-bell by a pivotally-mounted motive-cylinder 30, controlled from the engine-room similarly to the cylinder 19.

The operation of my device is as follows: The skip being drawn to the top of the furnace, its front wheels engage the stops 9, Figs. 1 and 2, and its rear end being elevated by the bail the contents are dumped into the chute and slide down its inclined sides and drop therefrom into the throat or funnel 12 upon the bell *b* at its base. The skip then being allowed to tip back, its rear wheels again engage the track and it is lowered to the bottom of the same. The operation is repeated until a suitable amount of stock is accumulated in the throat, whereupon the bell *b* is lowered by admitting fluid to the cylinder 19 and the contents dropped and distributed upon the charging-bell proper, B. The charging-bell B is intermittently raised and lowered, as usual, by the cylinder 30, and the stock is uniformly distributed in the furnace.

The advantages of my invention will be appreciated by those skilled in the art. The throat or funnel by receiving the stock which drops into it from the inclined sides of the upper chute or hopper and concentrating it in the center, irrespective of how it is dis-

charged into the chute or hopper, causes the charge to drop upon the lower charging-bell in such manner as to give a much more equal and uniform distribution than if it were not employed. The throat is at least substantially as large at its mouth as at its upper end, so that the stock will drop freely into it instead of sliding down an inclined or converging side, as in the upper hopper. The contents of several skips can be dropped into the upper chute 11 before the bell of this hopper is moved to discharge into the hopper below.

The apparatus shown in Figs. 3 and 4 is the same as that shown in Figs. 1 and 2, except in respect of the shape of the supplemental hopper 11 and the tracks on which the skip bears while dumping. The hopper 11, as above explained, is conical, but its axis inclined toward the tracks, so that the stock, coming as it does in a somewhat-inclined direction from the end of the skip, will be discharged more nearly into the center of the hopper. This figure shows the upper bell *b* dropped to discharge the stock into the hopper below. It also shows the skip-tracks arranged without any stops 9 and with supplemental guard-rails 10', on which the rear wheels of the skip ride when the skip is being dumped.

I claim—

1. The combination with a blast-furnace having at its upper end a main charging hopper and bell, of a supplemental hopper supported above the main hopper and having an inwardly-converging side, a throat at the lower end of the supplemental hopper into which the material drops from the converging side of the supplemental hopper, said throat being at least substantially as wide at its mouth as at its upper end, and of smaller cross-sectional area than the main hopper, a bell seated against the lower end of the throat, a track leading to the supplemental hopper, and a skip movable upon the track and arranged to discharge the material upon the inclined converging side of the upper hopper; substantially as described.

2. The combination with a blast-furnace having at its upper end a main charging hopper and bell, of a supplemental hopper supported above the main hopper and having an inwardly-converging side, a throat at the lower end of the supplemental hopper into which the material drops from the converging side of the supplemental hopper, said throat having at least substantially as great an area at its mouth as at its upper end, and of smaller cross-sectional area than the main hopper, a bell seated against the lower end of the throat, mechanism for operating both bells, a track leading to the supplemental hopper, and a skip movable upon the track and arranged to discharge the material upon the inclined converging side of the upper hopper; substantially as described.

3. The combination with a blast-furnace,

having at its upper end a main charging hopper and bell, of a supplemental hopper supported above the main hopper and having inwardly-converging sides, a throat at the lower end of the supplemental hopper into which the material drops therefrom, said throat being at least substantially as wide at its mouth as at its upper end, and of a smaller area than the main hopper, a downwardly-movable bell-bottom arranged to close the lower end of the throat, a pair of tracks leading to the supplemental hopper, a pair of tipping skips movable upon the tracks and arranged to alternately deposit the material upon its converging side, and means for operating both bells; substantially as described.

4. The combination with a blast-furnace, having at its upper end a main charging hopper and bell, of a supplemental hopper supported above the main hopper and having an inwardly-converging side, the axis of the sup-

plemental hopper being inclined toward the place of discharge of the skip, a throat at the lower end of the supplemental hopper into which the material drops from the converging side of the supplemental hopper, said throat being at least substantially as wide at its mouth as at its upper end, and of smaller cross-sectional area than the main hopper, a bell seated against the lower end of the throat, a track leading to the supplemental hopper, and a skip movable upon the track and arranged to discharge the material upon the inclined converging side of the upper hopper; substantially as described.

In testimony whereof I have hereunto set my hand.

EDWIN E. SLICK.

Witnesses:

JOHN F. BANKERD,
L. M. REDMAN.