L. L. BEEKEN.

COAL SAMPLING MACHINE.

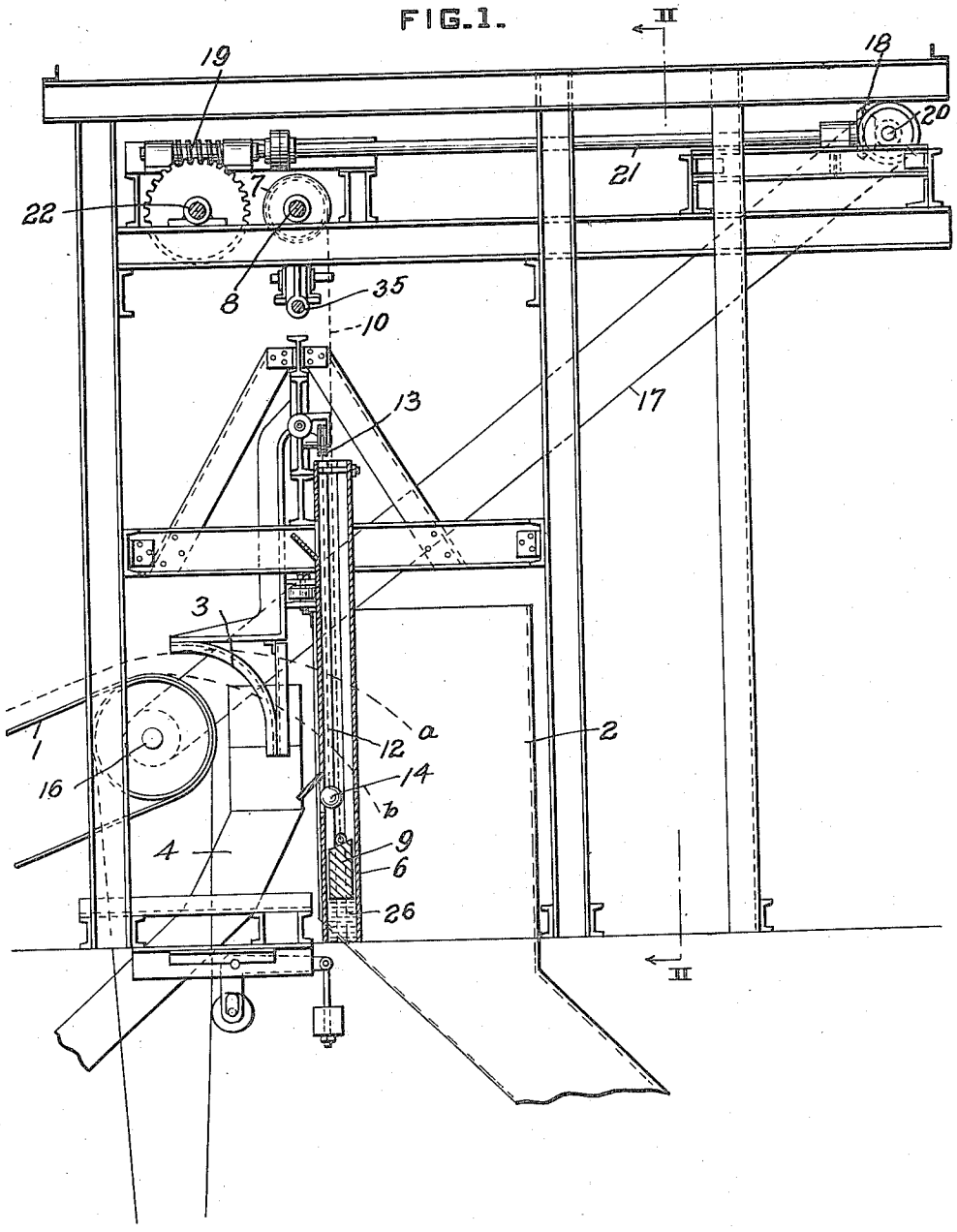
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1,186,646.

Patented June 13, 1916.

4 SHEETS—SHEET 1.

FIG. 1.



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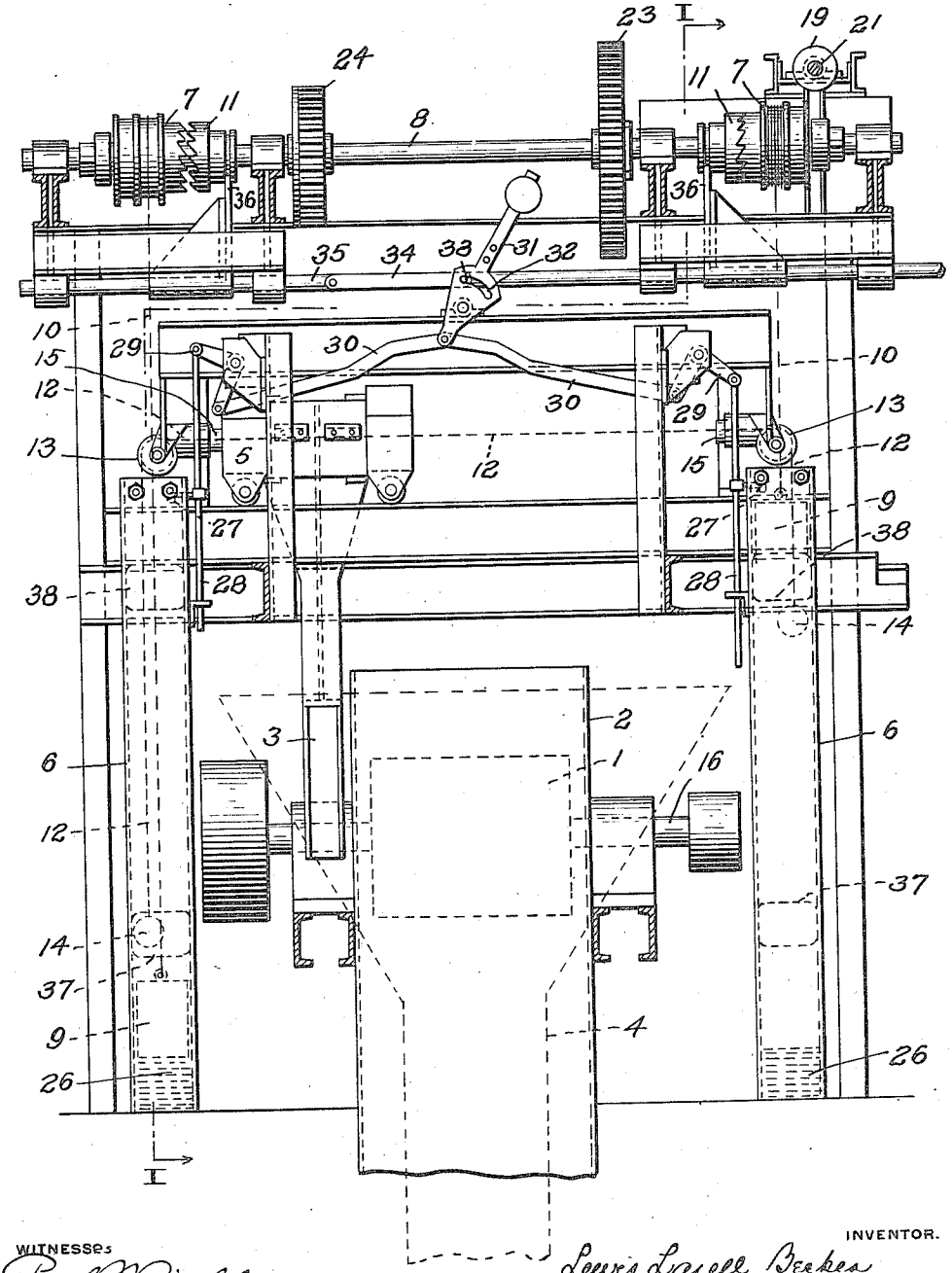
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4 SHEETS—SHEET 2.

FIG. 2.



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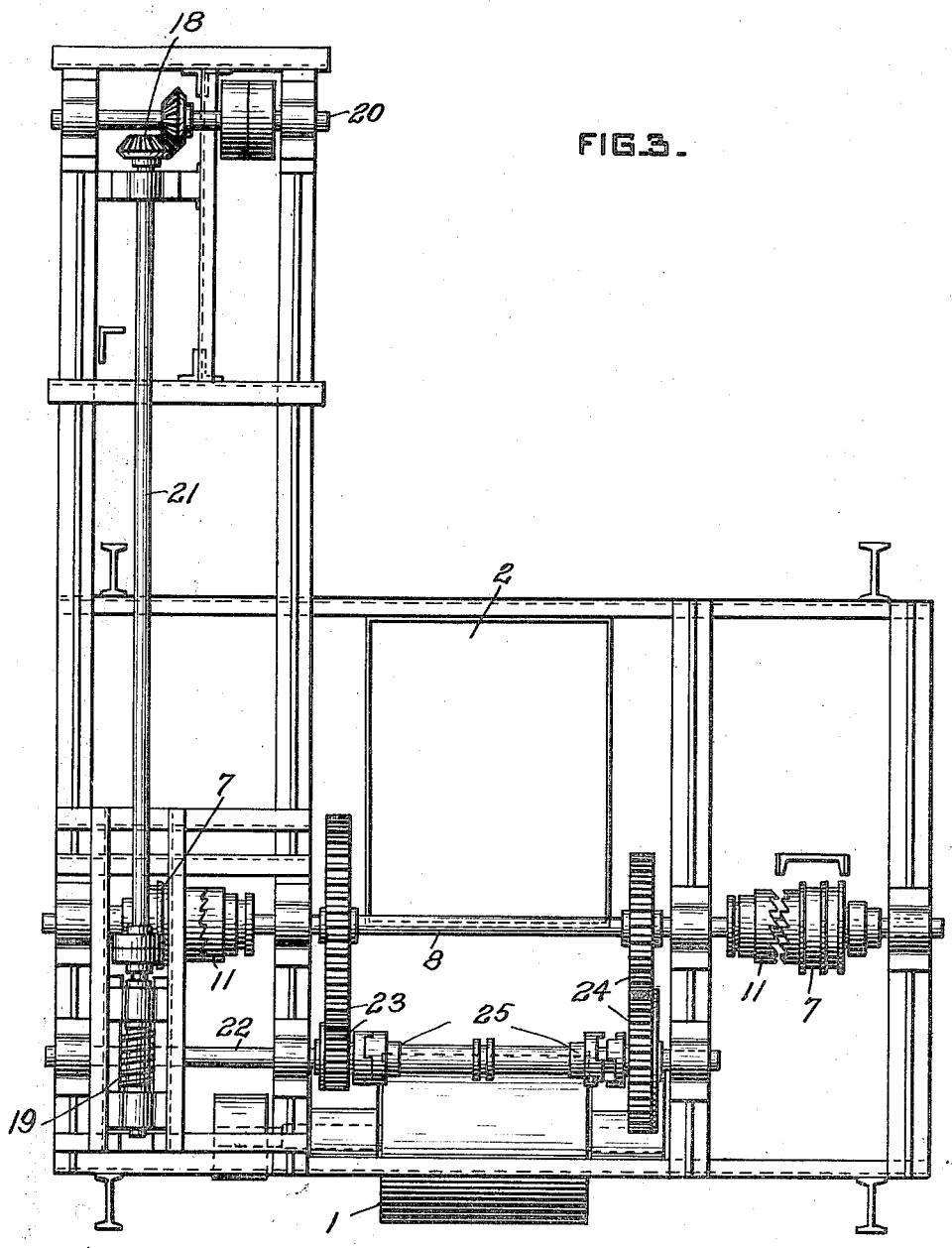
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4 SHEETS—SHEET 3.

FIG. 3.



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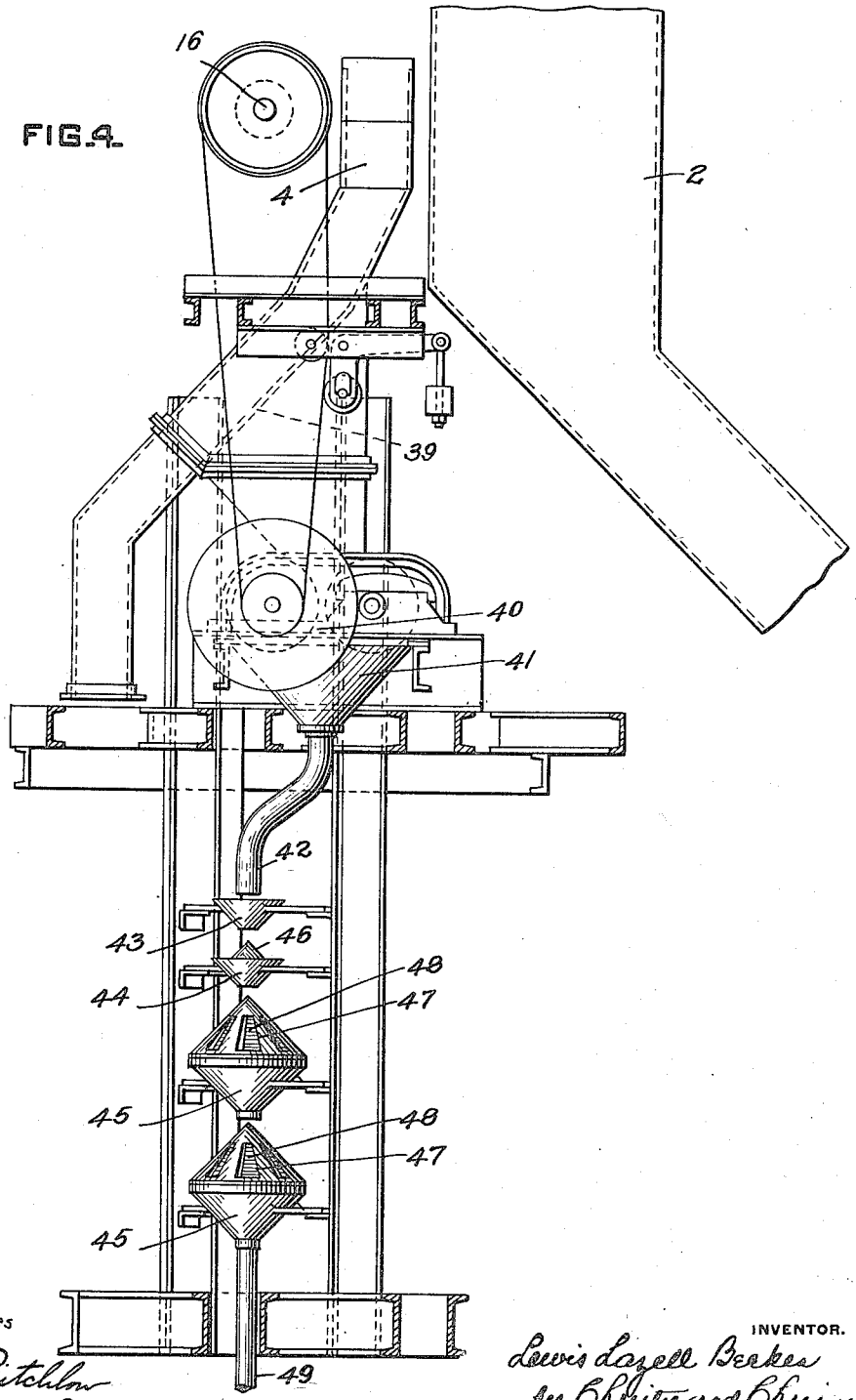
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4 SHEETS—SHEET 4.

FIG. 4.



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UNITED STATES PATENT OFFICE.

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COAL-SAMPLING MACHINE.

1,186,646. Specification of Letters Patent. Patented June 13, 1916.

Application filed July 6, 1915. Serial No. 38,159.

To all whom it may concern:

Be it known that I, LEWIS LAZELL BEEKEN, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Coal-Sampling Machines, of which improvements the following is a specification.

My invention relates to sampling apparatus and is embodied in machinery which abstracts from a large body of coal in course of normal handling and at properly related successive points in that body, sample quantities of coal for testing, and which prepares the samples so abstracted for the testing operations.

The coal-sampling machine which embodies my invention is illustrated in the accompanying drawings.

Figures 1 and 2 are views in vertical section and Fig. 3 a top plan view of a portion of the machine. The plane of section of Fig. 1 is indicated by the line I—I, Fig. 2; and the plane of section of Fig. 2 is indicated by the line II—II, Fig. 1. Certain parts are, for the sake of clearness, omitted from the machine as shown in Figs. 1 and 3. These Figs. 1–3 show particularly the means provided for abstracting the sample quantities from an advancing body of coal. Fig. 4 is a view on the same plane as Fig. 1 showing in side elevation the apparatus for crushing, grading and subdividing the sample coal abstracted by the instrumentalities shown in the other figures, in preparation for testing. Certain parts shown in Fig. 1 are omitted from the showing of Fig. 4.

Referring first to Figs. 1–3, 1 indicates a belt conveyer, on which it may be understood coal is conveyed (as from a coal barge, for example), and 2 is the intake of a bin which receives coal conveyed on and delivered from the adjacent end of conveyer 1. In Fig. 1 the normal path of the advancing body of coal is indicated by the dotted lines *a* and *b*. Properly speaking, the belt conveyer itself is shown in Fig. 1 only; the part which in Figs. 2 and 3 is marked 1 is the drum on which the conveyer travels. A deflector 3 is mounted to traverse this advancing stream of coal from side to side at the point where it is in transit from conveyer 1 to intake 2 and in such traverse to deflect and direct into a suitably placed chute 4 a portion of the advancing body of coal. As is particularly indicated in Fig. 2, the deflector 3 will ordinarily be relatively narrow, as compared in width with the conveyer 1 and the normal stream of coal which conveyer 1 will deliver; and it will be understood that the width of deflector 3 (its speed being assumed to be determined) will determine the size of each abstracted sample, while the frequency and regularity of the reciprocation of deflector 3 from side to side across the stream of coal will determine the number and regularity of the samplings taken from a given quantity of coal advancing on conveyer 1. The deflector 3 is borne on a carriage 5 (see Fig. 2), and this carriage is mounted to travel from side to side of the machine and in its travel to carry the deflector to and fro across the stream of coal, to effect the ends indicated above.

On either side of the machine and beyond the range of reciprocation of carriage 5 are two vertically extending guideways, here shown as rectangular boxes 6; directly above these two guideways are drums 7, mounted on a shaft 8; and from these drums 7 weights 9 are suspended, by chains or cables 10, in guideways 6. Clutch members 11 are provided which in their alternate positions connect drums 7 severally to rotate in unison with shaft 8 or leave the drums free to rotate upon shaft 8 as an axle.

From carriage 5 extend chains or cables 12 to either side of the machine and these chains or cables 12 extend over sheaves 13 which are arranged above the guideways 6. On the free ends of these chains or cables 12 and within guideways 6 are hung blocks which conveniently take the form of balls 14, and these balls are of sufficient weight to keep the chains or cables 12 taut in all positions of carriage 5. It will be observed (Figs. 1 and 2) that the weights 9 and the balls 14 are hung in guideways 6, not in precise alinement, but so nearly side by side as to engage one another in their relative movements in the manner and for the ends presently to be described.

The range of movement of carriage 5 is limited by stationary bumpers 15. The range of movement of the balls 14 within guideways 6 is accordingly limited. The weights 9, hung by chains or cables 10 from drum 7 have a greater range of movement; they may be raised higher and may descend

lower than balls 14, whose paths of movement are limited in the manner just explained.

Shaft 8 is driven from any suitable source of power; conveniently, it is in this case driven from the shaft 16 of the supporting drum of conveyer 1. From shaft 16 through belt connection 17, beveled gears 18, and worm gears 19, shafts 20, 21, and 22 are driven. Shaft 8 is driven from shaft 22 through spur gears. As shown, two sets of spur gears 23 and 24 are shown and they are arranged to be thrown alternately into service by means of the clutch mechanism 25. These two sets of gears affording speed transmission at different rates are provided that through the instrumentalities yet to be more fully described the frequency of the travel of the deflector across the stream of coal may be altered. Of the two gear connections shown in the drawings one affords a frequency of reciprocation of the deflector four times greater than the other; in one case the traverse of the deflector occurs once in four minutes, in the other once every minute. It will be understood that it is merely a matter of proportion and multiplication of the instrumentalities described to obtain any desired frequency and any number of alternate rates.

Referring now to Fig. 2, it will be observed that the clutch member 11 on the right is in engagement with the adjacent drum 7, so that drum 7 is secured to turn in unison with shaft 8, and it will be understood that the turning of shaft 8 has wound up chain 10 (on the right) and has raised weight 9 to the position in which it is shown, near the upper end of guideway 6, and that further turning of shaft 8 will (the clutch remaining closed) raise weight 9 still higher. It will also be observed of the corresponding instrumentalities at the left in Fig. 2, that the clutch 11 is open, and that weight 9 rests at the lower end of guideway 6; and it will be understood that, drum 7 being left free to turn on shaft 8 as its axle, the weight 9 has descended by gravity to its permissible limit. Bumpers 26 may be provided to afford such a limit to the descent of weights 9.

The parts being in the positions indicated, further turning of shaft 8 will raise still higher the weight 9 on the right, and in its further rise weight 9 will engage and lift a finger 27 which extends from and is rigidly borne by a rod 28 mounted to slide vertically in suitable guides. The lifting of finger 27 will carry rod 28 upward and will swing a bell-crank lever 29, to one arm of which rod 28 is pivotally connected. The swinging of lever 29 will shift from left to right link 30, which extends across the machine and is pivoted at its opposite ends to the other arm of each of the two correspondingly arranged bell-crank levers 29, one of which has already been named. This link 30 is at its middle point pivoted to the reciprocable weighted lever 31, and lever 31 as it swings engages (through slot 32, pin 33, and link 34) a transverse and longitudinally movable rod 35. This rod carries, rigidly mounted upon it, two forks 36 which engage the two clutches 11. With rod 35 in the position shown, the clutch at the right is in engagement with its drum 7 while the clutch on the left is open. The shifting of rod 28 by the rising of weight 9 (on the right) to the predetermined limit of its movement will, through the instrumentalities described, shift rod 35 from right to left, opening the clutch on the right and closing the clutch on the left.

Immediately on such shifting of rod 35 weight 9 on the right, no longer sustained in its elevated position, falls (the drum on which its chain is wound being now free to turn on shaft 8). In its descent weight 9 engages ball 14 which hangs beneath it, and (the passageway being so constructed as to prevent ball 14 from escape) the weight in its descent carries ball 14 with it and in so doing drags carriage 5 (which bears the deflector) across the machine from left to right. At the same time the ball 14 on the left is drawn upward from the position shown in Fig. 2 to a position corresponding to that previously occupied by the ball on the right. Such reciprocating of carriage 5, effected by the descent of weight 9 means, of course, that deflector 3 has made one traverse across the advancing stream of coal.

When in the descent of weight 9, with ball 14 carried before it, the carriage 5 has been shifted through the range of its intended travel, the ball 14 has come opposite a break 37 in the continuity of the guideway 6. Thereupon, by virtue of the fact that ball and weight are so hung and so shaped that the ball is subject to a stress tending to drive it sidewise, the ball escapes through the break 37, the weight 9 passes the ball, falling until it is stopped by bumper 26, or otherwise. When the descending weight 9 has thus passed ball 14 by, the ball swings back from its escape in break 37 and hangs above the weight 9. These parts then occupy the relative positions in which the corresponding parts on the left are shown in Fig. 2. Such being the operation of the parts on the right (Fig. 2) consequent upon the shifting of the clutches 11, it remains to observe what occurs on the left. It has already been said, however, that the ball 14 on the left is carried from the lower limit of its range of motion to the upper by the descent of the weight 9 in the right, and the consequent shifting of carriage 5.

When the clutch 11 on the left is closed by the right-to-left shifting of rod 35, drum 7 on the left begins to turn in unison with

shaft 8, and as it turns it winds up the chain 10 by which weight 9 is suspended. Thus weight 9 is raised more slowly, following the ascent of ball 14 in the guideway 6. As the weight 9 approaches the upper end of guideway 6 it engages first the ball 14. The engaging surfaces are so disposed that the ball 14 is swung out of the way through a break 38 in the guideway, allowing weight 9 to rise above the ball and when the weight has thus risen above it, ball 14 swings back to the position shown on the right-hand side (Fig. 2) where, when the weight in due course falls, it will carry ball 14 with it in its descent, in the manner and with the consequences already described. The further rise of weight 9 brings it into engagement with and causes it to shift finger 27 (which corresponds in form and function to the finger on the right-hand side, already described), and with that the movements already described are repeated by the corresponding parts.

The deflector 3, in each traverse across the current of coal advancing from conveyer 1 to bin 2, deflects a quantity of coal into the mouth of chute 4. Descending in the chute 4, the deflected body of coal passes through an opening 39. In this opening, if desired, a grid may be placed, to separate and carry away pieces of wood or other large bodies which may accidentally be found in the coal. Passing through opening 39 the coal falls into the crusher 40 (which, as shown in Fig. 4, may be driven from the shaft 16 of the conveyer).

From crusher 40 the crushed sample coal falls to a hopper 41, whence it passes through a chute 42 to the separating apparatus.

The separating apparatus consists of a collector 43, a distributer 44, and two dividers 45. The collector 43 is a hopper or funnel, and serves to center the stream of coal which pours from chute 42. The distributer 44 is also a funnel shaped member; but within it is arranged a conical deflector 46 whose lower edge is spaced at an interval from the inner surface of the funnel 44. Through that space the coal passes in a more uniform stream. The dividers 45 are hollow vessels of double conical form with radially arranged intake openings 47 in their upper cones and outlet openings at the apices of their lower cones. The radially arranged openings 47 in the upper cone of either or both of the two dividers 45 may be rendered adjustable in width, by providing two upper cones, nested one within the other and rotatable one upon the other, and by properly shaping the openings in such coöperating parts. In Fig. 4 such a second cone is indicated at 48 in the upper one of the two dividers shown. The upper divider discharges upon the lower, the lower discharges to a pipe 49 which leads to the laboratory or place from which coal may be taken for sampling.

It is manifest that as many dividers 45 may be employed as desired.

By adjusting the size of the intake openings of the divider, the user of this apparatus may obtain for purposes of test such amount of coal as he can most conveniently handle, and at the same time have a good average of all the coal collected in the manner and by the machinery above described.

The operation has been explained incidentally in the foregoing description of the apparatus, and may now be briefly summarized. The conveyer 1 is driven by the rotation of shaft 16, and as it advances it delivers a stream of coal to the bin 2, in a stream indicated by the dotted lines *a* and *b*, Fig. 1. As shaft 16 rotates, shaft 8 is rotated. The parts being in the position shown in Fig. 2, continued rotation of shaft 8 causes the weight 9 hanging at the right-hand side of the machine to rise still further, and in so doing to engage stop 27 on rod 28 and shift rod 28 and, through the intermediate instrumentalities, to shift rod 35, open clutch 11 on the right and close clutch 11 on the left. Immediately on the opening of the clutch on the right the weight 9 on the right falls, until its further descent is stopped by bumper 26. (Manifestly bumper 26 is a mere convenience; the descent of weight 9 might be limited and checked merely by the suspending cable or chain 10, secured to its drum 7.)

Immediately on the closing of clutch 11 on the left, the weight 9 on the left begins to rise, as its suspending chain or cable 10 is wound up. The weight 9 on the right in its descent engages block or ball 14 (then positioned near the upper end of the guideway 6) and by this engagement becomes effective to drag carriage 5 (then standing at the left-hand side of its range of reciprocation) from left to right, until it occupies at the right-hand side of the machine precisely the position corresponding to that shown in Fig. 2. In this travel of the carriage the deflector 3 which it bears has traversed the advancing stream of coal, *a*—*b*, from side to side, and turned aside the intended portion of the stream. As weight 9 and ball 14 descend together and approach the lower end of the guideway, the ball comes opposite orifice 37, slips aside and allows weight 9 to pass it; whereupon it swings back to the position shown on the left, Fig. 2, from which position it rises freely when the carriage is drawn across its runway to the opposite side. The weight 9 as it rises and approaches the upper end of the guideway engages the ball again. But here the ball slips aside through the opening 38, allowing the weight to rise above it, whereupon it swings back beneath the

weight, and is in position to be engaged by the weight and carried down with the weight in its next descent.

It will be observed that the rapidity of traverse of carriage 5 with its deflector 3 is dependent on the size of weight 9; and that the period between successive movements of the carriage or the frequency of reciprocation is dependent on the speed at which shaft 8 rotates. As has been said, the clutch 25 may be shifted to one or the other of its alternate positions to effect reciprocation once every minute or once in four minutes.

The quantity of coal turned aside by deflector 3 from the main stream descends through chute 4 to the crusher, and, being crushed is subdivided, and the desired fraction carried to the laboratory.

I claim as my invention:

1. In a coal-sampling machine the combination with means for causing a body of coal to progress in a stream, a deflector extending into the pathway of such a stream and movable athwart said pathway, means for moving said deflector, and means operated by the movement of said deflector for reversing the movement of said deflector moving means.

2. In a coal-sampling machine the combination with means for causing a body of coal to progress in a stream, a carriage mounted to travel to and fro adjacent to and in a direction transverse to the line of flow of such stream, a deflector borne by said carriage and in the range of carriage movement extending into the line of flow of the stream, and means for imparting to said carriage a to and fro travel, such means including a shaft rotating in one direction, two spools loosely mounted on said shaft, two carriage-impelling weights suspended one from each of said spools, and a clutch mechanism engaging in alternation the two spools, such mechanism being shifted by the said weights in their movement.

3. In a coal-sampling machine a deflector, means for causing said deflector to pass transversely through a body of coal at successive points in its length and a separator including a double conical member arranged in the line of flow of coal delivered from said deflector, said double conical member having adjustable radially arranged intake slots in one cone and a discharge opening in the apex of the other cone.

4. In a coal-sampling machine, a separator arranged in the line of advance of coal including a vertically arranged double conical member with upper radially arranged intake slots and a lower apically arranged discharge and a funnel shaped feed member arranged above said double conical member.

5. In a coal-sampling machine the combination of a carriage mounted to travel to and fro across and adjacent to an advancing body of coal, a deflector borne by said carriage and in the to and fro travel of said carriage passing to and fro through the advancing body of coal, a pair of weights, means for raising and releasing in alternation first one of said weights and then the other, and operative connections between said weights and said carriage to give the to and fro movement to the carriage.

6. In a coal-sampling machine a carriage runway extending from side to side and adjacent a pathway in which a body of coal advances, a carriage movable to and fro upon said runway, a deflector borne by said carriage and extending within the range of carriage movement into said pathway for coal, a pair of vertically extending guideways, a weight movable in each of said guideways, and a traction member extending from said carriage into each of said guideways, each of said weights in its descent in its guideway engaging such traction member and through such engagement effecting movement of said carriage on its runway.

7. In a coal-sampling machine a carriage movable on a runway to and fro across and adjacent a path of travel of a body of coal, a deflector borne by said carriage and extending into said path of travel, a pair of vertically arranged guideways, a weight in each of said guideways, a shaft, a pair of drums mounted on said shaft, a clutch mechanism alternately securing one of said drums and then the other to rotate in unison with said shaft, suspending members securing said weights to said drums, means for shifting said clutch mechanism on the rise of one of said weights in its guideway, a traction member extending from said carriage into each of said guideways, such traction members being engaged by and carried along with the said weights as they severally descend each in its guideway, whereby the further descent of the weight effects the movement of the carriage.

8. In a coal-sampling machine, a carriage runway extending from side to side and adjacent a pathway in which a body of coal advances, a carriage movable to and fro upon said runway, a deflector borne by said carriage and extending within the range of carriage movement into the pathway for the coal, a pair of vertically arranged guideways, blocks hung one in each of said guideways by suspending members secured to said carriage and movable in said guideways throughout a certain range in unison with said carriage in its to-and-fro movement upon its runway, a pair of weights arranged one in each of said guideways, and movable therein throughout a range exceeding that of the blocks already named, means for raising said weights in alternation to the upper

limit of normal movement and releasing them when so elevated to the action of gravity, and provision for the passage of said weights individually from a position beneath to a position above one of said blocks, or the reverse, as the weights in their movement pass beyond the range of block movement.

9. In a coal-sampling machine, a carriage runway extending from side to side and adjacent a pathway in which a body of coal advances, a carriage movable to and fro upon said runway, a deflector borne by said carriage and in the range of carriage movement extending into the pathway for the coal, a pair of vertically arranged guideways, blocks hung from said carriage one in each of said guideways and movable in said guideways up and down in alternation in unison with to-and-fro movement of said carriage on its said runway, a pair of weights suspended one in each of said guideways, means for raising the said weights in alternation to points in said guideways higher than the upper range of movement of the said blocks therein and for releasing said weights when so raised, means for limiting the fall of said weights when so elevated and released, such limiting means affording a range of movement for said weights to points in said guideways lower than the lower range of block movement, and provision for the passage of said weights individually from a position beneath to a position above one of said blocks, or the reverse, as the weights in their movement pass beyond the range of block movement.

In testimony whereof I have hereunto set my hand.

LEWIS LAZELL BEEKEN.

Witnesses:

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