Feb. 14, 1933. G. H. MASSY 1,897,208

MEASURING DEVICE

Filed Aug. 23, 1929

Fig. 1.

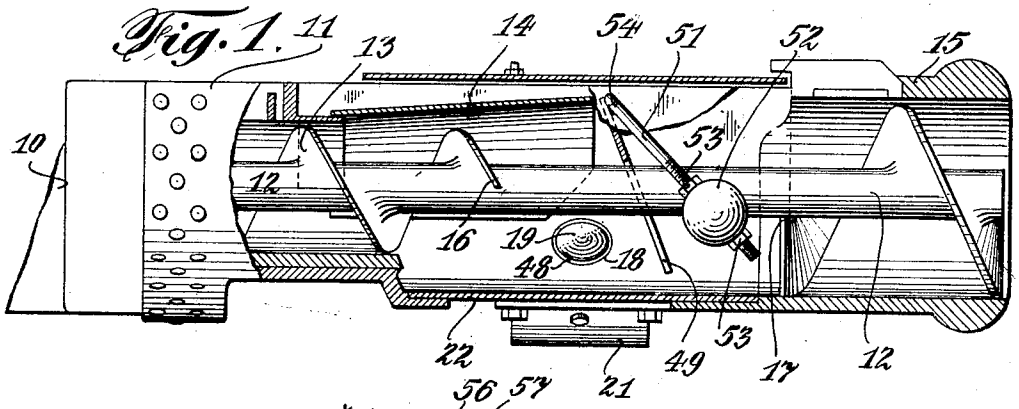


Fig. 2.

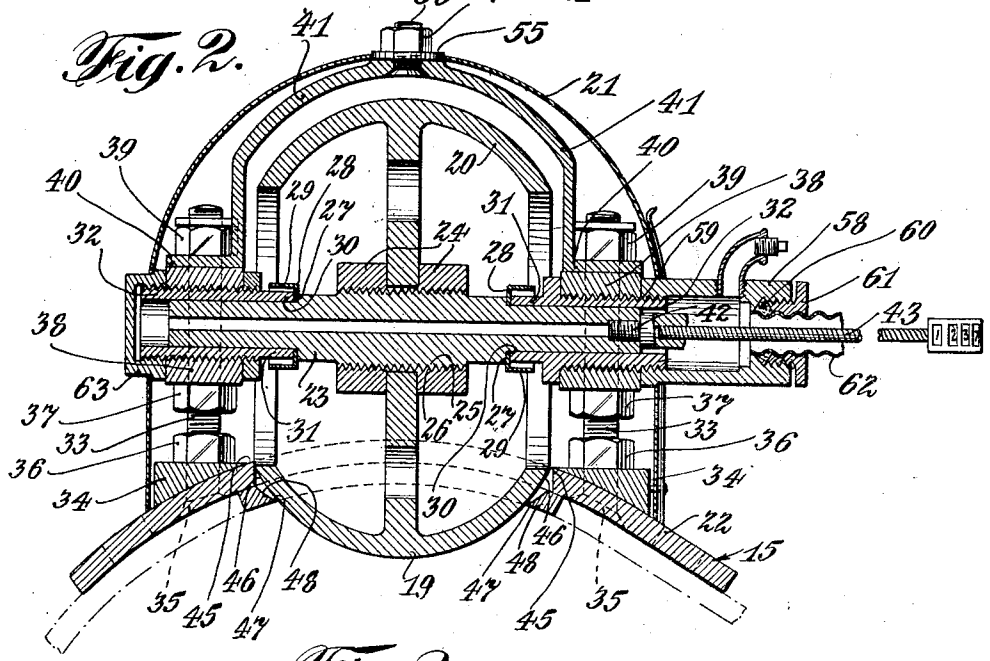
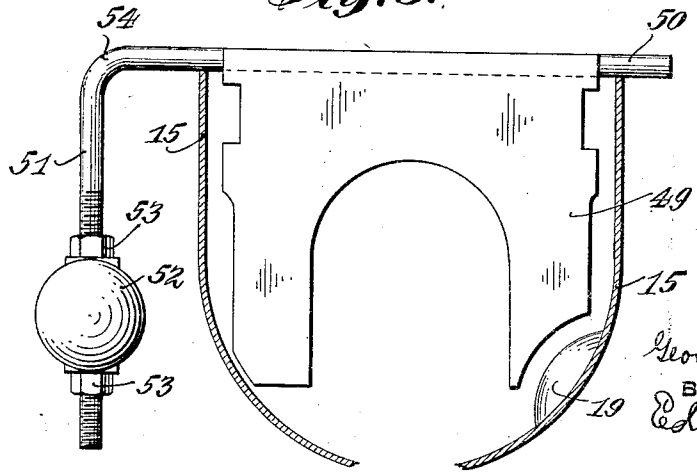


Fig. 3.



INVENTOR
George H. Massy
BY
Edward Thomas
ATTORNEY

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GEORGE H. MASSY, OF BAYONNE, NEW JERSEY

MEASURING DEVICE

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This invention relates to measuring devices and is herein illustrated as applied to a measuring device for showing the amount of coal delivered through a locomotive stoker to the locomotive fire box, and is more particularly illustrated as adapted to be connected to a Duplex stoker in which the crushed coal is fed through a horizontal expanding tube from the tender to the fire box of the locomotive.

According to the form of the invention herein disclosed, the friction of the coal in passing a given point is utilized to drive a registering device which records the amount of coal passing through the stoker. The device is also shown as provided with a gate or controlling device which compels the coal fed past a given point to fill the tube at the point where the coal is being measured. Other features and advantages will hereinafter appear.

In the accompanying drawing,

Figure 1 is a sectional side view of a stoker feed tube embodying the present invention.

Figure 2 is a sectional view showing the construction of the friction member which is driven by the coal and its connections.

Figure 3 is a front view of the gate.

In the device herein illustrated the broken or granular coal delivered from the usual crusher arms (not shown) enters a crusher member 10 and flows into the opening of a tube 11 in which revolves a shaft 12 carrying a screw feed blade 13. The tube 11 is connected to the tender of the locomotive and according to the present invention is provided with an expanding cone projection 14 so that the coal feeds toward and into the enlarged base of the cone and enters the usual tube 15 which is connected to the locomotive so that it delivers the coal into the fire box.

In the form of the invention herein illustrated the screw feeding blade 13 is cut off at 16 so that the shaft from the point 16 to a point 17 has no feeding blade on it. Between the points 16 and 17 is provided a circular opening 18 through which projects a part 19 of a truncated or incomplete sphere 20 so journalled in a housing 21 fast to the lower side 22 of the tube 15 that the spherical surface 19 engages the coal lying in the tube and is rotated by the coal on the shaft 23 of the sphere section 20. The shaft 23 is so mounted that the sphere surface 19 turns easily and exactly with the movement of the flowing coal as it passes from the member 10 through the tube 11 and the tube 15. For this purpose the shaft 23 is screwed into an internal boss 24 so that an external thread 25 on the shaft 23 engages an internal thread 26 on the boss 24 and holds the sphere section 19 on the shaft.

The shaft 23 is held against the end movement by shoulders 27 which bear against washers 28 having overhanging skirts 29 adapted to throw any dirt clear of the surface 30 of the washer which bears against the end 31 of a journal 32, there being a journal 32 and a washer 28 at each side of the sphere section 19.

The journals 32 are carried by adjustable supports at each end of the shaft 23, each adjustable support comprising two threaded standards 33 passing through blocks 34 fast on the outer surface of the tube 15 and riveted over at 35 on the inner surface of the tube, so that nuts 36 can be screwed upon the supports 33 against the members 34. Other nuts 37 are screwed on to the standards 33 and form supports for a bushing 38, which is held in place by nuts 39 screwed down against the lug 40 of an arch bracket 41, which spreads across from end to end of the sphere segment 19, so that it unites the two bearings or journals 31.

There are a pair of the standards 33 and the other supporting elements for the journal 32 at each end of the shaft so the support for the shaft is accurately adjustable to align both the support and the shaft. The shaft 23 is herein shown as hollow and having a brass member 42 tightly screwed into its internally threaded end so that a flexible driving shaft 43 connected to a cyclometer or other registering device will count the revolutions of the shaft 23 in any desired terms of quantity of coal or other material which may be measured.

The sphere segment 19 is surrounded by a

closely fitting edge 45 of the casing 15 which is cut away from the sphere so as to leave an edge with a maximum clearance of a sixty-fourth of an inch.

In order to keep coal from jamming into the V opening 46 formed by the edge 45, there is provided an edge 47 on a collar 48 running around the interior of the tube 15 at the edge 45 and also closely fitting the sphere segment, so the coal flowing past the edge 47 will pass smoothly over the sphere, the collar 48 being welded electrically onto the tube 15. The collar 48 has been found satisfactory when about three-eighths of an inch thick and about the same width when closely fitting the curvature of the tube 15.

In order to make sure that the same volume of coal is always passing the segment 19 when coal is fed at a given rate, there is provided a flow equalizing device best shown in Figure 3 as including a volume gate 49 in the form of a plate having an open bottomed arch through it, in which arch the shaft 12 can turn freely. The gate 49 is called an equalizing device because it is found to keep the cone projection 14 full of coal so that the cross sectional area of the column of coal passing the sphere 19 is constant. The plate 49 is kept in position because it is electrically welded to the advanced face of a transverse shaft 50 which is journalled in the tube 15 well above the shaft 12 and has a turned over end 51 upon which is carried a weighted ball 52. The weighted ball 52 has been found satisfactory when weighing ten pounds and made of cast iron and held by set nuts 53 about 12 inches from the bend 54 which the end 51 makes with the body of the shaft 50. The equalizing gate or plate 49 is illustrated as so journalled that the coal reaches it just after having passed the sphere segment 19, and it is found that under these conditions, and lying just outside the expanding cone 14, the device provided with the equalizing gate causes the coal to be measured with great accuracy. To hold the gate in place the end 51 makes an angle of 15° with the gate 49, so the ball thrusts the gate against the on-coming coal.

In order to hold the casing 21 in place, it is provided with an opening 55 through which a bolt 56 riveted on to the arch bracket 41 passes, so that a nut 57 may be screwed down on the bolt 56 to hold the casing 21 in place. In order to close the end of the casing around the shaft 43, there is provided a hollow member 58 provided with a screw thread 59 adapted to be threaded down over journal 32 and is also provided with a rubber gasket 60 against which a hollow nut 61 is adapted to be screwed to hold the casing 62 around the shaft 43 in place. On the opposite journal 32 there is screwed a corresponding cap 63 which closes the end and around which the casing 21 is adapted to fit, thus keeping dust and dirt out of the bearings.

It is found that a device of the character illustrated will measure coal with remarkable accuracy. The device has been installed upon several railroads and no railroad has reported an error exceeding 1% and some, on long runs, have found that the error did not exceed one-tenth of one percent of the coal used. Various types of sphere segments 19 have been used both rough and smooth, and bronze and aluminum. So far as observed a smooth segment of brass was as satisfactory and as accurate as any.

As shown in Figure 3, the gate 49 need not fit the conduit tube 15 closely but may have a half-inch clearance, and may be cut away opposite the segment 19 to give the same clearance there, segment projecting inwardly an inch and a half from the edge 47.

Having thus described certain embodiments of the invention, what is claimed is:

1. In a measuring device for solids, the combination with a nearly horizontal conduit having an opening in its wall, of means for feeding fine material through the conduit, a swinging gate in the conduit yieldably held so as to keep constant the cross-sectional area of the column of material fed past it, a rotatable device having a portion projecting through the opening in the wall of the conduit part of the way to the opposite side so that the material engages and rotates it, before leaving the gate, and a registering device driven by the rotatable device to indicate the volume of material fed through the conduit

2. In a measuring device, the combination with a nearly horizontal conduit having an opening in its wall, of means for feeding granular material through the conduit, a swinging gate in the conduit yieldably held so as to keep constant the cross-sectional area of the column of material fed, a relatively smooth rotatable device lying in the opening in the wall of the conduit so that the material engages and rotates the device nearly at the gate, and a registering device driven by the rotatable device to indicate the volume of material fed through the conduit.

3. In a measuring device, the combination with a nearly horizontal conduit having an opening in its wall, of means for feeding granular material through the conduit, a swinging gate in the conduit journalled near its top so as to swing well clear of the wall of the conduit, a weight holding the gate against the pressure of the on-coming material to keep constant the cross-sectional area of the column of material, a relatively smooth rotatable device projecting through the opening in the wall of the conduit so that the material turns the rotatable device before it has cleared the gate, and a registering device driven by the rotating device to indicate the volume of material fed through the conduit.

4. In a measuring device, the combination with a conduit having a relatively small

section followed by a larger section, of a screw feed for delivering granular material from the small section of the conduit to the larger section of the conduit, an equalizing gate past which the material is fed so that the cross-sectional area of the column of material is maintained constant, a rotatable device substantially at the gate and driven by the material, and a registering device driven by the rotatable device to indicate the volume of material fed through the conduit.

5. In a measuring device, the combination with a conduit having a relatively small section followed by a larger section, of a screw for forcing granular material out of the relatively small section of the conduit into the larger section thereof, a second screw for removing the material from the larger section, a swinging gate between the screws weighted to act as an equalizer and keep constant the cross-sectional area of the column of material fed past it, a rotatable device substantially at the gate and driven by the material, and a registering device driven by the rotatable device to indicate the volume of material fed through the conduit.

6. In a measuring device, a conduit, means for feeding granular material through the conduit, a swinging transverse plate within the conduit having substantial clearance at the sides and adapted to permit material to pass, a weight swinging the plate against the thrust of the material so that the cross-sectional area of the column of material is kept constant, a register, and a rotatable device driven by the movement of the material and connected to the register to indicate the volume of material fed through the conduit.

7. In a measuring device, a conduit having an expanding section and an exit, means for feeding granular coal material through the expanding section of the conduit, means for withdrawing the material into the exit end of the conduit, a swinging plate journalled transversely of the conduit and having an opening and forming a gate for the material so as to cause the coal to fill the conduit, a weight holding the gate against the on-coming coal, a rotatable device driven by the material, and a register driven by the device to indicate the volume of material fed through the conduit.

8. In a measuring device, a conduit including a side having an opening therein, means for feeding granular material through the conduit, means for maintaining the conduit full of the material at a point near the feeding means, a rotatable member having a spherical surface journalled so as to project through the opening in the side of conduit and to be driven by the material where it fills the conduit, a register, and means whereby the register is driven by the member to indicate on the register the volume of material fed through the conduit.

9. In a measuring device, a conduit, a screw including a shaft for feeding granular material into the conduit, a second screw on said shaft for carrying the material out of the conduit, an equalizing device between the screws for holding the conduit full at that point, a relatively smooth rotatable member projecting into the conduit and driven by the material, and a registering device driven by the rotatable member to indicate the volume of material fed through the conduit.

10. In a measuring device, a conduit, a screw including a shaft for feeding granular material into the conduit, means for keeping the conduit constantly full at one part of the path of the material, a second screw carrying material out of the conduit after it has passed the part where the conduit is full, a registering device, and means driven by the flow of the material where it fills the conduit for driving the registering device.

GEORGE H. MASSY.