D. M. MYERS.

WEIGHING SHOVEL.

APPLICATION FILED OCT. 5, 1914.

1,232,960. Patented July 10, 1917.

Fig. 1

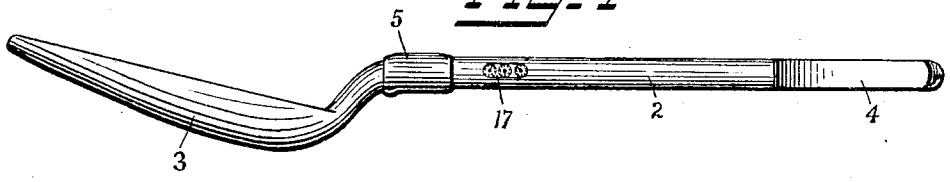


Fig. 2

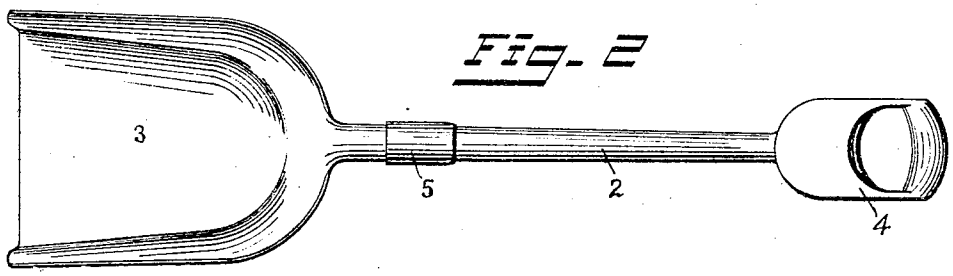


Fig. 3

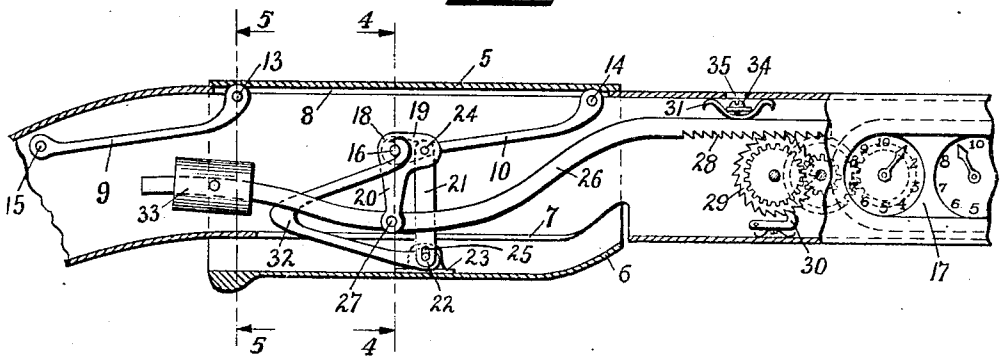


Fig. 4

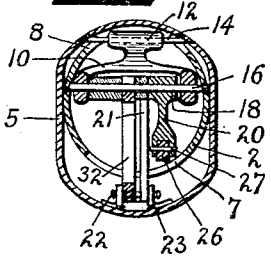


Fig. 6.

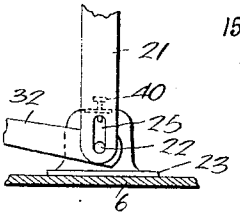
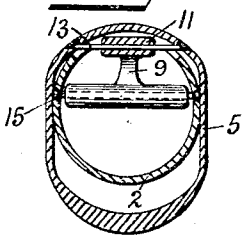


Fig. 5



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UNITED STATES PATENT OFFICE.

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WEIGHING-SHOVEL.

1,232,960. Specification of Letters Patent. Patented July 10, 1917.

Application filed October 5, 1914. Serial No. 865,089.

To all whom it may concern:

Be it known that I, DAVID MOFFATT MYERS, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Weighing-Shovels, of which the following is a specification.

The object of this invention is to enable the production of a shovel which is capable of weighing and totaling the amount shoveled with a substantial degree of accuracy, which, while comprising parts relatively movable in a vertical sense against the tension of a scale spring, is rigid and structurally firm as to endwise movement into the heap of coal or the like, which presents no radical departure in appearance or manner of handling from ordinary shovels, and in which the mechanism is housed in a compact and advantageous manner within the handle. Further objects are to prevent the added load on the shovel pan, due to the upward heave on the part of the stoker, causing any additional actuation of the counting mechanism, and to provide means whereby the weight of the pan part of the shovel, unloaded, does not affect this mechanism. These and other ends are attained by the parts, arrangements and combinations hereinafter described and more particularly pointed out in the claims. The preferred construction will now be briefly described, reference being had to the accompanying drawings, in which:

Figure 1 is a side view of the shovel;

Fig. 2 is a plan view thereof;

Fig. 3 is a fragmentary vertical longitudinal section on an enlarged scale;

Fig. 4 is a cross-section on the line 4—4 of Fig. 3; and

Fig. 5 is a cross-section on the line 5—5 of Fig. 3;

Fig. 6 is a detail view showing part of the lost motion connection for eliminating the tare of the shovel.

The shovel has a handle part 2, which is a continuous elongated member or shaft, preferably of tubular metal construction, having the shovel pan 3 rigidly connected or united thereto at the front end, and at the other end an ordinary, relatively fixed, rear hand grip 4. The other part of the handle comprises a forward grip 5, which is movable vertically in relation to the handle member 2 and the rear hand grip. The forward grip is disposed at a point on the shaft where the user naturally grasps with the left, or forward, hand in lifting the loaded shovel, and as indicated this location is comparatively near the pan. In formation it is preferably tubular, so that the shaft 2 may pass through it, being sufficiently larger than the shaft in the vertical dimension to permit of the desired vertical movement. Transversely it may be just wide enough to accommodate the shaft with a sliding fit, and at the bottom its rear edge is curved or inclined upward, as shown at 6, approximately to the plane of the bottom of the shaft, so that the hand may encounter no obstacle in sliding forward to this grip. The bottom of the shaft within the forward grip is cut away at 7, to permit the entrance of this portion 5 of the said grip when the shaft sinks under load, and also to accommodate parts of the weighing mechanism, presently to be described. The top of the shaft is similarly cut away, at 8.

Means are provided for guiding the handle parts in relation to each other vertically and for resisting forces tending to displace them longitudinally. In the preferred embodiment of the invention illustrated, such guiding and retaining means consists of linkage pivoted to the forward grip 5 and to the shaft 2, and extending substantially lengthwise of the handle so as to constrain the parts to relative vertical movement while holding them against relative longitudinal movement. The said linkage is shown as comprising two links 9 and 10, having at one end broad pivotal bearings 11 and 12 on longitudinally spaced pins 13 and 14 secured transversely within the top of the tubular grip 5, and at their other, or forward ends, similar bearings on pins 15 and 16 fixed to the shaft 2. In the particular construction shown the link 10 is bifurcated or yoke-shaped, in order to accommodate other parts about to be described. The linkage may be arranged so as to secure substantially a parallelogram of movement, or this may be varied so that the relative motion of the parts 2 and 5 is more or less of a tilting one, parallel movement, however, being preferred.

The shovel not only weighs the individual loads but also totals the weights, this being in fact its more important function. The weight-registering or indicating means therefore includes or comprises a counting mech-

anism 17, housed within the hollow shaft 2, in rear of the grip 5, its dials being visible through a glass-covered window in the side of the shaft. The said counting mechanism may be and preferably is of usual construction, comprising two, three or more digit wheels or dials, representing units, tens, hundreds, etc., suitably geared and provided with known transferring devices, all of which requires no particular illustration.

The means for operating the counting mechanism through relative movement between the handle parts 2 and 5 is housed within these tubular members, and comprises means for changing the direction of movement from vertical to approximately horizontal and for transmitting this changed motion lengthwise of the handle to the counting mechanism. In the simple and concrete embodiment illustrated, these instrumentalities comprise primarily a bell-crank 18, which is fulcrumed on one of the handle parts and has a substantially horizontal arm 19 to be acted upon by the other of said parts and a substantially vertical arm 20 for actuating the counting mechanism. More specifically, the bell-crank is shown fulcrumed on the long handle member 2, the pin 16 being advantageously utilized for the purpose. The manner of connecting the arm 19 with or causing it to be acted upon by the grip 5 may be varied; but preferably a link or pivotal post 21 is employed, the same being pivoted at its lower end on a pin 22 carried by a suitable bracket 23 fixed to the bottom of the grip, and its upper end being pivoted at 24 to the said arm of the bell-crank. One of the bearings of the link, preferably the bearing 25 at the lower end, is vertically elongated or slotted, for a purpose presently to be described.

From the foregoing it will be understood that when the handle member 2 is forced downward by load relatively to the forward grip 5, the fulcrum 16 also moves downward with reference to the upper end of the link 21, which acts like a relatively stationary abutment, thus rocking the bell-crank, and causing the lower end of its depending arm 20 to swing rearward of the handle. The bell-crank also affords means for suitably proportioning the motion transmitted to the counting mechanism, in order to secure the proper actuation thereof by the extent of relative movement available between the handle parts. Thus, its arms are preferably of unequal length, the depending arm being the longer, in this way advantageously multiplying the movement. Motion is transmitted from the bell-crank to the counting mechanism by means of a toothed bar 26, or longitudinally movable member, which is pivoted or otherwise connected at 27 to the depending arm 20 and extends rearward to the counting mechanism, which it actuates by means of its teeth 28. The construction is such that the bar operates the counting wheels only on the one movement, that is to say, the rearward movement of the bar, this being suitably accomplished by giving the said teeth a ratchet or inclined formation, to coöperate with similar teeth on a ratchet wheel 29, which is appropriately geared or connected to the counting mechanism. Retrograde movement of the ratchet wheel, and therefore of the counting mechanism, is prevented by a spring-pressed pawl 30. Forward movement of the bar causes its teeth merely to slide idly over the ratchet wheel; and in this operation a spring 31, which urges the bar downward into engagement with the ratchet wheel, yields to permit the restoring movement. The said spring may be, as illustrated, a bow spring secured to the top of the bar and bearing against the top of the interior of the handle member 2, its tension being adjustable by a screw 34 accessible through a hole 35.

The scale spring 32, which is operatively interposed between the handle parts and opposes their relative movement under load, may be constructed and arranged in a variety of ways, but in the preferred embodiment shown and claimed herein is of V-shape and acts expansively upon the pins 16 and 22, which are connected to the handle parts 2 and 5, respectively, and by which it is confined. Preferably the spring normally brings the top of the grip against the top of the shaft 2, as shown in the views.

It will now be understood that when a load is lifted on the shovel pan, the handle part 2 is lowered relatively to the forward grip 5, and that the extent of this movement, because of the scale spring, is proportional to the weight. The motion is transmitted in changed direction and preferably multiplied in degree to the counting mechanism, the various elements being properly proportioned, so that the said mechanism is actuated proportionately to the weight on the shovel pan. The shovel pan and the portion of the weight of the handle member 2 not supported by the hand grasping the rear grip 4 constitute a load on the scale spring irrespective of the presence of material in the pan, and in accordance with the invention the shovel is adapted to deduct this tare automatically, so that the counting mechanism registers only the added load taken up by the pan. I find that this result may be secured in a very simple and effective manner by providing for an appropriate degree of lost motion at a suitable point in the instrumentalities which produce the registering movement of the counting mechanism; and it is for this purpose that the bearing 25 is slotted, as al-

ready described, the length of this slot (which may be determined by an adjustable set screw 40) representing the amount of relative movement of the handle parts and resulting compression of the spring which are due to the tare weight. While the spring is compressed by this initial movement, the bell-crank 18 is not affected until the link or post 21 has been lowered sufficiently to receive solid support on the pin.

When the load has been discharged from the pan the handle part 2 rises relatively to the grip 5 to its normal position, shown in the drawings. In so doing it elevates the fulcrum 16 of the bell-crank, but the link 21 connected to the said grip, after the lost motion 25 is taken up, prevents the outer end of the arm 19 from rising, and consequently the bell-crank is swung back to normal position, and by it the bar 26 is retracted.

In use the stoker or person handling the shovel, grasps the rear grip 4 with one hand, usually the right, and the shaft 2 with the other hand, at a point in rear of the forward grip 5, and thrusts the pan into the heap of material in the usual way. The part 2 being a continuous member, having the pan at one end and the rear grip at the other, the shovel in this operation is as rigid and steady as one of ordinary construction. The operator now slides the left hand forward, grasps the forward grip and lifts the load on the pan. At this time the mechanism is actuated in the manner already described and the weight is registered. The next operation in the ordinary course is to heave the weight upward preparatory to or as part of the movement which throws the load off the pan. This upward throw or upward component increases the load on the pan, and would cause an excessive and false actuation of the registering mechanism, were not means provided for meeting this condition. In accordance with the invention such means are provided, the principle involved being one of inertia. For this purpose the bar 26 is extended forward of the bell-crank and weighted as indicated at 33. Upon upward throw of the shovel this weight tends to remain behind, and thus swings the bar about the pivot 27 as a fulcrum, thereby raising its toothed portion clear of the ratchet 29 of the counting mechanism, against the tension of the spring 31. By this or other suitable inertia means the operating means are disconnected from the counting mechanism during upward throw, so that a false indication is not produced.

While I have described the illustrated preferred embodiment of the invention in detail, it will be understood that numerous changes, substitutions, additions and omissions may be resorted to without departing from essentials. The mechanism shown is of a simple character, designed to withstand the rough usage to which the implement is naturally subjected, but this is not to be taken as an indication that further refinements or greater complexity of construction may not be adopted if desired. Where terms such as "vertical" or "horizontal" are employed, it will be understood that they are used approximately or relatively rather than absolutely. It is to be clearly understood that the described device not only registers the action of lifting a shovelful of material, but also records more or less in exact accordance and proportion to the weight of material lifted during each of such individual actions.

What is claimed as new is:

1. A weighing shovel comprising a continuous handle member having the shovel pan at its front end and a relatively fixed grip at its rear end, a relatively movable forward grip, and weighing mechanism operable by the relative movement between the handle member and the forward grip.

2. A weighing shovel comprising a two-part handle, one part being the handle proper having the shovel pan at the front end and a relatively fixed grip at the rear end, and the other part being a relatively movable forward grip, in combination with weighing mechanism housed within the handle and operable by relative movement between the forward grip and the handle proper.

3. In a weighing shovel, the combination of a continuous handle member having the shovel pan at the front end and a relatively fixed grip at the rear end, a relatively movable forward grip through which the continuous handle member passes, a scale spring interposed between said handle member and the forward grip, registering mechanism, and connections for operating said mechanism by relative vertical movement between said handle member and forward grip.

4. A weighing shovel, comprising a hollow handle member having the shovel pan at the front end and a relatively fixed grip at the rear end, a hollow forward grip inclosing the handle member adjacent the pan, and spring weighing mechanism housed partly within the forward grip and partly within the handle member and connected with both, the wall of the handle member being cut away within the forward grip to accommodate the mechanism.

5. In a weighing shovel, the combination of a handle member bearing the shovel pan at its front end and having a relatively fixed rear grip, a relatively movable forward grip, a spring opposing relative vertical movement of said handle member and forward grip, counting mechanism, and means whereby said mechanism is operated by such relative movement.

6. A weighing shovel comprising a two-part handle, one part being a handle member bearing the shovel pan at its front end and being adapted to be gripped by one hand of the user at a point remote from the shovel pan, and the other part being a forward grip for the other hand, said forward grip being movable vertically relatively to the handle member and its rear grip, in combination with guiding means preventing relative longitudinal displacement of said forward grip and handle member, and spring weighing means housed within the handle and operable by relative vertical movement between the handle parts.

7. In a weighing shovel, a two-part handle, one part being an elongated member bearing the shovel pan at its forward end and affording a relatively fixed rear hand grip, and the other part being a relatively movable forward grip, and longitudinal links connecting said handle member and forward grip to resist longitudinal stresses while permitting relative vertical movement, in combination with a scale spring and suitable motion transmitting and registering mechanism housed within the handle and operable by relative vertical movement between the handle parts.

8. In a weighing shovel, a shaft, a shovel pan rigidly secured to said shaft, a forward grip, said grip and shaft being movable in relation to each other, a scale spring opposing such movement, registering means carried by said shaft, a member movable longitudinally of the handle for operating said means, and means whereby relative vertical movement between the shaft and grip produces longitudinal movement of said member.

9. In a weighing shovel, a handle member bearing the shovel pan at its front end and affording a rear hand grip, a relatively movable forward grip, a scale spring and a motion-multiplying and direction-changing device operatively interposed between said forward grip and handle member, in combination with registering means carried by the handle member, and a longitudinally movable connection between said device and registering means.

10. In a weighing shovel, the combination of a handle member bearing a shovel pan at its front end and affording a rear hand grip, a relatively movable forward grip, guiding means constraining said forward grip and handle member to relative vertical movement, a scale spring opposing relative movement of said parts, a bell-crank operatively interposed between the same, a bar connected with said bell-crank and movable thereby longitudinally of the handle, and registering mechanism operable by said bar.

11. In a weighing shovel, the combination of a handle member bearing a shovel pan at its front end and affording a rear hand grip, a relatively movable forward grip, guiding means constraining said forward grip and handle member to relative vertical movement, a scale spring opposing relative movement of said parts, a bell-crank operatively interposed between the same, counting mechanism carried by the handle member, and a longitudinal bar connected with said bell-crank and having means for operating said counting mechanism by movement in one direction only.

12. In a weighing shovel, a shaft and forward grip, a scale spring and a bell-crank operatively interposed between the shaft and forward grip, in combination with a longitudinally acting connection connected to said grip, and registering means operable thereby.

13. In a weighing shovel, a shaft and forward grip, said shaft carrying the shovel pan, movable relatively to each other under load, a scale spring opposing such movement, counting mechanism operable thereby, and means for automatically deducting the tare of the pan part.

14. In a weighing shovel, two handle parts adapted for relative vertical movement, one bearing the shovel pan, a scale spring opposing such movement, a registering device, and an operating connection having lost-motion means for deducting the tare of the pan part.

15. In a weighing shovel, two handle parts comprising a shaft and forward grip, adapted for relative vertical movement, the shaft carrying the shovel pan, a scale spring opposing such movement, a bell-crank fulcrumed on one of said parts, a link connecting one arm of the bell-crank with the other handle part, counting mechanism, and a connection between the other arm of the bell-crank and said mechanism.

16. In a weighing shovel, the combination with a handle part comprising a member bearing the shovel pan at its front end and affording a rear hand grip, a relatively vertically movable handle part affording a forward grip, and a scale spring opposing such relative movement, of a bell-crank fulcrumed on one handle part, a pivotal lost-motion link connecting one arm of the bell-crank with the other handle part, and counting mechanism connected with the other arm of the bell-crank.

17. A weighing shovel comprising two relatively vertically movable parts, one bearing the shovel pan, a scale spring opposing such movement, a registering device, means for operating said device under relative vertical movement between the parts, and inertia means for disconnecting the operating means from the registering device during the upward throw of the shovel.

18. A weighing shovel comprising two parts capable of relative vertical movement, one

part bearing the shovel pan, a scale spring opposing said relative movement, counting mechanism, means including a toothed bar for operating said counting mechanism, and a weight arranged to disengage said bar from the counting mechanism on upward throw of the shovel.

19. A weighing shovel comprising two parts capable of relative vertical movement, one part bearing the shovel pan, a scale spring opposing said relative movement, a bell-crank interposed between said parts, counting mechanism, and a toothed bar pivotally connected to said bell-crank to operate said counting mechanism, from which it is automatically disconnectible by the effect of its inertia.

20. A weighing shovel comprising two parts capable of relative vertical movement, one part bearing the shovel pan, a scale spring opposing said relative movement, a bell-crank interposed between said parts, a toothed bar pivotally connected to said bell-crank, counting mechanism, a spring for yieldingly holding said toothed bar in engagement with the counting mechanism, and means whereby said bar is disconnected from the counting mechanism by inertia on upward throw of the shovel.

21. A weighing shovel comprising a shaft and forward grip capable of relative vertical movement, said shaft carrying the shovel pan, a scale spring opposing said relative movement, a bell-crank interposed between said parts, a toothed bar pivotally connected to said bell-crank, and counting mechanism operable by movement in one direction of said toothed bar.

22. In a weighing shovel, the combination of a handle part comprising an elongated member bearing the shovel pan at its front end and affording a relatively fixed rear hand grip, a handle part affording a forward grip, linkage connecting said handle parts for relative vertical movement, a scale spring opposing such movement, a bell-crank fulcrumed on one of said parts and having one arm arranged to be acted on by the other part, a toothed bar pivotally connected to the other arm of the bell-crank, and counting mechanism operable by movement in one direction of said bar.

23. In a weighing shovel, the combination of a handle part comprising an elongated member bearing the shovel pan at its front end and affording a relatively fixed rear hand grip, a handle part affording a forward grip movable vertically relatively to the other handle part, a V-spring interposed between the handle parts, means interposed between said parts to transmit movement lengthwise of the handle, and registering mechanism in the handle operable by such transmitted movement.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

DAVID MOFFATT MYERS

Witnesses:
EMILY N. HUYCK,
HAROLD A. STREATOR.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."