Sept. 14, 1926. 1,599,630

W. M. BAGER ET AL

DIPPER HANDLE END

Filed Dec. 28, 1925 2 Sheets-Sheet 1

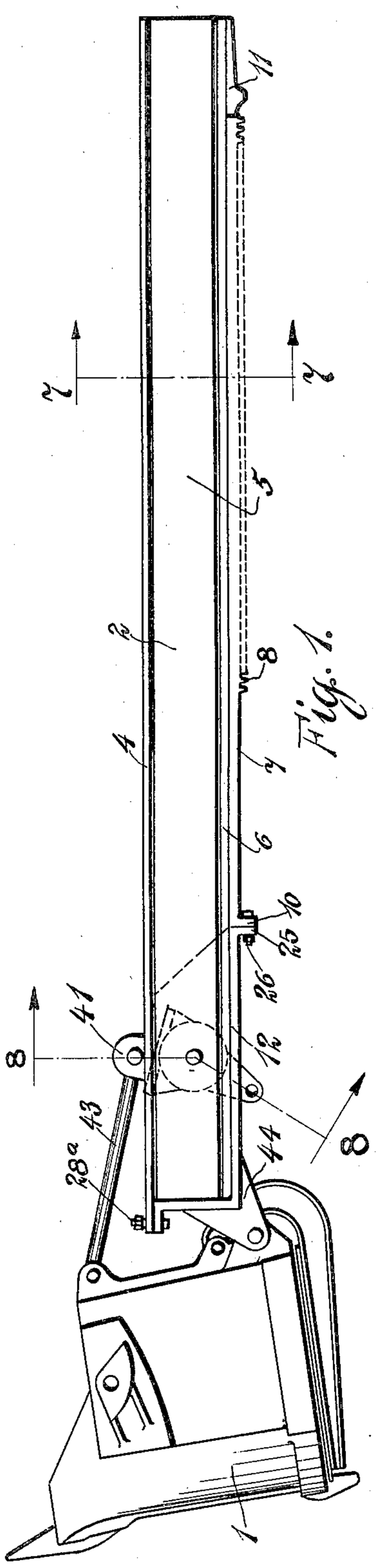

Fig. 1.

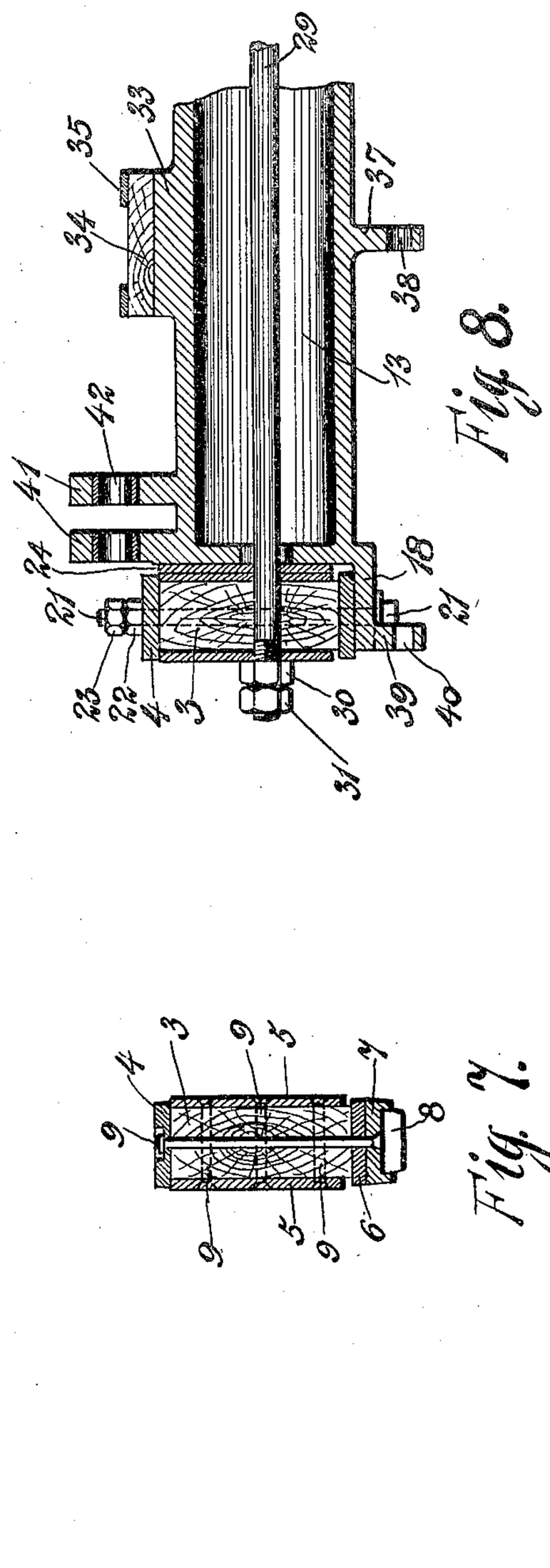

Fig. 8.

Fig. 7.

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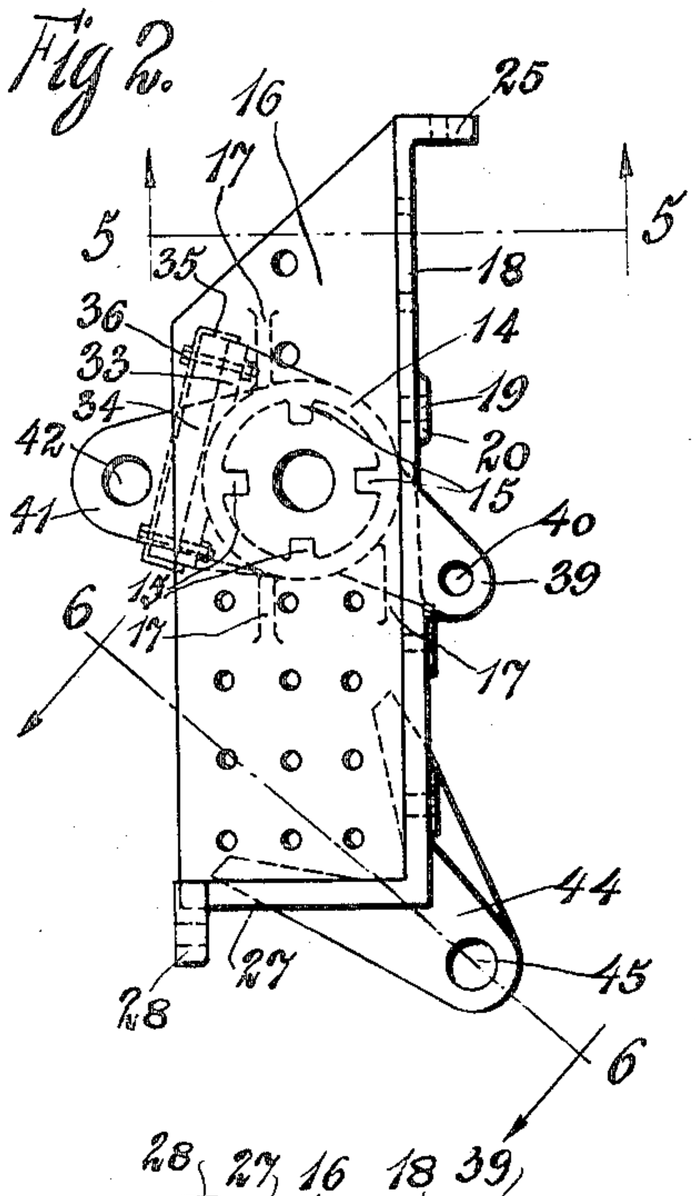
2 Sheets-Sheet 2

Fig 2.



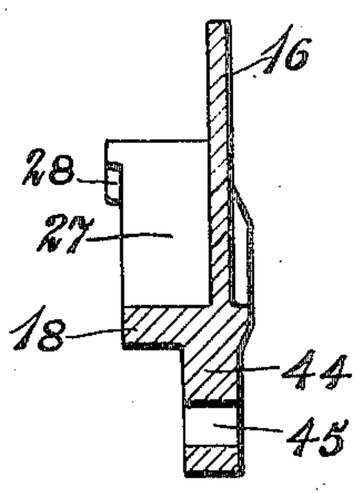


Fig. 6.

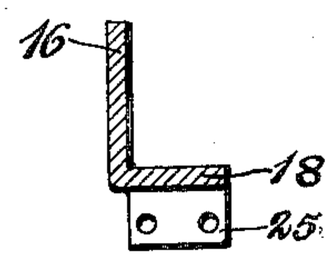


Fig. 5.

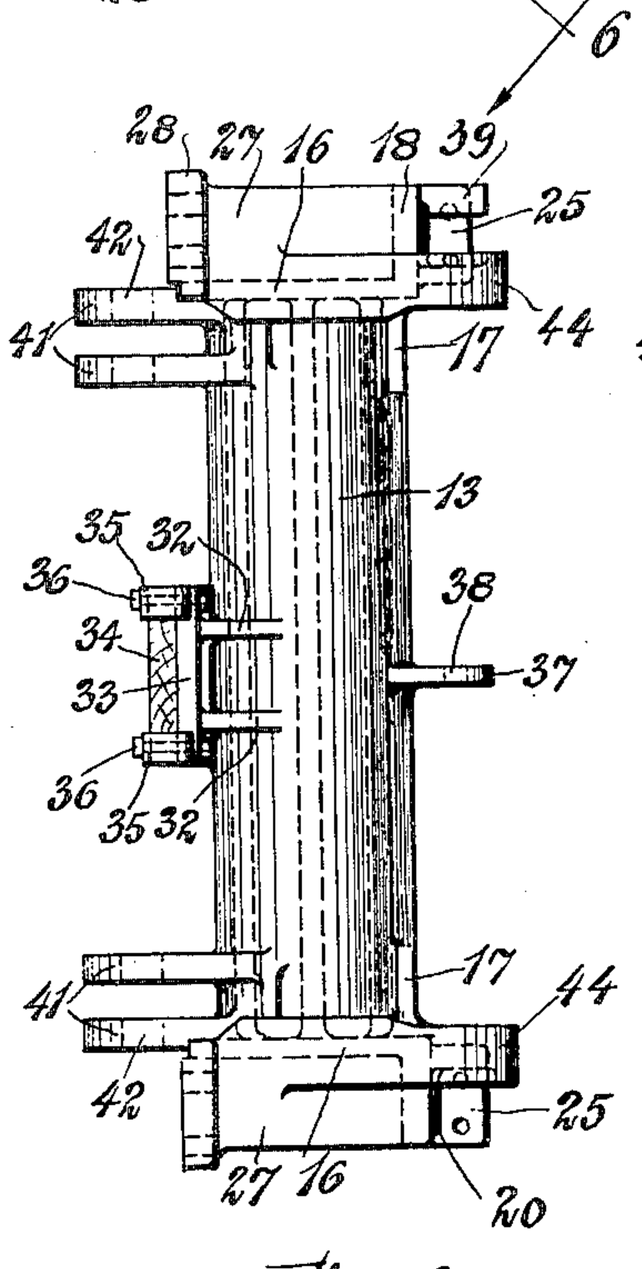


Fig. 3.

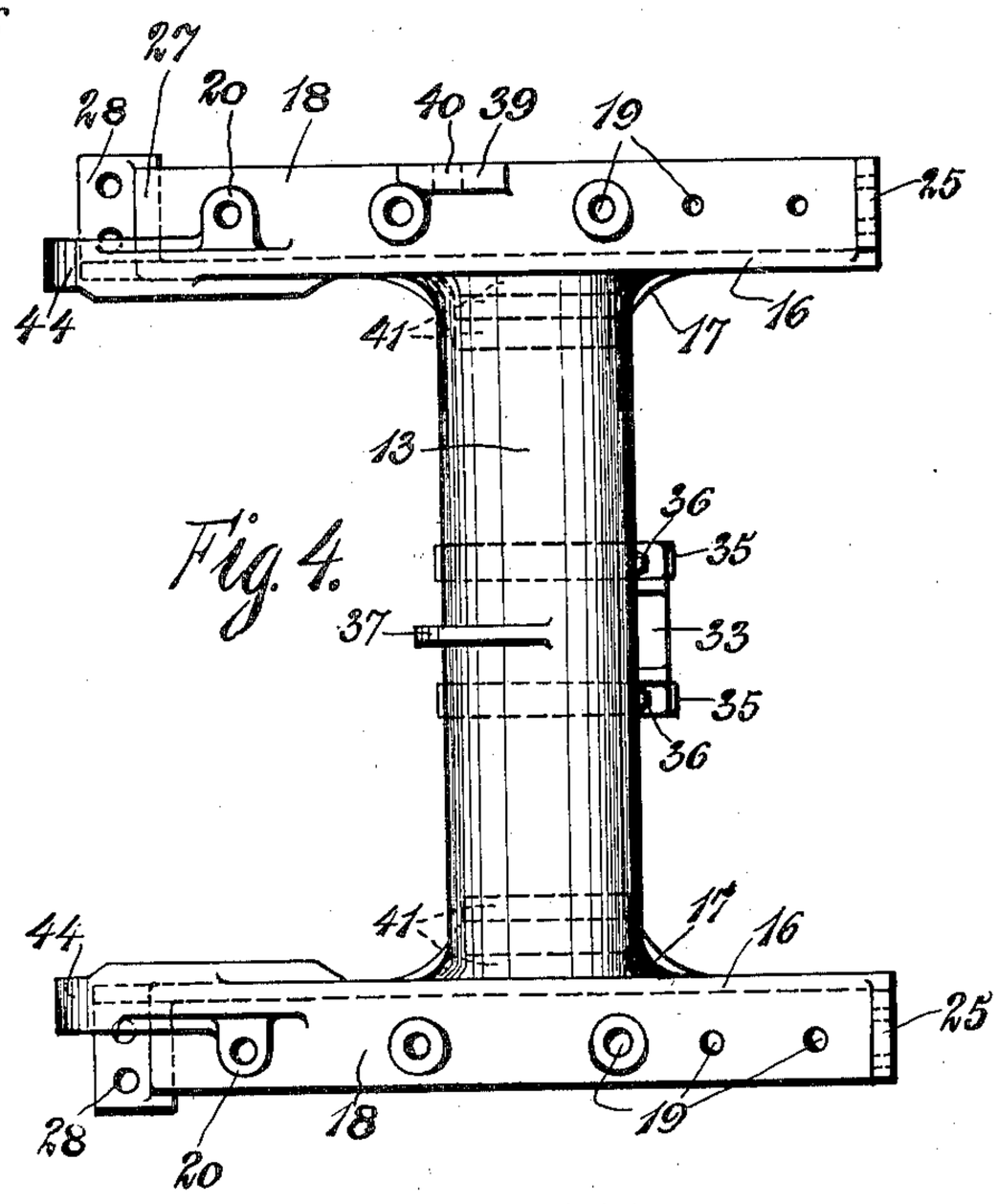


Fig. 4.

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UNITED STATES PATENT OFFICE.

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DIPPER-HANDLE END.

Application filed December 28, 1925. Serial No. 77,922.

This invention pertains to that type of excavating machine which has a dipper-handle consisting of two parallel dipper-sticks, and relates to the construction of that part of the dipper-handle which is adjacent the dipper; having reference to combining, in one unitary casting, the handle-end, the back-brace connection and the torsion-box; and having more particular reference to the employment of said construction in excavating machinery designed for heavy duty, such as rock work, mining operations, etc.

In the usual construction the rack is merely secured by bolts transverse to the handle; and such bolts are therefore subject to extreme shear, owing to the sudden reversals of stress caused by the alternations of thrust and retraction. In our invention the rack is so secured; but we also connect it to the handle-end casting by abutting flanges, which will directly transmit a thrust to the handle-end casting. These flanges are further held in contact by means of tension bolts.

It is a further object of this invention to provide a handle-end construction which shall distribute the load upon all components instantly and without jars; and which will moreover distribute it to the various parts in a proportion commensurate with the strength of such parts. To this end we have combined into one casting the handle-end, back-brace connections and torsion-box, and have at the same time retained the natural resiliency of the usual combined wood and steel construction of the handle. This has ensured the requisite degree of flexibility, while at the same time means are provided for holding the component parts of the handle in definite and permanent relation.

Another object of our invention is to provide a construction wherein the rack, top bar and side bars of the dipper-sticks shall be very firmly secured to the handle-end casting in such manner that the strains set up shall be minimized. We have therefore everywhere disposed the connections to the handle-end in such a way as to secure the maximum of strength. Having provided abutting flanges as connection between the rack and the handle-end casting, we further connect the casting and the dipper-handle by prolonging the upper plate of the dipper-stick beyond the end of the wooden core, to face a flange on the handle-end casting, the upper plate being bolted to this flange by bolts sufficiently large to take up all shear. Our dipper handle is further rigidly secured to the handle-end casting by a series of bolts, each passing vertically through all parts of a dipper-stick and through a bottom flange on the handle-end casting; and also by a very large bolt which passes through both dipper-sticks and through the casting at the center of the torsion-box. We have thus provided a very rigid connection between the torsion-box and the dipper-sticks, which is independent of such contingencies as slight shrinkage of the wooden core of the dipper-stick.

A further object of our invention is to furnish a handle-end that shall be relatively light in consideration of the work it is required to do, in order that as little as possible of the power shall be expanded solely for actuation of the machine itself. In furtherance of this object, we have departed from the usual construction of the torsion-box, in that we have not made its dimension in the direction of the length of the handle equal to the parallel dimension of those parts of our casting which enclose the ends of the dipper-sticks. We have instead employed a torsion-box whose form is that one best adapted to withstand torsion, namely; cylindrical, with its circular cross-section in a vertical plane parallel to the dipper-sticks. We have thereby very materially reduced the amount of material necessary, and hence also the cost of production and the power necessary to actuate the moving parts.

Our torsion-box is also reinforced against bending by internal flanges longitudinally disposed. These provide extra strength without any great increase of weight. We have thus made a small cylindrical torsion-box do the work usually done by a much larger rectangular one.

Our unitary casting also provides lugs for the back-brace connections, which lugs are integral with said casting. As the back-brace member is to transmit to the dipper both the forward thrust and the backward pull, it is alternately a compression member and a tension member; and the great advantage of having the back-brace connection directly integral with the torsion-box is obvious. The length of the of the back-brace is adjustable for the purpose of altering the "angle of rake" of the dipper.

Furthermore, as our handle-end construc-

tion allows the use, on the dipper-sticks, of the usual rolled steel top plate, side plates and bottom plate, bolted to the wooden core, we have thus retained all the advantages of the usual flexible, cheap and simple construction, and have added thereto the particular advantages of our form of handle-end, and of our method of connecting it to the dipper sticks.

A further object of our invention is to provide an easily replaceable bumper of resilient material, mounted upon that portion of the handle-end which is likely to be struck by a sheave when the dipper is placed in extreme position. We have thereby reduced breakage of the sheave to a minimum.

From the foregoing it is evident that we have provided a novel and useful handle-end construction that is especially adapted for very heavy work, such as rock work or mining; one which is not unwieldy in size or of excessive weight, while at the same time retaining all the necessary strength; that we have provided a construction which, though compact and sturdy, will resist torsion and bending stresses, and will therefore require only a minimum of repair and replacement; and that, furthermore our invention retains to the fullest possible degree the cheapness and flexibility of the usual construction; and that therefore the advantages we have enumerated are attained without a commensurate increase in cost or a sacrifice of any of the advantages of the usual construction.

Other advantages of our invention will be evident to those skilled in the art, and therefore need not be herein more specifically set forth.

The invention consists in the novel parts, and in the combinations and arrangements thereof, which are defined in the appended claims; and of which one embodiment is exemplified in the accompanying drawings, which are hereinafter particularly described and explained.

Throughout the description, the same reference number is applied to the same member or to similar members. The sections in all cases are viewed in the direction shown by the arrows.

Figure 1 is a side elevation of a dipper and dipper-handle, showing our improved handle-end casting in place, certain of the details being omitted.

Figure 2 is a side elevation of the dipper handle-end casting on an enlarged scale.

Figure 3 is a front view of the same.

Figure 4 is a bottom plan of the same.

Figure 5 is a sectional elevation of the rear end of the casting, as indicated at 5—5 in Figure 2.

Figure 6 is a sectional view, taken at 6—6 of Figure 2.

Figure 7 is a section, taken at 7—7 in Figure 1.

Figure 8 is a section, taken at 8—8 in Figure 1.

A dipper 1 is carried by the dipper-handle 2, said dipper-handle comprising two parallel dipper-sticks, one of which is shown in detailed cross-section in Figure 7. This is the conventional cross-section of dipper-sticks of this class, regardless whether or not our invention is employed. Each dipper-stick consists of a wooden core 3, of rectangular cross-section, and bears a top plate 4, two side plates 5, 5, and a bottom plate 6. These four plates extend the entire length of the wooden core 3, and are standard rolled-steel plates. Below the bottom plate and extending, as shown in Figure 1, from a point near the rear end of the dipper-stick forwardly part way towards the dipper, is a rack-plate 7, having a rack 8 integrally cast therewith for engagement with the shipper-shaft pinion (not shown), to perform the thrusting operations of the dipper. At intervals along the length of the core 3, these five plates, 4, 5, 5, 6, 7, are transversely bolted to the core and to each other by bolts 9, as shown in Figure 7. As is shown in this figure, there is a small clearance between the side plates 5 and the bottom plate 6, to allow the full utilization of the resiliency of the wooden core 3 and to compensate for any slight irregularities in the plates. The forward end of the rack-plate 7 is provided, as shown in Figure 1, with a vertical flange 10, the function of which is hereinafter explained. At the rear end of the handle, the usual dipper-handle stop 11, which prevents the handle from running out too far, is attached to the bottom of each dipper-stick.

The handle-end casting 12, shown in place in Figure 1 and separately in Figures 2, 3, 4, comprises in its central portion a torsion-box 13, which is cylindrical in form, as shown in Figure 2 by the dotted circular section 14. The torsion-box 13 is provided with internal longitudinal stiffening flanges 15, shown in Figures 2 and 3; but, to avoid confusing detail, omitted from other figures.

The end faces of the cylindrical torsion-box 13 are integrally cast therewith, and are prolonged to the trapezoidal form 16 shown in Figure 2. External flanges 17 are also supplied to brace the torsion-box 13 and the trapezoidal plate 16. The lower edge of each of the faces 16 bears an outwardly extending flange 18 which is provided with bolt-holes 19, the flange being reinforced on its under side by bosses 20 at certain of said bolt-holes. Through these bolt-holes and through similarly disposed bolt-holes in the dipper-sticks 3, there pass bolts 21 provided with nuts 22 and lock-nuts 23, as shown in

Figure 8. The dipper-sticks 3 are further bolted to the handle-end casting by a bolt 29, extending transversely through both dipper-sticks and longitudinally through the torsion-box, said bolt being provided at each end with a nut 30 and a lock-nut 31. Figure 2 shows a plurality of bolt-holes in the trapezoidal member 16, by means of which the adjacent dipper-stick is bolted to the face 16 in a manner which will be readily understood; though, for the sake of avoiding confusing details, said last-named bolts are not shown in the figures. These bolts together with the bolts 21 and 29 hold the dipper-sticks rigidly in place with respect to the handle-end casting. At each side, between the casting and the adjacent side plate of the dipper stick, is a reinforcing plate 24.

The rearward end of the bottom flange 18 is prolonged downwardly into a vertical flange 25, which abuts the similar flange 10 at the forward end of the rack-plate 7. These flanges 25 and 10, are secured together by tension bolts 26 as shown in Figure 1. These flanges will directly transmit the stress in thrust and the tension bolts holds them firmly in contact in retraction of the dipper.

An outwardly extending end-flange 27, perpendicular to the side plate 16 and to the bottom flange 18, serves for abutment of the forward end of the dipper-stick. At the upper end of this flange there is a forwardly extending flange 28, to which the top-plate 4 of the dipper-stick is secured by the bolts 28^a, which are made of large size to withstand shear. Or, if preferred, they may be surrounded by shear plugs.

At the top of the center of the torsion-box are two transverse external flanges 32, bearing a bumper plate 33 which is slightly inclined rearwardly as shown in Figure 2. Upon this plate rests a bumper 34 of wood, being fastened thereto by straps 35, which cover those edges of the bumper which are parallel to the dipper-sticks; said straps being extended down the front and rear end-faces of the bumper and bumper-plate. These straps are secured to the bumper-plate in any manner that will firmly hold the bumper while at the same time allowing easy removal and replacement. Such a means may, for example, be by bolts 36 going through the strap, bumper and bumper-plate. The resiliency of the bumper prevents breakage of the boom-point sheave when the dipper is raised to its extreme lift.

From the bottom of the torsion-box 13, at the center thereof, depends a lug 37 having an eye 38. At one side of the casting depends a similar lug 39 having an eye 40. These eyes, 38 and 40, are aligned to serve as bearings for a trip-shaft (not shown), which bears upon its inner end adjacent the lug 37, a lever or other device (not shown), for pulling the chain or other means for unlatching the dipper-door. The outer end of this shaft, adjacent the lug 39 bears a lever (not shown) for the purpose of rotating the trip-shaft.

Adjacent each end of the torsion-box and at the top thereof, there are a pair of lugs 41, each provided with an eye 42. Figure 1 shows the back-braces 43, which are pin-connected through these eyes 42. The back-braces are adjustable as to length by being each provided with several points of possible connection with the back-brace lugs 41. If desired, back-braces may be provided in easily substitutable sets of different lengths; or other means of adjustment may be employed.

At the junction of each trapezoidal end-piece 16 of the torsion-box with its bottom flanges 18 and its end flange 27, there is a forwardly and downwardly projecting lug 44, provided with an eye 45. These serve for connecting the dipper 1 with the handle-end casting 12, as shown in Figure 1.

It is to be noted that all those parts shown in Figures 2, 3 and 4, except the bumper 34, the straps 35 and bolts 36, form one integral casting.

Although the foregoing exemplifies one embodiment of our invention, we do not intend to limit ourselves to the particular disclosure, but intend to avail ourselves of all equivalents.

We claim:

1. In a machine of the class described, the combination of: a boom; a dipper-handle, comprising a pair of dipper-sticks, and being mounted on the boom for rotation about and reciprocation with respect to a point on said boom; each stick including an upper plate and a rack; a digging dipper carried by said handle; back-braces for said dipper; a boom-point sheave mounted on said boom; tripping apparatus for said dipper; and a single casting, serving as a torsion-box, a connection for the two sticks, and a dipper support; said casting having lugs for attachment to the dipper, lugs for attachment of the back-braces and lugs for supporting the tripping apparatus, and being rigidly bolted to each of said upper plates by means of a flanged joint, and to each of said racks by means of abutting flanges, and carrying a bumper of resilient material for contact with said boom-point sheave.

2. In a machine of the class described, the combination of: a boom; a dipper-handle, comprising a pair of dipper-sticks, and being mounted on the boom for rotation about and reciprocation with respect to a point on said boom; each stick including an upper plate and a rack; a digging dipper carried by said handle; back-braces for said dipper; a boom-point sheave mounted on said boom;

tripping apparatus for said dipper; and a single casting, serving as a torsion-box, a connection for the two sticks, and a dipper support; said casting having means for supporting the dipper and means for supporting the tripping apparatus, and being rigidly bolted to the upper plate and the rack by means of flanged joints, and carrying a bumper of resilient material for contact with said boom-point sheave.

3. In a machine of the class described, the combination of: a boom; a pair of dipper-sticks, mounted thereon for rotation about and reciprocation with respect to a point on said boom; each stick including an upper plate and a rack; a digging dipper carried by said sticks; and a single casting, serving as a torsion-box, a connection for the two sticks, and a dipper support; said casting having upper and lower sets of lugs for supporting said dipper, and being directly and rigidly connected to the upper plate and to the rack.

4. In a machine of the class described, the combination of: a pair of dipper-sticks; each stick including an upper plate and a rack; a digging dipper carried by said sticks; and a single handle-end casting; said casting having means for supporting said dipper, and being directly and rigidly connected to the upper plate and to the rack.

5. In a machine of the class described, the combination of: a pair of dipper-sticks; each stick including an upper and a lower plate; a digging dipper carried by said sticks; and a single handle-end casting; said casting having means for supporting said dipper, and being directly and rigidly connected to the upper and to the lower plate.

6. In a machine of the class described, the combination of: a boom; dipper holding means mounted thereon; a digging dipper held by said means, a boom-point sheave mounted on said boom; and a bumper of resilient material, mounted on said means for contact with said boom-point sheave.

7. In a machine of the class described, the combination of: dipper holding means; a digging dipper held by said means; and a bumper of resilient material, mounted on said means.

8. In a machine of the class described, the combination of: a pair of dipper-sticks; a digging dipper carried by said sticks; a handle-end casting; and a torsion-box integral with said casting; said torsion-box having its dimension longitudinal of the dipper-sticks substantially less than the longitudinal dimension of the rest of the casting.

9. In a machine of the class described: a handle-end torsion-box of hollow cylindrical form, reinforced with internal ribs extending parallel to the axis of the cylinder.

10. In a machine of the class described; a handle-end torsion-box of hollow cylindrical form, reinforced with ribs extending parallel to the axis of the cylinder.

11. In a machine of the class described: a handle-end torsion-box of cylindrical form.

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