July 27, 1943. H. H. HOPKINS ET AL 2,325,134

DREDGE

Filed Oct. 23, 1940 3 Sheets-Sheet 1

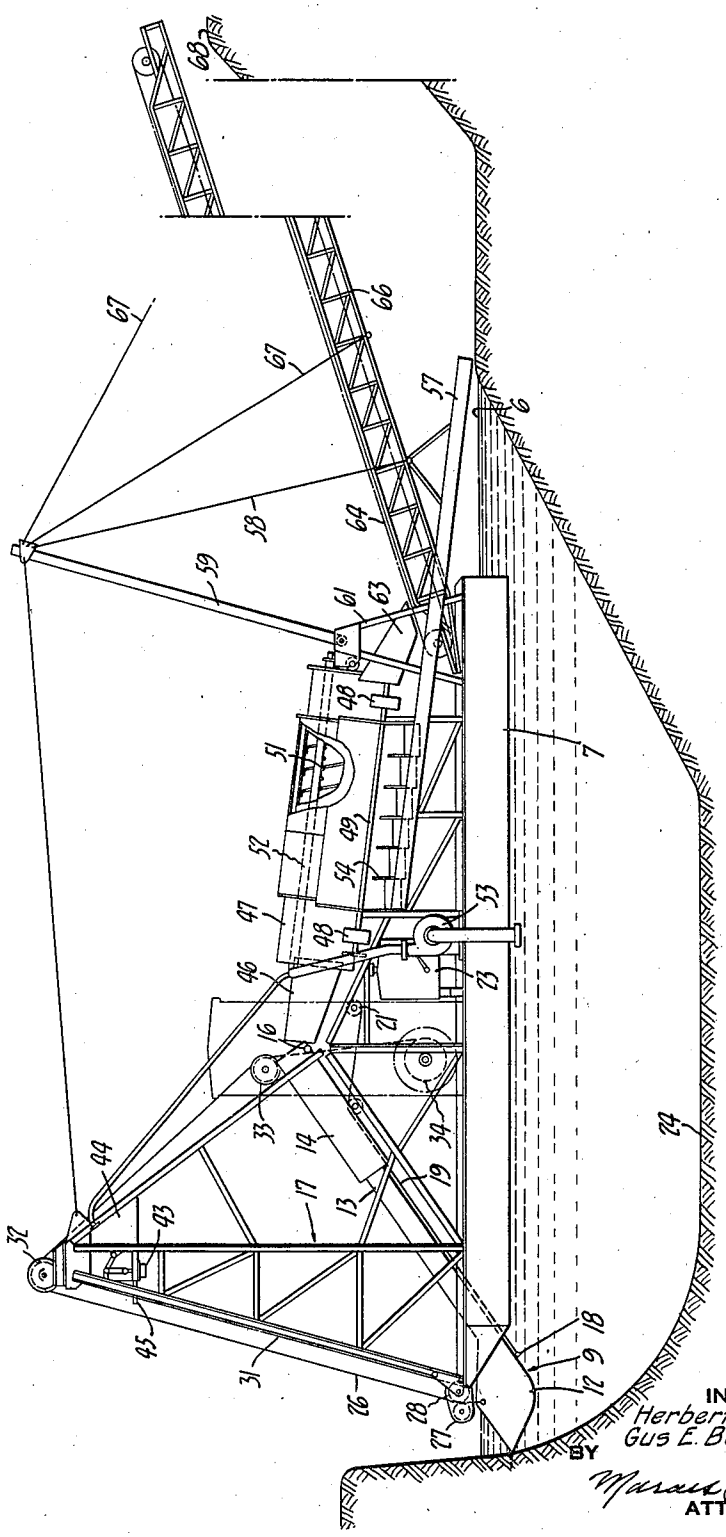


FIG. 1

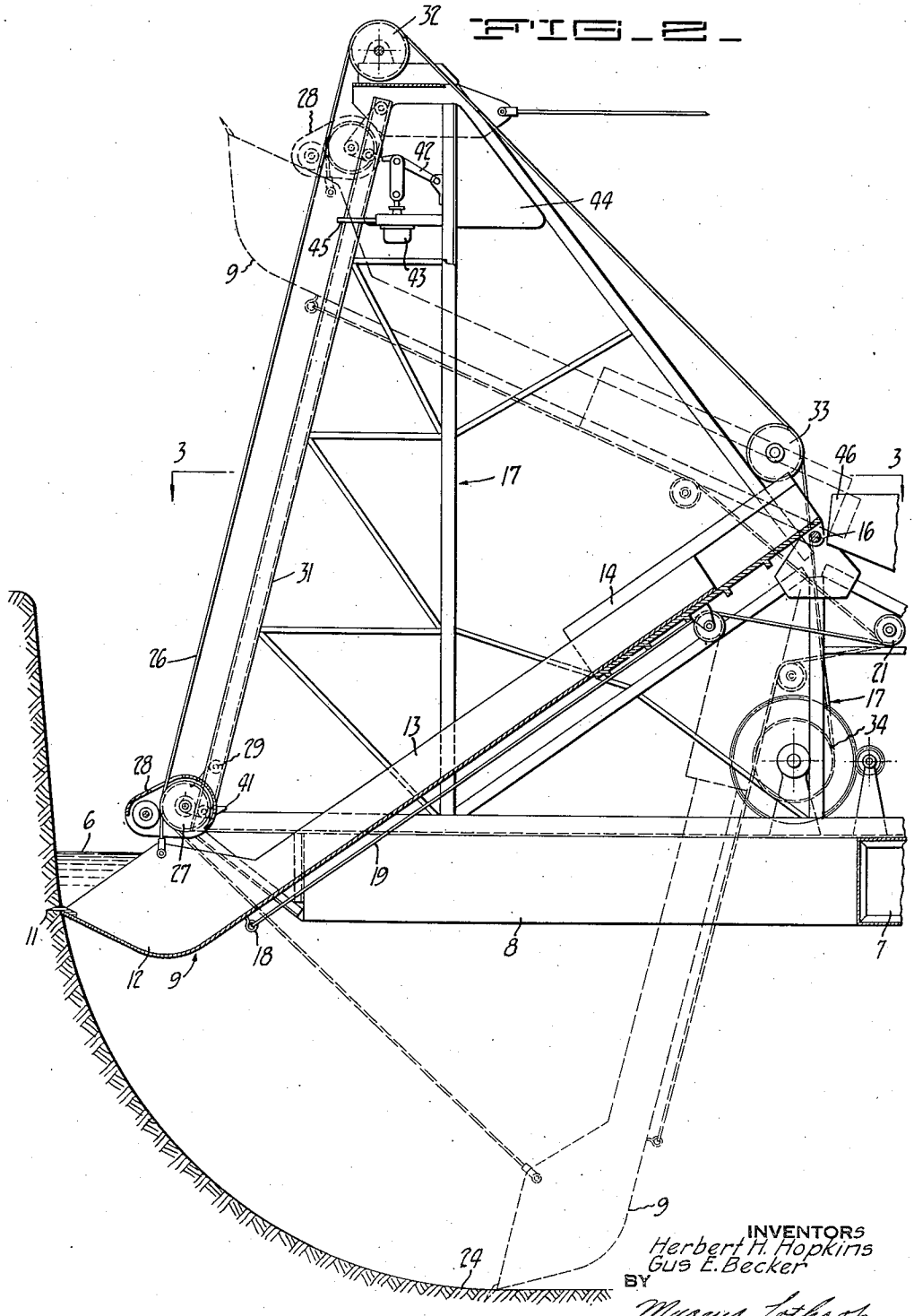
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FIG. 2.



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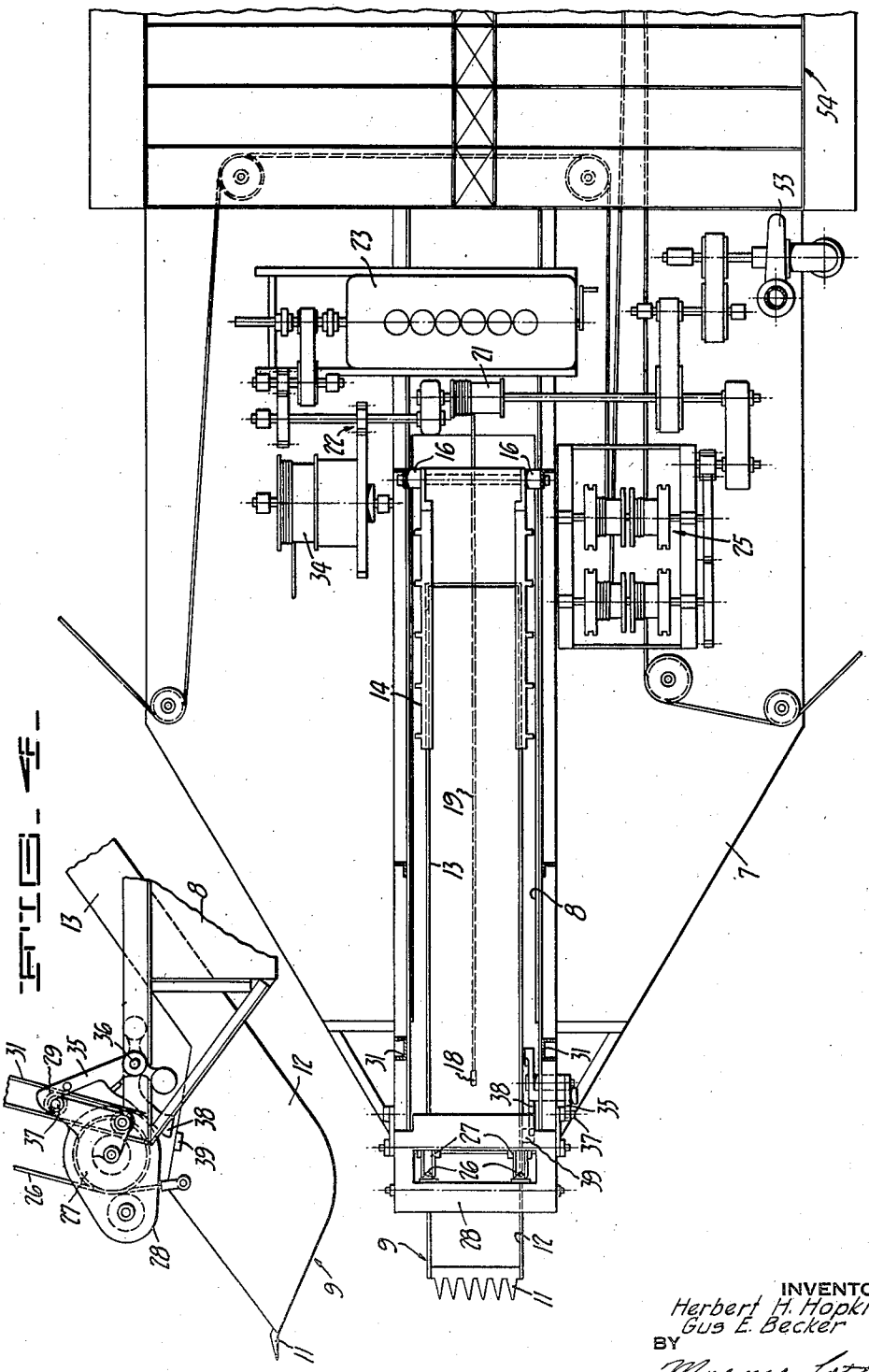


FIG. 3

FIG. 4

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UNITED STATES PATENT OFFICE

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DREDGE

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Application October 23, 1940, Serial No. 362,348

5 Claims. (Cl. 37—71)

Our invention relates to dredges of the type shown in our Patent 2,091,279, issued August 31, 1937, and is particularly concerned with dredges which are designed and constructed to obviate the necessity of using an endless chain of dredging buckets. Dredges of the present type utilize a dipper, which includes a chute through which the excavated material is discharged. In dredges of this nature it is of importance to apply the force to the dipper in such a way that a maximum leverage is available for excavating the subaqueous material and for lifting it to a discharging position. It is also important that each load of excavated material be completely, or as completely as possible, discharged from the excavating dipper in order to make way for subsequent material. It is also important to mount the dipper in a way which will facilitate its ready operation throughout its entire range despite adverse excavating conditions.

It is therefore an object of our invention to provide a dredge in which the force for moving the dipper is applied with a favorable mechanical advantage.

Another object of our invention is to provide a dredge in which the material in the dipper is adequately sluiced out.

A further object of our invention is to provide a dredge dipper mounting which is capable of trouble-free and long-continued satisfactory use.

A further object of our invention is to provide a dredge which is a general improvement over dredges of the type heretofore known.

Other objects will be set forth in connection with a description of the invention, which is illustrated in the accompanying drawings. In the drawings:

Fig. 1 is a side elevation, a portion being in section, of a dredge constructed in accordance with our invention, parts being broken away to reduce the size of the figure.

Fig. 2 is a side elevation, part being broken away to disclose in section on a longitudinal plane the forward portion of our dredge drawn to an enlarged scale.

Fig. 3 is a partial plan of our dredge showing the forward portion thereof, part being shown in cross-section on a horizontal plane.

Fig. 4 is an enlarged side elevation showing the dipper and carriage latch.

In its preferred form the dredge of our invention comprises a barge or float, having a pivoted cradle mounted thereon, within which a dipper is slidably disposed. The dipper is operated by a plurality of cables, at least one of which passes from the dipper to a winch mechanism over a sheave on a travelling carriage arranged to occupy positions to increase the mechanical advantage of the cable and to permit the dipper in its uppermost position automatically to trip an arrangement for releasing a quantity of flushing water through the dipper itself, in order to transfer all of the excavated material therefrom to the classifying and value-saving mechanism located on the dredge.

Our dredge is especially useful in connection with machines of relatively small capacity, for example, having a dipper size of approximately one or two cubic yards, and arranged to be readily transported by being fabricated in relatively small sections. There is no special limitation to these sizes although commercial embodiments have found success in this size range. In the usual instance, the dredge operates upon a pond 6 and comprises a float or barge 7, constructed in any convenient fashion, substantially in the usual shape of barges, that is to say, being approximately rectangular in plan, with a tapered bow and having a reentrant portion 8, within which a dipper 9 is movable.

The dipper 9 comprises at its leading edge a plurality of serrated teeth 11 fastened on to the dipper body 12, which is U-shaped in cross-section and smoothly merges with a similarly shaped dipper handle 13, which latter constitutes a chute. This chute is slidably fitted within a cradle 14, having a cross section similar to but slightly larger than that of the chute for free mechanical translation with respect thereto. The cradle is mounted by a pivotal connection 16 on the framework, generally designated 17, which is upstanding from the barge 7. The size and arrangement of the dipper 9 with respect to the cradle 14 are such that while part of the inside walls of the cradle may be exposed when the dipper 9 is completely projected, nevertheless when the dipper is in discharging position the dipper handle or chute overlies the interior walls of the cradle to afford protection for whatever lubricant there may be thereupon to assist the sliding movement. This is quite important since if any oil is washed or sluiced overboard into the pond 6 it eventually finds its way back into the amalgamating or saving tables and grossly cuts down the recovery of values or gold.

In order to move the dipper 9, there is attached thereto by a fastening 18 a haul-back cable 19 which extends from the dipper body 12 under-

neath the dipper handle to a haul-back drum 21 located substantially amidships. While no attempt has been made herein to show in detail the substantially standard control mechanisms for the various operating instrumentalities, the haul-back drum 21 is connected by gearing and shafting 22 to a source of power such as an engine 23, which is likewise mounted amidships. The shafting 22 also drives winches 25 operating the various bow and stern lines which are controlled in the usual way to position the barge 7.

When the haul-back cable 19 is tensioned the dipper 9 is caused to slide telescopically within the cradle 14 so as to reduce the radial distance between the pivot axis 16 and the excavating teeth 11. This is the position usually occupied by the dipper when the cradle 17 is in substantially a vertical position. Then when the haul-back cable 18 is quickly released the weight of the dipper 9 causes it to descend substantially vertically until the teeth 11 engage the bottom 24 of the pond 6. At this time the excavating teeth 11 are substantially vertically below the pivot axis 16.

In order to haul the dipper forwardly and upwardly and at the same time not to exert force in a direction which would tend to cause telescoping movement radially inward of the cradle 14, we attach to the dipper body 9, preferably at each side thereof, hoist cables 26 which extend forwardly over sheaves 27 rotatably mounted in a carriage 28. A bail and single cable can be used, but the present construction is equally advantageous. The carriage has rollers 29 to guide it on upright channels 31 disposed at the forward end of the barge 7 and forming part of the framework 17. The channels 31 are parallel but are inclined rearwardly so that their upper ends are somewhat aft of their lower ends. The hoist cables 26 are carried over sheaves 32 at the top of the framework 17 and then pass around guide sheaves 33 to extend to one or more winding drums 34 driven by the shafting and gearing 22 from the engine 23.

In order that the carriage 28 will remain in its lowermost effective position while actual excavation is going on it is latched or locked in lowermost position by a two-part latch including a latch lever 35 counterweighted and pivoted on a pin 36 to engage a projection 37 on the carriage 28. The lever 35 is tripped by a counterweighted lever 38 engaged by a projection 39 at the side of the dipper body 12. Thus while the dipper is excavating between its substantially vertical lowermost position and its partially inclined position adjacent the surface of the pond 6 as shown in Figure 1, the latch 35 is effective to hold the carriage in lowermost position so that the hoist cables 26 extend substantially at right angles to the dipper and the force exerted upon the dipper is exerted with maximum effect at substantially a right angle thereto. Excavation is therefore carried on with an efficient and economical use of power.

When, however, the dipper has been raised to achieve a position as shown in Figures 1 and 4, the projection 39 strikes the lever 38 rotating the latch lever 35 clockwise (as seen in Figure 4) so that the carriage 28 is released. Continued or further tension upon the hoisting cables 26 causes the loaded dipper to abut the carriage and to cause the carriage and dipper to rise as a unit until the uppermost position is achieved. This position is indicated by dotted lines in Figure 2. In such a position and due to the inclination of the guide rails 31, the dipper handle 13 is telescoped with the cradle 14 and projects from the far end thereof so that none of the interior of the lubricated cradle is exposed.

As the dipper arrives at its uppermost position a projection 41 on the carriage operates a lever 42 connected to a valve 43 mounted on the framework 17. The valve is then opened to release a large supply of water either from a pipe line or from a storage tank 44 to discharge forcefully through nozzles 45 into the interior of the dipper body 12 in order to sluice the excavated material therefrom throughout the length of the dipper and handle.

By providing the tank 44 it is possible to utilize a constantly operating pump with a relatively small supply line and to accumulate between the cycles of operation of the dipper 9 sufficient water to provide a thorough clearing out of all the excavated material each cycle. If adequate water is pumped without the storage tank an intermittently effective pump of considerable size and uneconomical efficiency is necessary. With the tank arrangement, however, a small size pump working constantly and efficiently affords a large body of flushing water effective to wash the excavated material from the dipper body down through the dipper handle 13 and into a transition trough 46 leading to a rotating screen 47. Upon the discharge of the material from the elevated dipper the hoist ropes 26 are released and the dipper descends to a substantially vertical position. As it passes the lower portion of the rails 31 it leaves the carriage 28 which relatches in its lowermost position ready for the next cycle.

To cushion the shock of intermittently received material, the revolving screen 47 rests upon rubber-faced rollers 48 which are mounted on drive shafts 49 disposed at each side of the revolving screen and both of which are connected together to be driven from the engine 23. With this arrangement it is feasible to use the rubber-faced rollers 48. The rollers are wet by the water pouring through the screen and, being rubber, their co-efficient of friction thereon is not high. However, by connecting all of the rollers 48 together for driving in unison adequate driving force to revolve the screen is afforded. In this way, consequently, we provide a cushioned mounting for the screen, yet transmit adequate rotative force thereto.

On the interior of the screen there is provided a plurality of nozzles 51 which receive water through a conduit 52 connected to a pump 53 driven by the engine 23 so that the usual washing and separating process occurs in the screen 47. The fines together with the values pass through the screen into a plurality of sluices 54, the fine tailings from which flow from tail sluices 57 over the stern of the barge 7. The tail sluices 57 are supported by cables 58 from a boom 59 on a superstructure 61 rising from the stern of the barge.

The coarse material which does not pass through the apertures in the screen 47 is assisted therethrough by a reinforced rubber spiral secured to and revolving with the interior of the screen, and finally passes through a transition piece 63 to a stacker belt 64 operating on stacker ladder 66 likewise suspended by cables 67 from the boom 59. The stacker belt 64 itself is preferably driven from the engine 23 so that all of the power on the barge is derived from the central engine 23. The coarse material carried by

the stacker belt 64 is discharged over the end thereof at the top of a tailings pile 68 adjacent the margin of the pond 6.

In accordance with this invention therefore, we provide a dredge in which the force is applied to the dipper with a considerable mechanical advantage, in which the dipper itself is moved throughout its path by means of a sliding connection to a pivotally supported cradle in such a way that the lubrication of the sliding members is not detrimental, and also one in which the supply of sluicing water is economically and adequately provided.

We claim:

1. A dredge comprising a barge having a superstructure thereon, a cradle pivotally mounted on said superstructure, a dipper having a chute slidably mounted in said cradle, a carriage guided on said superstructure to rise and fall, and a cable secured to said dipper and trained around said carriage for sliding said dipper within said cradle and lifting said dipper and said carriage in unison.

2. A dredge comprsing a barge having a superstructure, a carriage guided for rising and falling movement on said superstructure, means for latching said carriage in one position, cable guiding means on said carriage, a dipper mounted on said superstructure, a cable trained around said guiding means and secured to said dipper for moving said dipper into abutment with said carriage, means on said dipper for unlatching said carriage from said position, means for ejecting water into said dipper, and means on said carriage for actuating said ejecting means.

3. A dredge comprising a barge having a superstructure, a carriage adapted to run on said superstructure between a lower position and an upper position, a dipper mounted on said superstructure to swing between excavating positions separate from said carriage and discharging positions in abutment with said carriage, means for operating said dipper separately and together with said carriage, and means operated by said dipper and said carriage in said upper position for ejecting water into said dipper.

4. A dredge comprising a barge having a superstructure thereon, a cradle pivotally mounted on said superstructure, a dipper having a chute slidably mounted in said cradle, means for guiding the end of said dipper opposite to said cradle in substantially a straight path, and a cable for lifting said end of said dipper in said path and simultaneously sliding said chute in said cradle.

5. A dredge comprising a barge having a superstructure, a carriage, rails on said superstructure to guide said carriage for rising and falling movement on said superstructure, a chute-like dipper pivotally and slidably mounted on said superstructure, means for so mounting the dipper pivoted on said superstructure and slidably engaging said dipper in a position to be protected from receiving material discharged from said dipper and a cable trained around said carriage and fastened to said dipper for moving said dipper separately and in unison with said carriage.

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