Sept. 18, 1923. 1,468,472

F. H. HEINE

PAVER MIXER CRANE

Filed Dec. 29, 1920 6 Sheets-Sheet 1

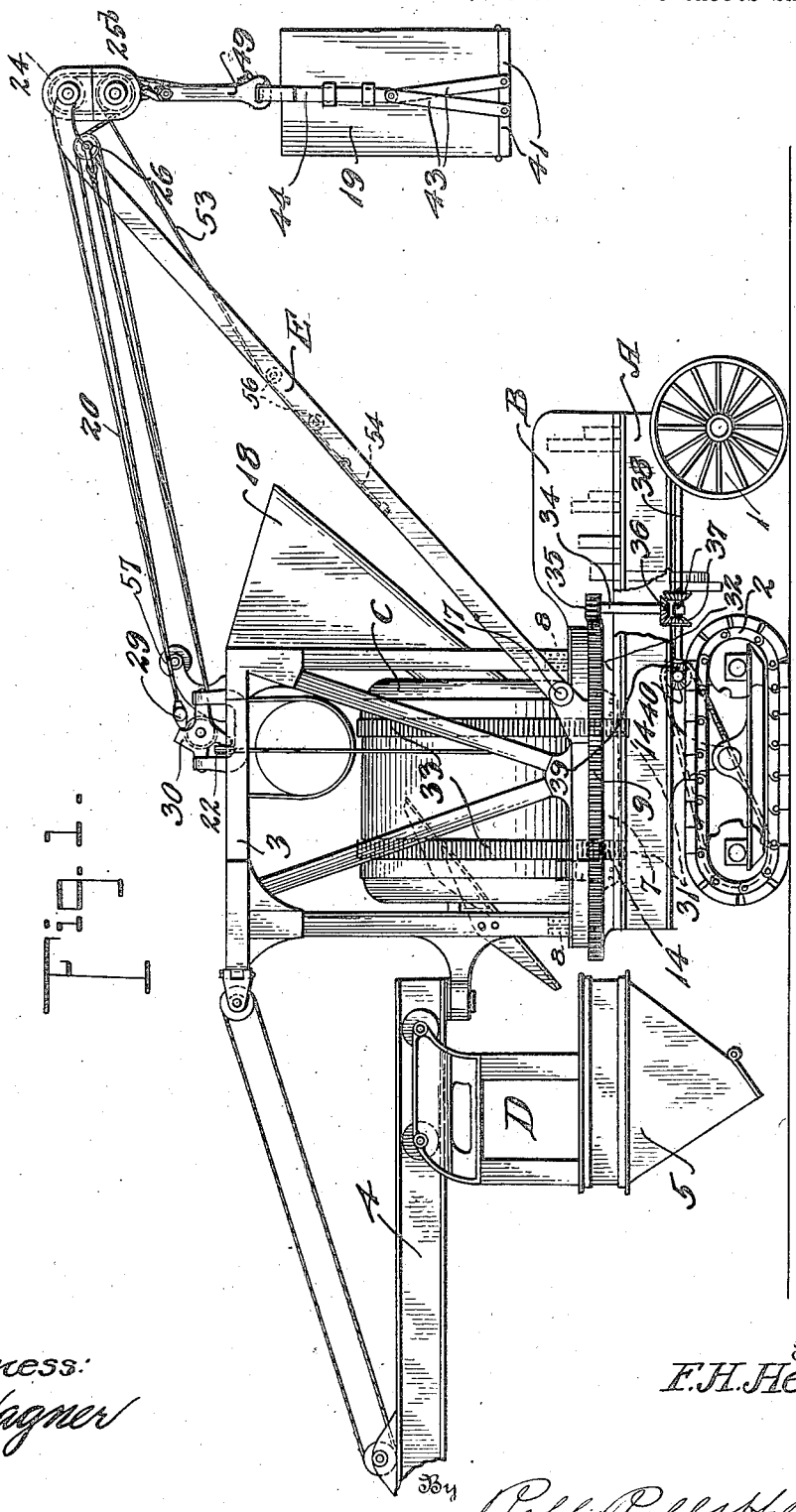


Fig. 1.

Witness:
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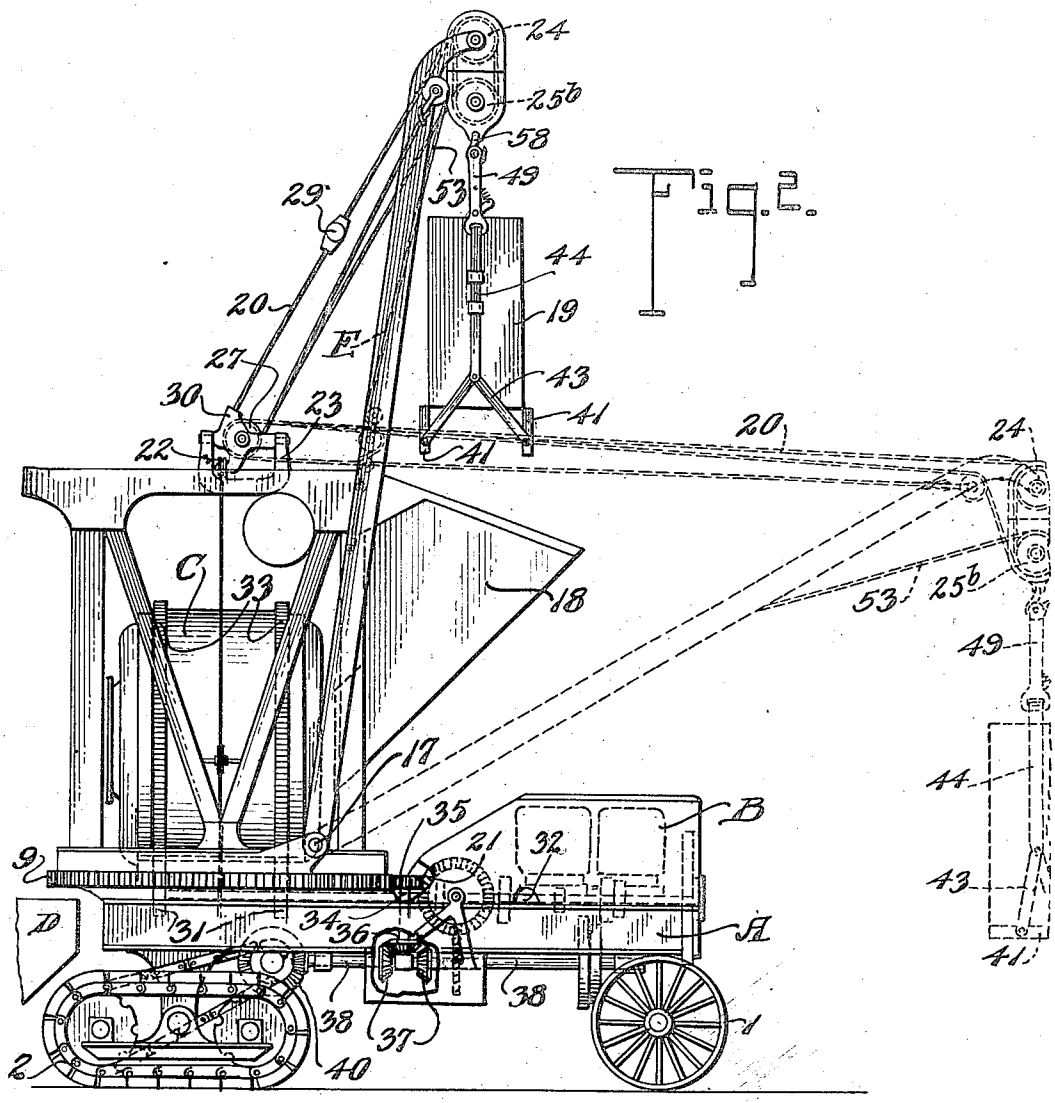
Sept. 18, 1923. 1,468,472

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PAVER MIXER CRANE

Filed Dec. 29, 1920 6 Sheets-Sheet 2

Fig. 2.



Witness:
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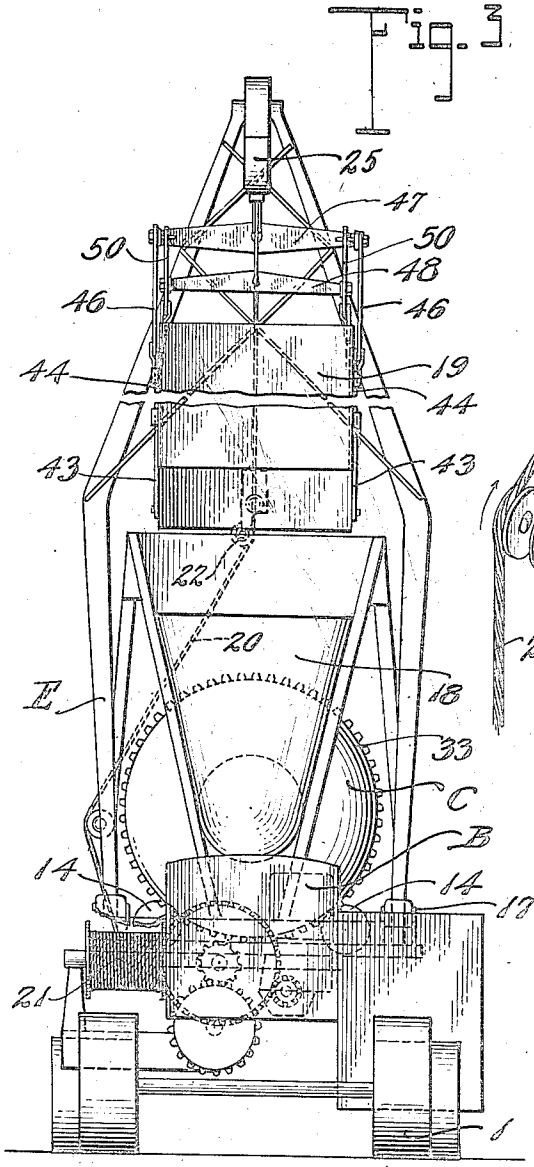
Sept. 18, 1923. 1,468,472

F. H. HEINE

PAVER MIXER CRANE

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Fig. 3.



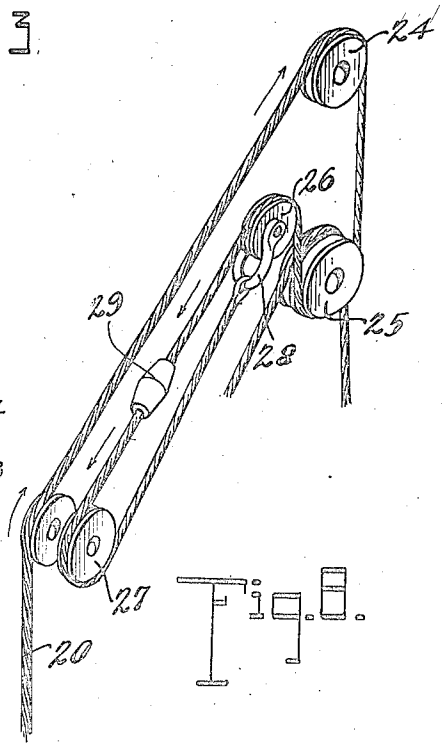


Fig. 8.

Witness:
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Sept. 18, 1923. 1,468,472

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PAVER MIXER CRANE

Filed Dec. 29, 1920 6 Sheets-Sheet 4

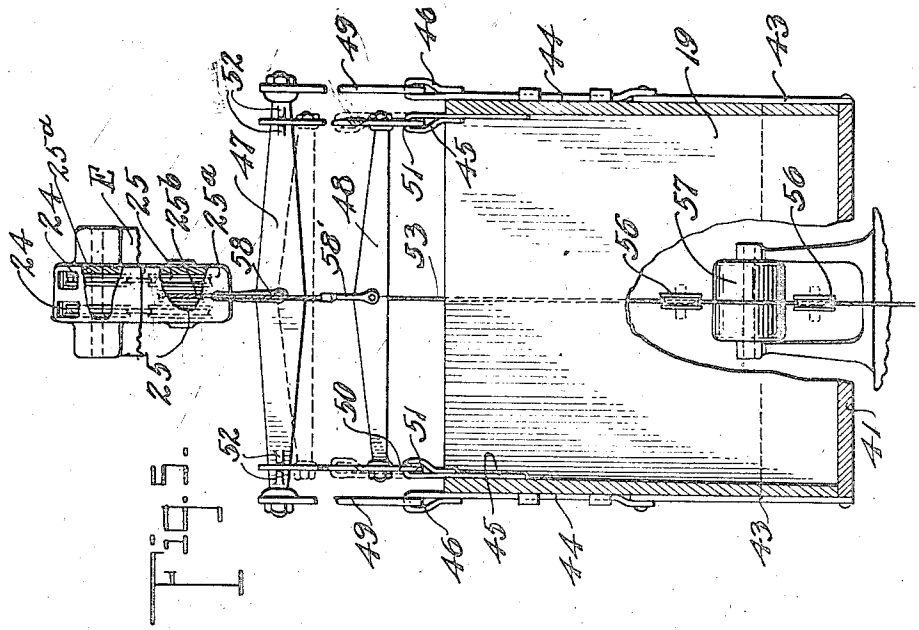


Fig. 5.

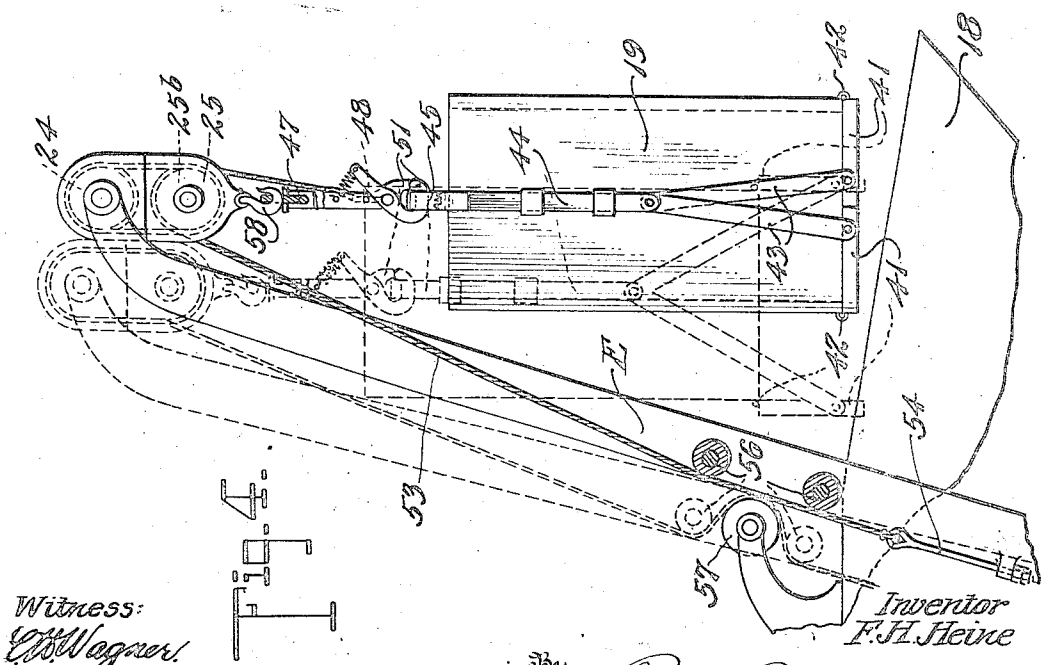


Fig. 4.

Witness:
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Sept. 18, 1923. 1,468,472

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PAVER MIXER CRANE

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Fig. 6.

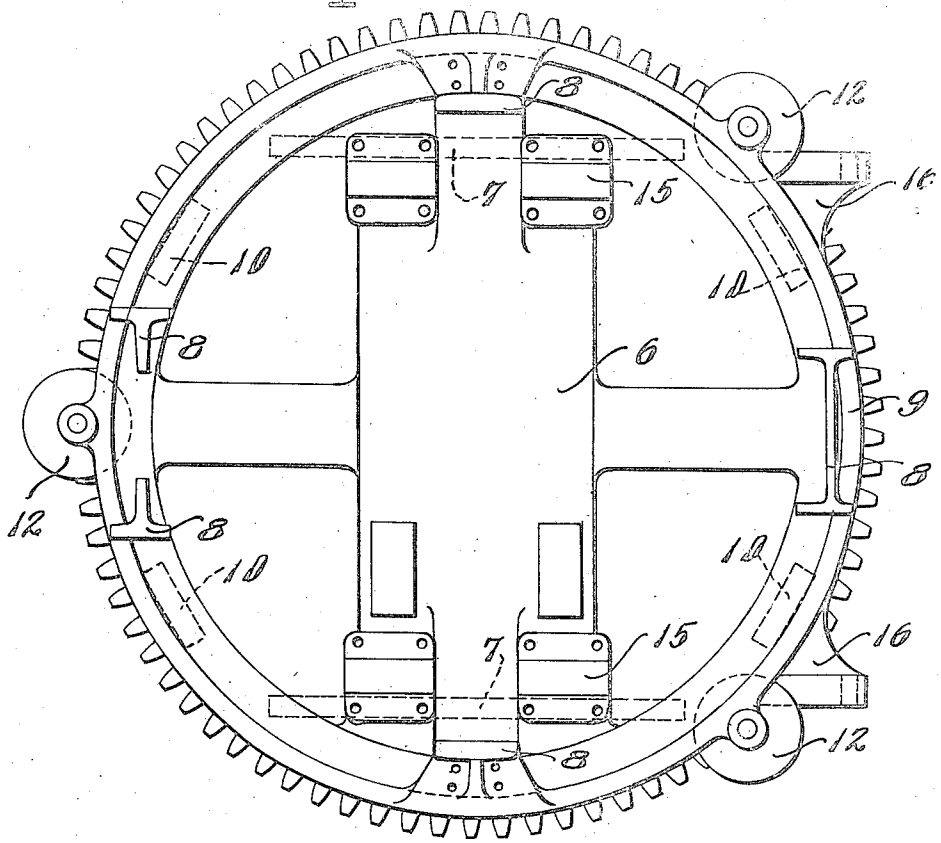
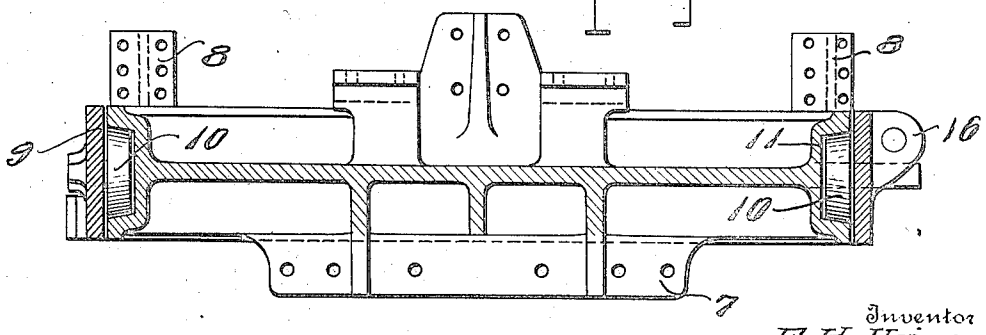


Fig. 7.



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Sept. 18, 1923. 1,468,472

F. H. HEINE

PAVER MIXER CRANE

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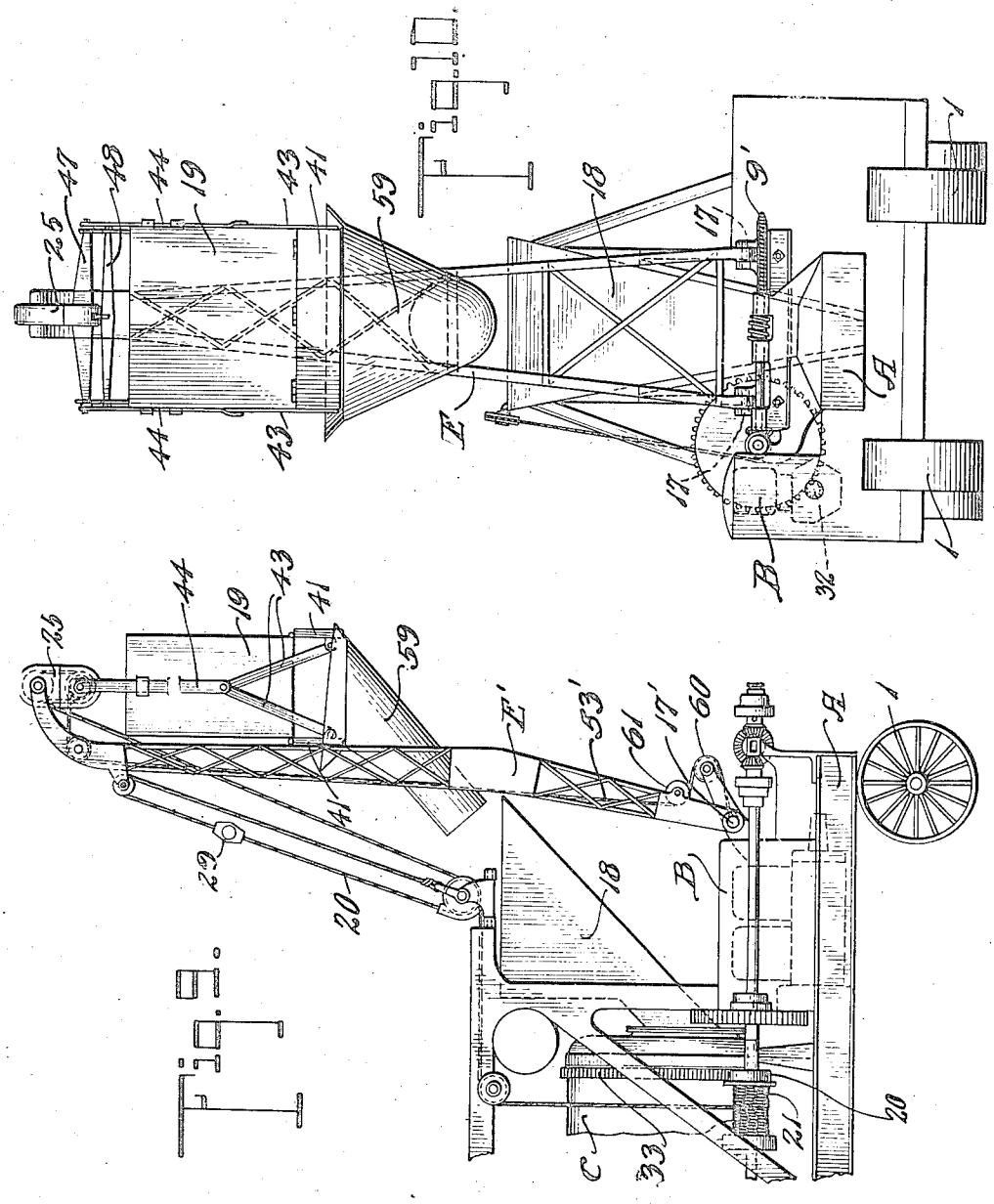


Fig. 6.

Witness:
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Inventor
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Patented Sept. 18, 1923. 1,468,472

UNITED STATES PATENT OFFICE.

FERDINAND H. HEINE, OF MILWAUKEE, WISCONSIN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO KOEHRING COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

PAVER-MIXER CRANE.

Application filed December 29, 1920. Serial No. 433,750.

To all whom it may concern:

Be it known that I, FERDINAND H. HEINE, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Paver-Mixer Cranes, of which the following is a specification.

In the art of paving streets, roads and the like with concrete, and especially in connection with the paving of roads, the system is now being largely practiced of supplying the aggregates of the concrete by an industrial railway alongside of the road site. The cars of the railway are equipped with removable hoppers or bodies in the form of batch boxes adapted to contain the aggregates to be mixed in a mixing machine which travels over the subgrade being paved.

With the above general statement of the mode of supplying the aggregates to the mixing machine it may be understood that the present invention proposes a machine in the form of a combined paver and crane, the paver comprising a distributing means associated with the mixing means. The distributing means is usually a boom and bucket and the mixing means a mixing drum. More specifically speaking, the design of the present machine includes a mobile support or truck equipped with a power plant arranged to operate the mixing drum, the distributing unit, preferably a boom and bucket attachment, and the crane which is peculiarly mounted for counter-balancing effect in relation to the distributing unit, and stabilized by reason of the peculiar relative mounting of the mixing drum itself; the machine as a whole being furthermore driven by said power plant.

In addition to the foregoing general features of the machine, I propose to employ a special design of box or hopper for holding the aggregates, one which may form a car body where an industrial railway is employed, or which may constitute a unit adapted to be carried by a truck if the supply of aggregates is to be carried by trucks in accordance with the particular system of supply employed upon the job where the paving is being laid. The batch box is used in connection with especially designed grappling means forming a part of the crane feature of the machine, whereby automatic dumping of the batch box may be effected when the latter has been raised and superposed in relation to a suitable hopper adapted to direct is contents into the mixing drum of the machine.

The various unit features of the machine such as the distributing unit, mixing unit, crane unit, and supporting unit or truck are designed for control by a single operator rendering the machine easy to manage in the performance of its several functions.

In the accompanying drawings:—

Figure 1 is a side elevation of a machine embodying the invention, certain features which are not shown in detail being somewhat diagrammatically illustrated;

Figure 2 is a somewhat enlarged view of the truck or supporting unit, and the mixing and crane units more clearly illustrating the arrangement of these parts;

Figure 3 is a rear elevation looking toward the crane end of the machine;

Figure 4 is a duplex view of the batch box and upper portion of the crane illustrating in full lines the position of the box previous to dumping, as it reaches a point above the mixer supply hopper, and dotted lines illustrating the dumping action;

Figure 5 is a view showing the batch box in vertical section, same broken away to more clearly illustrate the way in which the dumping cable is capable of being tripped by movement of the boom of the crane to its batch box elevating position;

Figure 6 is a plan view showing the gear ring and the supporting base upon which respectively are mounted the crane and the mixer with its supporting frame;

Figure 7 is a vertical view through the parts shown in Figure 6;

Figure 8 is a perspective view showing somewhat diagrammatically the method of training the hoisting cable of the crane over the sheaves about which it passes;

Figure 9 is a side elevation of a modification of the general machine construction showing a somewhat different mounting and disposition of the crane in relation to the mixing drum; and

Figure 10 is an end view of the modified construction of the machine.

Referring to the preferred form of the invention most largely illustrated in the drawings, A denotes the mobile support or truck of the machine having at one end a housed power plant B and at its opposite

end supporting the mixer C. This truck A affords a portable structure being equipped with wheels and caterpillars 1 and 2 or equivalent means through the medium of which the machine may be propelled forward. As seen best in Figure 1, the distributing unit D extends from one end of the framework 3 of the machine and the crane E extends from the opposite end being supported in a peculiar manner to be counterbalanced largely by the mixer C and its associated distributing unit D.

Distributing unit D may be of any conventional type and is illustrated as comprising the boom 4 and the distributing bucket 5 adapted to be propelled in and out along the boom by suitable means not illustrated, but which will be understood by those versed in the art upon reference to such patents as United States Patent of Koehring, Reissue No. 13,617, September 16, 1913, and Lichtenberg No. 1,141,470 of June 1, 1915. I show a somewhat different design of distributing unit but the same is not material to the invention as noted above. The driving mechanism for the bucket 5 will be operated from the power plant B.

Figures 6 and 7 plainly show the method of supporting the mixer C and the crane E upon the truck A. For this purpose I use a circular base frame or spider fastened rigidly by its flanges 7 to the side sills of the truck A and connected by suitable brackets 8 with the frame elements of the machine which are fabricated in a substantial manner. The frame or spider 6 is circular so as to permit the gear ring 9 to extend thereabout for rotative movement in relation thereto, said ring 9 being mounted upon rollers 10 which operate in a circular track forming the peripheral portion of the spider or base frame 6 and designated at 11. Other rollers 12 are mounted so as to be carried by the ring 9 and operate to carry the thrust incident to the movement of the boom of the crane E, in association with the rollers 10.

Upon the frame or spider 6 are journaled suitable rollers 14 mounted in bearings 15 and supporting the drum of the mixer C in a manner to permit free rotation of said drum.

As seen best in Figure 6, the gear ring 9 is provided with offstanding brackets 16 to which are pivoted the legs of the boom of crane E, the point of pivotal support being designated 17. A hopper 18 is mounted on the framework 3 so as to feed aggregates discharged thereinto from the batch box 19, into the drum of the mixer C. The boom of crane E is adapted to be raised and lowered by means of a cable 20 adapted to be wound about the hoisting drum 21 seen best in Figure 3, the latter being driven from the power plant in any suitable manner. From the drum 21 the cable 20 passes about suitable pulleys until it reaches a pulley 22 carried by a bracket 23 at the top of the framework 3 of the machine. From the pulley 22, see Figure 8, the cable 20 passes upwards over a pulley 24 at the upper end of the boom of crane E, thence downward around a double sheave 25 which is attached to the grappling and suspending means for the batch box, to be later described. From the double pulley 25 the cable passes upwards over a sheave 26 near the upper end of the boom aforesaid, thence downwards around a sheave 27 on the bracket 23, after which said cable is extended upwards and permanently connected with the boom preferably by a connection 28 attached to the axis of the sheave 26. At a point intermediate the sheaves 26 and 27 the cable 20 is equipped with an abutment 29 adapted to strike a stop element 30 on the bracket device 23. The manner in which the cable is trained over the sheaves connected with the batch box 19 will now be evident.

Figure 1 shows the mounting of the drum of the mixer C upon the rollers 14, and the drum is adapted to be rotated by gears 31 on a main drive shaft 32 leading from the engine or power plant B, said gears 31 meshing with ring gears 33 which surround the drum of the mixer.

Suitable drive means are employed for operating the drum 31 from the shaft 32 in the way of intermediate gearing, clutch, and brake mechanism, the clutch to connect the drum with the shaft 32 for winding the cable 20 to raise the batch box and the boom of the crane E, and the brake being employed to control opposite or gravitating movement of said parts when the driving force is discontinued. The rotation of the crane E is effected by utilizing a vertical shaft 34 equipped at its upper end with a pinion 35 to mesh with the ring gear 9 aforesaid. At its lower end the shaft 34 has a bevelled gear 36 with which are adapted to mesh either of two bevelled pinions 37 on a countershaft 38. The shaft 38 is driven from the engine shaft 32 by suitable variable speed gearing shown best in Figure 1 but which need not be shown in detail as obvious to one skilled in the art. At its front end the shaft 38 is provided with a bevelled gear 39 to operate a gear 40 which is suitably connected to drive the front caterpillars of the machine.

The several shafts will be provided with suitable bearings and obviously the method of driving the parts as previously set forth may be modified in a number of different ways so long as the operation of the parts is obtained as necessary and desired. Figures 4 and 5 best show the batch box elevating and dumping means and referring thereto it

will be noted that the batch box 19 is equipped with the downwardly openable dumping doors 41 pivoted at 42. The doors 41 are attached at their opposite ends to pairs of links 43, the upper ends of each pair of links being pivoted to a slide 44 mounted in guides on opposite ends of the batch box 19. At each end of the batch box are provided the loops or connecting members 45 rigidly attached to the box inside the latter and just opposite the slides 44 which are likewise equipped with loops 46 at their upper ends. Rigid links 49 connect the loops 46 of the slides 44 with a crosshead 47 forming a part of the suspending means for the batch box. Below the crosshead 47 is a smaller crosshead 48 the opposite ends of which are equipped with guide bars 50 having hooks 51 at their lower extremities to engage in the loops 45 aforesaid. Likewise the rigid links 49 have detachable hooks to engage in the loops 46 of the slides 44. The guide bars 50 engage between guide lugs 52 on the upper crosshead 47 and maintain the two crossheads in proper relative positions on relative movement of the same. The suspending sheave 25 around which the cable 20 passes is a double sheave so that a second cable 53 may pass thereover, said second sheave being attached to the lower crosshead 48 at one end, the other end of the cable 53 being secured to an eye-bolt 54 on the boom of the crane E. Adjacent to its point of attachment to the bolt 54 the cable 53 passes over two spaced rollers 56, these rollers being adapted to move to positions above and below an actuating roller or wheel 57 carried by the upper portion of the framework 3. The rollers 56 are grooved whilst the roller 57 is much wider and has a smooth periphery as seen best in Figure 5. The housing 25^a for the sheave 25 has a suspension hook 58 at its lower portion which engages with an eye or similar fastening on the upper cross head 47. If desired as shown in Figure 5, two of the sheaves may be provided in conjunction with the double sheave or sheaves arrangement at 25, there being a small intermediate sheave 25^b over which the dumping cable 53 operates. Under these conditions the hoisting cable 20 of the crane may be looped about sheaves 24 and 25 in a well known and conventional manner.

With the foregoing in view the general operation of the invention will be now explained. Assuming that the mixer C has not yet been charged the cycle of operation of the parts from the beginning would be substantially this: The crane E is lowered sufficiently to enable its grappling or suspending devices to be attached by the hooks 51 to the slides 44 and loops 45 of the batch box 19 whatever form said box may take for reasons previously suggested. The crane, of course, has a radius of movement of about 180 degrees so that the batch box may be picked up from either side of the machine or from a point in rear thereof, the gear 9 being actuated for such purpose. It is however necessary that the crane E be swung so that its boom is in rear of the hopper 18 before the batch box is raised for dumping into the said hopper. We shall assume that the crane has been brought to the position practically as illustrated in Figure 1 wherein the batch box has been lifted from the car or motor vehicle. This lifting of the batch box is caused by the initial operation of winding the cable 20 on the drum 21. When the housing 25^a of the lower sheaves 25 abuts with that of the upper sheaves 24, as shown in Figure 1, the movement of the cable transmits movement to the boom of the crane E, and the raising of said boom takes place. As the upward limit of movement of the boom is reached the dumping cable 53 moves into contact with the actuating roller 57, the latter entering the space between the rollers or grooved wheels 56 (see dotted lines in Figure 4). A shortening or pull upon the dumping cable 53 is thus caused thereby raising the crosshead 48 connected with the batch box, relatively to the crosshead 47 which remains stationary, being suspended from the sheave housing 25^a. The raising of the crosshead 48 raises the batch box 19 bodily causing the box to slide upward relatively to the slides 44 on its ends. This effects a dumping of the doors 41 in an obvious manner and the contents of the batch box are discharged into the hopper 18 and pass from thence into the mixer C. After being mixed in the mixer C the aggregates by which the concrete will be formed are discharged into the bucket 5 of the distributor and caused to be discharged from said bucket 5 upon the site where the concrete is to be deposited. Any means well known in the art may be employed to discharge the materials from the mixer C to the bucket 5.

In the modified construction of the invention shown in Figure 9 it is contemplated to provide the same general units which have been set forth in respect to the previously described construction, the loading or charging unit comprising the same being somewhat differently disposed, however. In the present case said unit is located at one side of the mixer unit. Furthermore the boom of the crane E′ in Figure 9 is supplied with a chute or charging device 59 which moves with the boom and constitutes effectively an extension of the hopper 18 carried by the frame 3 of the machine.

In this construction the boom of the crane E′ is pivoted at 17′ upon a gear ring formed with worm teeth designated 9′. With this gear ring meshes a worm 35′ adapted to be driven in any suitable manner from the

power plant of the machine so as to cause turning of the boom of the crane. The dumping mechanism for the bucket will be the same as previously described in all essential particulars and involves the dumping rope 53′ having its lower ends secured to the separating means adjacent to the pivot 17′ of the boom, and passing about a grooved wheel 60 carried by the base or mobile truck on which the crane is mounted. The boom of the crane E′ has a grooved wheel adapted to engage the dumping cable 53′ as the boom reaches its upper limit of movement when hoisted. The wheel 60 is effective to deflect laterally and cause a pull to be exerted on the dumping cable 53′ at the time above mentioned, whereby the batch box 19 will be automatically dumped. In this construction the cable winding drum 21′ may be employed and operates in the same manner as described in the previous construction, having a slightly different disposition upon the machine, however.

In respect to both constructions of the machine illustrated, the cable 20 is paid out from the drum 21 and permits lowering of the boom E until the abutment 29 of the cable strikes the stop 30, thus limiting the downward movement of the boom. Thereafter the boom may be swung over the car and continued paying out of the cable 20 results in separating of the sheave housing 25^a and 25^b and permits of lowering the batch box upon a car or vehicle truck as the case may be.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a machine of the class described, in combination, a mobile support, a concrete aggregates charging unit mounted on said support and comprising a crane including a base, a mixing unit adapted to receive the aggregates from the charging unit and to supply mixed concrete to a distributing unit, and means supporting the mixing unit upon the base of the crane to stabilize the latter upon the support.

2. In a machine of the class described, in combination, a mobile support, a mixing unit mounted thereon, a distributing unit extending from the support at one side of the mixing unit, a loading or charging unit mounted on and extending from the support at a point diametrically opposite the said distributing unit and comprising a crane including a base, a power plant carried by said mobile support and common to the several units aforesaid, and means supporting the mixing unit on the base of the crane to stabilize the latter.

3. In a machine of the class described, the combination of a portable support, a mixer thereon, a charging hopper for the mixer, a crane for supplying batches of materials to the mixer, comprising a boom consisting of spaced side members adapted to receive therebetween the charging hopper of the mixer as the boom is raised to a position for discharging materials into said hopper, means connecting the boom with the support enabling vertical movement of the boom, and enabling swinging of the boom laterally as well, and operating means for raising and lowering and swinging said boom.

4. In a machine of the class described the combination with a mobile support, of a mixing device mounted thereon, a circular base plate carried by the support and forming a support for the mixing device, a crane comprising a gear mounted on said circular base plate and a boom pivotally connected with said gear to be turned thereby, the boom being arranged to extend from the machine at one side of the mixing device, a distributing unit extending from the machine at the side of the mixing device diametrically opposite the boom of the crane, and operating means for the crane, mixing device, and distributing unit.

5. In a portable concrete paving machine, the combination of a portable support adapted to be operated under power to advance with the work as it proceeds, a concrete mixer mounted upon said support, a distributing boom pivoted to the support for horizontal swinging movement, and extending longitudinally from the discharging end of the mixer, a distributing device adapted to travel on said boom, a crane for charging the mixer and comprising a boom connected with the support for horizontal swinging movement, and extending from the support longitudinally thereof in a direction opposite the distributing boom and adapted to counterbalance said boom and bucket thereon, and a grappling apparatus connected with the boom of the crane for hoisting materials to be charged into the mixer.

6. In a machine of the class described, the combination with a portable truck, of a power plant thereon, a base plate carried by the truck, a mixer supported on said base plate for rotation, a framework extending upwardly from said base plate, a crane gear carried by the base plate, a boom carried by said gear to be turned thereby, hoisting means connected with the boom and framework and operable from said power plant for elevating a load, means connecting the power plant to operate the mixer, a distributing unit carried by said frame to receive materials from the mixer for distribution and arranged so as to counterbalance the boom.

7. In a machine of the class described, the combination with a mobile support, a mixer thereon, and means for charging said

mixer embodying a crane comprising a boom movably mounted on and adapted to be raised and lowered and swung in a horizontal plane, and hoisting and dumping means carried by said boom including a grappling device for engaging and elevating a batch box, and automatic means connected with said grappling device for effecting movement of its parts to cause dumping of said batch box at a predetermined time in the movement of the boom.

8. In a machine of the class described, a crane comprising a boom, a grappling device carried by the boom and comprising a pair of relatively movable crossheads each having means for detachably engaging and thereby connecting with it a dumping batch box, a hopper to receive materials from the batch box which may be connected with the boom grappling means, and a dumping contrivance operable as an incident to movement of the boom to carry the batch box above said hopper.

9. A machine as claimed in claim 8 wherein the dumping means comprises a connection leading from the body of the machine to the cross heads of the grappling device whereby at a certain point in the movement of the boom relative movement is imparted to the crossheads to cause actuation of the connections for attaching the same to the batch box.

10. In combination, a batch box comprising openable doors, actuators attached to said doors, connectors for connecting the body of the box to a grappling device, a grappling device comprising spaced crossheads, means for raising said crossheads, means whereby the crossheads may be connected with the aforesaid connectors and actuators and a dumping contrivance attached to one of said crossheads to impart movement thereto relative to the other crosshead at a certain point in the movement of the batch box by hoisting means therefor, whereby to effect dumping of the batch box, and means for hoisting the batch box to a point at which its hall be dumped.

11. In a concrete paving machine, the combination of a portable support, self contained power mechanism for driving said support along a sub-grade to be paved, a distributing mechanism at one end of the support and a charging crane at the other end of the support, each comprising horizontally swinging booms arranged to extend in opposite directions from each other, a concrete mixer disposed between said booms, and a hoisting apparatus connected with the charging crane boom comprising batch box grappling means and hoisting members attached thereto, and means acting on said hoisting members and grappling means when elevated to charge the mixer, whereby said grappling means may be caused to operate automatically for effecting batch box discharge operations.

12. In a machine of the class described, the combination with a mobile support, a mixer thereon, and means for charging said mixer embodying a crane comprising a boom movably mounted on and adapted to be raised and lowered and swung in a horizontal plane, and hoisting and dumping means carried by said boom including a grappling device for detachably engaging and elevating a batch box, and means connected with said grappling device for effecting movement of its parts to cause dumping of said batch box at a predetermined time in the movement of the boom.

13. In a concrete paving machine, in combination, a portable support, a mixer thereon, and means for charging said mixer embodying a crane comprising a boom movably mounted on and adapted to swing in a horizontal plane, and hoisting and dumping means carried by said boom including a grappling device consisting of grappling members for detachably engaging and lifting a batch box, with automatic means connected with the grappling device for effecting movement of the grappling members to automatically dump a batch box at a predetermined point in the movement of the boom.

14. In a concrete paving machine, the combination of a portable support, a concrete mixer thereon, means for charging said mixer comprising a crane consisting of a boom adapted to be raised and lowered and connected with said support, power means to lower and raise said boom, a batch box, grappling means connected with the power means for operation thereby and having connection with the batch box, and means whereby initial movement of the grappling means is adapted to raise the batch box, and subsequent movement of said grappling means will raise the boom and the batch box together to bring the batch box to discharging position.

15. In a concrete paving machine, the combination of a portable support, a batch box hoisting apparatus thereon consisting of a crane comprising a boom, quickly detachable batch box grappling means comprising relatively movable members, means connecting one of said members with the batch box body, said batch box embodying dumping doors, means connecting the other of said members with said doors, and means for compelling a relative movement of said members to effect a dumping action of the doors of the box for discharging said box.

16. In a concrete paving machine, the combination of a portable support, a batch box hoisting apparatus thereon, the latter including a crane embodying a movable boom, hoisting means for said boom, includ-

ing grappling means for a batch box, a batch box comprising dumping doors, the grappling means aforesaid including complemental members adapted for relative movement, one member detachably connected with the doors of the box, the other member detachably connected with the body of the box, the hoisting means being controllable to cause relative movement of said members and to thereby cause discharging action of the box.

17. In a concrete paving machine, the combination of a portable support, a concrete mixer mounted thereon, a charging hopper for said mixer leading thereto, a charging means for feeding aggregates into said hopper, including a crane consisting of a swinging boom pivoted to the portable support, power means for raising and lowering said boom, grappling apparatus connected with said power means and comprising a pair of relatively movable members, a batch box comprising dumping doors, means for detachably connecting one of said members of the grappling apparatus with the doors, and means for detachably connecting the other of said members with the body of the batch box, and control mechanism for causing relative movement of the said members whereby to cause a discharging action of the batch box, the boom of the crane being constructed so as to elevate the batch box to a point above the charging hopper of the machine.

18. In a concrete paving machine, the combination of a portable support, a concrete mixer mounted thereon, a charging hopper for said mixer leading thereto, a charging means for feeding aggregates into said hopper, including a crane consisting of a swinging boom pivoted to the portable support, power means for raising and lowering said boom, grappling apparatus connected with said power means and comprising a pair of relatively movable members, a batch box comprising dumping doors, means for detachably connecting one of said members of the grappling apparatus with the doors, and means for detachably connecting the other of said members with the body of the batch box, and control mechanism for causing relative movement of the said members whereby to cause a discharging action of the batch box, the boom of the crane being constructed so as to elevate the batch box to a point above the charging hopper of the machine, the boom being constructed of side members adapted to straddle the charging hopper of the mixer as the boom raises, to bring the batch box over said hopper, and the means for controlling discharge of the batch box being automatic.

19. In a machine of the class described the combination of a portable support and batch box hoisting apparatus thereon, comprising a crane having a boom, a batch box comprising a body and dumping doors, hoisting means intermediate the boom and said batch box, and including cross-heads, one crosshead connected with the body of the batch box, and the other crosshead connected with the doors, together with cable hoisting means arranged to effect relative movements of said crossheads whereby to correspondingly effect relative movement of the body of the batch box and its doors so as to effect dumping operation of the batch box, the connections between the crossheads and the batch box and its doors being detachable whereby the batch box may be entirely disconnected from the hoisting means aforesaid.

20. In a machine of the class described, a hoisting boom, means for raising and lowering said boom comprising a hoisting cable connected with the boom, and sheave devices connected with said cable, together with grappling means carried by said sheave devices for cooperation with a batch box to be handled by the machine, the sheave devices being adapted for relative movement to enable the grappling means to move independently of the boom, and said sheave devices being co-operative with one another so that at a predetermined point in their movement they will abut and effect movement of the boom on the further operation of the hoisting cable.

21. In a machine of the class described, a hoisting boom, means for raising and lowering said boom comprising a hoisting cable connected with the boom, and sheave devices connected with said cable, together with grappling means carried by said sheave devices for co-operation with a batch box to be handled by the machine, the sheave devices being adapted for relative movement to enable the grappling means to move independently of the boom, said sheave devices being co-operative with one another so that at a predetermined point in their movement they will abut and effect movement of the boom on the further operation of the hoisting cable, and stop means connected with the hoisting cable so that on paying out said cable the boom will be stopped from movement at a predetermined time, and further paying out of the cable will cause an independent movement of certain of said sheave devices.

22. In batch box hoisting apparatus as described, in combination, a support, a crane thereon comprising a boom, and cable hoisting means associated with the boom and support, and including grappling devices embodying parts to be detachably connected one to a batch box body and the other to doors of a batch box, means to actuate the cable to move the box body and its doors together, and automatic means to cause a rela-

tive movement of said parts and thereby the batch box and its doors, as the same reach a predetermined position, so that dumping of the contents of the box takes place.

23. In batch box hoisting apparatus as described, in combination, a support, a crane thereon comprising a boom, and cable hoisting means associated with the boom and support, and including grappling devices embodying parts to be detachably connected one to a batch box body and the other to doors of a batch box, means to actuate the cable to move the box body and its doors together to elevate the same preparatory to discharge of the box, a cable connected to one of the said parts to cause a special independent movement thereof and thereby cause relative movement of the box body and its doors, to dump the box, and a member to act on the cable automatically in the hoisting action of the box to effect such relative movement of the parts.

24. In batch box hoisting apparatus as described, in combination, a support, a crane thereon comprising a boom, and cable hoisting means associated with the boom and support, and including grappling devices to connect with batch box apparatus for hoisting the same, and a cable for initially raising the batch box apparatus alone, and means acted on by the cable to raise the said apparatus and the boom together.

25. In batch box hoisting apparatus as described, in combination, a support, a crane thereon comprising a boom, and cable hoisting means associated with the boom and support, and including grappling devices to connect with batch box apparatus for hoisting the same, and a cable for initially raising the batch box apparatus alone, and means acted on by the cable to raise the said apparatus and the boom together, and lower them simultaneously, and a device coacting with the cable in its lowering movement to limit the lowering of the boom and permit additional movement of the batch box apparatus alone.

26. In batch box hoisting apparatus as described, in combination, a support, a crane thereon comprising a boom, and cable hoisting means associated with the boom and support, and including grappling devices to connect with batch box apparatus for hoisting the same, and a cable for initially raising the batch box apparatus alone, means acted on by the cable to raise the said apparatus and the boom together, and lowering them simultaneously, and a device coacting with the cable in its lowering movement to limit the lowering of the boom and permit additional movement of the batch box apparatus alone, and comprising an abutment applied to said cable and engageable with the support to prevent the boom movement downward whilst the batch box apparatus movement continues.

In testimony whereof I affix my signature.

FERDINAND H. HEINE.