Feb. 25, 1930. W. LEHMAN ET AL 1,748,931

BANK GRADER

Filed June 3, 1929 2 Sheets-Sheet 1

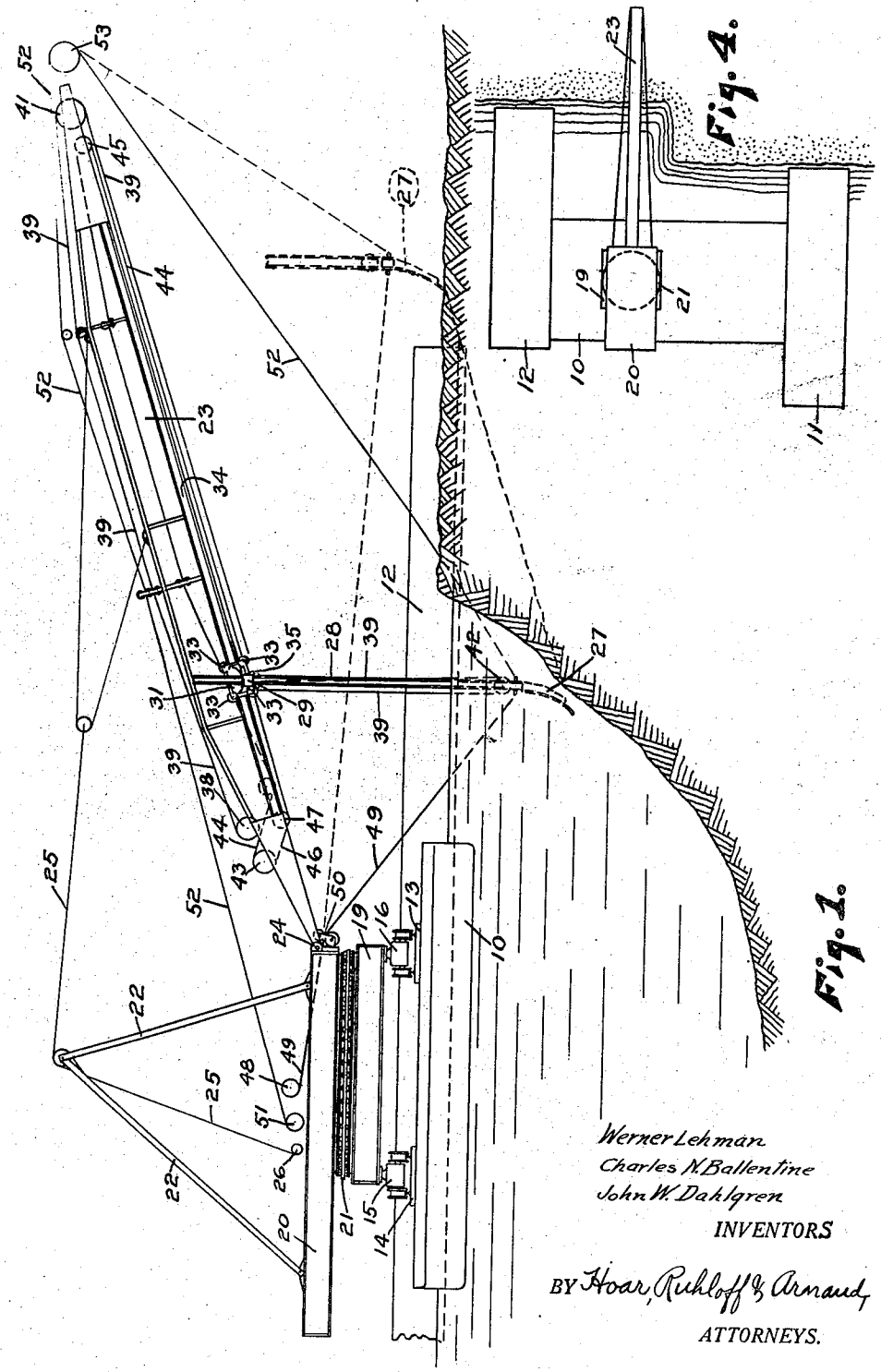


Fig. 1.



Fig. 4.

Werner Lehman
Charles N. Ballentine
John W. Dahlgren
INVENTORS

BY Hoar, Ruhloff & Arnaud,
ATTORNEYS.

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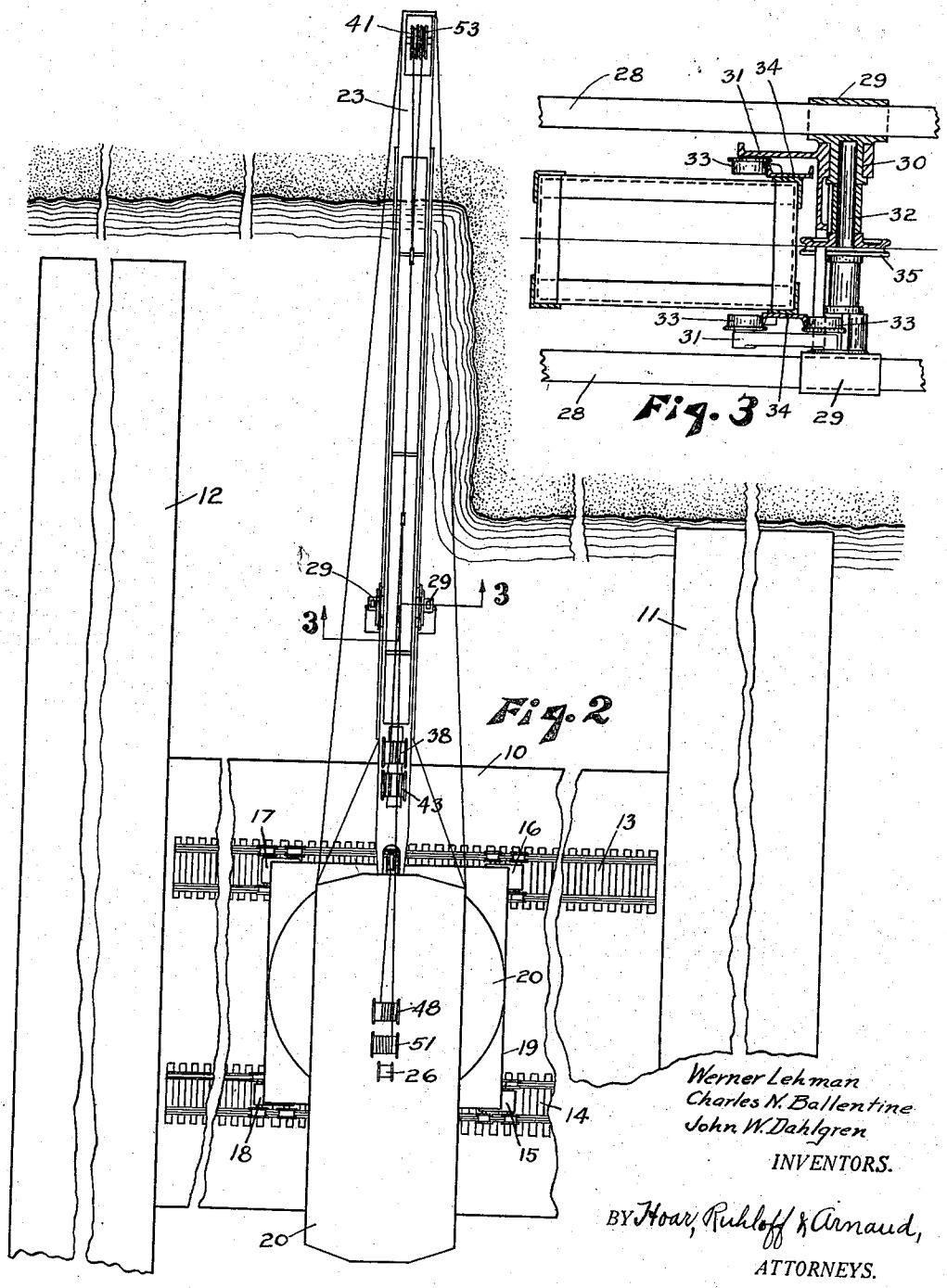



Fig. 2




Fig. 3

Werner Lehman
Charles N. Ballentine
John W. Dahlgren
INVENTORS.

BY Hoar, Ruhloff & Arnaud,
ATTORNEYS.

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# UNITED STATES PATENT OFFICE

WERNER LEHMAN, OF SOUTH MILWAUKEE, WISCONSIN, AND CHARLES N. BALLENTINE, OF BIRMINGHAM, ALABAMA, AND JOHN W. DAHLGREN, OF SOUTH MILWAUKEE, WISCONSIN, ASSIGNORS TO BUCYRUS-ERIE COMPANY, OF SOUTH MILWAUKEE, WISCONSIN, A CORPORATION OF DELAWARE

## BANK GRADER

Application filed June 3, 1929. Serial No. 368,102.

Our invention relates to new and useful improvements in bank graders.

Our invention is primarily designed for use in connection with Mississippi River flood prevention work, in which it is necessary to grade the banks to a long and rather gentle slope, extending this slope below the water line, and covering it with concrete slabs, which are laid like clapboards, with the overlying edges down-stream.

Heretofore it has been possible to grade only above the water line, and hence only at low water. The principal object of our invention is to provide a bank grader which can used accurately under water, and hence at all times. This we accomplish by means of a gauge on the boom, and by setting the boom to the slope of the desired bank. Hence we do not have to see into the muddy water and can use our grader at all times.

In addition to our principal object, we have worked out a number of novel and useful details, which will be readily evident as the description progresses.

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.

Figure 1 is a side elevation of a bank grader embodying our invention.

Figure 2 is a plan view of a bank grader embodying our invention, parts of the main scow and the pontoons being cut away to eliminate excessive width in the figure.

Figure 3 is an enlarged rear elevation, partly in section, of the handle mounting, taken along the lines 3—3 in Figure 2.

Figure 4 is a miniature sketch showing the general proportions of the scow and the pontoons.

Referring to the drawings, it will be seen that 10 is the scow which carries our machinery. This scow is of very considerable length in the up-and-down-stream direction, to permit great longitudinal travel of the grading machinery. The scow is an important feature of our invention, as it enables the graded material to be scraped down hill.

Lashed to the ends of this scow, in any convenient manner, are long and wide pontoons 11 and 12, part of their width being cut away in Figure 2. These pontoons serve the purpose of regulating the distance of the machinery from that portion of the bank to be graded and that portion of the bank already graded.

13 and 14 are tracks running the entire length of the scow 10. On these tracks operate four trucks 15 to 18, which support the base 19. A turntable 20 rotates on this base, on rollers 21. This turntable carries the motors or engines or other means (not shown) for actuating the machinery for propelling the base along the tracks, and the various winches to be hereinafter referred to.

The turntable also carries an A-frame 22, and a boom 23, with its foot pivoted at 24 to the turntable.

A boom hoist rope 25, actuated by a boom hoist winch 26, serves, at the will of the operator, to determine the angle of inclination of the boom.

A scraper-blade 27 is affixed to the bottom end of a scraper handle 28. This scraper handle is in two parts, as shown in Figure 3, which figure also see for the following description of the mounting of the handle. Each member of the handle operates freely through a saddle block 29. Each saddle block is pivoted in a bearing 30, both bearings being in carriage 31. The two saddle blocks also support a shaft 32. The carriage 31 carries eight wheels 33 which run on tracks 34 on the lower side of the boom 23. A sheave 35 is mounted on shaft 32. The purpose of this sheave will be explained later herein.

The bifurcated handle and the two independently journaled saddle blocks form an important feature of our invention, as they permit a certain degree of twist in the scraper-blade when it strikes an obstruction.

The control of our grader is effected by the pontoons and propelling machinery already

described, and by five winches and six ropes about to be described.

The distance of the scraper-blade 27 from the boom 23 is determined by winch 38 and rope 39, which passes through various unnumbered guides and around sheaves 41, 35 and 42, to an anchorage on the carriage 31. That reach of rope 39 which lies between sheaves 41 and 35, has, at sheave 35 in Figure 1, been slightly offset from its actual position, so that it shall not interfere with other lines of the figure. This reeving of rope 39 is an important feature of our invention, as it serves as a safety device, in case rope 44, to be hereinafter described, should break.

The position of the carriage on the boom is determined by winch 43 and rope 44, which passes through various unnumbered guides and around sheave 45, to an anchorage on the carriage; and also by rope 46, which passes over sheave 47 to an anchorage on the carriage.

The dragging of the scraper-blade 27 is effected by winch 48 and rope 49, which passes through fairlead 50 to an anchorage on the scraper.

The scraper may be hauled backward to begin another cycle by the back haul mechanism, which consists in a winch 51 and rope 52, which passes over various unnumbered guides and around sheave 53, to an anchorage on the scraper.

Although, in the preferred embodiment of our invention, sheaves 41 and 53 are arranged side by side, as shown in Figure 2; yet, for simplicity in demonstrating the reeving of ropes 39 and 52 in Figure 1, we have shown sheave 53 slightly displaced from its actual location.

The operation of our invention is as follows. The pontoons are adjusted, so that one, 11, rests firmly against that part of the bank not yet graded, and the other, 12, rests firmly against that part of the bank which has already been graded; and so that the scow 10 is at such a distance from shore that the grading to be done is all within the scope of the length of the boom 23.

The boom is then set, by means of winch 26 and rope 25 to the proper angle, i. e. exactly the angle to which the bank is to be graded.

The machinery is moved to that end of the scow which lies toward the completed work. An operator on the foot of the boom, by controlling winch 43, gradually moves the carriage 31 from the outer end of the boom 23 toward the scow, during the scraping operation, and at the same time so regulates winch 38 as to keep a uniform length of handle always projecting above the saddle blocks 29, thus insuring that the scraper 27 will scrape a bank parallel to the tracks 34.

Another operator, located on the turntable 20, controls the actual scraping by means of winches 48 and 51. This scraping is done by moving the scraper 27 toward the scow synchronously with the motion of the carriage 31. This synchronous motion is readily accomplished by maintaining the handle at some unvarying inclination.

The winches can be differently distributed to the two operators, if desired, or the stand of one or both of them moved to some other position in the apparatus.

After each swath has been scraped, the machinery is propelled along the tracks to a position to scrape the next swath.

The same machine is also employed as a simple derrick, to lay the concrete slabs before mentioned.

Having now described and illustrated one form of our invention, we wish it to be understood that our invention is not to be limited to the specific form or arrangement of parts hereinbefore described, except in so far as such limitations are specified in the appended claims.

We claim:

1. In a grader, the combination of: a main base; a boom, pivoted thereon; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; means to move the carriage back and forth along the runway; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle.

2. In a grader, the combination of: a main base; a boom, pivoted thereon; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; means to move the carriage back and forth along the runway; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle, and facing toward the main base.

3. In a grader, the combination of: a boat; a boom, pivoted thereon; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; means to move the carriage back and forth along the runway; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle.

4. In a grader, the combination of: a boat; a main base, adapted to traverse the boat; a boom, pivoted on the main base; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway;

means to move the carriage back and forth along the runway; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle.

5. In a grader, the combination of: a scow; pontoons, attached to the ends of the scow, to butt against the bank being graded, whereby to hold the bank-grader in a fixed position with respect to the bank; a main base, adapted to traverse the scow; a boom, pivoted on the main base; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle.

6. In a grader, the combination of: a main base; a boom, pivoted thereon; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; means to move the carriage back and forth along the runway; two saddle blocks, mounted for independent rotation on the carriage, and each adapted to receive slidably one member of the handle; a handle, consisting of two parallel members, and mounted in the saddle blocks to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle.

7. In a grader, the combination of: a main base; a boom, pivoted thereon; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; a winch; a rope running from this winch, over a sheave near the outer end of the boom, and thence to an anchorage on the carriage, to move the carriage outwardly; means to move the carriage inwardly; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; a second winch; a rope running from this second winch, over a sheave near the outer end of the boom, thence over a sheave on the carriage, and thence to a hoisting association with the handle; and a scraper-blade, mounted on the lower end of the handle.

8. In a grader, the combination of: a main base; a turntable thereon; a boom, pivoted on the turntable; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; means to move the carriage back and forth along the runway; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle.

9. In a grader, the combination of: a main base; a turntable thereon; a boom, pivoted on the turntable; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; means to move the carriage back and forth along the runway; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle, and facing toward the main base.

10. In a grader, the combination of: a boat; a turntable thereon; a boom, pivoted on the turntable; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; means to move the carriage back and forth along the runway; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle.

11. In a grader, the combination of: a boat; a main base, adapted to traverse the boat; a turntable on the main base; a boom, pivoted on the turntable; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; means to move the carriage back and forth along the runway; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle.

12. In a grader, the combination of: a main base; a boom, pivoted thereon; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; a winch; a rope running from this winch, over a sheave near the outer end of the boom, and thence to an anchorage on the carriage; a second rope wound the opposite way on this same winch, and running to an anchorage on the carriage; a handle, mounted on the carriage to swing and reciprocate with respect thereto; a scraper-blade, mounted on the lower end of the handle; a second winch; a rope running from this second winch, over a sheave near the outer end of the boom, thence over a sheave on the carriage, and thence to a hoisting association with the handle; a third winch; a rope running from this third winch, over a sheave near the outer end the boom, and thence to an anchorage adjacent the junction of the scraper-blade and handle; a fourth winch; and a rope running from this

fourth winch to an anchorage adjacent the junction of the scraper-blade and handle.

13. In a grader, the combination of: a main base; a boom, pivoted thereon; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; a winch; a rope running from this winch, over a sheave near the outer end of the boom, and thence to an anchorage on the carriage; a second rope, wound the opposite way on this same winch, and running to an anchorage on the carriage; a handle, mounted on this carriage, to swing and reciprocate with respect thereto; a scraper-blade, mounted on the lower end of the handle, and facing toward the main base; a second winch; a rope running from this second winch, over a sheave near the outer end of the boom, thence over a sheave on the carriage, and thence to a hoisting association with the handle; a third winch; a rope running from this third winch, over a sheave near the outer end of the boom, and thence to an anchorage adjacent the junction of the scraper-blade and handle; a fourth winch; and a rope running from this fourth winch to an anchorage adjacent the junction of the scraper-blade and handle.

14. In a grader, the combination of: a scow; pontoons, attached to the ends of the scow, to butt against the bank being graded, whereby to hold the bank-grader in a fixed position with respect to the bank; a main base, adapted to traverse the boat; a turntable on the main base; a boom, pivoted on the turntable; means for adjusting at will the inclination of the boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; a winch; a rope running from this winch, over a sheave near the outer end of the boom, and thence to an anchorage on the carriage; a second rope, wound the opposite way on this same winch, and running to an anchorage on the carriage; a handle, mounted to swing and reciprocate with respect to this carriage; and a scraper-blade, mounted on the lower end of the handle, and facing toward the scow; a second winch; a rope running from this second winch, over a sheave near the outer end of the boom, thence over a sheave on the carriage, and thence to a hoisting association with the handle; a third winch; a rope running from this third winch, over a sheave near the outer end of the boom, and thence to an anchorage adjacent the junction of the scraper-blade and handle; a fourth winch; and a rope running from this fourth winch to an anchorage adjacent the junction of the scraper-blade and handle.

15. In a grader, the combination of: a main base; a boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; means to move the carriage back and forth along the runway; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle.

16. In a grader, the combination of: a main base; a boom; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; means to move the carriage back and forth along the runway; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle, and facing toward the main base.

17. In a grader, the combination of: a main base; a turntable thereon; a boom, on the turntable; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle.

18. In a grader, the combination of: a main base; a turntable thereon; a boom, on the turntable; a runway, lengthwise of the boom; a carriage, adapted to travel on this runway; means to move the carriage back and forth along the runway; a handle, mounted to swing and reciprocate with respect to this carriage; means to swing the handle; means to reciprocate the handle; and a scraper-blade, mounted on the lower end of the handle, and facing toward the main base.

19. In a bank-grader, the combination of: a boat; a main base adapted to traverse the boat; a turntable on the main base; a boom, pivoted on the turntable; excavating instrumentalities carried by the boom; and two pontoons, adapted to be lashed to the ends of the boat, and to butt against the bank being graded, whereby to hold the bank-grader in a fixed position with respect to the bank.

In testimony whereof we affix our signatures.

WERNER LEHMAN.
CHARLES N. BALLENTINE.
J. W. DAHLGREN.