The present invention relates to concrete surfacing implements and particularly to implements primarily designed for simultaneously levelling and surfacing freshly deposited concrete.

It has been the practice for a number of years past, in laying concrete roadways, to deposit freshly mixed concrete between parallel marginal members or screeds and to promptly thereupon the freshly deposited concrete to the action of levelling and surfacing instrumentality. Frequently the concrete confining or screed elements are metallic members of substantial weight and are so well supported in position that they may comprise, in effect, carrying rails for a relatively large and heavy road machine, the road machine in turn supporting a concrete levelling instrumentality and one or more concrete surfacing or smoothing members. Needless to say, mechanisms of this character are extremely bulky and costly and are entirely unsuitable for use in many places where concrete slabs must be laid, as for instance in forming floor slabs of buildings which have been erected or are in the process of erection. It has heretofore been generally customary, in the laying of floor slabs within buildings, for the operator to employ hand operated levelling devices and to follow such devices with individually manipulated relatively small float machines, principally of the rotary type, no combination levelling and smoothing mechanisms heretofore designed or suggested being suitable for use indoors or under conditions which make it necessary that the surfacing implement be freely manipulated around corners and so as to avoid striking pillars and the like.

In accordance with the present invention a combined concrete levelling and smoothing instrumentality is provided which, while useful wherever freshly deposited concrete is to be levelled and smoothed, is nevertheless particularly suitable for use in close quarters, as within buildings in the laying of floor slabs. The improved implement may be readily manipulated manually, being so designed and constructed that it can be drawn forward as rapidly as may be desired with the application of a minimum pushing or pulling force, may be readily turned when necessary and quickly and easily removed at the completion of the levelling and surfacing operation. Furthermore, it is so constructed as to minimize the necessity for the use of screeds, screeds in many instances being wholly unnecessary so long as the operator is provided with some means to indicate the desired level of the completed floor. In order to accomplish this objective the implement is provided with a relatively large work-engaging undersurface, the undersurface area being such that, for a given weight, the implement as a whole will when in use have practically no tendency to cut down into a body of freshly deposited concrete of average consistency, but on the other hand may be easily advanced manually in such manner that its undersurface will move along a true horizontal plane during the time that the grading and smoothing operations are being accomplished.

Naturally, to accomplish grading, the implement must have at least a portion which will not ride upwardly when it strikes a mass of concrete which projects above the level of the surface of the slab which is in process of formation. Hence the implement as constructed comprises two portions, i. e., a grading portion with a relatively narrow elongated work-engaging undersurface, and an entirely separate surface smoothing portion the undersurface of which is relatively wide. The combined area of the undersurfaces of the two work-engaging members is sufficiently great, with relation to the weight of the implement in its entirety, to prevent settlement of the implement into a body of concrete of average consistency when the implement is in use, as previously stated, and of this combined area that of the undersurface of the smoothing implement comprises by far the larger part, the undersurface of the levelling member being only a fraction as large as that of the smoothing member. It is essential to the operation of the implement that both the levelling member and smoothing member be longitudinally reciprocated as the implement is drawn along in a direction normal to these members, which are parallel. Longitudinal reciprocation facilitates the grading or cutting action of the grading member and likewise the smoothing action of the smoothing member. Longitudinal reciprocation of both members is also effective in reducing the resistance to forward movement of the implement. The implement just above briefly described has proven to be eminently successful in actual use and a preferred embodiment thereof is illustrated in the accompanying drawing by way of example.

In the drawing:

Figure 1 is a top plan view of the implement;
Figure 2 is a side elevation; Figure 3 is a section on line 3-3 of Figure 2; Figure 4 is a section on line 4-4 of Figure 2, showing the implement in operative position upon a body of freshly deposited concrete; and Figure 5 is a section on line 5-5 of Figure 1, several of the operative portions illustrated being shown in different positions in full and dotted lines.

Figure 6 is a section on line 6-6 of Figure 4.

In the drawing the smoothing member is indicated generally by the numeral 10 and the grading or levelling member by the numeral 11, these members being relatively long and narrow, parallel, and coextensive in length. The work-engaging portion of the smoothing member comprises a metallic plate 12 and the work-engaging undersurface of the grading member 11 comprises the lower surface of one flange of an angle bar 13. The outer vertical surface of this angle bar 13 likewise functions as a work-engaging surface, as indicated in Figure 4, contacting with and pushing before it that portion of the body of concrete which is above the level which had been selected for the upper surface of the completed slab. The mass of concrete which will be engaged and advanced by the vertical face of the levelling member 11 will, of course, vary and hence the area of engagement of this mass of concrete with the forward face of member 11 will be different at different times as the implement is advanced in the direction of the arrow A in Figure 4. The work-engaging undersurfaces of both members, however, will remain constant and in originally designing the implement the undersurface of the grading member 11 is made relatively narrow in order that the member may have a cutting action or will have the capacity to descend into a body of freshly deposited concrete instead of riding upwardly over the concrete as the implement is advanced, of course the area of this undersurface varying with the weight of the implement.

The area of the undersurface of the smoothing member 12 on the other hand is relatively large and in actual practice the width of the undersurface of the plate 12 is preferably several times the width of the undersurface of the grading member 11, a successful implement for instance having a grading member with an undersurface two inches in width and a smoothing member with an undersurface ten inches in width.

The details of construction of members 10 and 11 may be varied as may be desired. In the embodiment of the invention which is shown grading member 11 comprises a vertically disposed plank to the lower end of which the angle bar 13 is affixed and the surfacing member 10 comprises, in effect, a girder-like frame which includes lower angle members 15, upper angle members 16, uprights 17, and inclined bracing elements 18, thus providing a structure of the greatest rigidity for a given weight, tendency to sag being further counteracted by a stiffening brace rod indicated at 19. Members 10 and 11 are interconnected together by any suitable means which will permit their relative longitudinal reciprocation to a limited extent, but at the same time will unite the two members so that they may be manipulated as a unit for all purposes. Conveniently the members may be provided with a plurality of parallel rods 22, disposed in a plane parallel to the bottom plate 12, and projecting toward the member 11. To the ends of these rods are secured, respectively, the rectangular plates 23 the upper and lower edges of which are also parallel to the plane of the bottom plate and are provided with shoes or slides 24 which are V-shaped in cross section, as shown. The slides 24 are longitudinally reciprocable within rectangular guide frames 25, having V-shaped guides 26 to slidably receive and retain slides 24, the guide frames 25 being bolted or otherwise suitably secured to member 11. By this means the members 10 and 11 are secured together for free relative longitudinal reciprocation while being, at the same time, operatively connected for manipulation as parts of a single implement.

Supported upon the frame of the smoothing member 10 at a central point is a motor bed plate 30 upon which is fixed a motor 31 which may be an electric motor or a gasoline engine. The motor 31 and the underlying bed plate 30 may be shifted longitudinally of the smoothing member 10 to a limited extent, the bed plate 30 being slidably mounted upon parallel supporting angles 32 rigidly secured to the frame of the smoothing member and extending longitudinally thereof. Means may be employed for varying the weight of the motor when desired includes the operating lever 35 fixed to shaft 36 extending transversely of the smoothing member and mounted in bearings 37 secured to this member. Also fixed on shaft 36 are two upwardly extending parallel arms 38 the outer ends of which are connected by links 39 to the bed plate 30.

Mounted in bearings 40 fixed upon smoothing member 10 is a transversely disposed rotatable shaft 41, to one end of which is keyed or otherwise secured a pulley 42 which is preferably in the form of a disk 42a having a grooved periphery. Disk 42a is in the same vertical plane as grooved pulley 44 mounted on a shaft supported by the frame of motor 31 and driven by that motor when the implement is in operation. A belt 45 passing over pulleys 44 and disk 42 serves as a driving belt for disk 42 and the driving connection established by this belt may be established or interrupted as desired by longitudinally moving the motor 31 by means of the hand lever and links 46 previously described. When the hand lever is moved to the right the motor shaft 41 is shown in full lines in Figure 5, the motor is driven to the left (Figure 2), the belt 45 tightly engages the pulley 44, and disk 42 is positively driven by the motor when the motor is in operation. When the handle 35 is lifted to a vertical position, as shown in Figure 2 and in dotted lines in Figure 6, the belt is loosened and disk 42 will no longer be driven even though motor 31 is in operation.

As clearly disclosed in Figure 2, disk 42 is provided with an eccentric pin 50, which pin is connected by a link 51 to a pin 52 mounted in a bracket 53 fixed upon the top of the reciprocating member 11. When the motor is in operation and disk 42 is being rotated the link 51 will serve to transmit forces which tend to effect relative movement of members 10 and 11 first in one direction and then in the opposite direction and, in the normal operation of the implement, the forces thus transmitted during grading and surfacing of freshly deposited concrete there is simultaneous movement of the two members in opposite directions, the speed of longitudinal reciprocation of each member being dependent upon the speed of operation of the motor 31. It is apparent that the members 10 and 11 are so designed with relation to each other that both are longitudinally moved by the power means em-
ployed, instead of one only, as is customary with all other types of similar mechanisms heretofore proposed or used. The frictional resistance to the movement of each member is, of course, a function of the weight of that member and the extent of its bearing area upon the concrete below. In the case of the embodiment of the invention illustrated, in which the width of the work-engaging face of the smoothing member is ten inches and the width of the work-engaging face of the grading member is two inches, the actual weight of the smoothing member, including the operating motor, is approximately 200 pounds and the actual weight of the grading member is approximately 85 pounds. With an implement the grading and smoothing members of which are 16 feet long it follows that the approximate pressure per square inch which will be exerted upon a body of concrete by the work-engaging undersurface of the implement will be fourteen one-hundredths (.14) pound.

By reason of the manner in which the implement has been designed, and further because, in the operation of the implement, all of its work-engaging surfaces are continually in motion, the implement will tend to maintain itself in the same horizontal plane if it is drawn over a body of freshly deposited concrete mix of average consistency, a most important point of advantage inasmuch as the customary screeds may, if desired, be dispensed with and only a few spaced grade markers retained for the guidance of the operator. By reason of its light weight the implement may be readily manipulated, being easily drawn by two operators by any suitable handle means, such for instance as the handles indicated at 60 and 61, secured to the smoothing member 10 and extending outwardly and upwardly therefrom so that the cross bars 60a and 61a of the respective handles are at a convenient elevation to be clasped. The handles are, of course, reciprocated with the smoothing member, but the amplitude of reciprocation is not great, only a few inches in the average case, and the motion is not unpleasant to the worker. An implement of the type described will surface a large area of freshly deposited concrete in a short time, effecting a very substantial saving over other implements heretofore designed for similar purposes and the surface which results from the operation of the implement is sufficiently smooth and true to be the final surface of the slab being formed. Naturally, however, final trowelling is recommended for interior surfaces.

It will be appreciated by one skilled in the art that the design and arrangement of the implement may be substantially varied in adapting the invention in the fabrication of implements for special uses. The implement may be made in any desired length and its weight may be increased where the concrete mixtures which it has to deal with are unusually dry or decreased where the mixtures are to be unusually wet. Considerable modification of the invention, therefore, is permissible without departure from its teaching.

This application is a continuation-in-part of my prior application, Serial No. 415,803, filed October 20, 1941.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A concrete surfacing implement comprising smoothing and grading members and power means mounted on one of said members and operatively connected to the other member, said members being elongated and disposed in parallelism and the power means effecting, when in operation, relative longitudinal movement of said members, the area of the work-engaging surface of the smoothing member being at least several times as great as the area of the work-engaging undersurface of the grading member while the pressure exerted by each unit area of the smoothing member upon the work is only a fraction of the pressure exerted by each similar unit area of the grading member against the work.

2. A concrete surfacing implement comprising smoothing and grading members and power means mounted on one of said members and operatively connected to the other member, said members being elongated and disposed in parallelism and the power means effecting, when in operation, relative longitudinal movement of said members, the area of the work-engaging surface of the smoothing member being approximately five times as great as the area of the work-engaging undersurface of the grading member while the pressure exerted by the smoothing member upon the work is less than half, per unit of area, of the pressure exerted by the grading member upon the work.

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