

J. B. HILL.
DITCHING MACHINE.
APPLICATION FILED JULY 17, 1908.

941,145.

Patented Nov. 23, 1909.

3 SHEETS—SHEET 1.

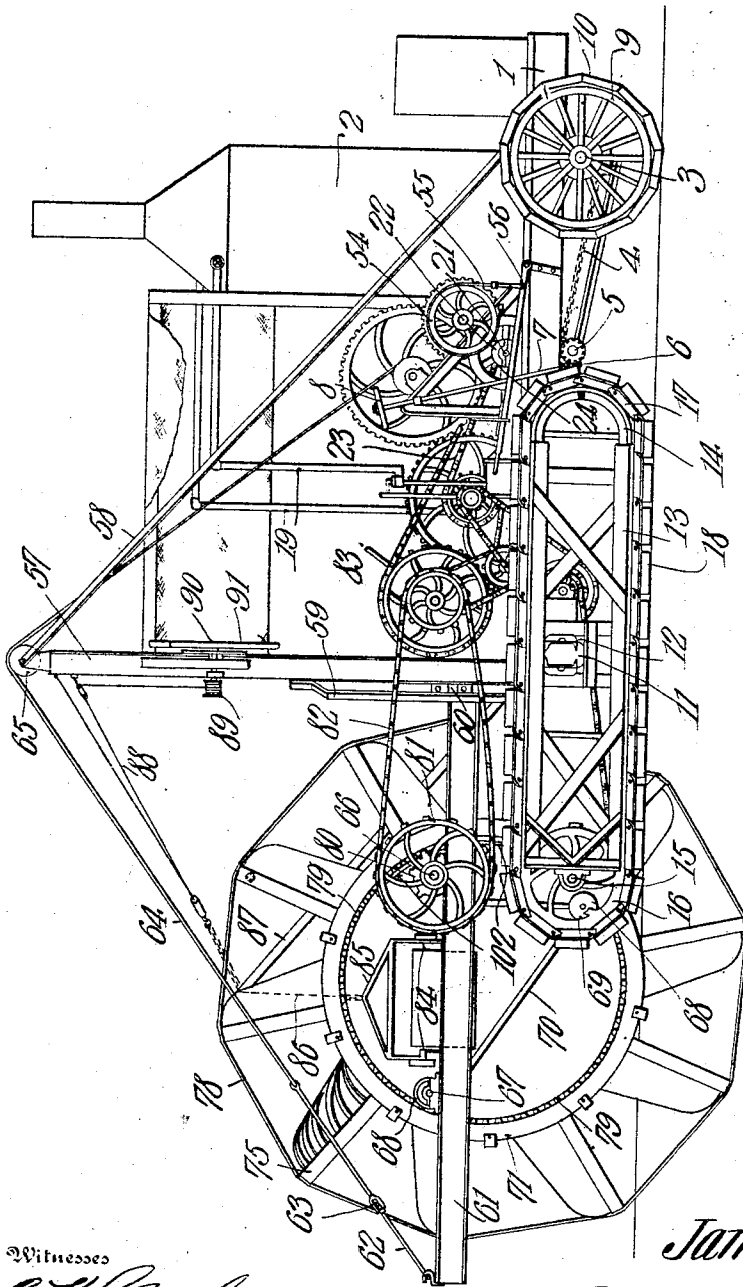


Fig. 1.

Witnesses
E. J. [Signature]
F. T. [Signature]

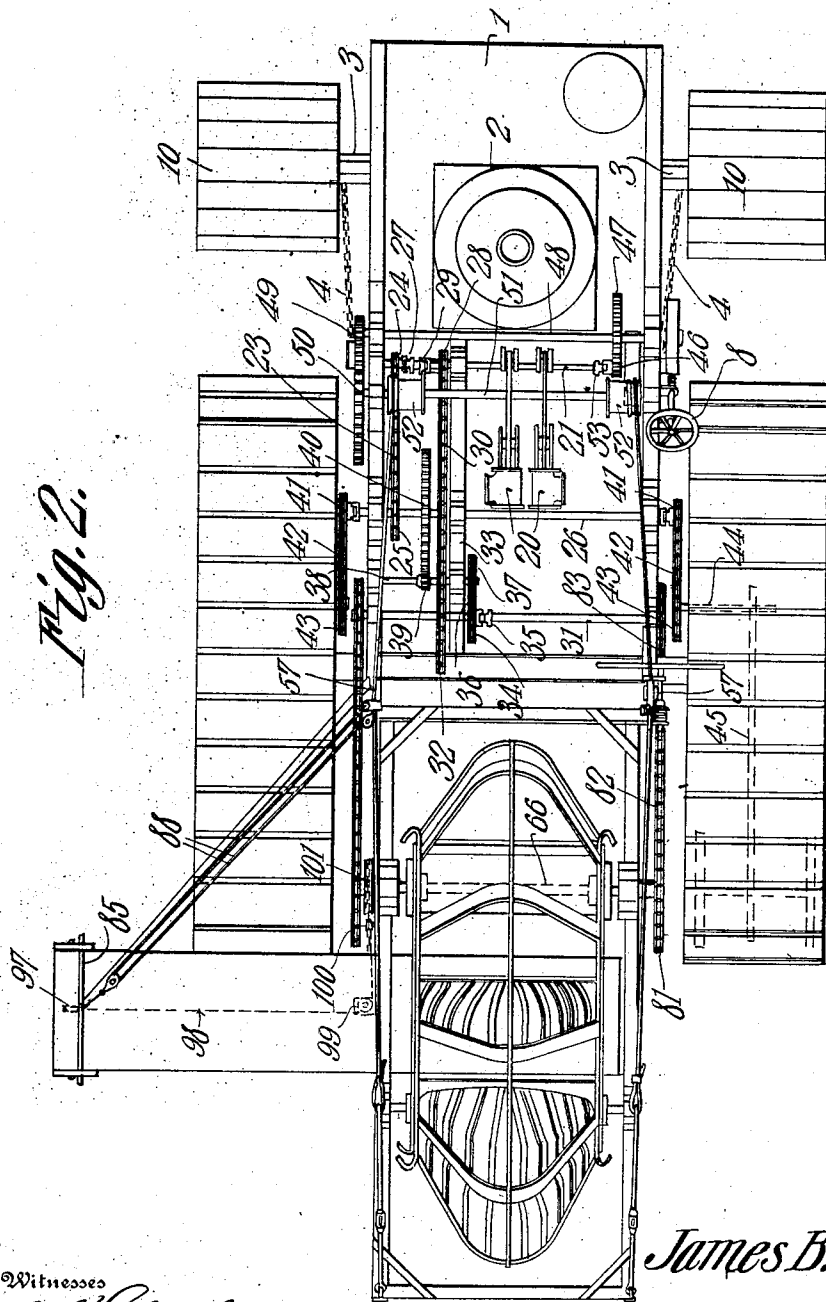
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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 3.

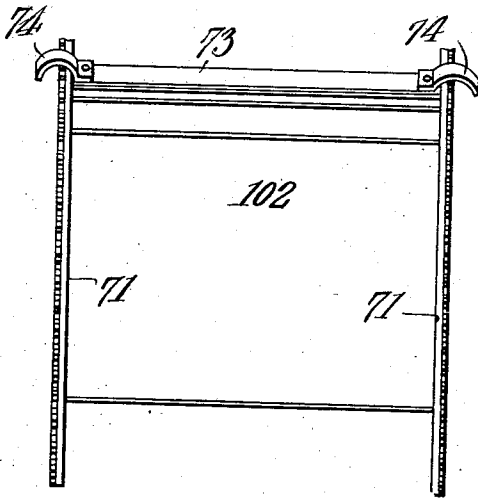
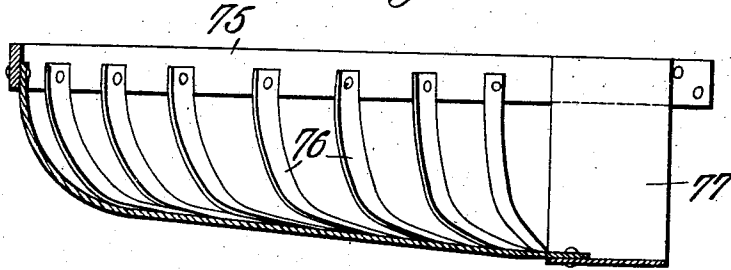


Fig. 4.

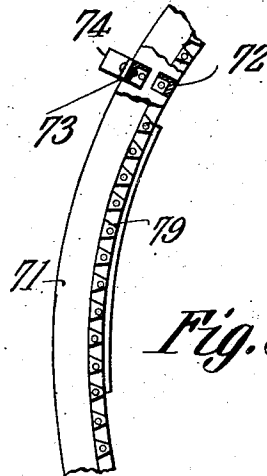


Fig. 5.

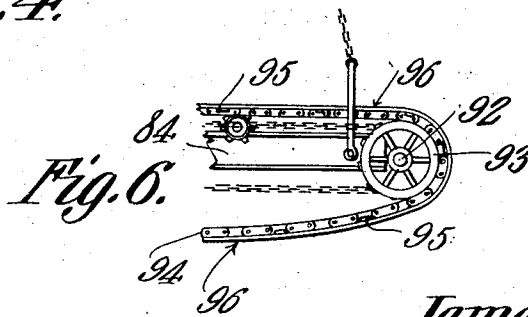


Fig. 6.

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UNITED STATES PATENT OFFICE.

JAMES B. HILL, OF FINDLAY, OHIO.

DITCHING-MACHINE.

941,145.

Specification of Letters Patent.

Patented Nov. 23, 1909.

Application filed July 17, 1908. Serial No. 444,015.

To all whom it may concern:

Be it known that I, JAMES B. HILL, a citizen of the United States, residing at Findlay, in the county of Hancock and State of Ohio, have invented a new and useful Ditching-Machine, of which the following is a specification.

This invention has reference to improvements in ditching machines, and its object is to produce a self-propelling ditching machine, capable of operation particularly on soft marshy ground.

The invention comprises a suitable carrier or vehicle mounted at the forward end upon broad supporting wheels and at the rear end upon long broad traction aprons, and adjacent to the aprons the carrier supports a ditching wheel having about its periphery a number of buckets, which are part solid and part basket, so as to adapt them to excavate in wet ground and remove dirt while allowing the water to drain away. In connection with the excavating wheel there is provided a conveyer upon which the buckets dump, and which will transport the excavated dirt to one side of the ditch, and either deposit it upon the ground or upon suitable vehicles for conveyance to a distant point.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming a part of this specification, in which drawings,

Figure 1 is a side elevation of the improved ditching machine. Fig. 2 is a plan view of the same, and Figs. 3, 4, 5 and 6 are detail views.

Referring to the drawings there is shown a platform 1 near one end of which is mounted a boiler 2. At the boiler end of the platform there is mounted an axle 3, connected near each end by a chain 4 to the corresponding end of a shaft 5 journaled in suitable bearings beneath the platform 1. The shaft 5 is coupled by worm gearing 6 to another shaft 7 extending upward above the platform, and terminating in a manipulating wheel 8, constituting the steering wheel of the structure.

Upon each end of the axle 3 there is mounted a wheel 9 having a broad polygonal periphery 10 made up of a continuous series of juxtaposed segments. By providing a broad polygonal tread for the wheels 9 they become well suited for soft, marshy ground and will sustain the weight of the

structure without sinking too deeply into such ground.

Near the other end of the platform 1 is a cross beam or axle 11 extending beyond the sides of the platform and strengthened by suitable longitudinal channel irons 12. At each end of the beam or axle 11 there is secured a rectangular frame 13. The top and bottom longitudinal members of the frame 13 are connected at one end by the semi-circular tracks 14, and at the other end there is a transverse shaft 15 carrying sprocket wheels 16, near each end corresponding to the track 14, at the other extremity of the frame 13. The top and bottom members of the frames 13 and the end members 14, constitute tracks for endless series of links 17 connected together at their ends and each carrying the corresponding end of a tread member 18. The series of links 17 also extend around the sprocket wheels 16 on the shaft 15, so that when the latter is propelled by suitable power, the treads 18 are carried continuously around the frame 13, progressively. The endless series of treads constitute supports for the corresponding end of the machine, and are in line with the wheels 9.

Steam from the boiler is conveyed through pipes 19 to cylinders 20 constituting the engine cylinders, and the pistons of the cylinders are connected up to the main shaft 21 upon which is mounted a suitable fly-wheel 22.

Power is transmitted from the main shaft 21 by a sprocket chain drive 23, from a pinion 24 on the main shaft to a sprocket chain gear 25 on another shaft 26, mounted on the main platform 1. The pinion 24 is not normally in engagement with the shaft 21 but may be coupled to or uncoupled therefrom through a suitable clutch 27. Mounted upon the main shaft 21 is another sprocket pinion 28 under the control of a suitable clutch 29 by means of which the sprocket pinion 28 may be coupled to or uncoupled from the main shaft 21. The sprocket pinion 28 receives a sprocket chain 30 through which power is conveyed to a shaft 31 through the intermediary of a sprocket gear wheel 32. The shaft 31 is suitably journaled upon supporting members 33 erected upon the platform 1. The shaft 31 carries a sprocket gear wheel 34 arranged to be coupled to or uncoupled from the shaft 31 by means of a suitable clutch 35. Power is transmitted

from the shaft 31 by means of a sprocket chain 36 engaging the sprocket wheel 34 on the shaft 31, and another sprocket wheel 37 on a counter-shaft 38 journaled on the support 33. The counter-shaft 38 carries a pinion 39 in mesh with the gear wheel 40 mounted on a shaft 26.

At each end of the shaft 26 there is mounted a sprocket wheel 41 coupled by a sprocket chain 42 to another sprocket wheel 43 on a counter-shaft 44 mounted in the corresponding frame 13 and transmitting power by means of the sprocket chain 45, to the shaft 15, before described.

The construction is such that power may be transmitted to the traction apron made up of the links 17 and members or treads 18 to propel the entire structure in either direction at appropriate speed and without necessity of stopping or reversing the engine. On the power shaft 21 there is a pinion 46 meshing with the gear wheel 47 on another shaft 48, which latter in turn carries a pinion 49 meshing with the gear wheel 50 on another shaft 51, carrying two drums 52 and suitably journaled on the support 33 as shown. The pinion 46 is under the control of a suitable clutch 53 by means of which the pinion 46 may be coupled to or uncoupled from the drive shaft 21 at will. On one end of the shaft 48 is a band wheel 54 engaged by a friction band 55 connected to and under the control of an operating lever 56 pivotally secured at an appropriate point on the platform 1. At the end of the frame 1 remote from the boiler 2 are erected two posts 57 spaced apart a distance equal to the width of the frame or platform 1. The upper ends of these uprights are held firmly by brace rods 58 extending therefrom to the other end of the frame or platform 1.

Secured to but spaced from the lower edges of the uprights remote from the platform 1 are guide members 59, receiving between them and the said uprights the pivot support 60 of a U-shaped frame 61, the pivots being at the free ends of the side members of the frame, and the connecting member of the frame being at the end remote from the pivot or at the outer end of said frame.

Secured to the outer ends of the side members of the frame 61 are adjustable links 62, made adjustable by an included turn-buckle 63. Connected to these links 62 is a flexible cable or chain 64 extending over a pulley 65 on the upper end of a respective one of the uprights 57, and from thence to a respective one of the drums 52 on the shaft 51. By coupling up the engine power shaft 21 to the shaft 48 and then to the shaft 51, the outer end of the frame 61 may be elevated when desired by winding up the chains or cables 64 upon the drums 52. When however, it is desired to lower the

frame 61 about its pivot support 60, the shaft 48 which is normally disconnected from the power shaft is permitted to rotate by relieving the pressure of the friction band 55 upon the friction wheel 54, when the weight of the frame 61 and parts carried thereby will cause the said frame to gravitate toward the lower position, and unwind the cables or chains 64 from the drums 52.

Extending laterally across the frame 61 at appropriate points thereon and mounted in suitable journal supports on the side members of said frame are two shafts 66 and 67 each carrying a pair of supporting rollers 68 and at another point approximately 120° distant more or less from the shafts 67 and 66 is a third shaft 69, also carrying rollers 68 and supported by suitable straps or braces 70 fast on the frame 61. The rollers 68 are shaped and designed to each receive and carry two spaced annular side members 71 of the ditching wheel. These two annular side members are connected together and at the same time spaced apart by pairs of angle bars 72 and 73, secured to the side members adjacent to their respective inner and outer peripheries. Fast to the spacing bars 73 are curved plates 74 projecting for a distance beyond the outer faces of the respective annular side members 71.

Firmly secured to and extending radially outward from the two annular side members 71 of the ditching wheel are the cutting edge members 75 of the ditching buckets, these buckets being completed by spaced strips 76 each connected at one end to the cutting member 75 and at the other end brought to a supporting cross piece 77, to which all the strips are connected in substantially parallel relation at their inner ends. The buckets therefore, both constitute cutters and baskets for loosening up dirt and for carrying the same to a point of deposit while any water which may be contained in the earth drains off through the spaces between the strips 76. This is particularly valuable where the ditching machine is used in wet or marshy ground for the water readily escapes through the basket-like buckets and is not elevated by the action of the ditching wheel. The outer ends of all the cutters 75 are connected together by bars 78, so that while the outer ends of the buckets are some distance from the annular side members 71, each serves to support the next adjacent one against the strain of digging because of the connecting bars 78.

Formed on or secured to the outer faces of the annular members 71 near the inner periphery thereof, are projecting teeth 79 with which engage suitable teeth formed on a pinion 80 fast on the shaft 66, there being a pinion for each series of teeth 79. The shaft 66 also carries a sprocket wheel 81 with

which engages a sprocket chain 82, in turn engaging another sprocket wheel 83 on the shaft 31. By this means power is transmitted from the engine to the ditching wheel so that the latter may be rotated in the proper direction at the proper speed and started or stopped at the will of the operator.

Supported by the frame 61 is a conveyer frame, the side members 84 of which are shown in Fig. 1 as composed of channel iron. The inner end of this conveyer frame is pivotally mounted on the frame 61 and the outer end is supported by a yoke 85 carried by a chain 86 extending over the outer end of a boom 87 to which it is connected, and then to a suitable tackle 88 having one end connected to one of the uprights 57, and the other to a winding drum 89 on a short shaft 90 journaled in the other upright 57 to be within reach of the operator who is stationed on the corresponding side of the machine. A hand wheel 91 serves to operate the shaft 90, and so controls the tackle connected to the drum 89. By means of the hand wheel 91, the outer end of the conveyer frame may be elevated or lowered and may be held in the adjusted position by a suitable pawl and ratchet which, however, are not shown in the drawings, this being a very common expedient for the purpose.

At the outer end of the conveyer frame is a shaft 92 carrying at its outer ends sprocket wheels 93 over which pass sprocket chains 94 connected by cross pieces 95, to which is fastened a heavy canvas belt 96 forming the receiving surface of the conveyer. The shaft 92 carries a chain wheel 97 by means of which rotative movement is imparted to the shaft 92. The chain wheel 97 receives motion from an endless chain 98, extending over idlers 99 and 100 by means of which its direction of movement is changed and finally passing around a chain wheel 101 fast on one end of the shaft 66, so that the conveyer is set in motion in an appropriate direction as the ditching wheel rotates.

Carried by the frame 61 interior to but in close relation to the annular side members 71, is a curved plate 102 so located as to close the inner ends of the buckets against discharge during a certain portion of their rotation about the axis of the ditching wheel for a purpose which will presently appear.

Let it be assumed that it is desirable to dig a ditch in soft, moist or marshy ground. The ditching machine is conveyed to the desired location under its own steam acting then as a traction engine and because of the extensive surface presented by the polygonal wheels 10 and traction apron by which the engine is propelled, the very broad surface presented prevents the machine from sinking into the soft ground to any material extent; but at the same time a slight separa-

tion of the contiguous edges of the strips 18 will enable the traction apron to obtain a firm grip upon the soft ground. While the machine is being transported to the point where the ditching operation is to begin the ditching wheel is held in an elevated position so as to prevent it from engaging the ground. When, however, it is desirable to begin the ditching operation, the ditching wheel is lowered until it is in engagement with the ground, by a suitable manipulation of the friction wheel 54. By suitably coupling up the ditching wheel to the engine, rotary motion is imparted to the ditching wheel in a direction which will cause its lower portion to move in the same direction as the travel of the machine and as the ditching operation progresses, the buckets are allowed to sink into the ground to the desired depth of the ditch, and then the machine may progress and the ditch be dug at a uniform depth. As the buckets are lifted out of the ground any free water which may be contained in the dirt will find its way through the strips 76, back into the ditch, and the comparatively dry dirt will be elevated toward the upper part of the wheel. The inner ends of the buckets are open or free from obstruction, and so when they approach the horizontal position there is a likelihood of their contents falling out of the inner ends of the buckets. It is for this reason that the plate 102 is provided so that the contents of the buckets can not escape until the upper end of the plate is reached, and this upper end is so located that when the buckets discharge it will be upon the conveyer canvas 96, the said conveyer extending entirely through the ditching wheel, so as to readily receive any dirt discharged from the buckets, which discharge of the dirt is of course, effected by gravity. As the ditching operation proceeds the conveyer is also caused to move so as to carry the excavated dirt away from the machine and deposit it at some considerable distance from the ditch, or if desired it may be deposited into carts and conveyed to a greater distance from the ditch. The elevation of the outer end of the conveyer is controlled by a suitable manipulation of the hand wheel 91, and this elevation will depend upon the amount of dirt excavated and the speed of the conveyer, which factors will determine the height of the pile of dirt deposited from the end of the conveyer.

The depth of cutter may be regulated by adjusting the pivot supports 60 of the frame 61 vertically in the space between the guides 59 and the uprights 57 so that the frame 61 may always be set approximately horizontal independent of the depth of cut, and the conveyer apron will therefore, also be in a substantially horizontal plane laterally, so that the material deposited thereon from the

buckets will not tend to gravitate off the sides of the conveyer.

It is to be observed that the traction aprons provide an extensive support for the ditching machine whereby it is adapted to operate in soft or marshy ground, while at the same time a large tractive surface is provided which is necessary in marshy ground where the character of the surface would cause an ordinary traction wheel to slip.

The connections between the engine and the traction aprons and also the ditching wheel are such that the ditching machine may be propelled in either direction, and the ditching wheel may be rotated independent of the movement of the machine and also the ditching machine may be given a forward movement during the rotative movement of the ditching wheel, which latter will be the ordinary condition for continuous ditching operation.

What is claimed is:

1. In a ditching machine, a ditching wheel having radial buckets each composed of a radially disposed cutting rim and a basket receptacle for the excavated material, formed of strips fast at one end to the cutting rim, and at the other end lying approximately parallel and connected to a cross strip at the discharge end of the bucket.

2. In a ditching machine, a ditching wheel having radially disposed cutting buckets all interconnected at the ends most distant from the axis of rotation of the wheels.

3. In a ditching machine, a ditching wheel provided with buckets having radial cutting members all interconnected at their outer ends, and basket receptacles for the excavated material comprising separated strips all connected at one end to the cutting members of the bucket, and at the other end to a common cross member at the discharge end of the bucket.

4. In a ditching machine, a ditching wheel comprised of two spaced annular members, spacing bars connecting said members, cutters connected to the outer spacing bars and projecting laterally beyond the outer face of the annular members, and ditching buckets extending radially from the annular members, each bucket being composed of a cutting member extending radially from the annular members, and a basket for the reception of the excavated material composed of spaced strips each connected at one end to the cutting member of the bucket and at the other end to a common connecting member extending between the inner ends of the cutting member at the discharge end of the bucket, all the buckets being interconnected at their outer ends.

5. A ditching machine comprising a suitable vehicle, power means thereon, steering wheels having broad polygonal peripheries, broad elongated endless traction aprons in line with the steering wheels and operatively connected to the prime mover of the vehicle, a ditching wheel pivotally supported on the vehicle and having its pivot support adjustable in a vertical plane, said ditching wheel having radially extended buckets interconnected at their outer ends and provided with basket receptacles for the excavated material, an adjustable conveyer extending into the ditching wheel and carried by the ditching wheel support, means for adjusting the ditching wheel in a vertical plane about its pivot support, and means for coupling the ditching wheel, or the traction aprons, or both to the prime mover of the vehicle at will.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JAMES B. HILL.

Witnesses:

G. F. WALTON,
H. C. WARFEL.