(No Model.)

S. KERSHNER.

ROTARY ENGINE.

No. 602,456. Patented Apr. 19, 1898.

Fig. 1,

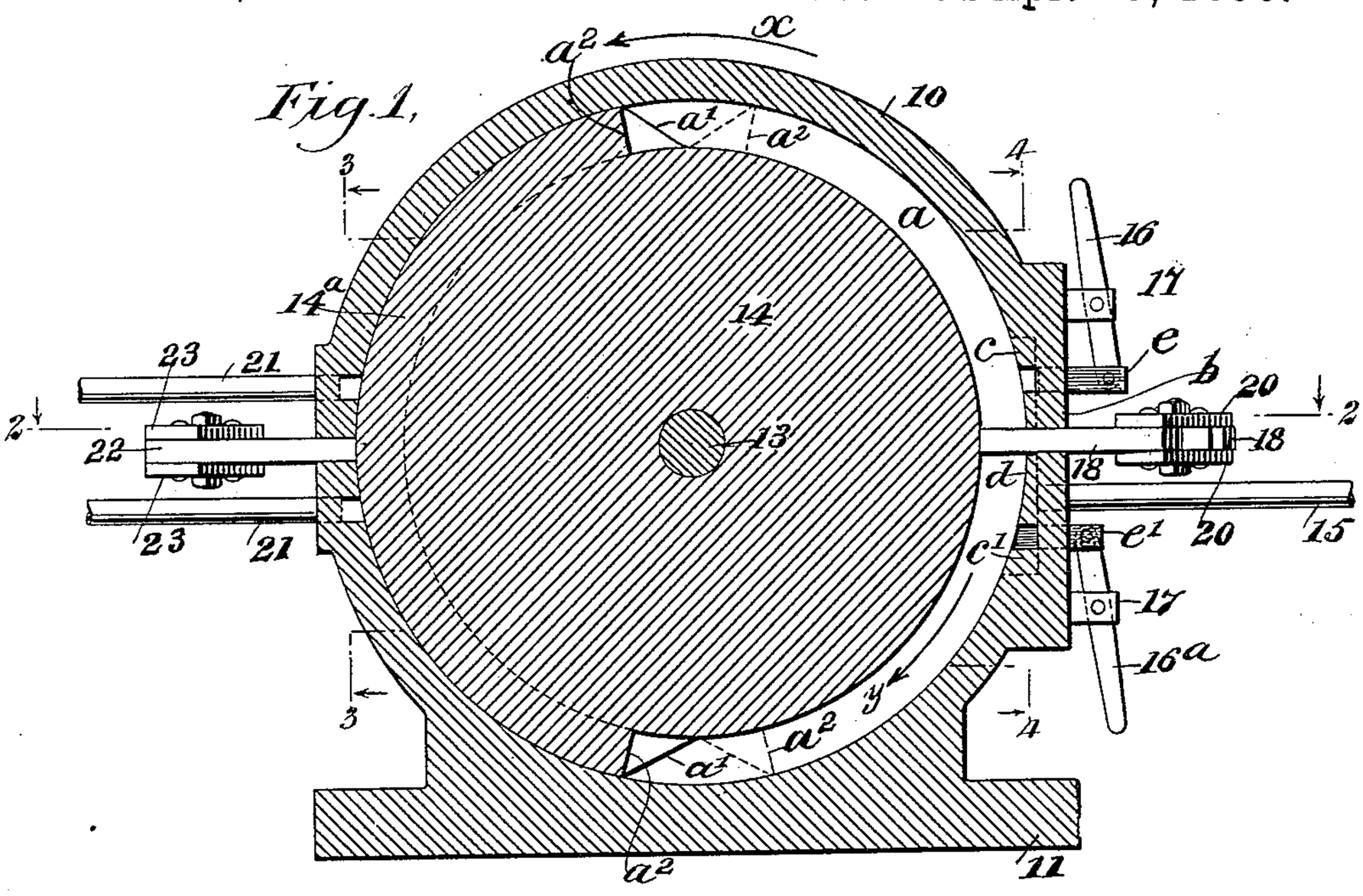


Fig. 2,

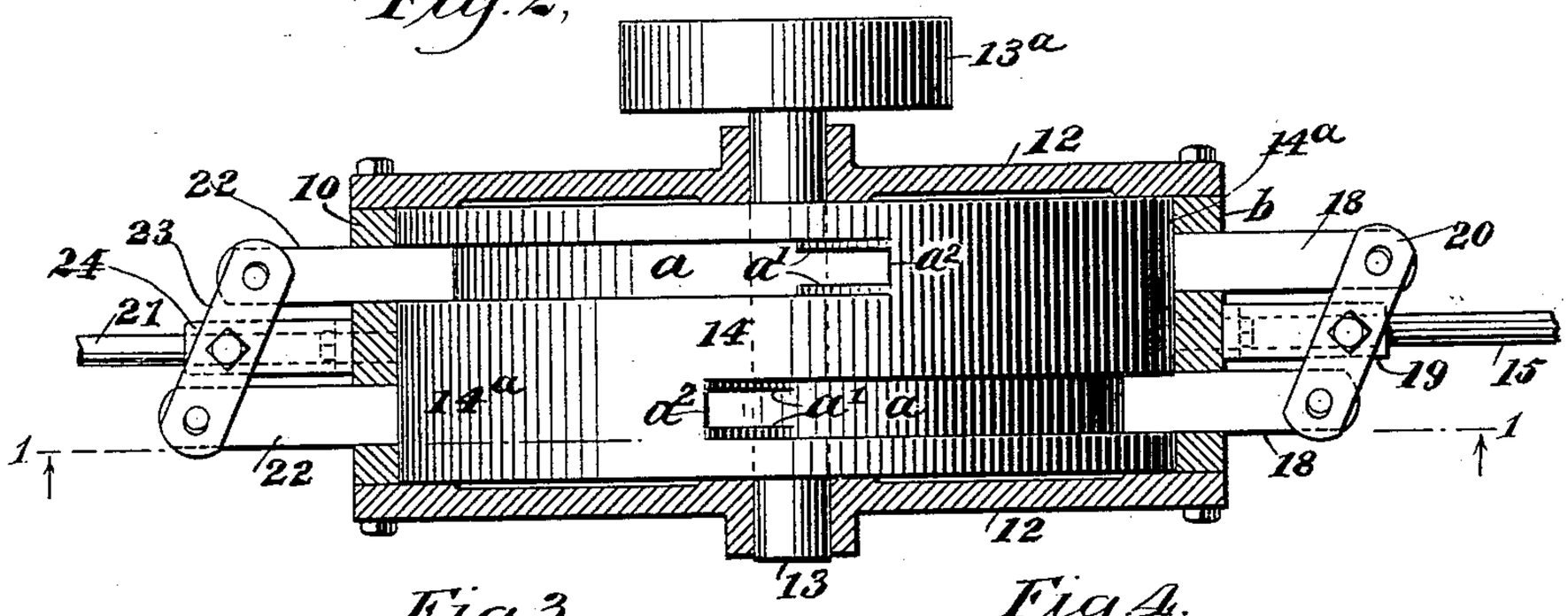


Fig. 3,

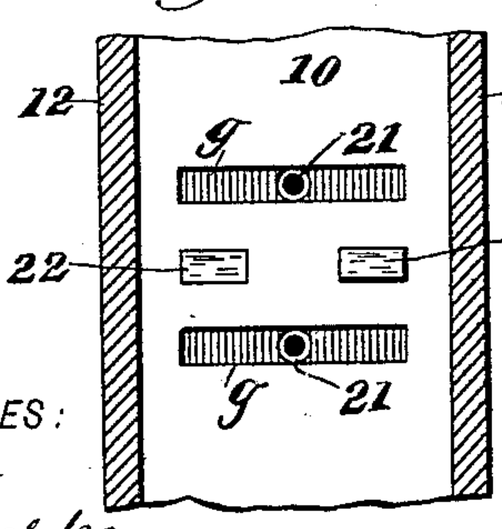
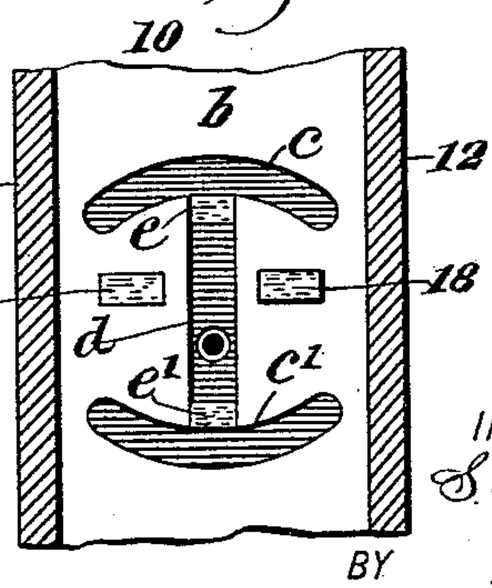


Fig. 4.



WITNESSES:

Edward Thorpe.

Wm. P. Patton

INVENTOR

S. Kershner.

BY

ATTORNEYS.

UNITED STATES PATENT OFFICE.

STURGEON KERSHNER, OF BLUE HILL, NEBRASKA, ASSIGNOR OF ONE-FOURTH TO FERDINAND KERSHNER, OF MARION, IOWA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 602,456, dated April 19, 1898.

Application filed June 8, 1897. Serial No. 639,871. (No model.)

To all whom it may concern:

Be it known that I, STURGEON KERSHNER, of Blue Hill, in the county of Webster and State of Nebraska, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

This invention relates to engines of the rotary type using steam or other fluid as a motive agent.

The object of my invention is to provide novel details of construction for an engine of the indicated type which will afford a high degree of operative efficiency by the consumption of the motive agent in an economical manner, a further object being to provide an engine of the indicated character with means for the instant reversion of motion in the working parts of the engine, as occasion may require.

The invention consists in the novel construction and combination of parts, as is hereinafter described, and defined in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side view of the improved engine substantially on the line 1 1 in Fig. 2. Fig. 2 is a sectional plan view essentially on the line 2 2 in Fig. 1. Fig. 3 is a transverse sectional view of interior details substantially on the line 3 3 in Fig. 1, and Fig. 4 is a transverse sectional view substantially on the line 4 4 in Fig. 1.

In the drawings illustrating an embodiment of my invention, 10 indicates the engine-cylinder, having a base 11, whereon it is maintained in an upright position when erected for service.

The true circular bore of the cylinder 10 is closed steam-tight at each side of said cylinder by the attached side plates or heads 12, as indicated in Fig. 2.

The heads 12 are centrally perforated for the reception of the shaft 13, which is revolubly engaged therewith, and upon said shaft a circular piston-block 14 is secured.

The piston-block 14 is peripherally a true cylinder and has a steam-tight running engagement with the bore of the cylinder 10, and the true parallel end walls of the piston-block are also adapted to work steam-tight in contact with the inner surface of the cylinder-heads 12 near their peripheries.

In the circumferential wall of the piston-block 14 two essentially semicircular channels *a* are formed, and said channels, that are flat-bottomed and have perpendicular side walls, lie near opposite ends of the piston-block at opposite sides of the central shaft 13, as indicated in Figs. 1 and 2 by full and dotted lines, it being of advantage to make the channels *a* of an equal depth throughout their length.

At one side of the circumferential wall of the case or cylinder 10 a steam-chest *b* is formed or secured, and the inner surface of said chest in its general contour conforms with and becomes a portion of the circular bore of the cylinder.

The outer surface of the chest *b* may be rendered flat and vertical, as shown in Fig. 1, and at a suitable point the body of the chest is perforated for the introduction and attachment therein of one end of the steam-conduit pipe 15.

The live-steam pipe 15, that is to be extended to any source of steam-supply, (not shown,) is advantageously introduced at or near the transverse center of the chest *b* and is so removed from the ends of the latter that two similar transversely-disposed steam-ducts *c c'*, in the form of channels, may be produced in the body of the chest, one at each side of the steam-pipe 15, respectively above and below said pipe, as shown in Fig. 4.

The ducts *c c'* are connected by a vertical channel *d*, which is intersected by the perforation wherein the live-steam pipe 15 is introduced, so that steam from said pipe may pass through the channel *d* into either or both of the transverse ducts *c c'*, if unobstructed.

To control the influx of steam or other motive agent into the ducts *c c'* and thence into the channels *a*, as will be further explained, the similar pair of gate-valves *e e'* are provided.

The gate-valves *e e'* are introduced steam-tight through suitably-formed apertures in the body of the chest *b*, and at their outer ends, which project sufficiently from the exterior wall of the chest, said valves are pivoted upon the inner ends of two rockable le-

vers 16 16ª, which are pivoted intermediately of their extremities upon posts 17, whereby said levers are adapted to move the gate-valves toward or from the piston-block 14, between the channels *a*, at which points the periphery of said block is continuously circular.

Between the gate-valves *e e'* and at each side of the steam-duct *d* two orifices are formed in the body of the chest *b* for the slidable insertion therein of the similar abutment-bars 18, that project steam-tight therethrough.

A post 19 projects from the chest *b* to afford support for two rocking arms 20, said post being placed between the abutment-bars 18, so that the rocking arms, which are pivoted upon opposite sides of the post, at its outer end and near their longitudinal centers, may with their outer end portions embrace the outer ends of the abutment-bars and be pivoted thereto, as shown in Figs. 1 and 2.

The abutment-bars 18 are so spaced apart that their inner ends will freely enter respective channels *a*, which they come opposite to when the piston-block 14 is revolved.

To enable the free entrance and exit of the ends of the abutment-bars 18 in and from the semicircular channels *a*, each extremity of each channel is provided with inclines *a'*, that are at the sides of the channel, the latter ending at each termination of the same in a vertical shoulder a^2, that is located between the slopes or inclines *a'*, as shown in Figs. 1 and 2.

It will be evident that if the parts are correctly proportioned one of the abutment-bars 18 may be seated upon the flat bottom of the channel it is adapted to enter by sliding down the inclines or slopes *a'*, while the other abutment-bar is moved outwardly on account of the contact of its inner end with the circumferential wall of the piston-block between the ends of the channel *a* it will occupy, when the said block is rotatably moved a half-revolution in either direction.

To facilitate the easy movement of the bars 18 toward and from the piston-block 14, the joints where the rocking arms 20 are pivoted to said bars may have pivot-holes therein slightly elongated, as represented in Fig. 2, which will avoid a cramping action of parts and permit the bars 18 to move freely in parallel planes.

On the side of the cylinder 10 oppositely from the chest *b* two exhaust-steam pipes 21 are inserted in perforations in the cylinder-wall, said pipes being positioned in the same plane near the transverse center of the cylinder, as shown in Figs. 2 and 3.

The inner end of each of the exhaust-pipes 21 communicates with a transverse recess *g*, said recesses being formed on the inside of the wall of the cylinder and have such length as will permit them to have communication with each channel *a* when the piston-block 14 is rotated.

Between the spaced transverse ducts or recesses *g* two abutment-bars 22 are positioned, said bars being slidably engaged in a steam-tight manner with suitably-shaped orifices formed in the wall of the cylinder 10.

The abutment-bars 22 at their outer ends are pivoted between rocking bars 23, that at their longitudinal centers are pivoted upon a post 24, which laterally projects from the cylinder 10.

The abutment-bars 22 are so spaced apart as to allow their inner extremities to freely enter the channels *a*, which they are opposite, and the construction of the pivot-joints between the rocking bars 23 and the abutment-bars is such as will facilitate the free movement of the latter in parallel planes.

The abutment-bars 22 are so arranged with regard to the opposite abutment-bars 18 that when one bar 22 is in one of the steamways or channels *a* the abutment-bar 18, that is directly opposite said bar 22, will be moved outward by reason of its riding upon the convex face of the piston-block between the shoulders a^2 of the steamways *a*, and as the piston-block is rotated the relative positions of the opposite abutment-bars 18 22 are reversed in alternate order.

For convenience in designating the blank sections 14ª, that are circumferential portions of the piston-block 14, intervening the ends of the steamways *a*, said blank parts may be termed "cams," as in effect they have the function of cams to periodically actuate the abutment-bars 18 and 22.

In operation steam or other motive agent is introduced through the live-steam pipe 15 into the vertical steam-duct *d*. If the piston-block 14 is to rotate in the direction of the arrow *x* in Fig. 1, then the lower gate-valve *e'* is closed by moving it inwardly, as represented in said figure, while the upper gate-valve *e* is slid outwardly. This described adjustment of the gate-valves *e e'* causes inducted steam to pass up through the duct *d* into the upper transverse steam-duct *c* and thence into each circumferential steamway *a* as the piston-block is rotatably moved by pressure of steam. It will be seen that the abutment-bar 18, that is occupying the steamway *a*, as shown in Figs. 1 and 2, at the right-hand side of the piston-block 14, affords an abutment for live steam that enters the steamway above said abutment-bar and presses on the adjacent shoulder a^2, so as to revolve the piston-block in the direction of the arrow *x*. When the rotatable movement of the piston-block 14 causes the lowermost shoulder a^2, that is the lower terminal of the steamway *a*, (shown in Fig. 2,) to pass the abutment-bar 18, that has occupied said steamway, then the cam 14ª, which follows the steamway mentioned, will raise the said abutment-bar and rock the other abutment-bar 18 down into the remaining steamway *a*, which at this instant has been brought into position for such an engagement of the abutment-bar therewith. Obviously the inducted live steam will now continue the rotatable movement of the piston-block in the direction of the arrow *x*,

and the shaft 13, with the pulley 13^a thereon, will be continuously revolved for actuation of other machinery, as may be desired. As the channels or steamways *a* have an equal depth throughout their length, as shown by full and dotted lines in Fig. 1, it will be evident that the area of steam-pressure on the abutments 18 22 will be alike throughout the revolutions of the piston-block 14, and the power developed by steam-pressure on said abutments will be uniform in useful effect. The abutment-bars 22 are automatically changed in position in unison with the movements of the abutment-bars 18, and said bars 22 alternately become abutments in the steamways *a* to insure the complete expulsion of exhaust-steam from each steamway as the piston-block 14 rotates in the direction indicated by the arrow *x*. If it is desired to change the direction of rotary motion of the piston-block 14, shaft 13, and pulley 13^a, the upper gate-valve *e* is closed and the lower gate-valve *e'* is opened. This will cause the pressure of steam or other motive agent entering the channels *a* to be exerted upon the lowermost sides of the abutment-bars 18 alternately, and thus press the shoulders a^2 of the channels *a* to effect a revolution of the piston-block 14 in the direction indicated by arrow *y* in Fig. 1.

While steam of high pressure is preferred as a motive agent, it is evident that compressed air, gas, or water may be used under pressure to effect a movement of working parts of the engine.

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

1. In a rotary engine, the combination with a circularly-bored cylinder and a rotatably-supported cylindric piston-block therein, said piston-block having spaced circumferential channels extending partially around the piston-block at opposite sides thereof, said channels being of an equal depth throughout their length of abutment-bars adapted to work through the side of the cylinder, and alternately enter and leave the circumferential channels of the piston-block, as specified.

2. In a rotary engine, the combination with a circularly-bored cylinder having an inlet at one side and an exhaust at the opposite side, and abutment-bars pivoted on rocking bars, said latter bars pivoted on a projection from said cylinder, the inner ends of the abutment-bars working through apertures in the cylinder or chest thereon, of a cylindrical piston-block peripherally and laterally engaging the bore of the cylinder and the heads thereon, said piston-block having spaced peripheral channels extending partly around the piston-block at the opposite sides thereof, said channels having each a sloped terminal wall at each end thereof and adapted to alternately receive the inner ends of the slidable abutment-bars, substantially as specified.

3. In a rotary engine, the combination with a cylinder, a shaft rotatable centrally therein, a piston-block secured on the shaft and peripherally engaging the bore of the cylinder, said block having two spaced peripheral channels extending on opposite sides of the block partially around the same, and concentric on their bottoms with the axis of the shaft, each channel ending in an incline at each end, thus leaving cam formations intervening the ends of the channels, of two abutment-bars engaging their inner ends with the channels alternately, and slidable in the side of the cylinder, said bars being supported to reciprocate at their outer ends, an inlet supply-pipe for motive agent at one side of the cylinder, and an exhaust at the opposite side thereof, as specified.

4. In a rotary engine, the combination with a cylinder, a center shaft rotatable therein, a piston-block secured on said shaft, peripherally engaging the bore of the cylinder, said block having two spaced peripheral channels extending on opposite sides of the block and partially around the same, leaving cam formations intervening between ends of the channels, of two abutment-bars at each side of the cylinder, slidable in the walls thereof, and having their inner ends alternately engaged with the channels, both pairs of abutment-bars being supported to reciprocate at their outer ends, an inlet-pipe for motive agent at one side of the cylinder, two exhaust-pipes at the opposite side of said cylinder, and two spaced gate-valves adapted to control the direction of rotation had by the piston-block and center shaft, as specified.

STURGEON KERSHNER.

Witnesses:
WM. A. GARRISON,
W. W. HIGGINS.