C. COMSTOCK.

PUMP.

APPLICATION FILED AUG. 11, 1909.

966,428. Patented Aug. 9, 1910.

2 SHEETS—SHEET 1.

FIG. 1.

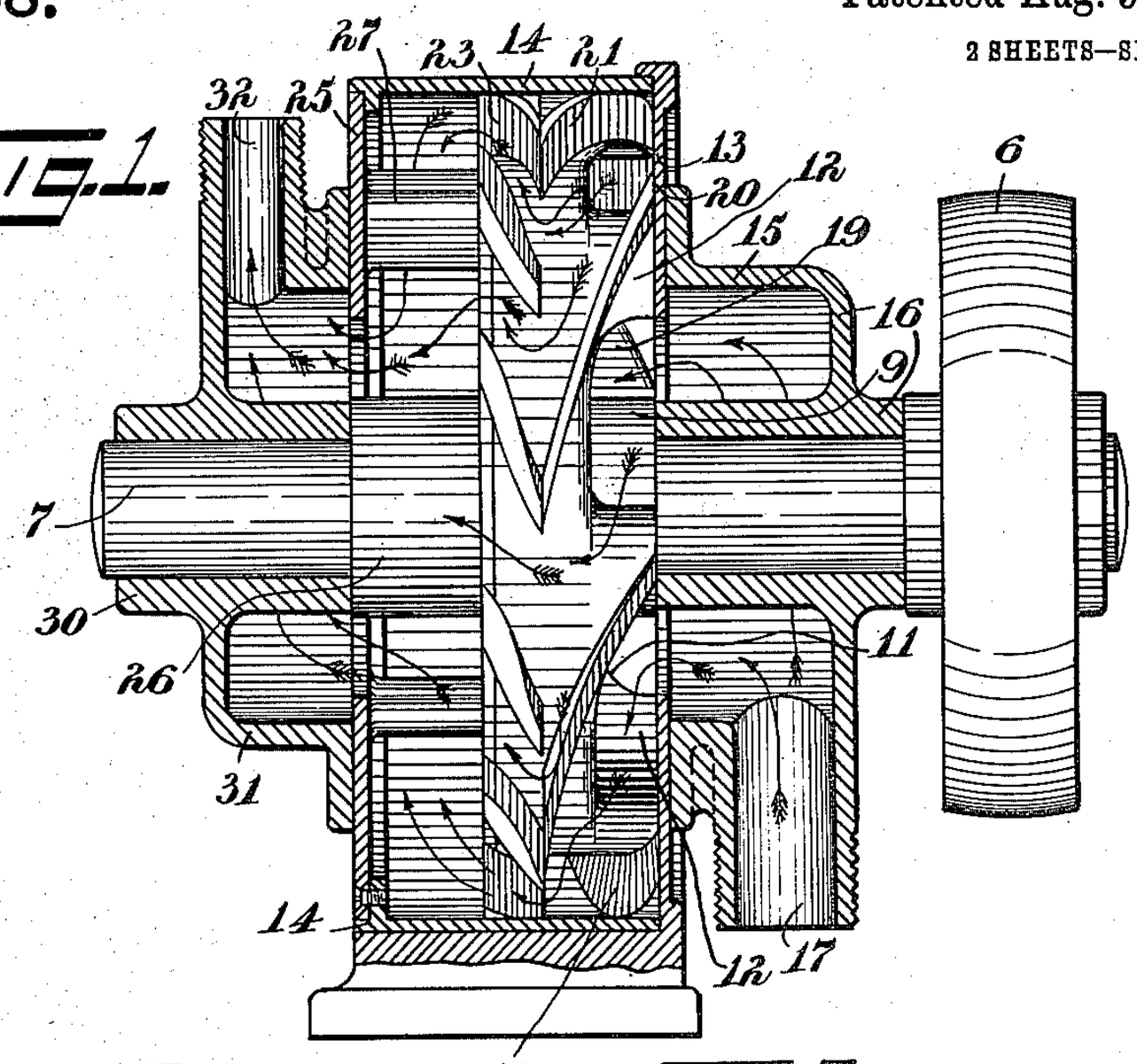


FIG. 2.

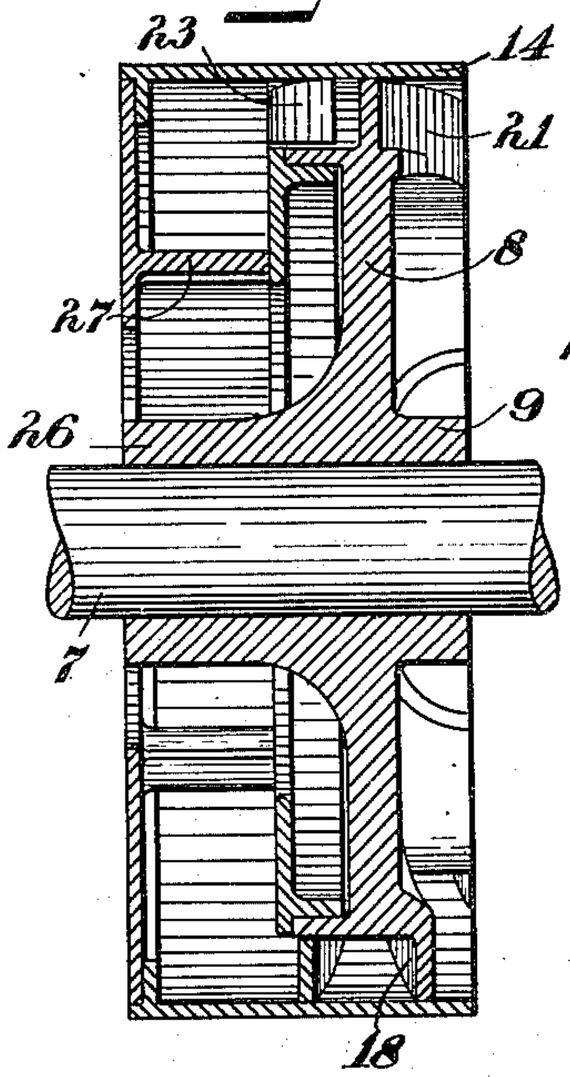
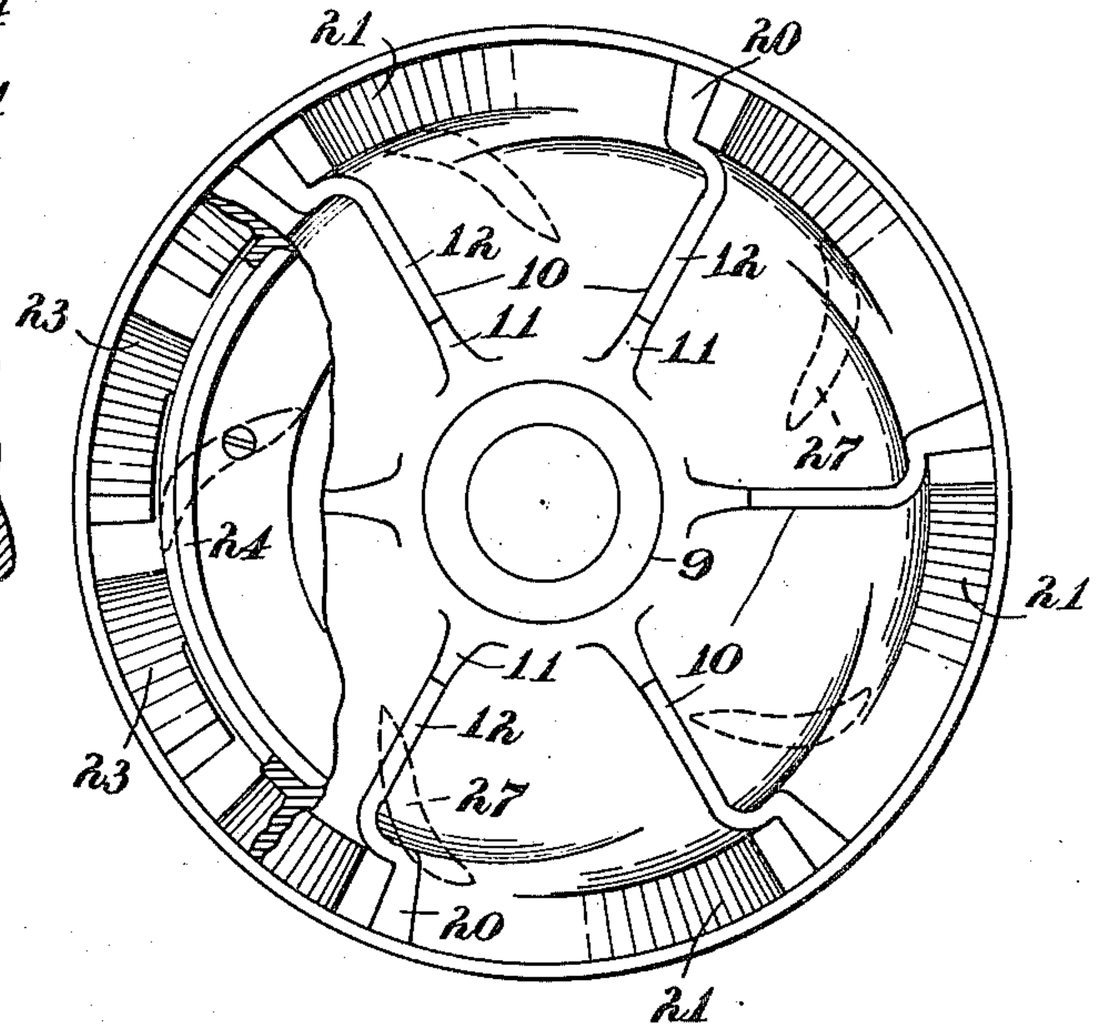


FIG. 3.



Witnesses:

L. C. Badeau.

H. D. Penney

Inventor:

Chester Comstock,

By his Attorney,

F. D. Richards.

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2 SHEETS—SHEET 2.

Fig. 4.

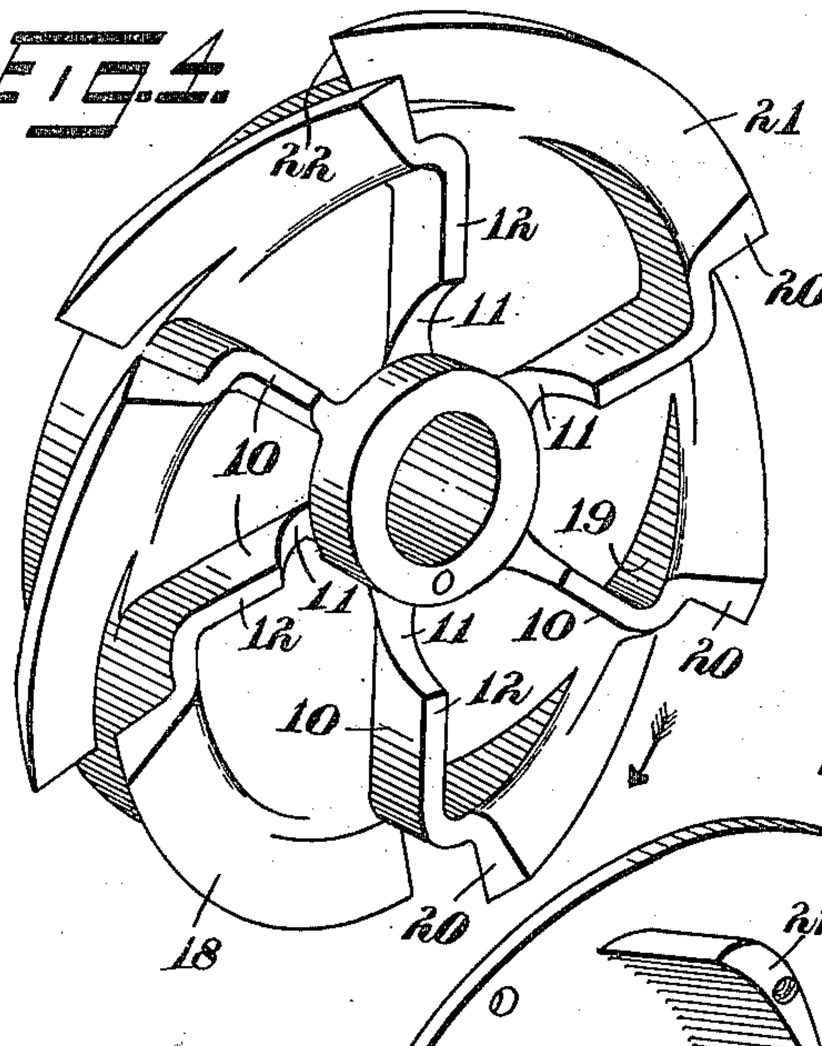


Fig. 5.

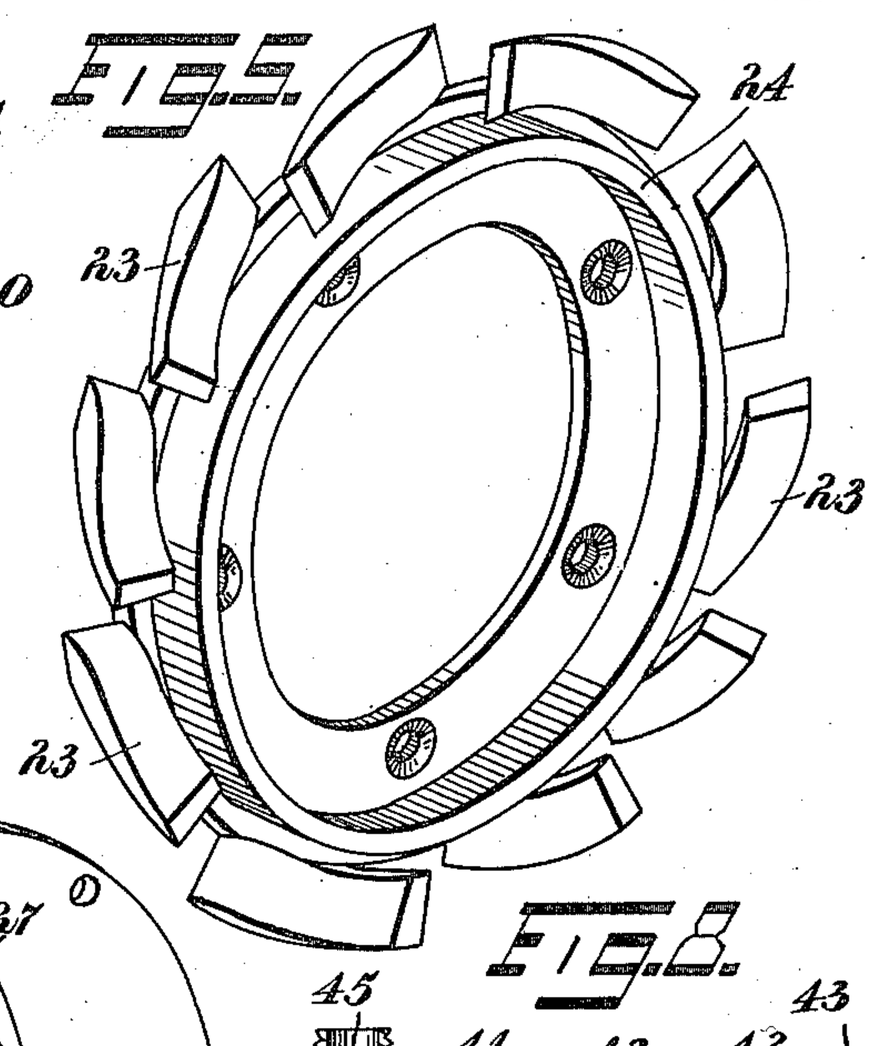


Fig. 6.

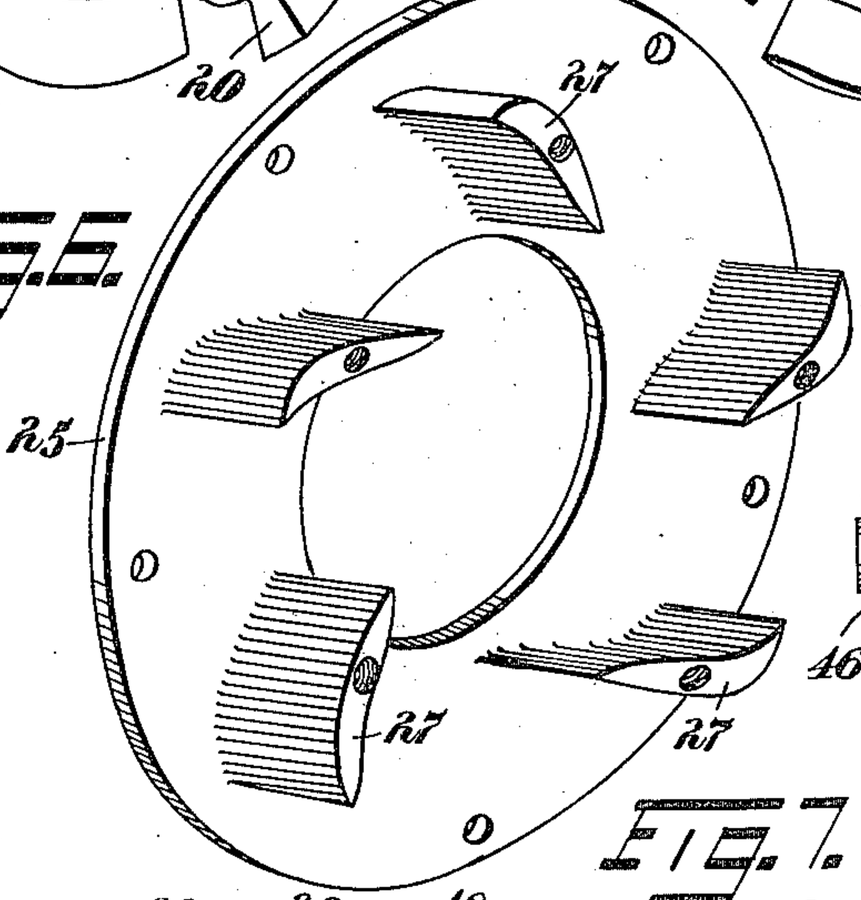


Fig. 8.

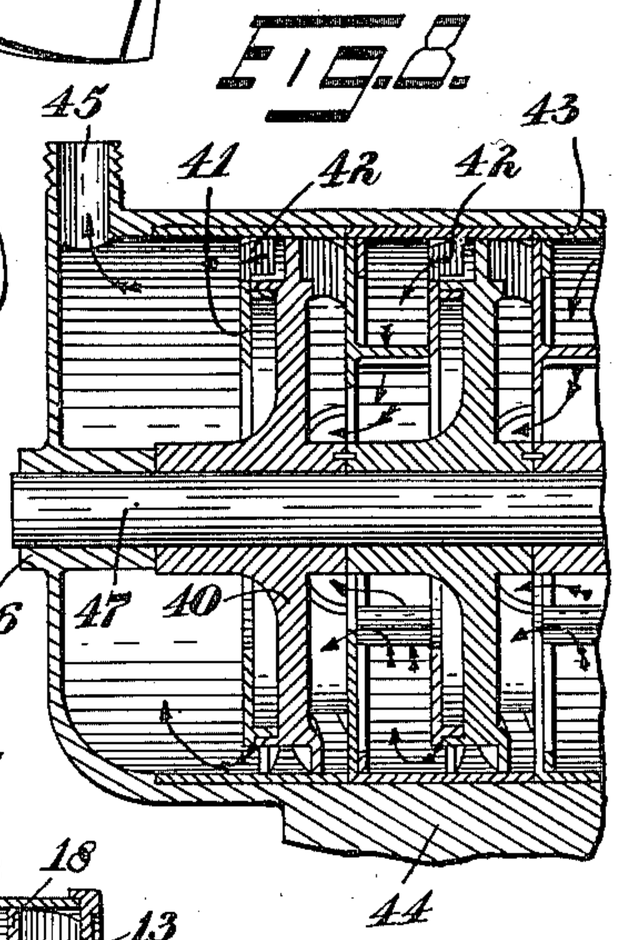
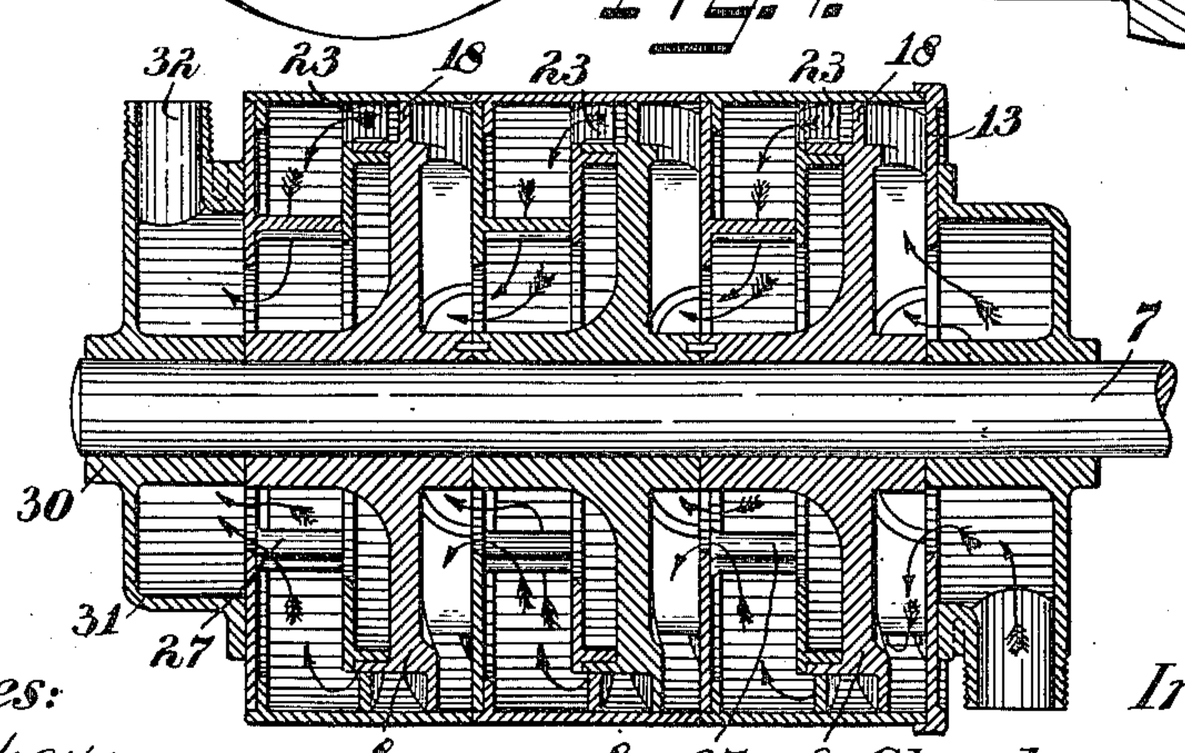


Fig. 7.



Witnesses:

L. C. Badeau.

H. D. Penny

Inventor:

Chester Comstock,

By his Attorney,

C. H. Richards.

UNITED STATES PATENT OFFICE.

CHESTER COMSTOCK, OF RIDGEWOOD, NEW JERSEY.

PUMP.

966,428. Specification of Letters Patent. Patented Aug. 9, 1910.

Application filed August 11, 1909. Serial No. 512,313.

To all whom it may concern:

Be it known that I, CHESTER COMSTOCK, a citizen of the United States, residing in Ridgewood, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Pumps, of which the following is a specification.

The object of this invention is to provide an improved form of pump having means whereby water or other fluid is first given a movement by centrifugal force, outward from the center to the periphery of the impeller, and thereupon the water engages members that will serve to force it in an axial direction.

A further object of the invention is to provide in connection with such impeller, stationary members in the casing that will receive the water advanced in a forward or axial direction, and assist in the forward movement of the water.

A further object is to thereupon direct the water driven forward, causing it to be turned in its course and moved toward the axis of the impeller shaft, for the purpose of being received by another such impeller, that is, by another stage of the pumping apparatus, in which second stage, being a duplicate of the first, the movement of the water is still further accelerated.

In the accompanying drawing representing an embodiment of my invention, Figure 1 is a vertical axial section through a single stage pump. Fig. 2 is a vertical section through the impeller member, showing a portion of the shell. Fig. 3 is an end view of the part shown in Fig. 2. Fig. 4 shows in perspective the impeller member. Fig. 5 shows the ring member of the shell with the stationary blades that coöperate directly with the propeller peripheral blades. Fig. 6 shows an end or partition wall of the casing with the blades for directing the water inward to the next stage. Fig. 7 is a vertical axial section of a multi-stage pump, corresponding with the other views; but on reduced scale; and Fig. 8 shows a modified form of outlet.

The impeller member is shown as comprising a disk or body portion 8 extending from a hub 9, that is secured on a driving shaft 7, which may be rotated by a pulley 6 or other source of power. The disk member is provided on its inlet face with a series of blades 10 extending preferably radially outward, and preferably perpendicular to the plane of the disk. These blades 10 do not extend inward to the hub; but have a cutaway portion at 11, whereby the radial edges 12 of these blades engage a wall 13 for the shell 14. An inlet is provided around the hub at the bore of this circular wall 13. A bearing member 15 is provided that is suitably secured to this end wall 13 and is somewhat cup-shaped around the journal 16, and is provided with an inlet pipe 17, whereby the water can pass into the cup portion around the bearing, and through the inner opening of the wall 13, to be received by the pockets; that are formed by the blades 12, the portion of the disk 8 between the blades, and the stationary wall 13. The rotation of the impeller would cause the water in these pockets to be thrown radially outward by centrifugal force, and the water will be forced against the bore of the shell. On the periphery of the impeller at the outlet of these pockets, are provided a circular series of blades, arranged similar to the blades of a propeller or fan. A series of blades 21 are arranged on the periphery of the disk, which are all inclined in the same rotative direction to the plane of the disk, and the adjacent extremities of the blades are practically opposite in a longitudinal direction, thus forming what amounts to a continuous circular series of blades and these blades extend radially outward from the periphery of the disk, with their outer edges in engagement with the bore of the shell. There is preferably one blade at the outlet of each of the pockets formed by the said radial blades. These blades preferably extend from the edge of the disk toward the free radial edge of the pocket blades 12, and their extremities are arranged in the same plane and ride against the partition wall 13, that is engaged by the radial blades. Each of the pockets also preferably has a wall 19 at its outer end somewhat triangular in shape, extending longitudinally from the periphery of the disk at the bottom of the projecting or overhanging inner edge of these blades 21, and also connecting with the outer peripheral edge of the pocket blades 12.

The impeller is rotated in the direction indicated by the arrow in Fig. 4, so that the edge of the blade engaging the partition

wall 13 advances, and the water that is driven out by centrifugal force in the pockets, will be received or caught by this front end 20 of the blade riding against the end wall 13. and the rear face 18 will strike the water and tend to cause it to move longitudinally along the periphery of the impeller, the water being driven outward, having naturally a considerable circular motion and being partly carried around with the impeller. For the purpose of further directing the water forward or longitudinally, and also make use of this rotary motion, a series of stationary blades are provided inside of the shell in the vicinity of these peripheral blades on the impeller. In the drawing is shown a circular series of blades 23, located inside of the shell opposite the peripheral blades 21, and which are shown as carried by a ring member 24, fast in the shell. These latter blades extend in a radial direction, and also are arranged diagonally to the transverse plane of the shell, or the plane of the impeller, but are inclined in the opposite direction from the impeller inclined blades 21. The water advanced by the propeller edge blades, will be received between this ring member and the shell, and will engage these stationary blades 23, whose ends are arranged to engage the rear ends 22 of the propeller blades 21. The water forced longitudinally by the propeller blades, having a somewhat rotary movement, will strike these stationary blades, that will tend to somewhat change the rotary movement of the water and cause it to advance more nearly in an axial direction. In the shell beyond this ring member and stationary blades is arranged a wall 25 extending radially inward from the shell, but having its bore offset from an extension 26 of the impeller hub, leaving a central space for the water advanced in it into the next stage of the pump. The water after passing the stationary peripheral blades strikes this abutment wall 25 and is, therefore, driven radially inward; but this water still has a certain amount of rotary force. For the purpose of assisting in directing the water toward the central outlet of this circular part between the ring member and this wall, a series of extending blades 27 are arranged between this wall 25 at its inner portion, and the opposite face of the ring member 24. But these blades are inclined in the direction of movement of the impeller, that is, are somewhat tangential to the bore of the partition member 25. These latter blades will further direct the water inward, and it will pass out from this stage of the pump, between the bore of this wall and the hub portion 26 of the pump. It will be observed that this wall 25 practically corresponds to the side wall 13 at the other end of this stage, and, as shown in Fig. 7, another stage of the pump, comprising an impeller, a ring member with peripheral stationary blades and tangential blades, is arranged beyond such ring member and the adjacent wall. As shown in this figure, a series of such stages can be arranged of any number, each of which receives the water centrally from the adjacent stage, and serves to increase its velocity, and, therefore, its pressure, under which it is forced or advanced. In Fig. 1, and also at the outlet end in Fig. 7, is shown a bearing head 30 having a cap or hood 31 surrounding the outlet in the wall, to receive the water, and direct it through outlet 32.

In the operation of the pump, it will be seen that the walls 12 forming pockets serve to carry the water around with the impeller and centrifugal force will drive the water radially outward. At the outer end of these pockets the water is received by the circular series of inclined peripheral blades, by which the water will be driven forward or axially or longitudinally. This longitudinally moving water having a considerably rotary motion, is now received by the circular series of inclined blades, and these blades are preferably of greater number than the peripheral impeller blades; but not a multiple whereby they do not have a symmetrical arrangement. These stationary blades will receive the water advancing and also rotating and serve to direct it forward into the circular pocket beyond. And in the latter the water will be driven radially inward assisted by the tangential blades that lead the water to the central outlet of this stage of the pump.

In the form shown in Fig. 8 the outlet arrangement is somewhat changed, the impeller 40 at the end of the pump discharging into the stationary blades 42 on the ring 41, and from these blades the water passes longitudinally in the end case 44 that is shown as engaging the shell 43, and provided with an outlet 45. The end case has the bearing for the shaft 47 on which the impeller 40 is fast. It will be seen that the partition member shown in Fig. 6 carrying the tangential blades 27 for directing the water radially inward, is simply omitted, because the water does not have to pass toward the center to engage another stage of the pump, but is led directly to the outlet of the pump at 45.

Having thus described my invention, I claim:

1. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, and a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk.

2. In a pump, an impeller comprising a

disk portion having radial blades on one side forming pockets, and a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk.

3. In a pump, an impeller comprising a disk portion having radial blades on one side forming pockets, and a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, there being one peripheral blade at the outlet of each pocket.

4. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, and a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, one extremity of each peripheral blade lying in the plane of the edge of the pocket-forming blades.

5. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, the pockets each having a peripheral wall connecting the edge of the disk with the inner edge of the peripheral blade and also with the outer edge of the pocket blade.

6. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell and the radial edge of the pocket blades and also the adjacent end of the peripheral blades engaging a transverse wall in the shell.

7. In a pump, an impeller comprising a disk portion having radial blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, the pockets each having a peripheral wall connecting the edge of the disk with the inner edge of the peripheral blade and also with the outer edge of the pocket blade, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell, and the radial edges of the pocket blades and the adjacent end of the peripheral blades engaging a transverse wall in the shell.

8. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell, the shell being provided with a series of blades extending radially and inclined to the plane of the said disk in the opposite direction from said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades.

9. In a pump, an impeller comprising a disk portion having radial blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, the pockets each having a peripheral wall connecting the edge of the disk with the inner edge of the peripheral blades and also with the outer edge of the pocket blade, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell, and the radial edges of the pocket blades and also the adjacent end of the peripheral blades engaging a transverse wall in the shell, the shell being provided with a series of blades extending radially and inclined to the plane of the said disk in the opposite direction from said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades.

10. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell, the shell being provided with a series of blades extending radially and inclined to the plane of the said disk in the opposite direction from that of the said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades, a ring member located inside of said blades on the shell, the casing having a transverse annular wall located beyond said shell blades and the ring, and a circular series of blades located between said latter wall and the ring and extending substantially in a tangential direction to the opening in the wall.

11. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell also the shell being provided with a series of blades extending radially and in-

clined to the plane of the said disk in the opposite direction from that of the said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades, a ring member located inside of said blades on the shell, the casing having a transverse annular wall located beyond said shell blades and the ring, a circular series of blades located between said latter wall and the ring and extending substantially in a tangential direction to the opening in the wall, there being a less number of the latter tangential blades than of the said peripheral blades.

12. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, and a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, the pockets each having a peripheral wall connecting the edge of the disk with the inner edge of the peripheral blades and also with the outer edge of the pocket blade, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell and the radial edges of the pocket blades and also the adjacent ends of the peripheral blades engaging a transverse wall of the shell, the shell being provided with a series of blades extending radially and inclined to the plane of the said disk in the opposite direction from said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades, a ring member located inside of said blades on the shell, the casing having a transverse annular wall located beyond said shell blades and the ring, and a circular series of blades located between said latter wall and the ring and extending substantially in a tangential direction to the opening in the wall.

13. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell the shell being provided with a series of blades extending radially and inclined to the plane of the said disk in the opposite direction from said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades, a ring member located inside of said blades on the shell, the impeller having an annular flange extending from the edge of the disk longitudinally in the opposite direction from the pockets and riding beneath a portion of the said radial blades in the shell.

14. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell also the shell being provided with a series of blades extending radially and inclined to the plane of the said disk in the opposite direction from said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades, a ring member located inside of said blades on the shell, the impeller having an annular flange extending from the edge of the disk longitudinally in the opposite direction from the pockets and riding beneath a portion of the said radial blades in the shell, the ring member in the shell having an annular flange riding beneath the said latter flange with its edge engaging the disk of the impeller.

15. In a pump, an impeller comprising a disk portion having radial blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell also the shell being provided with a series of blades extending radially and inclined to the plane of the said disk in the opposite direction from said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades, a ring member located inside of said blades on the shell, the casing having a transverse annular wall located beyond said shell blades and the ring, and a circular series of blades located between said latter wall and the ring, and extending substantially in a tangential direction to the opening in the wall, the impeller having an annular flange extending from the edge of the disk longitudinally in the opposite direction from the pockets and riding beneath a portion of the said radial blades in the shell.

16. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell also the shell being provided with a series of blades extending radially and inclined to the plane of the said disk in the opposite direction from the said peripheral blades and having their extremities located

in the plane of the extremities of the impeller peripheral blades, a ring member located inside of said blades on the shell, the casing having a transverse annular wall located beyond said shell blades and the ring, and a circular series of blades located between said latter wall of the ring and extending substantially in a tangential direction to the opening in the wall, the impeller having an annular flange extending from the edge of the disk longitudinally in the opposite direction from the pockets and riding beneath a portion of the said radial blades in the shell, the ring member in the shell having an annular flange riding beneath the said latter flange with its edge engaging the face of the disk of the impeller.

17. In a pump, an impeller comprising a series of blades extending radially outward and located at an angle to its plane of rotation, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell, the shell being provided with a series of blades extending radially and inclined in the opposite direction from said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades.

18. In a pump, an impeller comprising a series of blades extending radially outward and located at an angle to its plane of rotation, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell, the shell being provided with a series of blades extending radially and inclined in the opposite direction from that of the said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades, a ring member located inside of said blades on the shell, the casing having a transverse wall located beyond said shell blades and the ring, and a circular series of blades located between said latter wall and the ring and extending substantially in a tangential direction.

19. In a pump, an impeller comprising a series of blades extending radially outward and located at an angle to its plane of rotation, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell also the shell being provided with a series of blades extending radially and inclined in the opposite direction from that of the said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades, a ring member located inside of said blades on the shell, the casing having a transverse annular wall located beyond said shell blades and the ring, a circular series of blades located between said latter wall and the ring and extending substantially in a tangential direction to the hole in the wall, there being a less number of the latter tangential blades than of the said peripheral blades.

20. In a pump, an impeller comprising a series of blades extending radially outward and located at an angle to its plane of rotation, a shell in which the impeller is rotatable with the edges of the said blades engaging the bore of the shell, the shell being provided with a series of blades extending radially and inclined in the opposite direction from said blades and having their extremities located in the plane of the extremities of the impeller blades, a ring member located inside of said blades on the shell, the impeller having an annular flange extending over the edge of the disk longitudinally in the opposite direction from the pockets and riding beneath a portion of the said peripheral blades in the shell.

21. In a pump, an impeller comprising a series of blades extending radially outward and located at an angle to its plane of rotation, a shell in which the impeller is rotatable with the edges of the said blades engaging the bore of the shell, the shell being provided with a series of blades extending radially and inclined in the opposite direction from said blades and having their extremities located in the plane of the extremities of the impeller blades, a ring member located inside of said blades on the shell, the impeller having an annular flange extending from the edge of the disk longitudinally in the opposite direction from the pockets and riding beneath a portion of the said peripheral blades in the shell, the ring member in the shell having an annular flange riding beneath the said latter flange with its edge engaging the disk of the impeller.

22. In a pump, an impeller comprising a series of blades extending radially outward from the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell, the shell being provided with a series of blades extending radially and inclined in the opposite direction of the said blades and having their extremities located in the plane of the extremities of the impeller blades, a ring member located inside of said blades on the shell, the casing having a transverse wall located beyond said shell blades and the ring, and a circular series of blades located between said latter wall of the ring and extending substantially in a tangential direction, the impeller having an annular flange extending from the edge longitudinally in the opposite direction from the pockets and riding beneath a portion of the said radial blades in the shell, the ring member in the shell having an annular

flange riding beneath the said latter flange with its edge engaging the face of the disk of the impeller.

23. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell and the radial edges of the pocket blades and also the adjacent ends of the peripheral blades engaging a transverse wall of the shell, the shell having an annular wall in its bore beyond the peripheral blades of the impeller, a second impeller similar to said impeller having its pocket blades arranged to engage the latter wall, means for receiving the liquid from the peripheral blades of the first impeller and directing it radially inward around the inner edge of said latter wall to be received by the pockets of the second impeller.

24. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell, the shell being provided with a series of blades extending radially and inclined to the plane of the said disk in the opposite direction from said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades, the shell having an annular wall situated beyond the blades in the shell to receive the liquid and direct it radially inward, and a second impeller similar to said impeller with its pocket blades engaging the said latter wall to receive the said liquid at the inner portions of its pockets.

25. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell, the shell being provided with a series of blades extending radially and inclined to the plane of the said disk in the opposite direction from said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades, a ring member located inside of said blades on the shell, the casing having a transverse annular wall located beyond said shell blades and the ring, a circular series of blades located between said latter wall and the ring and extending substantially in a tangential direction to the opening in the wall, a second impeller similar to said impeller rotatable in the shell with its pocket blades engaging the said latter wall, such wall being open at its inner portion permitting the liquid to pass into the inner portions of the pockets of the second impeller.

26. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell, the shell being provided with a series of blades extending radially and inclined to the plane of the said disk in the opposite direction from that of the said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades, a ring member located inside of said blades on the shell, the casing having a transverse annular wall located beyond said shell blades and the ring, a circular series of blades located between said latter wall and the ring and extending substantially in a tangential direction to the opening in the wall, a second impeller similar to said impeller rotatable in the shell with its pocket blades engaging the said latter wall, such wall being open at its inner portion permitting the liquid to pass into the inner portions of the pockets of the second impeller.

27. In a pump, an impeller comprising a disk portion having blades on one side forming pockets, a series of blades extending radially outward from the periphery of the disk and located at an angle to the plane of said side of the disk, a shell in which the impeller is rotatable with the edges of the peripheral blades engaging the bore of the shell, the shell being provided with a series of blades extending radially and inclined to the plane of the said disk in the opposite direction from that of the said peripheral blades and having their extremities located in the plane of the extremities of the impeller peripheral blades, a ring member located inside of said blades on the shell, the casing having a transverse wall located beyond said shell blades and the ring, a circular series of blades located between said latter wall and the ring and extending substantially in a tangential direction, a second impeller similar to said impeller rotatable in the shell with its pocket blades engaging the said latter wall, such wall being open at its inner portion permitting the liquid to pass into the inner portions of the pockets of the

second impeller, the shell being provided with a second series of blades extending radially inward and inclined to the plane of the disk in the opposite direction from that of the said peripheral blades and having their extremities located in the plane of the extremities of the second impeller peripheral blades, a second ring member located inside of said latter blades on the shell, the casing having an end wall located beyond said latter shell blades and said latter ring, and a second circular series of blades located between said latter wall and said latter ring and extending substantially in a tangential direction.

CHESTER COMSTOCK.

Witnesses:
FRED. J. DOLE,
WM. H. REID.