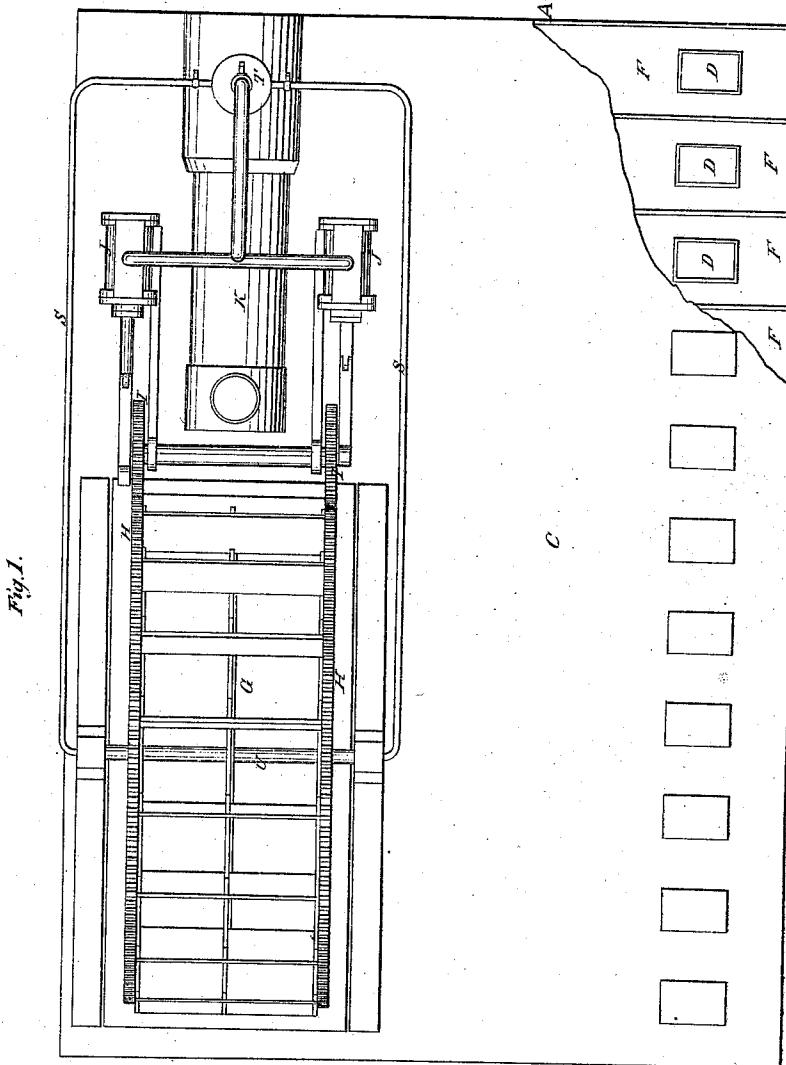


Sheet 1. 2 Sheets.

S. J. Gold.  
Paddle Wheel.

N<sup>o</sup> 66,830.

Patented Jul. 16, 1867.



Witnesses.

R. H. Seaton  
Isaac H. Blow

Inventor.

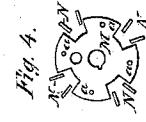
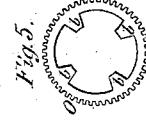
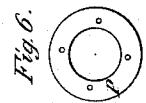
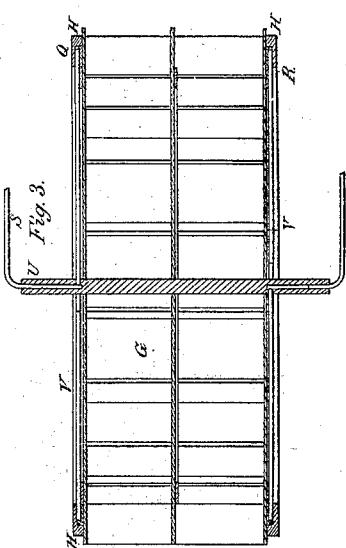
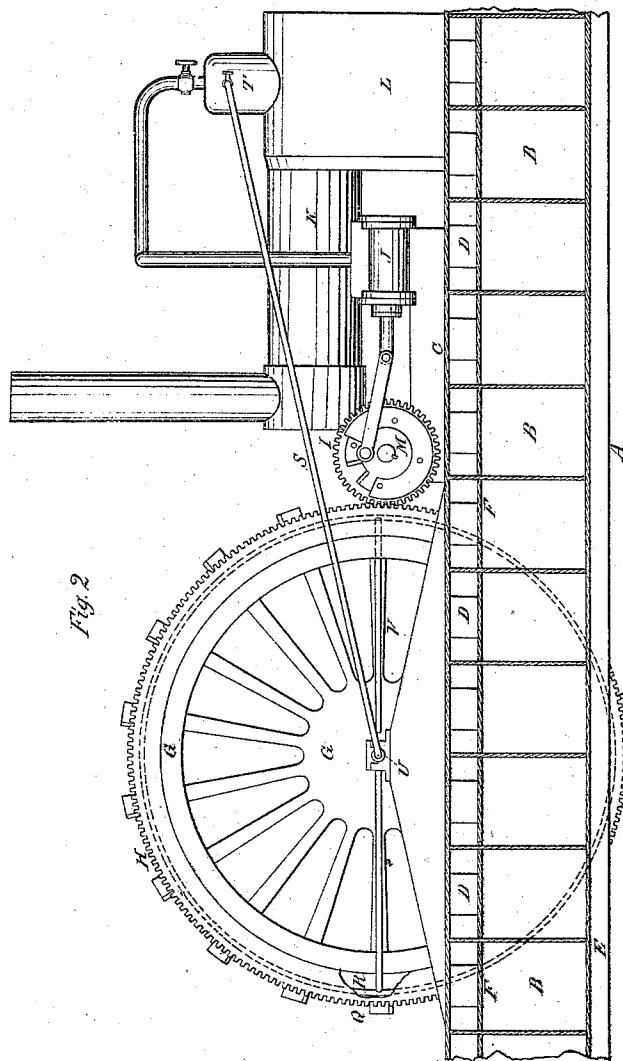
Stephen J. Gold  
By How & Weston  
Attest.

Sheet 2. 2 Sheets.

S. J. Gold.  
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No. 66,830.

Patented Jul. 16, 1867.



Witnesses.

R. H. Seaton  
Isaac H. How

Inventor.

Stephen J. Gold  
By How & Weston,  
Atty's

# United States Patent Office.

STEPHEN J. GOLD, OF CORNWALL, CONNECTICUT.

*Letters Patent No. 66,830, dated July 16, 1867.*

## IMPROVED MACHINERY FOR PROPELLING VESSELS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, STEPHEN J. GOLD, of Cornwall, in the county of Litchfield, and State of Connecticut, have invented certain new and useful improvements in Steam-Vessels; and I do hereby declare the following to be a full and exact description of the same.

My invention consists, first, in applying the power for driving the paddle-wheels of a side-wheel steamer to the said wheels at or near their peripheries by means of gearing-teeth on their peripheries, into which the teeth of a pinion, driven by a suitable engine, engage; second, in constructing the said pinion in two parts, viz, a cog-rim and a driving-body or centre, and inserting between the rim and body thereof India-rubber or some other elastic, non-resonant body, as hereinafter set forth; third, in applying heat to the gearing on the periphery of the paddle-wheel (when it is necessary to do so to melt ice which may accumulate thereon) by means of steam introduced into pipes set into or upon the wheel for that purpose; and, fourth, in constructing and supporting the hull of the vessel with transverse walls, securely fastened to the sides and bottom of the vessel and to each other by means of a web at or near their tops, and without ribs, thereby gaining great strength with comparatively small weight of materials, which construction I am enabled to employ by reason of the great saving of room which I make in the body of the vessel by the use of my invention, and by means of which construction, in conjunction with the rest of my invention, I am enabled to obtain a much higher rate of speed, or the same speed with less power, than would be possible with the hull made of the usual form and in the usual manner, while the other features of my invention may be employed in connection with the vessels now in use, and better results be thereby obtained than any hitherto secured; yet, in order to make the advantages of each and all of these features the most fully available, I consider the construction of the hull herein-described essential. In the accompanying drawings—

Figure 1 is a top view of a portion of a vessel made in accordance with my invention, showing one of the side-wheels, the engines and connections, the boiler, and the construction of the hull.

Figure 2 is a side elevation of the same.

Figure 3 is a horizontal section of the paddle-wheel, made through the line *x x*, fig. 2.

Figures 4, 5, and 6 are views in detail of the parts of the pinion for driving the paddle-wheel.

A is a section of the hull or body of the vessel. It is flat on the bottom, or nearly so, and the interior is made up of a continuous series of transverse cells or compartments; B B B, each three or four feet wide, as may be required for supporting the sides, and rendering ribs unnecessary from bow to stern. The exterior walls, as well as the bulk-heads, may be made of sheets of iron, steel, or other metal, securely fastened to the bottom and sides of the vessel. The deck C is secured to these bulk-heads at their upper edges, while another false deck, F, or top to the bulk-heads, is secured between them a short distance below the main deck. Hatchways D D are made through into the several compartments, giving ready and direct access thereto for the purpose of storing freight, &c. E is the keel of the vessel. The web or cover to the cells or compartments should be put in and made complete before the main deck is made fast. G is one of the paddle-wheels. The other one or more being like it, it is unnecessary to show more than one. H H represent gear-cogs at or near its periphery, into which mesh the cogs of pinions I I, which drive the said paddle-wheel, and are in turn driven by the piston-rods and connections of the engines. J J represent the engines, and K the boiler, and L the furnace. The form of boiler and engine indicated herein, and which is one that will give good results, is that of the ordinary locomotive engine and the boiler, without the wheels and the tender. M is the driving portion of the pinion, and N N are the blocks or pieces of rubber, which are inserted between the faces or cheeks of the teeth or projections a a a, fig. 4, and b b b, fig. 5, as seen in fig. 2. O is the rim of the pinion, containing the gear-cogs; and P is one of the rings which, being bolted one each side to the driving portion M, will hold the cog portion and rubber parts of the pinion firmly in their places. Q Q are steam pipes, laid into the wooden backing R of the segments of the gears H H, in contact with the segments, but protected from coming in contact with cold water by the said wooden backing. Steam is forced into the said steam pipes Q by means of steam-conveyers S, which receive steam from the dome T, and deliver it through the centre of the ends of the shaft U to the pipes Q. The heat contained in the steam being mostly communicated to the pipes Q, and through them to the gearing H H, any ice which may form on the said gearing will be quickly melted.

off, and the products of condensation with the waste steam are driven out through the pipes V, which are continuations of the pipes Q, as shown in red lines in fig. 2.

By gearing directly to the wheels at or near their peripheries, instead of applying the power of the engine to a crank fixed to the shaft of the paddle-wheels, having a length of one-third or less of the radius of the paddle-wheel, as is done at present, great weight of engine and its support is avoided, and I am enabled to use a small, light engine, giving it a high motion, and turn the wheels and drive the boat faster than has hitherto been done. By using smaller engines and boilers I save a very large amount of the submerged section of the vessel, which allows the boat to be forced through and over the water faster than can be done by the old mode of application of the power now in general use. I am also enabled to set my engines and boilers on the guards of the steamboat in front or aft of the wheel, and thus leave the entire centre of the boat free to be used for cabins, state-rooms, storage of freight, &c. Another advantage of this construction is that the twisting strain which, with the construction now in use, comes very severely upon the shafts of the paddle-wheels, the journals and boxes, and ultimately the wheel itself, is almost all removed, and the action of the engine on the paddle-wheel is square, direct, and nearly directly in line with the resistance, thus enabling me to use a lighter shaft and connections, and at the same time save considerable space in the vessel. The weight of machinery and space saved by the use of my invention are very considerable, enabling me to reduce the displacement of a steamer greatly, and consequently the resistance to speed. I am also enabled to make the vessel much lighter, as it does not have to carry the heavy machinery now in use, and is not subject to such powerful strains, whereby the displacement is still further reduced. The engines and boilers may be set within the sides of the boat, and the shaft which carries the pinions II would in that case have to be prolonged inward, and the engines made to turn it by means of suitable cranks and connections. The object of constructing the pinions II in the manner shown is to prevent the shock and noise which would otherwise occur if the pinions were run at a high rate of speed in gear with the cogs on the paddle-wheel. My object is also to prevent the strain on the rim of the pinion, which would occur if it were cast in one piece by contracting unevenly in cooling. By this construction the rim could be made of steel, and thus the durability of the pinion would be more nearly equal to that of the cogs on the paddle-wheel. The essential point of this part of the invention is to cut off the continuous metallic connection between the cogs of the pinion and its centre M, which is made fast to the shaft, by making the pinion in two parts, the rim being thus separate from the portion M, and interposing between these parts some elastic, non-resonant substance, as India rubber, leather, felt, &c., though I prefer to use India rubber, as I consider that the best. By this means the gearing will run together with very little noise, and there can be no shock in starting or changing the motion of the engine. The same result as to the deadening of the sound is obtained, though in a much less degree, by the wood backing, upon which the cog segment, at or near the periphery of the paddle-wheel, is put. The wood soon becomes thoroughly wet, and almost non-resonant. In boats intended to be used in the winter, or at times when ice forms readily, the cogs of the segments on the paddle-wheel are liable to become clogged with ice, so as to interfere with and prevent their efficient and safe working. This difficulty I remove by providing means for heating the said cogs, so that any ice which may have been formed on them will be at once loosened, and caused to fall off, and the formation of more will be prevented, though, while the wheels are in motion, no more will be formed thereon. The means which I employ consist of steam pipes laid into the wooden backing to which the segments of gearing are bolted, so that the said pipes shall come closely in contact with the said segments, and at the same time be sufficiently protected from contact with the cold water by being buried in and surrounded by the said wooden backing, except where they come in contact with the said segments. A groove may be made in the segments, and the steam pipe laid therein, and covered so as not to come in contact with the water by the wooden backing, or by any other substance which is a good non-conductor of heat. I introduce steam into these pipes through holes bored in the end of the paddle-wheel shaft, a radial pipe conveying the steam from the shaft to the heating pipe, and another radial pipe discharging the condensed water and waste steam at any desired point. I prefer to take the steam for the heating pipe directly from the boiler by suitable connections or conveyers.

In order to obtain sufficient strength in a vessel having but little depth of hold, I construct it with a series of transverse compartments by putting in strong, stiff bulk-heads at suitable intervals, (these bulk-heads take the place of the usual ribs in the old plan of supporting the sides of the boat,) and firmly secured to the bottom and sides of the vessel, and joining them near the top by a strong, stiff web, and also by securing them firmly to the main deck. These compartments are of ample capacity for storing baggage, freight, coal, and all articles of a bulky or heavy nature, while at the same time, being severally water-tight, they furnish the amplest security against the sinking or even the disabling of the vessel by the springing a leak of one or more of them, or by the vessel being stove by collision or otherwise. As I do not use the space in the body of the hull for the boilers, engines, &c., the compartments can be made very small and regular for support, as has not been possible in the old mode of applying power to steamboats, and thereby the vessel is made strong with less material, and the danger of sinking is almost entirely removed. These compartments may be made longitudinally, and divided into two or more, or left entire, each extending from stem to stern, but I prefer to make them as shown.

Having thus fully described my invention, I claim—

1. Applying the power to turn the paddle-wheels of steam-vessels directly to the paddle-wheels at or near their peripheries by means of gear-cogs on said paddle-wheels, which mesh into the cogs of a suitable pinion, which pinion is driven by the engine, substantially as hereinabove set forth.
2. Separating the rim of the pinion I from the inner portion M, to which it is secured, and with which it

turns, by interposing between them India-rubber or some other elastic, non-resonant body, substantially as and for the purpose set forth.

3. The combination with the gearing on the paddle-wheels of the pipes Q, substantially as and for the purpose specified.

4. The combination with the pipes Q and S of the openings through the shaft U for supplying the said pipes Q with steam, substantially as and to the effect set forth.

5. The combination of paddle-wheels, turned by means of cog-gear on said paddle-wheels at or near their peripheries, and suitable pinions, operated by steam machinery, substantially in the manner set forth, with the hull of a vessel constructed with numerous transverse walls or bulk-heads, connected near the top thereof by a web in such a manner that the said walls will sufficiently stiffen and strengthen the vessel without the use of ribs, substantially as hereinabove described.

STEPHEN J. GOLD.

Witnesses:

H. JAMES WESTON,

R. H. SEATON.