POSSIBILITIES OF THE FUSIBLE CORE PROCESS.

The fusible core process permits the construction of rubber to a desired thickness, and a reinforcement of the rubber with fabric to procure a desired strength upon a core or mandrel that will fuse or melt at a desired temperature, and can be removed from the interior of a rubber article in the form of a liquid after vulcanization.

Previous to this invention, gases had to be relied upon to expand within the rubber under heat. Expansion of this kind was naturally haphazard, and the thickness of the shell of rubber necessarily an unknown quantity.

If a solid mandrel was used to secure proper compression of the rubber, it has heretofore been necessary to cut the rubber to remove the mandrel or core; and revulcanization has had to be relied upon to close up the aperture. Second vulcanization of rubber is never reliable. By this process it is possible to produce, for illustration, water bottles on a core, building them to a desired thickness, compress them with hydraulic pressure, cure from the exterior to the interior, and fuse the core and remove the same through the neck of the bottle in the form of liquid, making a one-piece article built to a proper thickness and desired strength.

A bicycle or automobile tire may be built up in layers around a fusible core, subjected to pressure, cured, and the core fused and removed through the aperture used as a valve stem, in the form of a liquid. Pneumatic recoil cushions can be constructed of any desired strength by building up rubber and canvas around a core to a thickness the strength of which can be mechanically estimated, curing the rubber, fusing, and removing the core in liquid form through the valve stem, which can be afterward used to convey air to the interior of the cushion.

Life preservers can be constructed of a desired thickness to withstand the elements to which they are subjected, and a sufficient aperture constructed in the same to admit such a quantity of air as may be necessary to produce the proper buoyancy. By this process it is possible to cast a core of any desired dimension, building rubber to any desired thickness upon the same, and so secure the exact strength required for the gas container of dirigible balloons. Navigation in the air has heretofore been made practical by the construction of balloons by a combination of silk and rubber with lapped seams. The pressure of the atmosphere is such at various altitudes as to rend the seams, and in this manner destroy the balloon.

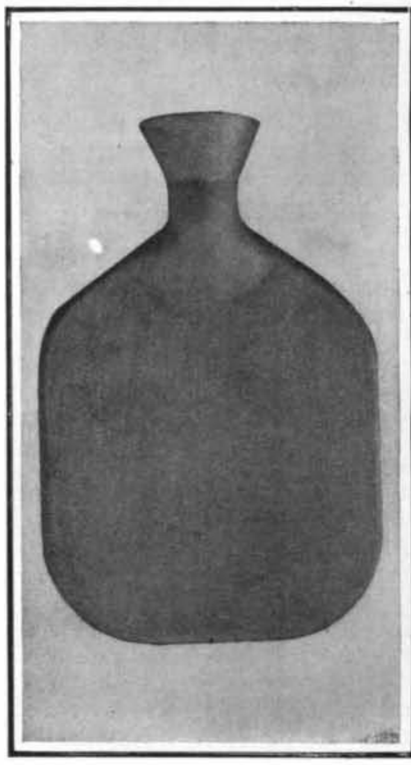
By the fusible core method a reliable thickness of rubber could be constructed over the core and molded, the rubber cured, and the core fused and removed through the valve stem, afterward used as a passage for the hydrogen gases. Construction of this nature can be made absolutely reliable.

This process can be carried still further, and the fusible core cast hollow and filled with air or gases. The rubber can then be built to the desired thickness on the outside, compression used, in conjunction with heat that is not sufficient to soften the core, to compact the rubber by external pressure, and the temperature then raised to a heat necessary to cure the rubber. This heat, radiating as it will to the inside of the core, expands the gases in the core, and when the core liquefies the gases continue their expansion, and assist the external pressure by pressing outward.

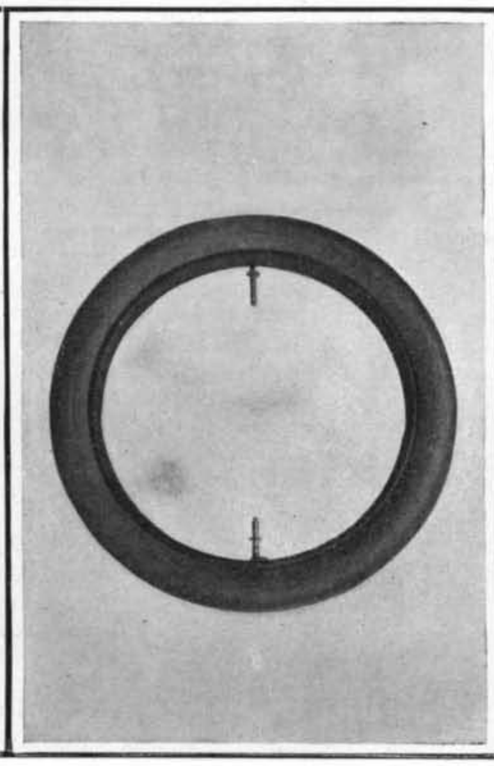
Articles cured in this manner have been subjected in the laboratory of the Massachusetts Chemical Company's Walpole Rubber Works to an external pressure of 2,000 pounds to the square inch, and internal gas pressure of 200 pounds per square inch. In this manner the rubber is compressed from all directions into one solid mass. Compression from all directions is as essential to procure perfect rubber goods as curing is.

Some of the large manufacturers of pneumatic tires have discovered this fact, and at the present day many tires or auto shoes are semi-cured on a solid mandrel, the said mandrel removed from the shoe, and a gas bag replaced where the mandrel is removed, and curing continued, so as to get external pressure followed by internal pressure to compact the rubber.

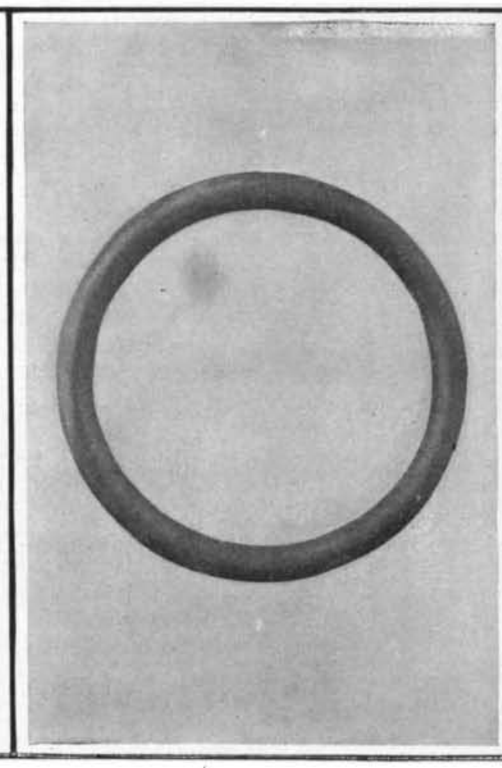
The fusible core process, as worked out and perfected by Mr. F. J. Gleason, vice-president and general superintendent of the Massachusetts Chemical Company's Walpole Rubber Works, bids fair to revolutionize not only many articles of everyday use, like hot-water bottles, rubber goods of every description, automobile and bicycle tires, but those of a more limited use as well, such as balloons, life preservers, etc.



Fusible core upon which water bottle is molded.



The core is melted and discharged through the air valves.



Core upon which adjoining tire was molded.

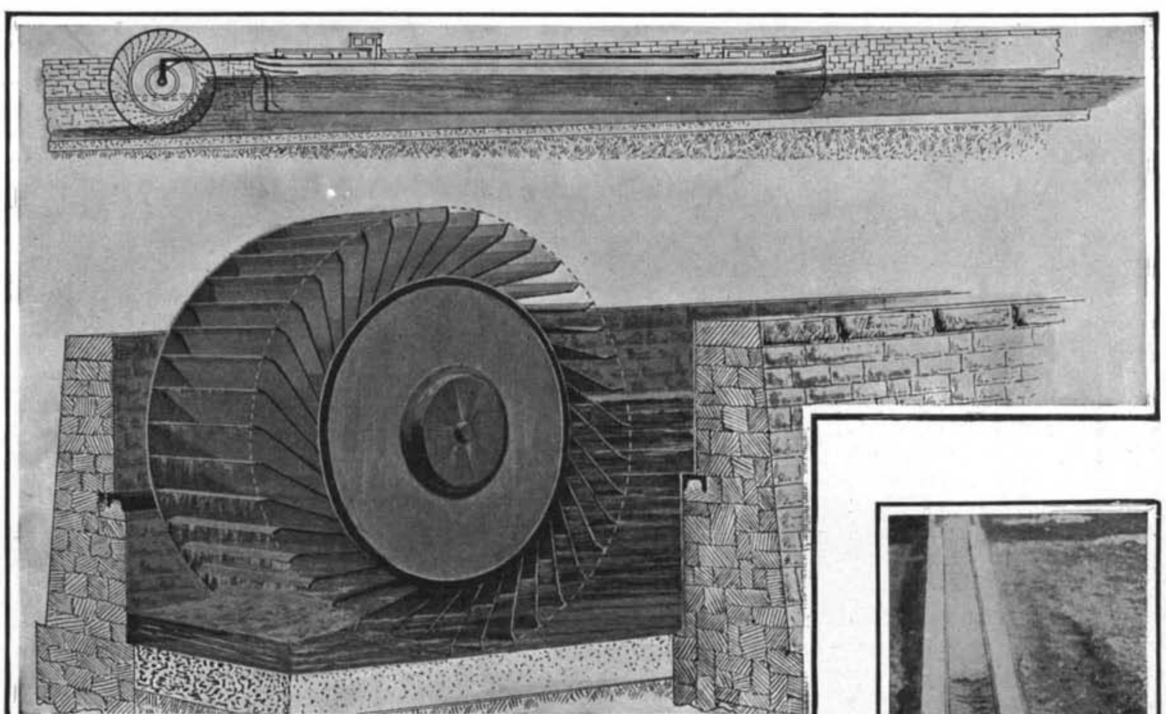
Bottle after fusible core has been melted and run out.

POSSIBILITIES OF THE FUSIBLE CORE PROCESS.

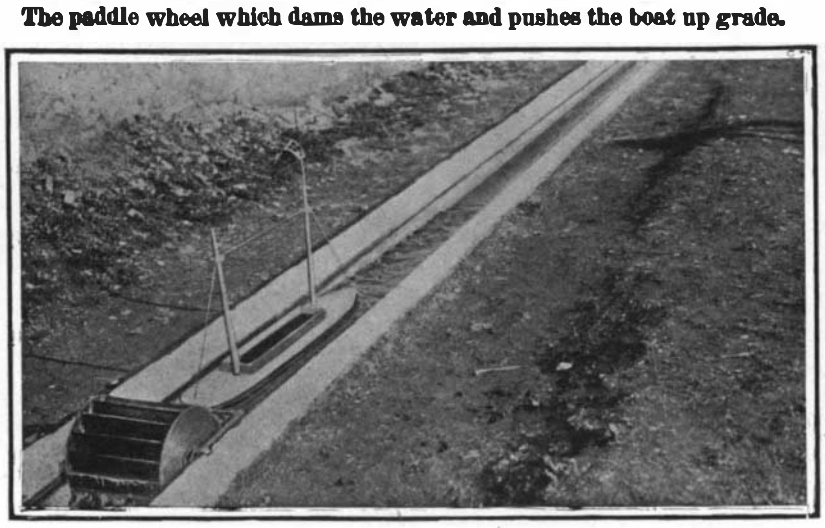
A MOVABLE LOCK FOR INCLINED CANALS.

BY H. PRIME KIEFFER, C.E.

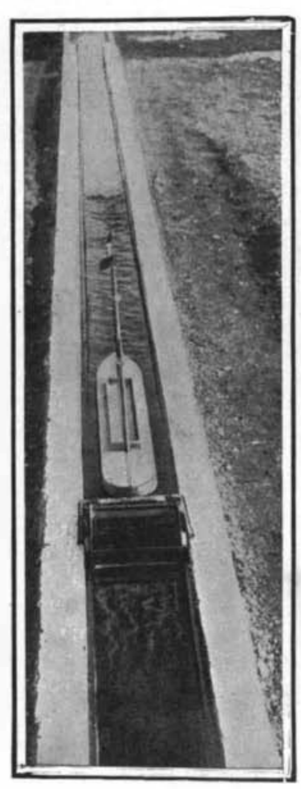
Engineer Giuseppe Bartolomei of Rome, Italy, has recently invented a movable self-propelled canal lock, which forms one of the cleverest and most ingenious advances since the employment of canals for transportation purposes was begun.



The paddle wheel which dams the water and pushes the boat up grade.



Model boat afloat in the dammed-up water being propelled up the canal.



Note the water backing up in front of wheel.

A MOVABLE LOCK FOR INCLINED CANALS.

The movable canal lock as designed by Signor Bartolomei consists primarily of a paddle wheel placed across the section of the canal, with the axis of the wheel resting on iron rails set into the retaining walls at the sides. It is presupposed that the canal is an inclined one, as otherwise there would be no use for locks. The canal may have an inclination of from 3 to 6 or even 7 per cent, and the grade need not necessarily be constant, but different stretches have different grades.

A clear idea of the system can best be obtained from the accompanying drawings and photographs, which were made from the model of the system which Signor Bartolomei has built near Rome. The writer made a thorough study of the model while on a visit to Rome recently. The model canal is about 80 feet long, the width between the rails 14 inches, while the distance from the base of the canal to the running base of the rails is 6 inches. The sides of the canal are perpendicular, and the bottom in cross section is horizontal. The iron T-rails are placed on offsets in the walls, at a distance of about 2 inches from the top of the walls, the base of the rails being placed flat on the offsets. The small boat used is barge shaped, is 3 feet 6 inches long, and draws 4 inches of water. The canal has 25 feet each of 3, 4, and 5 per cent inclines, the remaining 5 feet being open. As may be readily seen from the drawings, the paddle wheel just about closes the canal, the opening below the wheel being about ⅜ inch, or just enough to allow a slightly less quantity of water to pass under the wheel than comes down the canal. The wheel is then locked by a simple device, and the water backs up for a distance of 15 to 20 feet, thus giving a head of about 6 inches. The wheel is then unlocked and immediately begins to revolve, rolling upstream by the aid of the power generated with this head. The greater the head, the faster the wheel moves, thus allowing the water to pass under the wheel faster. When the water has reached its normal head of 6 inches, the wheel assumes its normal speed, which in the case of the model was about one-half mile per hour. It will be seen that the movement of the lock, if it may be so called, is automatic. It should be mentioned that the amount of traffic would make no difference, so long as the boats keep a few hundred feet apart. To stop or hold the boat at a certain point, it is necessary only to lock the wheel and raise it enough to allow the -rect quantity of water to pass under to keep the .t afloat.

So far we have been concerned only with the movement of the lock up the canal. A separate canal should be used for the traffic in the other direction, but exactly the same principle of the water wheel is employed. The main axis of the wheel for the descent is carried upon a truck supported by four wheels running directly upon the rails. With the action of a hand wheel, the wheels on either side of this truck may be brought closer together, so that they will raise the axis of the main wheel, taking it off the rails for a fraction of an inch; in other words, just enough to keep it from exerting its tractive force on the rails, and still not measurably increase the flow of water under it. Although the rotation, as well as the action, of the wheel will be exactly as in the upstream movement, the power will be transmitted through the two wheels direct to the rails. The rails of the truck will turn in the opposite direction from that of the water wheel; and as they, and not the water-wheel axis, rest on the rails, the boat and the wheel are propelled downstream, and with the same velocity as in the opposite direction.

The getting of the boats in and out of the canal is done by having slips connected with the canal at certain points, in which the water would be held at a definite level. At the entrance to the main canal there would be no obstruction excepting the rail on one side, and this could be lifted to permit the ingress and egress of the boats. The wheel would be allowed to propel itself down the canal for a short distance, while boats were taken in and out of the canal proper.

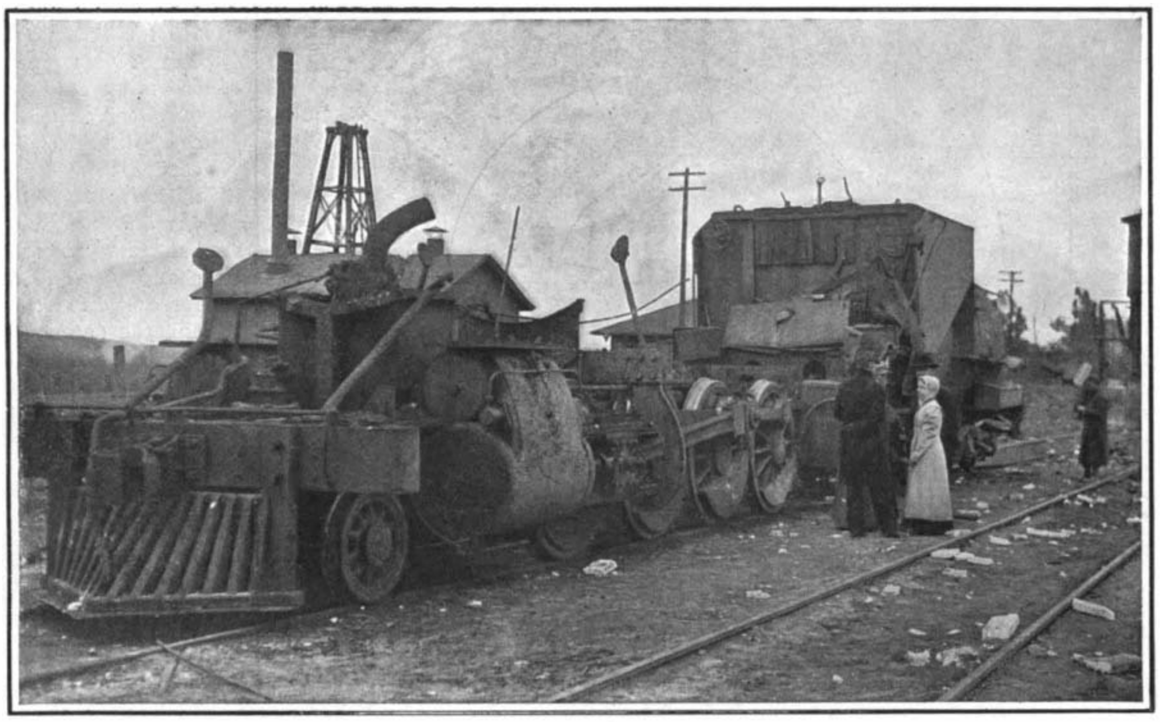
Mr. Alexander Potter, the well-known consulting engineer and an expert in the subject of hydraulics, has made an examination of the plans for this type of lock, as well as of the various hydraulic questions which enter into the solution of the problem. Mr. Potter states: "In a canal built upon a grade of 4 per cent, boats 120 feet long can be passed through the canal where there is an available water supply of 12 cubic meters per second. Comparing this with the amount of water supplied in passing boats on a flight of locks such as those on the Erie Canal at Cohoes and at Lockport, the amount of water required for the Bartolomei system is no more than that required for the operation of the Erie Canal for the same tonnage.

"From a theoretical standpoint, there is no question that a movable canal lock designed on the Bartolomei principle will operate satisfactorily. The device will be self-regulating, that is to say, when the tendency of the wheel is to go too slowly, the head of the water back of the wheel will increase, thus creating a greater force to make it move faster; and when the tendency is for the wheel to move too fast, the head will fall, thus decreasing its speed.

"There are certain problems in connection with this interesting device which have not been worked out by the inventor in sufficient detail; among these may be mentioned a mechanism for arresting the lateral motion of the wheel and for reversing the same; also prompt removal of the water wheel to permit egress from and ingress to the movable canal lock by the boats. While these problems may at first appear difficult, they can be readily mastered. The structural details of the wheel have not been worked out for a large scale, but this also is a problem capable of proper solution.

"In places where this invention can replace a flight of locks, there is no question that there will be a saving in the time of the passage of a boat through the locks, and its adoption would result in an economy of construction. Where ample water is not available, the value of the invention is of course greatly reduced."

EXPLOSIVE ENERGY OF A BOILER.



The locomotive after the boiler had been blown away.

The accompanying photographs illustrate in a striking manner what a magazine of explosive energy a steam boiler may be. They represent the wreckage of a locomotive, the boiler of which exploded at Beaumont, Cal., on the 12th of last month.

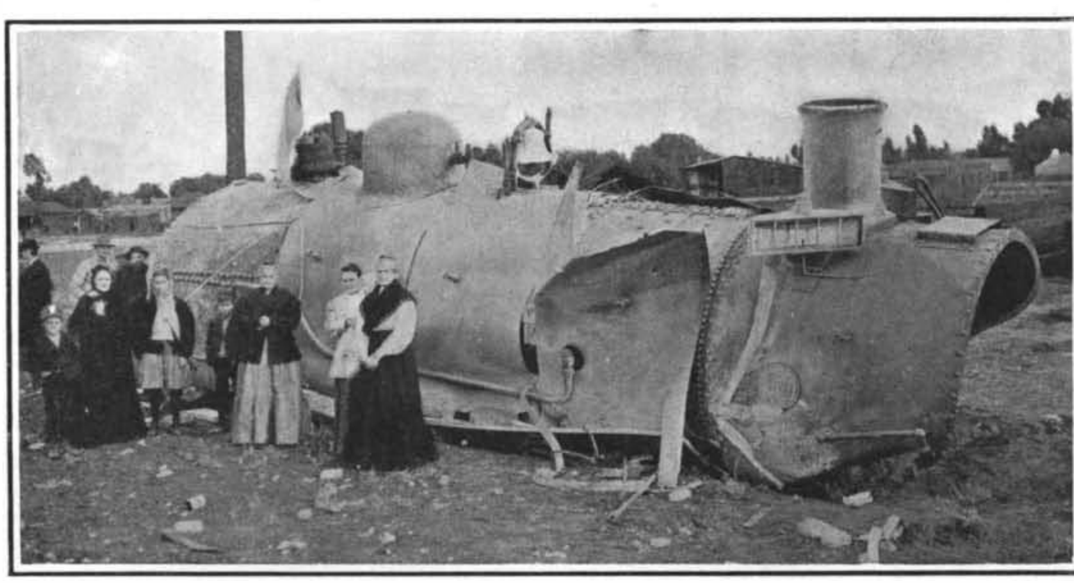
The boiler was wrenched from the trucks and shot upward and forward, turning end over end several times, according to an eye-witness, before it fell on its forward head 65 yards from its trucks, striking an empty oil-tank car. From this it ricocheted another 30 feet, turning end over end, alighting on its firebox end and again 40 feet before coming to rest in the position shown.

When the boiler struck the oil tank it drove in the head of the latter, twisted its steel frame, and drove two of its truck wheels down through the rails, which were broken in four places.

The front end of the locomotive, with its smoke-box door, was blown clean off, alighting 100 yards ahead of the engine and bounding over a pile of ties onto a side-track.

A small piece of wreckage was shot straight up in the air, and descended upon the tender with sufficient force to cut a clean, smooth, perpendicular slot, 12 inches long, through the side of the water tank, emptying the tank of water. The force of the explosion wrecked a freight car standing on a siding opposite the engine, although the car apparently was not struck by any heavy part of the locomotive.

A local board of inquiry reported the explosion as being due to low water, stating that the crown sheet of the boiler must have been 7 inches uncovered, although the evidence indicating this is not mentioned and must have been difficult to determine. Evidence of stoppage or other failure of the water-gage was inconclusive, so that it is difficult to see how the en-



Portion of boiler after being blown 265 feet through the air.

Oil-tank car struck by the boiler in its flight.

EXPLOSIVE ENERGY OF A BOILER.