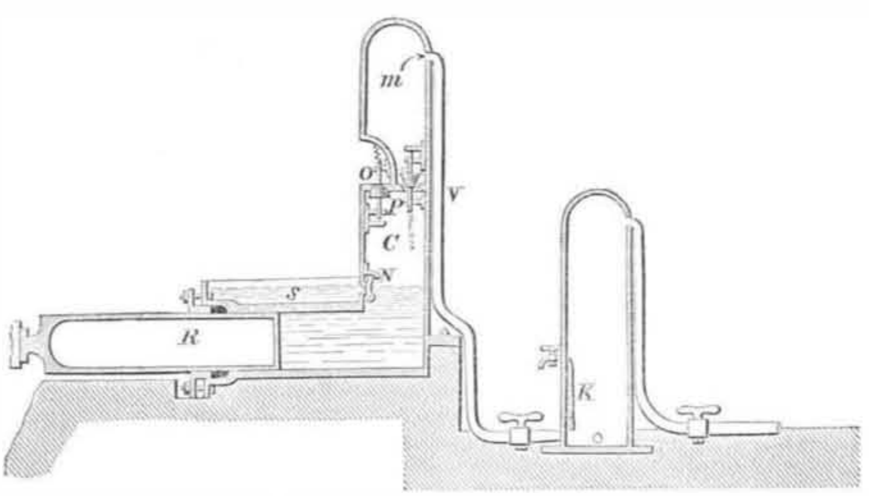
TRANSMISSION OF HYDRAULIC POWER FROM ITS SOURCE TO PROPEL MACHINERY AT A DISTANCE.

The *Bulletin Mensuel* contains an interesting discussion of the above subject by M. Leloup. We herewith give an abstract of the article, with an engraving of the apparatus by which M. Leloup proposes to accomplish the desired end.

M. Leloup says that there exist many difficulties in reaching and utilizing water power generated by the fall of water, situated at great distances from the centers of population, which, as such, are also manufacturing centers. The finding of any means to transmit, and to distribute in any desired amount, the power thus generated, so that the baker might knead his dough, the blacksmith forge his iron, by the aid thus afforded, is a desideratum. Combustible substances are now used to such an unprecedented extent as generators of mechanical power that the day must come when other means must be sought for, so that the fuels now in use can be economized for those industrial branches which cannot dispense with them. In order to do this we should turn our attention to the natural powers which exist on all parts of the globe, from the power creating high and low tides, to the power generated by the descent of the smallest brook. These powers are immense in comparison with all the power used in railway locomotion and in workshops. M. Leloup demonstrates that in the falls of French canals alone there exists a motive power of 336,320 horse-power.



The study of the question involves the solution of the great problem of the use of compressed air. Air has the property of indefinite expansion and contraction. It requires no process of preparation to enable it to contract and expand at regular intervals. It is the commonest of the elements and its cost is nothing.

He challenges the attention and the objections of practical men to the plan he proposes, by which the power of any fall of water can be transported to any distant place. The task would seem easily accomplished, by means of a force pump at the waterfall, a reservoir at a distance, and a tube connecting both. Tubes from this reservoir would lead the power to different establishments in the same way, as steam is distributed from a boiler to different steam hammers. What can be done with steam can also with more reason be done with compressed air, for the latter possesses the useful qualities of steam with none of the disadvantages resulting from condensation. In large forges the tubes which convey the steam to the hammers have to be clothed with linen or other non-conducting material, to prevent condensation and consequent loss of power. This inconvenience necessitates the multiplication of generators, to suit the multiplication of machines beyond a certain limit. This condensation is often so great as to absorb the greater part of the power of the steam at the boiler.

Air compressed in a solid and well closed leading tube loses none of its pressure. M. Leloup and M. Lucare made an experiment with a common lead gas-pipe, 5-16ths of an inch in diameter and 150 feet in length, coiled as gas-pipes usually come from the factory, applying a pressure of eighteen atmospheres, as indicated by a manometer; the instrument for three months indicated the same pressure. This result shows the entire reliability of tubes for conducting power.

The transmission of power by the use of pumps is attended with some difficulties. The high pressures required (15 to 18 atmospheres) exact great perfection in the mechanism of the apparatus. A pressure of 16 atmospheres is difficult to attain by a common air pump acting directly upon air. To obviate this difficulty water might be introduced into the pump, so that by a peculiar construction the piston would constantly be in contact with water instead of air. This combination changes the problem from the compression of gas, which is difficult, to the pressure upon water, which is much easier. The water in this system being constantly in contact with the piston, would first receive force, and it is known that the common force pump is sufficient for imparting 16 atmospheres pressure to water. The proposed apparatus is thus described:

It is composed of a cylinder bent at right angles so as to have one branch horizontal and the other vertical. The horizontal branch of the body of the pump is designed to receive the piston, R; the lower part, C, of the vertical branch to receive the injection; and the upper part, *m*, to receive the compressed air. This latter part communicates with the reservoir, K, by means of the tube, V. The apparatus is completed by a valve, P, called the evacuation valve; a valve, O, called an injection valve; a third valve, N, called the feed valve; a reservoir, S, called the feeding reservoir, and finally by the piston, R.

In the examination of the operation of this apparatus, we must remember that the only function of the water in the body of the pump is to insulate the moving pieces from the air. Let us now move the piston from the extreme inner position. By this movement the level of the water in C, will be brought down to a level with the lower end of the opening of the valve, N. The air will enter by the aspiration valve, O, and will occupy the vacuum caused by the displacement of the water in the body of the pump. The piston in returning to the inner position will at the same time elevate the level of the water in C, so as to reduce its capacity to nothing, consequently forcing the air up into the compressed air chamber, *m*, even raising a small amount of water also into *m*, which serves to pack the valve, P, during the next aspiration caused by the motion of the piston. The feed reservoir supplies through the valve, N, the amount of water used in packing the valve, P, and the losses commonly realized in pumps. The water after it has accumulated in *m*, flows through the pipe, V, into K, from which it is at proper intervals drawn off by a cock provided for that purpose. The connection of the compressed air chamber to the places where the power is to be utilized is made by tubes of metal or rubber, provided with valves to prevent the return flow of the air.

An American Invention in London.

The London *Standard* thus speaks of a life boat invented by a citizen of San Francisco:—

"Charles Gunner, a mechanic all the way from San Francisco, California, has provisionally registered a new boat which possesses some distinctive features, and a model of which we have had the opportunity of inspecting. The boat, intended by the inventor to be used for saving life at sea, is 36 feet in length, and of the same proportions as the boats of the Royal National Life Boat Institution. It is constructed to carry 40 passengers and a crew of nine men. Twenty passengers are intended to be accommodated in a cabin erected midships, and ten each in fore and aft cabins. The self-righting properties of the boat are efficiently secured by two air-tight cylinders placed midships on the gunwales, each six feet in length and three feet in hight, and a central circular cylinder of the same length and three feet in diameter, which is placed between the side cylinders and moves to either side of the boat on a self-acting pivot. As a coast life boat, the principal objections would be found in the air tight cylinders, which would be likely to be acted upon by the winds, to the detriment of its speedy progress through the waves; motive power would also be lost by the necessity of seating the oarsmen fore and aft. Ventilation of the cabins has not yet been perfected, but the inventor is sanguine of success on this point, without which, of course, it would possess no advantage over those at present in use. As a ship's life boat, however, there is no doubt that it would succeed admirably, its properties being such as to insure an effective launch under any circumstances and to enable it to live in any sea. The cabin could, in such case, be used for provisions."

ICE MACHINES.

Ice is not only a luxury in tropical climes or hot seasons which is beginning to be more and more appreciated, but the advance of civilization has made it a necessity for many industrial pursuits as well as for medical purposes. Taking then into consideration the difficulties incidentally experienced in gathering, storing, and transporting this substance, sometimes for thousands of miles, it is not to be wondered at, that attempts have been made, several years since, to make a practical application on a large scale, of the beautiful lecture-room experiments of making ice with the so-called freezing mixtures, with the reaction of previous heat, or with the air-pump. There are consequently three kinds of ice-machines; first, those acting by the cooling effect of certain chemical mixtures; secondly, those acting by the previous application of heat; and, thirdly, those by which the freezing is produced by the cooling effect of evaporation in a vacuum made by an air-pump. The first kind we may call chemical machines; the second, caloric ice-machines; and the third, mechanical ice-machines.

I. CHEMICAL ICE-MACHINES.

Chemical combinations often manifest, as a secondary result, a great change in temperature, sometimes a raise or heating, sometimes a descent or cooling of the resultant product. Everybody knows the enormous heating attending the combination of quicklime and water into hydrate of lime, or of sulphuric acid and water. The mixture of lime with sulphuric acid and water produces a red heat, and of sulphuric acid, nitric acid, and oil of turpentine produces even ignition. The same is the case with sulphuric acid and chlorate of potash; and this last peculiar property had been used for making lucifer matches, before the friction match was invented.

In other chemical combinations, cold is often produced. This is generally the case when the product of the mixture is liquid; on the contrary, when no liquefaction takes place, heat is the result. An intense cold is obtained when salt is mixed with snow or pounded ice; in this case, however, it is simply the strong tendency which salt possesses to dissolve in water, which forces, as it were, the ice to liquefy in order to procure water to the salt. If we force a solid to liquefy, or melt without giving it the heat necessary as latent heat for this liquefaction, it will take this heat from the sensible heat, which will then diminish, as it will become latent in the liquid; the sensible heat being the only heat the thermometer indicates. A similar effect is produced when dissolving other salts in water or any other liquid; the descent of temperature being very different according to the nature of the substances.

Thus, five parts of sal ammoniac and five parts nitrate of potassa dissolved in sixteen parts of cool water will cause the temperature to descend about 20° Fah. Nine parts of phosphate of soda dissolved into four parts diluted nitric acid, will cause a descent of temperature of 50°. Six pounds of sulphate of soda gradually dissolved in five pounds of hydrochloric acid, will cause such a descent of temperature that it will freeze from five to six pounds of water in the course of one hour. This ice dissolved in alcohol will cause the temperature again to descend more than 50°. The most remarkable mixture of this kind, discovered by Berzelius, and producing the most intense cold, is the following:

Two or three pounds of chloride of lime is heated until it forms a porous mass, and is powdered and passed through a sieve, by which operation it absorbs just enough moisture as is necessary to cause it quickly to dissolve in water. It is then mixed with half its amount of snow, in a wooden vessel placed in a mixture of snow and salt. In the interior of this cooling mixture, mercury or ether may be frozen when introduced in a platinum crucible or glass ball.

When this powdered chloride of lime is dissolved in half or two-thirds its amount of cold water, it will easily freeze water when introduced into the mixture in a proper vessel, and this may perhaps finally be found a cheaper freezing mixture than any of the common ones now in use, as by simple evaporation the original salt may be regained.

Lately a small machine has been introduced to the trade, similar to a large cream freezer, in which about one gallon of water could be frozen in the course of one hour. One of the above-mentioned freezing mixtures is the agent by which the result is accomplished. The machine itself being simple in its construction is, of course, not costly, but as the chemicals used are bulky and as a large amount of them is required, it is inconvenient and expensive. This kind of machine promises only to be of very limited practical application. The cheapest material to produce cold being the above mixture of sulphate of soda and hydrochloric acid, the first of which costs at present, wholesale, 3 cents, and the second, 6 cents a pound; making the cost of six pounds of ice 42 cents or 7 cents a pound—a price which can never compete with that of natural ice except in out of the way localities in the extreme southern States, where ice is occasionally sold for 10 cents per pound, and often cannot be had at all.

If the chemical products of the freezing mixtures had any commercial value it would diminish the price of the ice produced, but unfortunately this is not the case. For the benefit of those who wish to use such machines, or experiment in this line we give here the result of experiments with some of the best cooling mixtures.

TABLE OF COOLING AND FREEZING MIXTURES.

MIXTURES.	PARTS.	DESCENT OF THERMOMETER
Sulphate of Soda	6	60°
Chloride of Ammonium	4	
Nitrate of Potash	2	
Diluted Nitric Acid	4	
Sulphate of Soda	6	66°
Nitrate of Ammonia	5	
Diluted Nitric Acid	4	
Sulphate of Soda	8	50°
Hydrochloric Acid	5	
Nitrate of Ammonia	3	31°
Diluted Nitric Acid	4	

Experiments have proved that the addition of common salt is not advantageous when no snow or ice is used in the mixture, but that, on the contrary, it diminishes the cooling effects of other salts, and in some cases even produces a rise of temperature of a few degrees. This is especially the case when common salt is dissolved in any of the previously made solutions of chloride of ammonium, sulphate of soda, common saltpeter, or nitrate of soda. When, on the other hand, one of the four last named substances is dissolved in a previously made solution of common salt, a descent in temperature of from 10° to 20° Fah. is the result. This is only mentioned to show what an immense field of investigation there is yet open in this special branch alone.

Social Science in the West.

A call has been issued signed by a large number of professional men, as well as many who do not lay claim to that title, for a meeting to be held in Chicago, on the 10th of November next, at some place to be hereafter announced, to organize a Western Social Science Association.

It is stated that the organization is intended to be similar in character and design to the British Social Science Association, and the coöperation of the most able and earnest men in the West is hoped for as well as the sympathy and coöperation of all public-spirited citizens throughout the United States. A number of valuable papers are promised, and the subjects of education, public health, and jurisprudence will be freely discussed. The Association is designed to be kept free from sectarian and party influences, and its discussions will be published so far as its funds will permit. We most heartily wish this and all other efforts to correct the prevalent evils of society the utmost prosperity and success.

THE manufacturing establishments of Lawrence, Mass., were honored lately by a visit from the Chinese Embassy. The busy activity of a New England manufacturing town, must excite the extreme wonder of these Orientals.