MACLAINE'S TWIN SCREW PROPELLERS.

The "perfect" twin propellers are being introduced by the Perfect Piston Company, of Belfast. The object of the inventor was to produce a system of propulsion which should be advantageously applicable to all sizes of vessels, and calculated to materially increase the safety and economy of maritime trading. The system is illustrated in the annexed engravings, where Fig. 1 shows an end elevation of the stern of a vessel fitted with Mr. MacLaine's twin screws, Fig. 2 being an underside view, and Fig. 3 a side elevation of the stern. These views are engraved from photographs of the model of a steamship 500 feet long and 50 feet beam, with a load draught of 26 feet. The twin screws are each 19 feet in diameter, overlapped 5 feet, and 11 feet apart fore and aft, and the ends of the blades project through two separate propeller spaces, each 6 feet by 16 feet, with a solid 4 feet space between them.

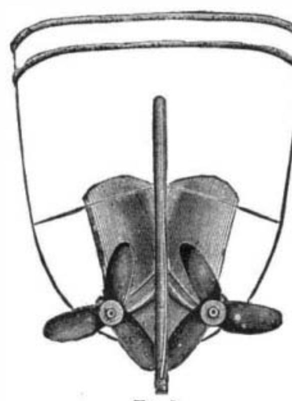


FIG. 1.

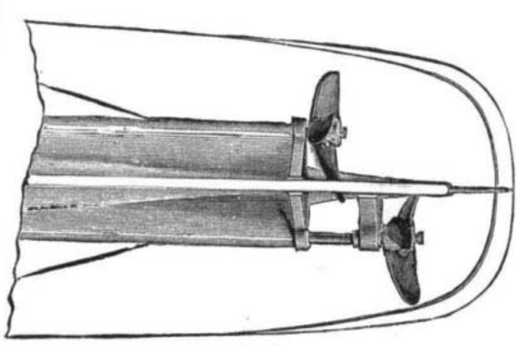


FIG. 2.

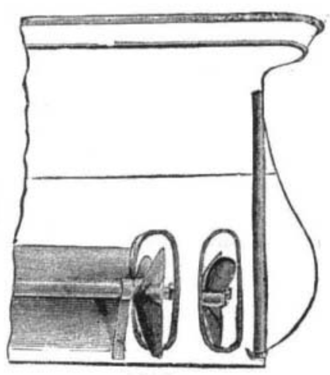


FIG. 3.

IMPROVED TWIN SCREW PROPELLERS.

By increasing the diameter of the propellers, together with overlapping them 5 feet and going forward 16 feet, the propeller shafting outside the hull becomes so shortened, and is brought so much nearer the center line, that it can be readily built into the vessel, and the stern tubes on both sides finished watertight up to forward propeller space, one shaft being continued aft to carry the after propeller, and be secured on a bracket placed on the solid 4 feet space between the apertures. The general result is that the propellers are so far distant fore and aft that the tips do not interfere with each other in their working, and the solid 4 feet space retains the body of the water from the forward propeller on its own side of the vessel, and prevents it interfering with the working of the other.

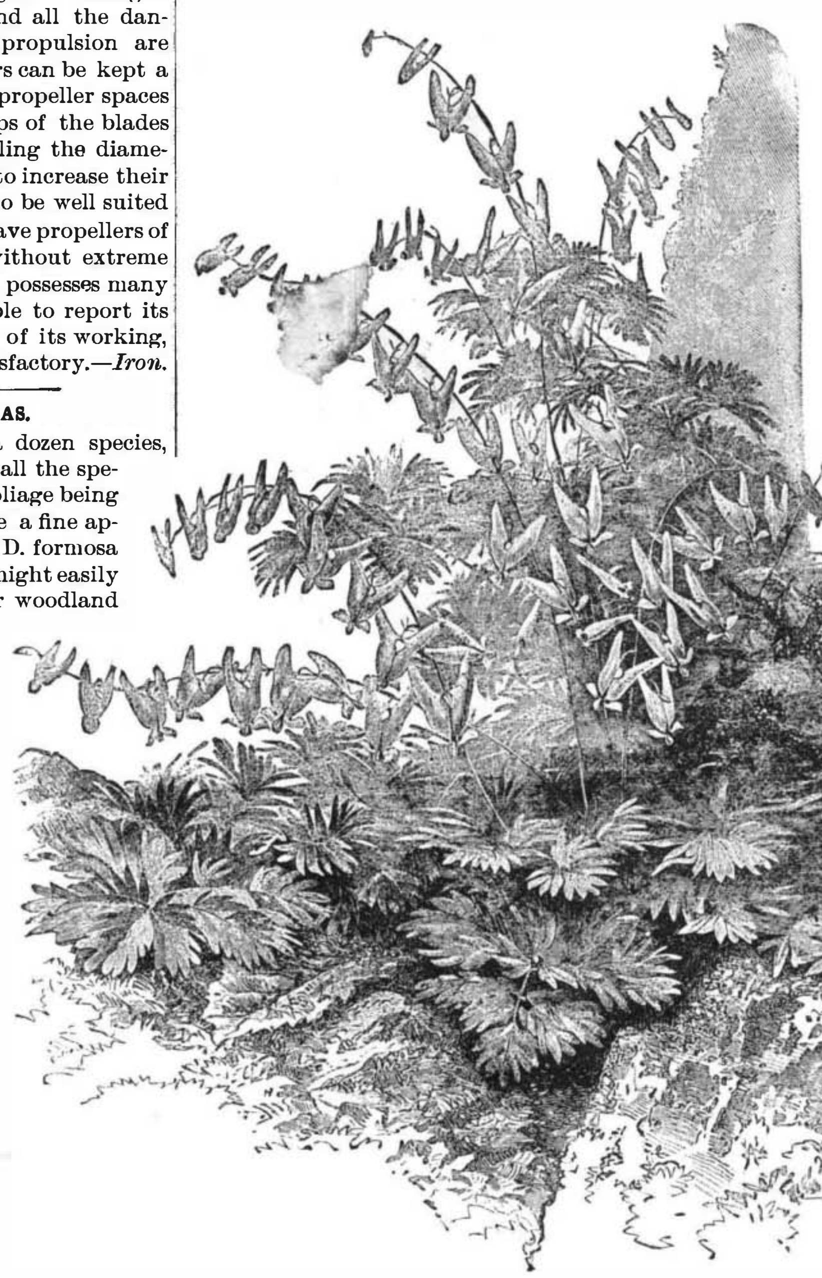
The propeller width is materially reduced, which facilitates docking; all brackets that might be damaged by floating ice are dispensed with, and all the dangers and difficulties of twin screw propulsion are avoided. In small vessels the propellers can be kept a few feet apart fore and aft, and the propeller spaces made merely sufficient to permit the tips of the blades to project through them, thereby enabling the diameters of the propellers to be enlarged to increase their efficiency. The system would appear to be well suited for tug boats, where it is desirable to have propellers of large diameter, with ample surface without extreme width over the propellers. In short, it possesses many advantages, and we hope soon to be able to report its practical application and the results of its working, which we hardly doubt will prove satisfactory.—*Iron.*

THE AMERICAN DICENTRAS.

This genus, which comprises about a dozen species, is chiefly confined to America; with us all the species are more or less hardy, and their foliage being graceful and almost unique, they have a fine appearance in borders and on rockeries. D. formosa eximia and the Chinese D. spectabilis might easily be naturalized on the margins of our woodland walks, perfect drainage being really the only essential toward their thorough establishment; thus used, they would fill up a gap between the daffodils and bluebells

D. canadensis (Squirrel Corn), though by no means common as yet in gardens, lacks none of the grace and beauty so characteristic of the allied species. It was at first believed to be only a form of D. eximia, which it resembles, but it is abundantly distinct, both in the color of its flowers and in the formation of its root stock; the scales, taking the form of grain, look not unlike yellow Indian corn. It is a valuable addition to the bog bed, where it succeeds well, provided it has a good rich soil and moisture during the growing season. The situation, though not exposed, should not be too shady, as this tends to the growth of leaves instead of flowers. The leaves, which are finely cut, are quite fern like. The flowers, which are borne raceme fashion, are nearly heart-shaped, and have short spurs; in color they are white or greenish-white, tinted with rose, and have a strong hyacinth fragrance. They are produced in April and May. It is found in woods from Maine to Kentucky.

D. chrysantha, figured in the "Flore des Serres," viii., 1,931, under the name of Capnorchis chrysantha, is an extremely handsome plant—indeed one of the most remarkable introductions of recent years in the way of herbaceous plants. Unfortunately, it gets disabled and even entirely destroyed in severe winters in the more northern parts of the kingdom. In the south, although it winters well in the open generally, it is all the better for the protection afforded by evergreen bushes, where, dotted about at intervals, it forms a striking feature; its large pyramidal spikes, rising up golden rod like, have a unique effect. It requires a light, rich soil, well drained, and the crowns should be well under the surface; a few large stones on each side of it greatly assist in giving the roots the desired warmth in spring. Where it does well it generally attains such dimensions that other plants get overcrowded by it. Plants of it raised from seed flower the second year; they may be kept through the first winter in pots, or when ready to handle they may be planted out where they are to bloom. Give it a slight protection during severe weather, and transplanting, except from pots if it can be avoided, had better not be attempted, as the result is oftener than otherwise a failure. It grows from 2 feet to 4 feet and even 6 feet high; the leaves are doubly pinnated, and the larger ones are over a foot long; they are pale or glaucous green, and are very pretty. The flowers, which are bright golden yellow, are about an inch long, and have beautifully curved or cordate bases. It commences to flower about the end of July, and continues into September. It is found on hills from Lake Co to San Diego, in California.



DUTCHMAN'S BREECHES (DICENTRA CUCULLARIA).

D. cucullaria (Dutchman's Breeches, or Hooded Fumitory), of which an illustration is here given, although oftener classed among curious and interesting plants rather than among those that are useful, is not to be despised when well grown as a rockery subject. Our experience with this plant has been varied; a half shady nook in pure peat seems to be the situation in which it feels most at home. It will be rarely found to do well in the open border without some protection; its slender leaves are invariably cut and destroyed by cold east winds early in spring. The scapes rise from a sort of granulated bulb, and bear from four to a dozen curiously hooded flowers, white, and invariably tipped with cream or pale yellow; the leaves, which have a glaucous green hue, are very delicate and pretty in outline. It flowers in April and May, and is a native of North America.

D. eximia.—This is a very ornamental plant, suitable for a small rockery, where its graceful, fern-like foliage never fails to attract attention, even without its handsome flowers. It will grow in almost any position, and in ordinary garden soil as well as in a peat bog. It makes a pretty clump in the mixed border, and, although liable to spread beyond bounds, a few pieces of slate will keep it in its place. It has a tendency, especially on the rockery, to run to the stones, leaving a blank in the center of the clump; this is, however, easily remedied by transplanting from the sides, which may be done in autumn without injury to the plant. The finely-cut divisions of the leaves are broadly oblong in outline, and glaucous if grown in full sun. The flowers, which are borne in clusters on compound racemes, are oblong in shape, with the crest of the inner petals slightly exserted; they are borne on stalks about a foot high. They are bright or deep rosy pink, and last from May until August. It is a native of the Alleghanies of Virginia.

D. formosa.—This plant is nearly related to the above, perhaps too near to bear a distinct specific name; the chief difference lies in its being dwarfer, and in having lighter colored flowers, and in its having a two instead of a four-angled stigma, as in eximia. D. formosa is easily managed, and may be grown with advantage in sheltered spots on the rockery. It makes a fine pot plant for edging stages, etc. It is a native of Sierra Nevada, where it is found at elevations of 3,000 feet. It flowers from May to July, the flowers appearing rather later than the leaves.

D. pauciflora.—This is a very slender species, not yet introduced. Its leaves are biternate, and have very narrow segments. The flowers are pure white, tinged with rose at the tips.

D. uniflora is a salmon colored species. Both are natives of California.—*K., in The Garden.*

Remarkable Salt Deposits.

At a recent meeting of the Royal Geographical Society, Sir Peter Lumsden read a paper on the countries and tribes he has recently visited west of Afghanistan. He gave an interesting description of the geography of the Murghab Valley and the customs of its people, and quoted a singular account of the Numaksar, or salt lakes of Yar-oilan, visited and described by Captain Yate. He said: "The valley of the lake from which the Tekke Turkomans from Merve get their salt is some six miles square, and is surrounded on all sides by a steep, almost precipitous descent, impassable for baggage animals, so far as I am aware, except by the Merve road, in the northeast corner. The level of the lake I made to be about 1,430 feet above sea level, which gives it a descent of some 400 feet from the level of the connecting ridge, and of some 950 feet below the general plateau above. The lake itself lies in the center of the basin above described, and the supply of salt in it is apparently unlimited. The bed of the lake is one solid mass of hard salt, perfectly level, and covered by only one inch or two of water. To ride over it was like riding over ice or cement; the bottom was covered with a slight sediment, but when that was scraped away the pure white salt shone out below. How deep this deposit may be it is impossible to say, for no one has yet got to the bottom of it. To the east of the dividing ridge is the second lake, from which the Saryks of Penj-deh take their salt. The valley in which this lake is situated is much the larger of the two. The valley proper is itself some fifteen miles in length by about ten miles in breadth. The salt in this lake is not smooth, as in the other, and did not look so pure. It is dug out in flakes or strata, generally of some 4 inches in thickness, is loaded into bags, and carried off on camels for sale without further preparation."

The Ship Railway between the Atlantic and Pacific.

E. L. Corthell, C. E., contributes to *Science* an interesting paper, the object of which is to present the scientific and commercial reasons why the ship railway across the Isthmus of Tehuantepec may be superior to either the Panama sea level canal or the Nicaragua lock canal.

It is estimated that $50,000,000 will be ample to put the ship railway into operation for the transportation of vessels of 5,000 tons. The estimated cost of the Nicaragua canal on a cash basis is $140,000,000, and of that at Panama as high as $350,000,000.

The route *via* Panama, between Liverpool and San Francisco, is about 700 miles longer than by Tehauntepec; between New York and San Francisco, about 1,200 miles; and between New Orleans and San Francisco, about 2,000 miles. Probably 1,000 miles excess of distance would be a fair average.

The time in transit across the isthmus would be at least three days shorter at Tehauntepec than at Nicaragua for either a steamer or sailing vessel. The Suez canal, which is 100 miles in length, delays a steamer 48 hours in transit, or her passage is at the rate of about two miles per hour; two-thirds of the distance is through the lakes, and there are no locks. At Nicaragua, about one-sixth of the distance only is through an open lake; and there will be from twelve to twenty locks, at each of which a vessel will be detained nearly an hour. The time required for passage, therefore, will be about four days; so that, although the total distance is shorter than at Panama, the time required for a steamer would be about the same.

Reference has already been made to the favorable situation of Tehauntepec with reference to the trade winds.

It is also hoped that the maintenance will cost much less per annum than that of either canal. The Panama canal being below the level of the sea, with the slopes of its enormous cuts exposed to the wash of the tropical rains, the difficulty of removing the material washed into its prism, and the controlling of the Chagres River, make the maintaining of the ship channel difficult and expensive. At Nicaragua the conditions are nearly similar.

The ship railway will not be subject at any point to the ravages of floods. It will be built over its entire length, on the solid ground, with excellent materials at hand for construction and maintenance. On either side is a natural harbor, which with small expense, by the construction of jetties, will gives two excellent ports. The climate is remarkably healthy, and native labor abundant and cheap. It is located in a country which has a comparatively strong government.

The estimated total cost of maintenance and operation in lifting, hauling, and placing the vessel with its cargo in the water again, is less than thirty cents per ton of cargo carried.

The great doubt which must exist in the mind of the reader is in the practicability of lifting and hauling a loaded vessel. The method proposed is very briefly this: to lift the vessel by an ordinary lifting dock, distributing and equalizing completely the weight of the vessel by a system of hydraulic presses before the weight is brought upon the carriage which is to transport it. This is all done under the water as the vessel rises out of it, and in such a manner as to be perfectly safe and easy for the vessel. The weight is finally placed upon the carriage in such a way that there is no more weight upon one wheel, or upon one part of the carriage in its length or width, than upon another. The weight upon no wheel will be over eight or nine tons, although they will be tested to twenty tons when manufactured. The whole load is transferred to the wheels by means of powerful springs, which will also be tested to twenty tons, and none of which will have imposed upon them in practice a weight of over eight and a half or nine tons. These springs not only give a perfect cushion for the vessel and carriage while being transported, but also serve to take up any slight irregularities there may be in the track. The system of supports designed, and shown in the working model, gives an area of support under the vessel from fifty to seventy-five times as great as that in the best lifting dock in the world; and, moreover, these supports completely adjust themselves to the model of the vessel in each case. As it has been said frequently by practical experts in designing and building docks, and handling vessels in them, the desideratum is to have a sufficient number of adjustable supports, and this has been sought for in the plans for the work as shown in the model.

The railway road bed will be about 50 feet in width; the width between the outer rails, about 30 feet. There will be six of these rails, weighing from 100 to 125 pounds per lineal yard. All six rails will be connected by a long steel plated tie, set into two feet of broken stone ballast or concrete, as the case may be. The locomotive power as designed is to consist of engines of from 75 to 100 tons, each of which will haul at least 3,000 tons on a grade of as much as 40 feet to the mile; so that two, or at the most three, such locomotives will haul the maximum load. The grades are very light. Much of the line of railway is practically level. The maximum gradient, of which there is only one length of about 12 miles, is one per cent, or 52·8 feet per mile. The change between grades will be made by the ordinary vertical curve, but a very flat one—one that will change from a straight line two inches in 400 feet. The railway is practically straight, the minimum radius being 20 miles. The line as laid down on the isthmus has curves of from 20 to 53 miles radius. At five points on the line, in order to avoid heavy mountain cuttings or very high embankments, a change of direction will be made by floating turntables—a simple and economical device in first cost and operation, on which the vessels will be turned about while resting on a cushion of water. The whole line has been very carefully surveyed, and is practically located. Careful examinations have been made to ascertain the character of the foundations, both for the road bed and for the masonry structures. The result of these examinations shows that there is no bad or even questionable ground anywhere between the two termini. The accompanying map shows the topography of the country and the route of the railway, the river to be navigated, and the harbors on the two sides.

It will be seen from the foregoing that the vessel, when lifted out of the water, is really water borne on a system of columns of water under pressure, and that in the position given by this hydraulic system, she is transported across the isthmus. It will also be seen and appreciated by every person who is accustomed to travel on the ocean, that the strain to the vessel by the methods proposed can never be so great as that which she must undergo every time she goes to sea.

Industrial Notes.

To Coat Iron with an Impermeable Black.—Mr. Puscher, of Nuremberg, has devised a very simple process of giving iron and other metals a black coating resembling enamel, and one that is very even and regular, since it is not applied with a brush. *La Nature* describes it as follows:

Into a box about twenty inches in height is put sufficient powdered soft coal to cover the bottom to a depth of about three-quarters of an inch. About three-quarters of an inch above this is placed a grating, and upon this are laid the objects be treated. After closing the box hermetically it is placed over a fire. The moisture contained in the coal evaporates, and thick bituminous vapors are given off. The bottom of the box is kept at a dull red heat for about half an hour, and the box is then removed from the fire, and after a time is opened. The coal will be found to be converted into coke, and the objects lying upon the grating will be covered with a black layer resembling enamel, but more adhesive, and especially more elastic than the latter.

Articles thus treated may be bent and be exposed to great variations of temperature without the coating undergoing the least change.

Ebonizing Wood.—*La Nature* gives the following process for ebonizing wood: The wood to be treated is immersed in a solution of permanganate of potash for a length of time varying with the concentration of the bath, and is afterward dried. In this way a very beautiful tint is obtained, which becomes brilliant through slight friction, and which is due to carbonization of the wood. A weak solution gives a violet color.

Bleaching by Electricity.—According to the *Annales Industrielles*, Mr. Bonneville gives the following process for bleaching fabrics by electricity. Into a one per cent cold solution of bromine is put one per cent of caustic soda, or of any equivalent alkaline base.

The vegetable fabric, first thoroughly saturated with water, is then placed in this solution and allowed to remain therein until it is colorless.

It is afterward passed through acidulated water, and finally rinsed. One per cent of sulphuric or nitric acid added to the bath, after it has been exhausted by successive operations, suffices to liberate the bromine again. The same quantity of caustic soda is afterward added to again form hypobromite of soda. The hydrofluosilicic acid, during the formation of the bromides and bromates, gives an insoluble fluosilicate of soda, which is easily got rid of by decantation.

In this case there are neither sulphates nor nitrates mixed in the bath. If, in the solution, there be placed two carbon electrodes, connected with a pile, the active oxygen will be continuously renewed by the regeneration of the hypobromous acid. It has also been proved that a bath that is entirely exhausted can be regenerated by the passage of the current.

Mr. Bonneville, then, recommends the industrial use of bromine and the hypobromites for the bleaching of vegetable tissues, the regeneration of the baths by acids, and the restoration of the bleaching power by means of electricity.

Artificial Ivory.—Natural ivory being rare and insufficient, says *Le Genie Civil*, quite an extensive industry has arisen to supply an artificial substitute. The majority of the products formerly employed were obtained by injecting whitewood with chloride of lime under strong pressure. At the Amsterdam Exhibition almost all the products had been prepared with the bones of sheep and waste pieces of deer and kid skin. The bones are macerated and bleached for two weeks in chloride of lime, then heated by steam along with the skin, so as to form a fluid mass, to which are added a few hundredths of alum. The mass is then filtered, dried in the air, and allowed to harden in a bath of alum. In this way there are obtained white, tough plates, that are more easily worked than natural ivory.

Soldering Platinum.—*La Lumiere Electrique* gives the following description of the process employed by Mr. Pratt for soldering platinum wire, crucibles, etc. Perchloride of gold ($AuCl_3$) is slowly heated up to 200° C. with an ordinary gas blowpipe, so as to obtain chloride of gold, then to a higher temperature in order to obtain metallic gold, which flows between the two surfaces which are to be united, and which have been previously juxtaposed.

The soldering is rendered complete by hammering while still hot. Mr. Pratt has found this method far preferable to the one that consists in the use of fine gold wire.

Comparative Cost of Fuels.

At a recent meeting of the Engineers' Club of Philadelphia, the secretary presented, for Mr. James Beatty, Jr., a paper upon the Relative Costs of Fluid and Solid Fuels. After giving the relative advantages in economy of labor in use, reduction of weight and bulk, ease of manipulation of fire, perfection of combustion, and cleanliness, the principal substances, experiments, and processes are noted.

Notes and tables are given as to the compositions of different fuels, their heat units and evaporative capacities, efficiency in furnace, prices per unit, and pounds of fuel for $1.00 and pounds of water evaporated from 212° F. for $1.00, in various localities.

The paper concludes with the following table, of which the author says: "These figures are very much against the fluid fuels, but there may be circumstances in which the benefits to be derived from their use will exceed the additional cost. It is difficult to make a comparison without considering particular cases, but for intermittent heating, petroleum would probably be more economical, though, for a steady fire, coal holds its own."

RELATIVE COSTS OF FLUID AND SOLID FUELS.

	Anthracite.	Bituminous.	Petroleum.	Coal Gas.	Generator Gas.	Water Gas.
New York	1·00	1·08	1·71	14·92	22·90	8·70
Chicago	1·00	·71	1·50	8·72	18·30	7·00
New Orleans	1·00	·59	1·56	17·90	15·30	5·80
San Francisco	1·00	·64	1·50	8·75	9·40	3·50
London	1·00	·61	2·05	7·16	17·70	6·30
Port Natal	1·00	·90	1·21			
Sydney	1·00	·34	1·39			
Valparaiso	1·00	·44	1·03			

Aerial Warfare.

In a lecture recently delivered in London, Prof. Gower suggests a plan of aerial warfare after this pattern: Could armies, forts, and arsenals be seriously assailed from that quarter in which attack was not now expected—the air above? His belief, from four years of study and observation, was in the affirmative, and as a means to that end he proposed simply to transfer to the upper levels the general plan of torpedo warfare, upon a larger scale and with its effective range indefinitely extended. He suggested that by means of aerostats explosions of 100 pound shells of gun cotton might be arranged over the enemy's position. Summarizing his proposals, the lecturer said: "In brief, I propose to you a warfare by gun cotton and hydrogen, to make the loss of an army a result of its meeting an opposing wind, to destroy the security of fortified positions, and finally to show, upon the simplest principles of self-preservation, that nations must keep peace and great armies be disbanded."

THE interest factor is one of the most potent features in all business transactions. Money will double itself at ten per cent in about seven years, at nine per cent in eight years, at eight per cent in nine years, at seven per cent in ten and a half years, at six per cent in twelve years, at five per cent in fourteen years, at four and a half per cent in sixteen years, and at four per cent in eighteen years.