accidents, the writer says that the wing of an aeroplane is in its structure very much like the mast and rigging of a sailing-boat, the main spars taking the place of the mast, while the wire stays take that of the shrouds. A very important difference is that the mast of a boat usually has a forestay to take the longitudinal pressure when going head to wind, while the wing of an aeroplane often has no such provision. It is possible that this had something to do with the Delagrange accident. Says the writer:

"Whether the failure of the wing was actually from longitudinal stress or from the supporting wire breaking . . . will probably

HOW TO COME DOWN GRACEFULLY.

Geffroy's aeroplane, which fell from a height of 80 yards, turning over in the air, and landing almost uninjured on a grassy slope. The aviator was unhurt. At the Issy meet, February 17, 1909.

never be accurately known; but it is quite clear that the question of ample strength to resist longitudinal stresses should be very carefully considered, especially when putting more power into an existing machine.

"The question of the most suitable material and fastenings for the supporting wires is, moreover, a matter which requires very careful consideration. In the case of biplanes the wires are so numerous that the failure of one or even more may not endanger the whole structure, but those of the monoplane are so few that failure of even one wire may mean a broken wing. In this respect, as in others, the position is, in fact, exactly the same as the mast of a sailing-boat, and one would expect, therefore, that the same materials would be suitable. At present, however, the stays of the aeroplane wings are almost invariably solid steel wire or ribbon, while the shrouds of a sailing boat are invariably of stranded rope, solid wire not having been found satisfactory. There is no doubt that, weight for weight, the solid wire will carry a heavier strain than the stranded rope when tested in a machine, but it is found in practise that it is not so reliable. The stranded rope seldom breaks without warning, but several strands go before the whole gets unsafe. As the breakage of these is very easily seen, an unsafe rope can always be replaced before actual breakage; whereas in the case of the single wire there is nothing whatever to show whether it has deteriorated or not.

"It does not, of course, necessarily follow that what is most suitable for a boat is also the most suitable for an aeroplane, but as the conditions are so very similar, it seems very doubtful policy to use in an aeroplane what is not good enough for a boat, as the consequences of failure are so much more serious.

"Incidentally the Delagrange accident shows what may be the evil effects of striving after 'records.' What is wanted to make the aeroplane of practical use is that it should be reliable and safe. The tendency of record-breaking machines is the exact opposite of this, as the weights of all the essential parts must be cut down to the finest limits possible in order to provide enough engine-power, petrol, etc., for the record run. It is, in fact, generally found in engineering that the design and materials which will give the best results for a short time are essentially different from those which are the most reliable, and striving after records consists simply in neglecting reliability and safety to the utmost extent to which the pilots can be persuaded to risk their necks."

COLD-STORAGE SURGERY

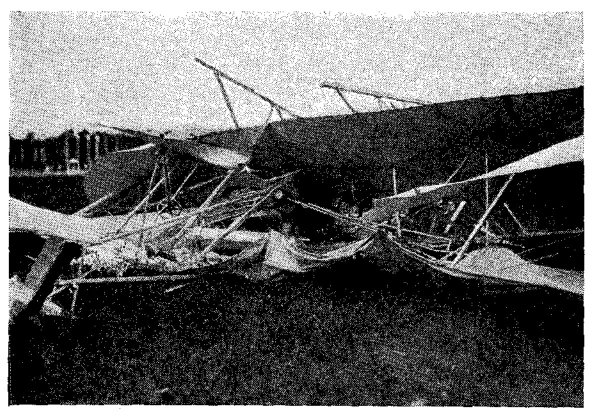
THAT the up-to-date surgeon may one day actually include in his equipment a refrigerator where various portions of bodily organs will be kept in cold storage ready to be spliced on where they are most needed is the rather startling suggestion made by Mr. R. Romme in *La Revue* (Paris, January 15). Recalling an earlier prediction of this kind, the writer asserts that it seems now to be in a fair way to be fulfilled. Dr. Carrel, whose success in the reparative surgery of the internal organs has already been noticed in these columns, has been experimenting on animals with material kept in cold storage as above suggested, and in many cases with complete success. The discussion is not only interesting in itself, but throws a side-light on the methods and merits of vivisection, which some regard as more cruel than useful, while others take the opposite view. Says Mr. Romme:

"No matter how inexpert he may be in anatomical matters, every one knows of the aorta from the aneurisms that sometimes develop there, whose rupture may cause sudden death. 'He succumbed to the rupture of an aneurism' is a phrase that is still often heard. Every one now knows that the aorta is a large artery, over an inch in diameter, which, issuing from the left ventricle, describes a curve and then descends along the vertebral column to the sacrum.

"It is comparatively easy to get at the aorta in the part situated in the abdominal cavity. If the surgery of the arteries were more advanced there would be no great difficulty, in case of an aneurism of the abdominal aorta, in opening the abdomen and uncovering the great artery and its aneurismal tumor. Dr. Carrel has performed several successful operations on the abdominal aorta of cats, removing a segment of the huge blood-vessel and replacing it with a similar segment taken from another animal or kept for some time in cold storage in a special liquid. . . . . . .

"Greater difficulty, however, would be experienced in an operation on the thoracic aorta. To get at this part of the artery it would be necessary to open the chest and to move the lungs to one side. Now in case of a large opening of the thorax, the lungs collapse, the respiration ceases, and the animal dies of suffocation.

"This difficulty, however, no longer exists. Researches made recently have shown that respiration may be replaced for some time by simple ventilation of the lungs. To realize this it is sufficient to place in the trachea a tube of average caliber and to pass through it a current of air under slight pressure. In contact with this air, which distends the lungs, the blood throws off its carbonic acid and is charged with oxygen. Asphyxia is thus avoided, and the animal may continue to breathe and live for three or four hours.



WHERE LEFEBRE MET HIS DEATH.

"This is precisely the arrangement adopted by Carrel in his experiments on dogs. . . . He draws the conclusion that operations on the thoracic aorta are not necessarily dangerous. It is, however, another matter to go further and say that the surgical treatment of aneurisms of the aorta is an accomplished fact. For to operate on an aneurism surrounded with inflammatory adherences and pathologic products is much more difficult than to treat a healthy aorta. We may hope, however, that the day when we shall know how to vanquish these difficulties is not far off and that in this day, in all surgical hospitals there will be a cold-storage plant where will be kept all sorts of segments—arteries, veins, joints, perhaps arms and legs, which the surgeon will utilize in his operations."—*Translation made for* THE LITERARY DIGEST.

LIQUID CRYSTALS

THESE curious bodies have been known for twenty years or more, but investigation during that time has brought out more and more of their interesting properties. Whether they should be called "crystals" is still in dispute; but this is a matter of definition and nomenclature solely. They exist, no matter what they are called. In *La Nature* (Paris) Maurice Leblanc tells us some of the latest facts about them. He writes:

"The maximum size of these crystals is much too small to enable direct visual observation; their possible size would even appear to decrease very rapidly as the softness of the constituent matter increases. Thus, for example, the microscopic crystals of soft soap are giants compared with the liquid crystals of benzoate of cholesterin. . . . . . .

"If a saturated solution of ammonium oleate in alcohol be allowed to cool, we see transparent crystals appear, of the form of very elongated 'diamonds'; these are visible with difficulty in natural light, for their refraction is very nearly that of the surrounding liquid. If the liquid be poured out, the crystals are seen to be displaced and deformed, twisting about to clear obstacles such as a grain of dust or an air-bubble. Everything takes place as if these crystals were simply portions of the liquid that had become doubly refracting.

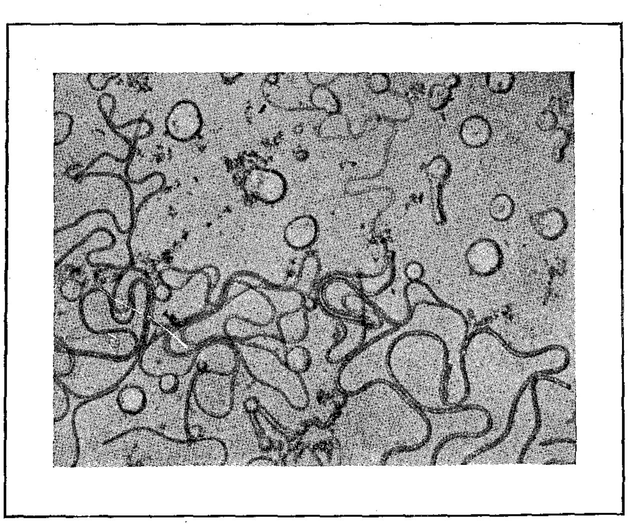
SPHERICAL "CRYSTAL" SWALLOWING AN AIR-BUBBLE.

"When two of these crystals meet, they join to form a single one as two drops of water would do, and this single crystal assumes at once the polyhedric form of the crystals that gave it birth; here we have the action of a force different from those of capillarity, which are the only ones that act when two drops of water run together.

"If the two crystals meet almost at right angles they unite, but the resulting crystal does not take the original form; it forms a sort of star; the same thing happens when in avoiding an obstacle the curvature of a crystal becomes too sharp; it can not straighten out and assumes the form of a portion of a star.

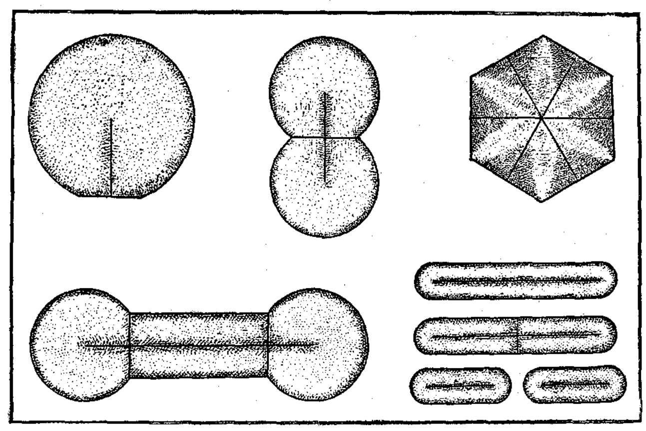
"The two fragments of an oleate crystal when cut in two assume each the polyhedric form of a complete crystal."

About 1890 Lehmann discovered crystals that form, when suspended freely, spherical drops like those of ordinary liquids.



LIQUID "CRYSTALS" ASSUMING BACTERIAL FORMS.

These have a fluidity comparable to that of water, but their particles are arranged in concentric circles about axes of symmetry. If two or more drops touch they blend and the resulting drop assumes the normal structure. By proper mixtures Lehmann obtained intermediate forms between the polyhedric crystals described above and the more liquid crystalline drops. Some of these exhibit phenomena strangely like those of the lower forms of life. A spherical "crystal," meeting an air bubble or a drop of different density, envelops or "swallows" it as an ameba does its



SPHERICAL "CRYSTALS" SHOWING APPARENT VITAL PHENOMENA.

food. "Buds" may appear on the flattened surface of a drop and break off, as when living organisms multiply by budding. Two spheres in contact may assume the form of a rod-bacterium or of a long snake-like organism. Says Mr. Leblanc:

"These formations would appear to grow, as living beings do, by additions made to their substance . . . while an ordinary crystal increases by the addition of new particles to its surface. As with bacteria, these rods and serpents advance or recede, squirm about, etc.

"The most curious thing is that, also like bacteria, they may separate into two or more parts, which behave like complete individuals and in their turn may grow and multiply.

"The cause of these movements is doubtless the force of crystallization, which attracts new molecules to those already grouped; in getting into position, the newcomers separate and repel the former. These experiments show that the force of crystallization may do mechanical work at the expense of their chemical energy; we have transformations similar to those that occur in the phenomena of life, and the Monists may see in this a support for their belief. The discovery of liquid crystals will surely give us new information on the constitution of matter and the forces exerted among molecules. Perhaps it will force us to modify some of our classic definitions and conceptions, but this is no reason why we should refuse to Mr. Lehmann and his associates the great honor due to their labors."—*Translation made for* THE LITERARY DIGEST.

A LUMINOUS ELEMENT—The gaseous element neon, discovered in the atmosphere by Sir William Ramsay, is remarkable for chemical inertness, but possesses a curious physical property discovered by J. Norman Collie and thus described in *The Scientific American* (New York, February 19):

"When a sealed glass tube, containing mercury in an atmosphere of neon at low pressure, is shaken it becomes strongly luminous. Similar effects are obtained when other gases are substituted for neon, but the light emitted by neon in these conditions is especially bright.

"If the shaking is repeated at intervals during two or three hours, the intensity of the light diminishes for a time and thereafter remains constant. The original luminosity can be restored by passing an electric discharge through the tube. If one end of the tube is heated to 750° F. while the other end is cooled by immersion in liquid air, and the tube is then allowed to return to the ordinary atmospheric temperature, the part which has been heated glows much more brightly than before. The luminosity is also greatly increased by substituting a tube of fused quartz for the