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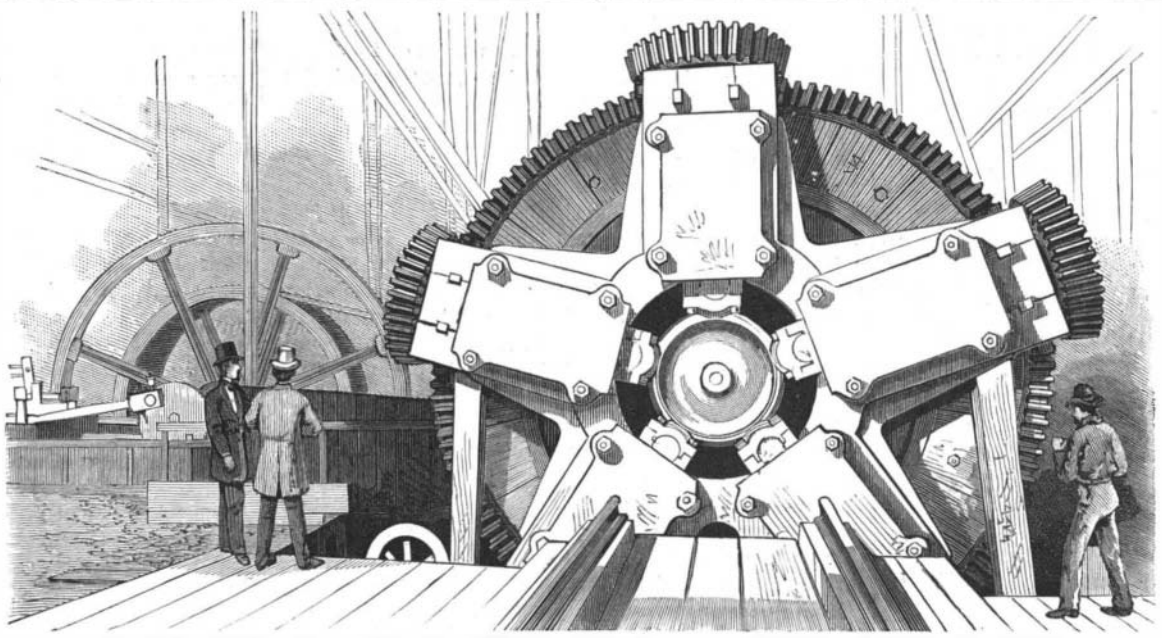
## COMPRESSED STEEL CAR WHEELS.

We give a series of engravings illustrating a new method of producing cast steel car wheels, rolled under great pressure, whereby a new product and new and important results are effected. It is the invention of Hervey W. Fowler, of Chicago, Ill., and for the manufacture of the wheels a large plant has been erected at Stony Island, Chicago, by the Fowler Steel Car Wheel Company, and is now in successful operation.

The general process of manufacture is briefly as follows: The wheels are first cast in the finest steel and while still hot are withdrawn from their moulds and subjected to an enormous rolling pressure, in the powerful machine herewith illustrated. Our large illustration shows a view of the car wheel rolling machine, and also a steel wheel blank on the carriage, by means of which it is introduced and removed from the machine.

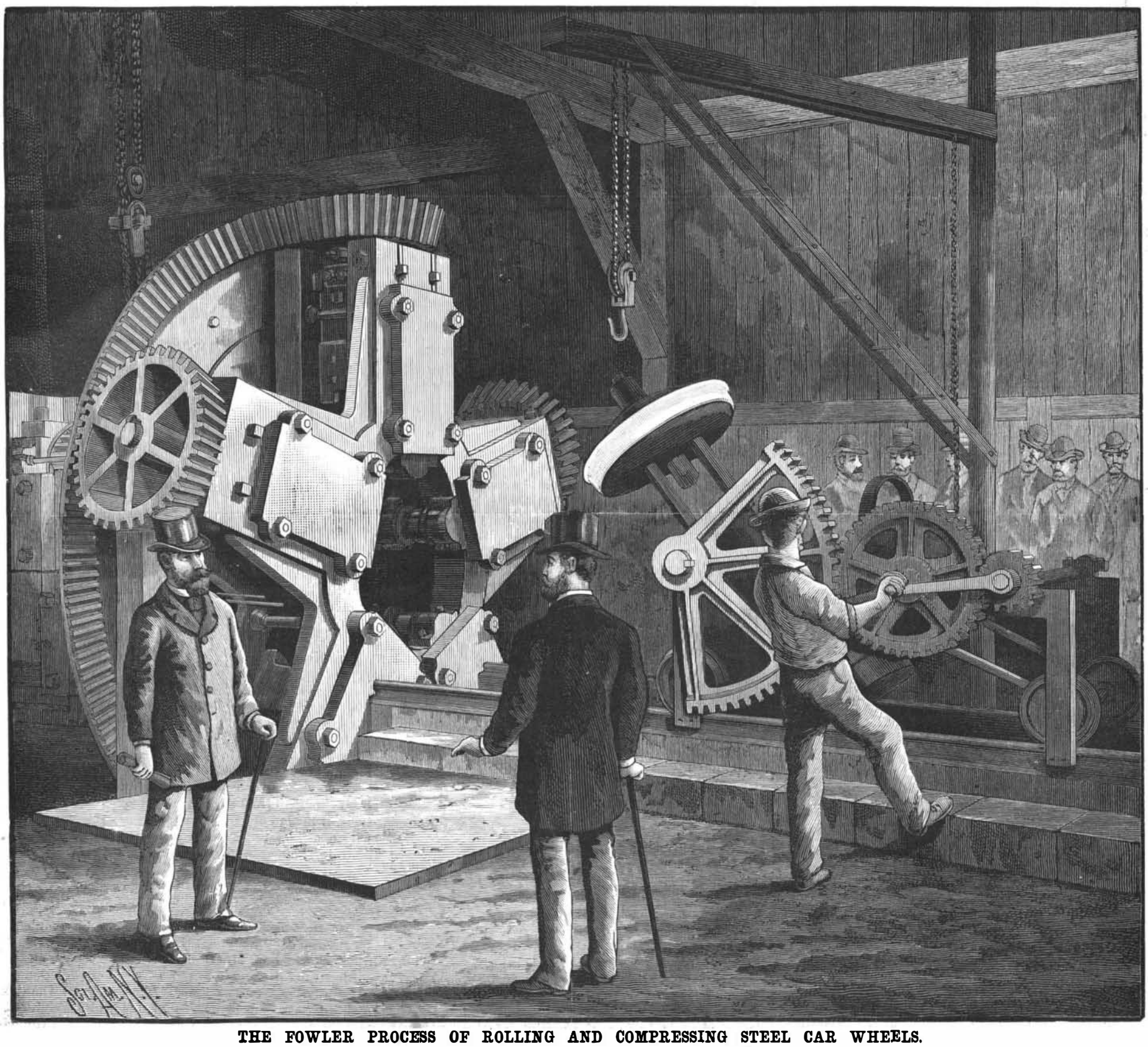


FRONT VIEW OF THE MACHINE, WITH CAR WHEEL BEING ROLLED.

Another illustration is a front elevation of the great machine, showing position of wheel blank while being formed, reduced in diameter and condensed by the embracing rolls.

In order to more clearly show the position of the rolls while operating upon the wheel blank, the car-

(*Continued on page* 178.)



THE FOWLER PROCESS OF ROLLING AND COMPRESSING STEEL CAR WHEELS.

## COMPRESSED STEEL CAR WHEELS.

(*Continued from first page.*)

riage and front supporting disk were removed before this picture was taken.

The great machine stands 18 feet in height from the bed plate, weighs 112 tons, and is capable of exerting a rolling pressure upon the wheel of 2,500 tons.

The heated wheel is taken from the furnace and placed upon a disk immediately in front of the opening in the machine intended to receive the wheel. Another mould or disk descends upon the wheel, and the two are fastened securely together by an axle passing through the hub of the wheel and drawn tightly together by means of a large key driven through with a sledge. As these disks exactly fit the wheel, and are thus held tightly upon it, there is no chance for the wheel to change shape while the tread is being rolled. The wheel is then tilted upon its carrier and quickly put in place between the rolls. A great engine revolves the wheel rapidly, and five rolls driven by screws operated by a pair of smaller engines press with great power upon the tread and flange of the wheel. It requires 180 revolutions of the engines operating the screws to make one revolution of the screws. The whole process of rolling requires only about two minutes. The rolled surface of the wheel, as it comes out, is polished, and shows clearly the great density of the metal effected by the compression. The diameter of the wheel is reduced about five-eighths of an inch in the process. The wheels are then annealed in the same manner as chilled wheels, after which they are ready for use.

Figs. 2, 3, 4 illustrate the gearing and mechanical combinations of the machine.

Fig. 5 shows a section of a truck wheel divided by a vertical line. The larger part represents a segment of a blank, the other, one-half of the finished wheel rolled therefrom. The relation clearly shows the reduction in diameter resulting from the action of the rolls.

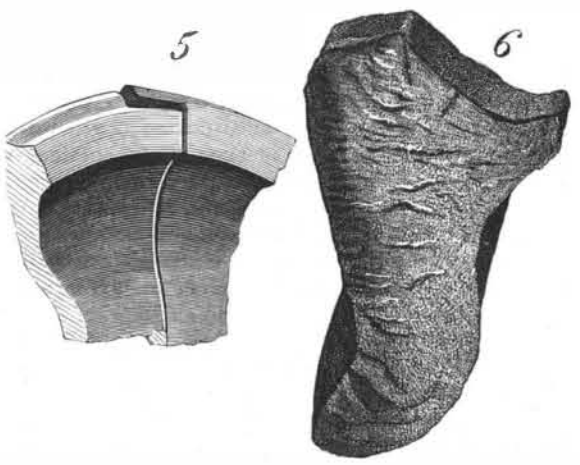
Fig. 6 is a view of a section of the broken rim from a finished wheel, showing the condensation of the steel in the flange and tread caused by the great pressure of the rolls.

The Fowler steel car wheel is an integral cast steel car wheel, having its hub, plate, and the main portion of its rim composed of the metal in its normal condition, with the flange and tread hardened and condensed in radial and peripheral lines, by process of rolling under enormous pressure. It is made from a solid blank of steel. The metal is produced especially for this purpose and is exceptionally strong. As compared with other wheels, it is relatively light (a 33-inch wheel of usual section of rim weighs but 460 lb.) It is rolled under enormous pressure to a perfect finish. It is absolutely round and exact in size. It is durable. The density of the metal in the tread and flange, resulting from the compression during the reduction in diameter, insures a greater mileage than is possible to either steel-tired or chilled wheels. It embodies the requisites of great strength, durability, lightness and concentricity.

The inventor says: The main objects of my invention are to economically correct such peripheral variations as are liable to exist in a solid steel-wheel casting, and also to condense and toughen the tread of the wheel. My machines can, however, be employed, if desired, for rolling the rims of other kinds of car wheels.

So far as I know, steel car wheel castings, if practically rolled at all, have heretofore been so rolled as to increase the diameter of the casting, and such machines as have heretofore been devised would inevitably produce a finished car wheel of greater diameter than the original casting. My machines do not thus increase the diameter of the original casting, but reduce it correspondingly to the degree of condensation and displacement of the metal at the flange and tread of the wheel. By said prior method the web of the wheel has also been rolled simultaneously with the tread; but by my method the wheel at and adjacent to its rim is only operated upon, although the web might be more or less condensed by additional co-operating mechanism without materially affecting my invention. My machines are adapted to properly operate upon a car wheel, whether it be wholly cold, or the rim heated and the web cold, or the entire wheel heated; but of course the results would be more or less varied in harmony with said several conditions. The method or process involved is believed to be novel, as well as the cast steel car wheel produced thereby.

My machine is believed to be novel, in that it embodies the combination of a series of circularly-arranged and positively-driven rolls, each having a pair of flanges or collars and a rolling face, corresponding to the periphery of a finished car wheel, and a housing for said rolls which affords a central space for the free reception of a car wheel, so that its periphery may be properly engaged by the several rolls. The two collars or flanges on each roll constitute means whereby the rim of a car wheel is accurately trued up and the metal confined against undue expansion between the inner and outer faces of the rim. For admitting and discharging a car wheel, and for gradually increasing the rolling pressure thereon, the rolls are radially adjustable, and are locked by adjusting or temper screws, as is common in rolling mills, and said screws are arranged to be simultaneously operated. I also employ driving gearing in a separate housing, and connect with the rolls by means of coupling bars. I have also provided an axial clamp, by which, whenever desirable, the web of a wheel may be supported




during the rolling operation, and I have also provided means whereby said wheel may, when desired, be axially mounted during the rolling operation.

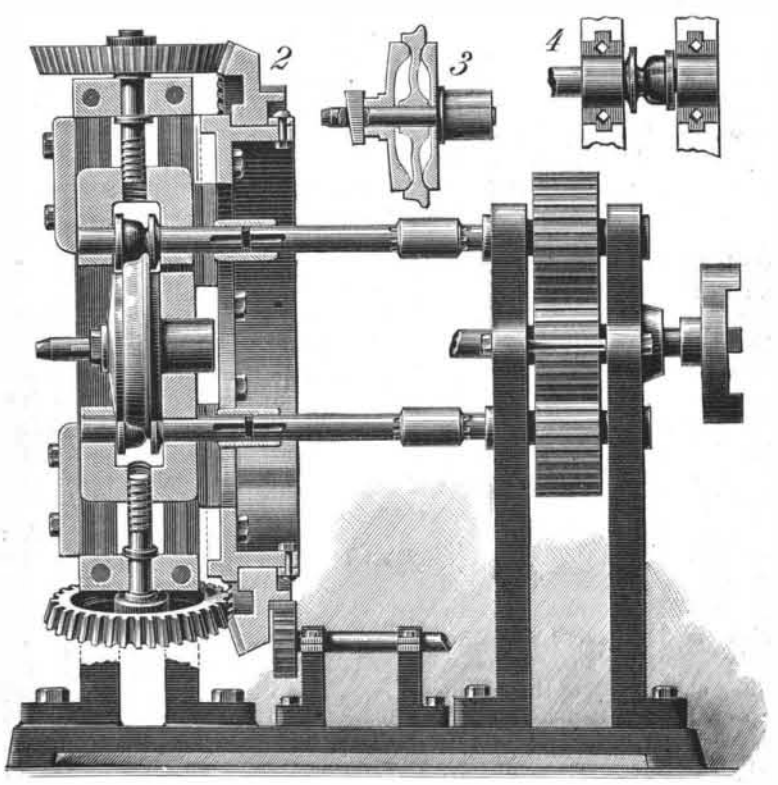
As a rule, I prefer the rolls so arranged that an axial support for the car wheel may be dispensed with, and I have referred to said rolls as being oppositely located, and by this I mean that said rolls are so located with reference to each other that each exerts an opposing rolling force against that of some one or more rolls which are located substantially opposite thereto, and while in most cases it may be desirable to have said rolls exactly equidistant, it is sometimes desirable to have them variably spaced.

Instead of relying upon the original heat in the car wheel casting, I can usually obtain better results by taking a cold casting and heating it in an annularly chambered furnace, which will thoroughly heat the rim of the wheel and keep the center sufficiently cool. When a casting has been thus specially heated, the clamp may or may not be used, according to the dimensions of the wheel and the degree of heat at its hub and web. In some cases a cold casting may be entirely heated and rolled, if due care be given to centrally clamping it, as described.

In rolling the tread of a wheel, the reduction in diameter may be readily gauged by means of suitable calipers, and when an axial support for the car wheel is employed, the careful control of the several rolls will enable the diameter to be accurately gauged.

A cast steel car wheel with its rim or tread rolled and condensed, as in my machine, and by the method described, is a novelty in the trade, and has special value because of the fact that the tread is thoroughly condensed, and is practically circular, and is considerably less in diameter than the original casting. Such wheels can be produced at much less cost than the well known steel tire wheels, or others of a composite structure, and yet mine are capable of similarly extended service with equally desirable results, and in many cases unequally worn wheels can be rerolled in my machines and rendered suitable for further and efficient service.

Referring to Fig. 6, it will be readily seen that the flange is perfectly developed, and it will be obvious that it, as well as the tread, must be composed of metal so condensed and worked as to render it well suited for the severe and trying service to which car wheels are necessarily subjected.




SECTIONAL ELEVATION OF CAR WHEEL ROLLING MACHINE.

### Pictet's New Ice Machine.

One of the objects creating considerable attention at the Jubilee Exhibition in Vienna is the new ice machine devised by M. Pictet, of Geneva, who has gone to Vienna to personally superintend his exhibit and introduce this machine in Austria. In general principles the machine does not differ from others, but there are some important modifications in detail. Instead of using sulphurous acid, as in his previous machines, M. Pictet uses a mixture of sulphurous acid and carbonic acid, which has received the name of "liquide pictet." The boiling point of this liquid under atmospheric pressure is at —19° C., and at a temperature of +50° C. the pressure of the gas is only half that of pure sulphurous acid. The inventor has some theory, according to which there takes place an actual chemical combination of the molecules of the two gases when they are being liquefied under pressure; and it is due to this property that the work expended in compression is much smaller than in any other working agent. The "liquide pictet" is not inflammable, and can even be used for the extinction of fires. It has the further advantage of leaving a greasy dew upon the surfaces of the cylinder, piston rod, valves, etc., rendering special lubrication unnecessary. The generator consists of a system of seamless copper pipes communicating with a chamber, at the bottom of which the liquid enters, while the gas is drawn off from the upper part. The arrangement of pipes is such as to facilitate an efficient circulation throughout the whole of the generator. The pump is provided with clack valves; but to avoid the risk of breakage, each valve is controlled by two springs, one pressing it down on its seat and the other acting as a stop when it rises.

### Snake Bite and Yellow Fever.

Dr. Urias da Silveira has sent to the Medico-Chirurgical Society of Rio de Janeiro a quantity of a vegetable substance which is very common in the provinces —Minas geraes and Barra mansa—and which, he says, he has used with great advantage in the bites of cobras, especially during the period in which the most serious symptoms—hemorrhages and ataxo-adynamic phenomena--appeared. He points out analogies between the effects of snake bite and of yellow fever, both of a symptomatic and pathological nature, and suggests that the drug he sent should be tried in cases of yellow fever.

### How Iron Rusts.

At a recent meeting of the Iron and Steel Institute, an interesting communication was read on the chemical processes involved in the rusting of iron, by Professor Crum Brown. It was explained that the necessary conditions for the production of rust are —first, metallic iron; second, liquid water; third, oxygen; and fourth, carbonic acid—both the latter being dissolved in the liquid water. Water in the vaporous condition, even in the presence of carbonic acid and oxygen, does not affect the metal, except at high temperatures, as in the formation of magnetic oxide of iron. Liquid water with oxygen dissolved in it does not act at ordinary temperatures on iron. This is shown by the fact that ordinary water exposed to the air does not rust iron if the water contains a substance such as lime or caustic alkali. As soon, however, as the lime or alkali is carbonized, the water and carbonic acid begin to act upon the iron, the first result being the formation of ferrous carbonate, which subsequently is changed to bicarbonate and dissolves, and then to reddish brown ferric hydrate. As in this process the carbonic acid gas is first absorbed and then given off again, the continuation of the process of rusting is not dependent on new carbonic acid absorbed from the air, but the original carbonic acid can carry on the process indefinitely, as long as liquid water is present, and oxygen is supplied from the air. Once the process is started, it goes on rapidly because the porous rust not only does not protect the iron, but favors, by its hygroscopic character, the condensation of water vapor from the air as liquid water. A piece of iron, therefore, which has begun to rust will continue rusting in an atmosphere not saturated with water vapor, an atmosphere in which a piece of clean iron will not rust, because liquid water will condense from such an atmosphere on the hygroscopic rust, but not on the bright iron.