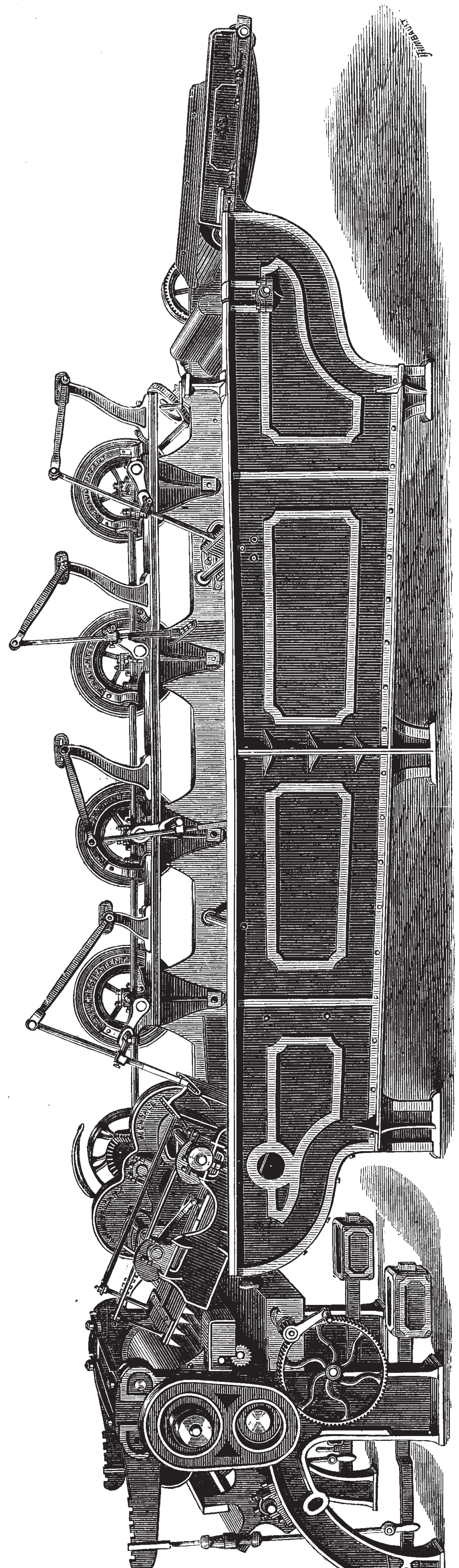
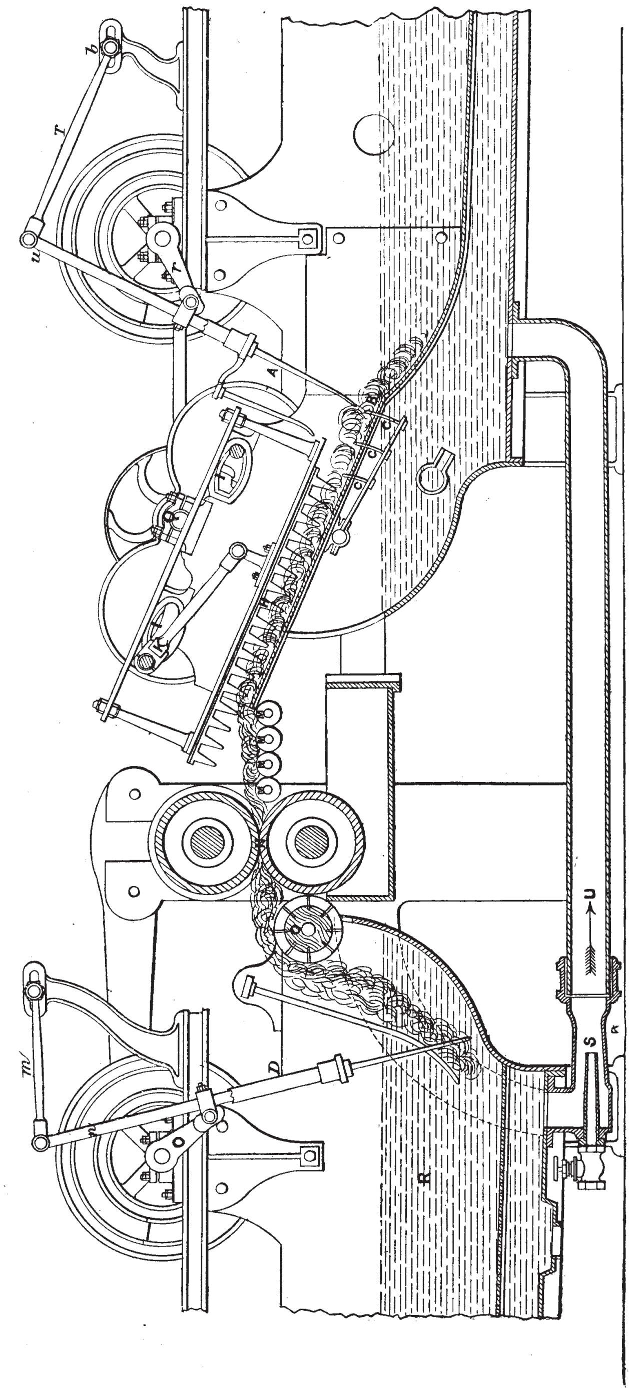
WOOL-WASHING MACHINERY.

CONSTRUCTED BY MESSRS. JOHN AND WILLIAM MACNAUGHT, ENGINEERS, ROCHDALE.

(*For Description, see Page* 18.)





TEXTILE MACHINERY, AT THE VIENNA EXHIBITION.

(*For Description, see Page* 18.)

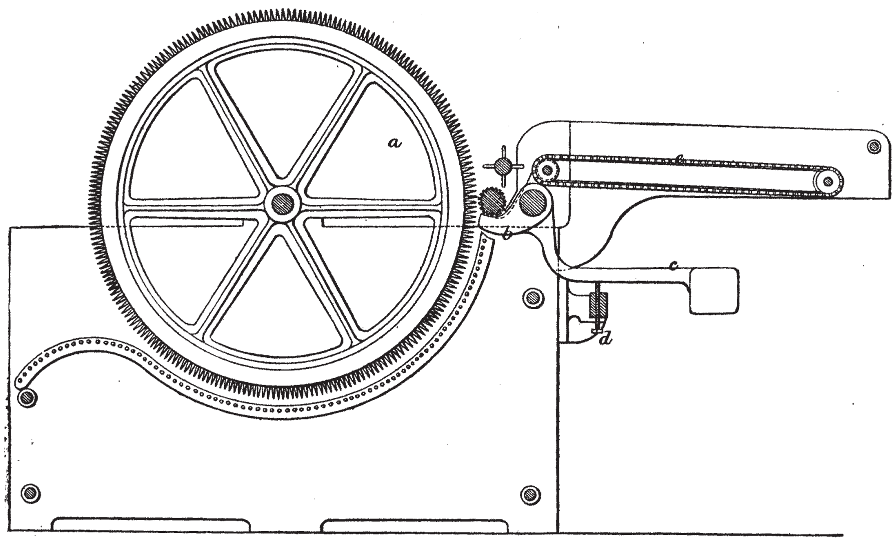


FIG. 1. WOOL OPENING MACHINE, CONSTRUCTED BY MESSRS. SCHIMMEL AND CO., ENGINEERS, CHEMNITZ.

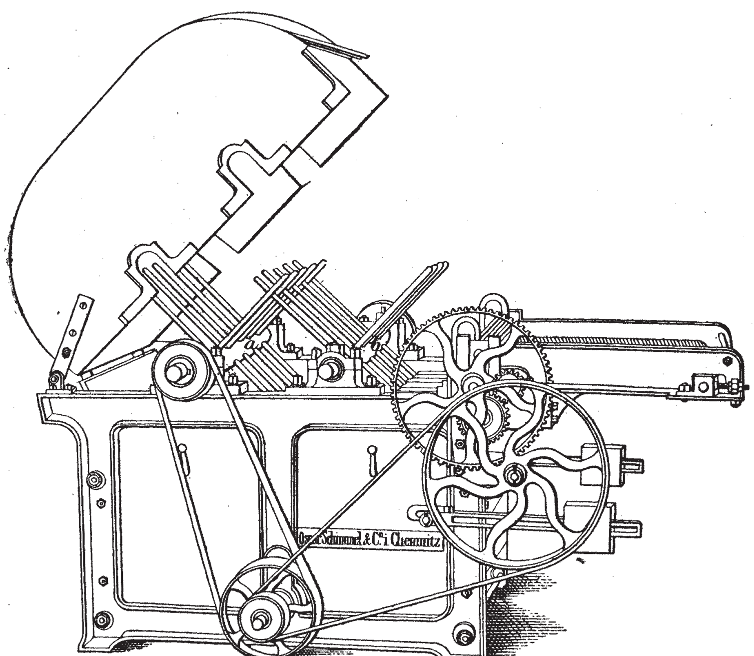


FIG. 2. SCUTCHING MACHINE, CONSTRUCTED BY MESSRS. OSCAR SCHIMMEL AND CO., ENGINEERS, CHEMNITZ.

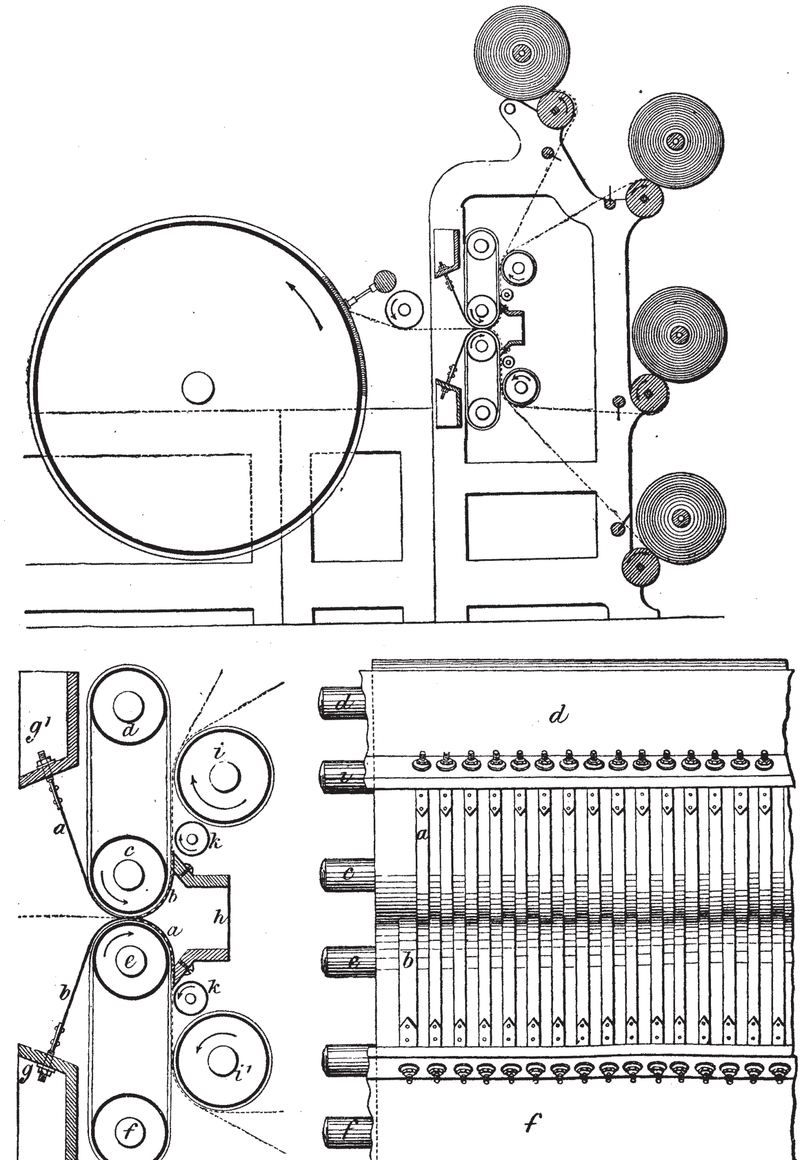


FIG. 3. CONTINUOUS DIVIDING APPARATUS FOR CARDING MACHINES, CONSTRUCTED BY MESSRS. BEDE AND CO., ENGINEERS, VERVIERS.

TEXTILE INDUSTRY AT THE VIENNA EXHIBITION.—No. XVII.

By Dr. H. Grothe.

Special Machinery for the Preparation of Wool.

Referring to our general report ("Textile Industry at the Vienna Exhibition, No. II.," p. 69 of our last volume) on the machines for the preparation of wool exhibited at Vienna, we shall now proceed to illustrate and describe in detail the chief interesting and novel arrangements shown for this purpose.

We may commence with the wool-washing machine exhibited by Messrs. John and William McNaught, of Rochdale. Since the invention and construction of the first self-acting wool-washing machine, by Petrie, of Rochdale, these machines have been constantly altered, and new combinations have been introduced from time to time. The system under notice, known under the name of the "Leviathan," consists of a combination of two, three, or four single machines, with a suitable arrangement for transferring the wool from one washing reservoir into the next. In general, all the working parts of these "Leviathans" have to produce simply a continually advancing movement of the wool to be washed, so that subsequently the particles of dirt and sweat dissolved by the washing fluid may easily be removed by pressure, if this result has not already been attained by the washing process. This operation is greatly facilitated by a constant renewal of the washing fluid, as well as by an abundant supply of cold rinsing water at the end of the process.

The wool-washing machine of Messrs. McNaught is illustrated on page 16, the upper figure representing the machine used as a single self-acting wool-washing apparatus for smaller quantities of wool, whilst the lower figure shows the transferring apparatus provided for carrying the wool from one washing reservoir to another in a series of machines. The arrangement of the working parts of this apparatus will be easily understood from the engravings. The washing reservoirs are provided with double bottoms, and are connected with each other by the tube H, through which the washing fluid can pass from one reservoir to the other; this movement is effected in a peculiar manner, a steam injector being fixed in the tube H, the steam jet of which when acting forces the fluid through H into the first reservoir, from whence it can pass back again into R as soon as it has reached the height of the communicating pipe. The wool is put in motion in the reservoirs by means of swing-rakes, which are moved in the manner shown in our engraving. The transferring arrangement for the wool is as follows: The rod *u* is jointed to one end of the link T, whilst the other end of this link works on an adjustable centre carried by a slotted bracket *b*. The lower end of the rod carries rakes A, which pierce through the wool, while a bush connected with the crank *r*, the axis of which is put in rotation by wheel gear, can slide along the rod *u*, whence the rotation of *r* produces an elliptical motion of the points of the rakes A; the larger axis of this ellipse, described by the rakes, is in the direction of the motion of the wool, and the points of the rakes are through one-half the curve in connexion with the wool, and travel forwards, whilst they rise above the wool and travel backwards through the second half of the curve. The rakes which carry the wool forward through the troughs are similarly arranged, and at the point of contact of each of the curves described by the four systems of rakes, as shown in the upper figure on page 16, fixed rakes are provided, through which the wool is pressed on one side and caught on the other side by the descending rakes of the next system, a continuous travel of the wool being thus effected. Returning to the arrangement for transferring the wool from one trough to the next, it will be seen from the lower figure on page 16 that the last system of rakes carries the wool on to an inclined plane, through which the small rakes C C C project; these latter hold the wool on the inclined plane B when the points of the rakes A have to travel backwards. From B the wool is taken off and carried forwards by a separate apparatus H, to which a curvilinear motion is also given by the cranks I and the rod K. The rollers M M M M carry the material between the squeezers N, from which it passes either over another roller, as shown, into the following washing reservoir, where it is at once caught by the rakes D worked by the crank O and the rods *n* and *m*, or over a second squeezer or pressing roller to the drying machine, as shown in the upper figure on page 16. This apparatus for getting the wool from one reservoir into the other, or from the last reservoir through the squeezers to the drying machine, is well designed, and fulfils its purpose perfectly, while the mode of forcing the washing fluid from one reservoir into the other by a jet of steam is very simple, and also gives most satisfactory results.

Messrs. McNaught build these machines of various sizes, and provide the self-acting single machines, as shown in our illustration on page 16, with a feeding cloth and a brass revolving immerser; the squeezers have wrought-iron shafts 4½ in. in diameter, and are covered with hemp or wool, while the fixed rakes are adjustable.

One of the most simple opening machines for lamb's wool exhibited at Vienna is shown in Fig. 1, page 17. One of the features of this machine is a new arrangement of feeding apparatus, consisting of the levers *b*, which form a semicircular body underneath the feeding roller, and which are pressed against the latter by the weights fixed on the arm *c*. The pressure of the levers against the roller, or the distance between the two, is adjustable by means of the screw *d*. The wool is carried along the feeding cloth *e*, and after the superfluous material has been removed by the scutcher, the rollers and the levers offer the wool to the cylinder *a*, which is provided on its circumference with opening teeth, and which passes over a movable perforated screen or grating. This opening machine is constructed by Messrs. Oscar Schimmel and Co., of Chemnitz, who also exhibited at Vienna the batting or scutching machine shown by Fig. 2, page 17. This machine, which is of very simple construction, and which has been largely adopted on the Continent, contains the two shafts, *a* and *b*, provided with scutchers, between which the wool has to pass when coming from the feeding apparatus; the arrangement and construction of the latter includes nothing new, and will be readily understood from the engraving.

We have already stated in our former articles that the machines for the preparation of wool by Messrs. Bede and Co., of Verviers (formerly Houget and Teston), are distinguished by great simplicity, and we may add here that this feature distinguishes the continuous dividing apparatus for carding machines of Messrs. Bede and Co.—which we illustrate by Fig. 3, page 17. This apparatus consists of two series of fixed steel bands, *a* and *b*, which are arranged in such a manner that the bands of the one series correspond in position to the spaces between the bands of the other series; these steel bands pass between the rollers, *c* and *e*, in such a manner that the steel band *b* passes at first round one-fourth of the circumference of *e*, and then round one-fourth of *c*, being finally fastened at the top to the frame *h*. Endless leather bands pass round the rollers *c* and *e*, and the rollers *d* and *f* respectively, and form with the rollers *i* and *i'*, vertically arranged systems of squeezers, with similarly arranged rotating and alternate motion of the rollers. The fleece of wool coming from the doffing cylinder passes between the steel bands, and is carried off by the leather bands round the rollers *c* and *e*, at those points where the steel bands do not cover the rollers; in this manner the fleece is divided into strips, one set passing upwards and the other downwards. The strips of fleece are carried by the rollers *k k* underneath the rollers *i* and *i'*, whence by the combined action of these rollers with *d* and *c* curls or puffs are formed.

The two lower views on page 16 show the details of the arrangement, whilst the upper view shows the construction in connexion with the carding machine, from which it will also be seen that the strips from each of the squeezers pass each on to a pair of rollers. We believe that this method of forming strips gives satisfactory results.

The President of the Institution of Civil Engineers.—Mr. Hawksley, as President of the Institution of Civil Engineers, gave a farewell dinner at the Albion Tavern on Saturday evening last. There were invited to meet his colleagues on the Council, the Presidents of other learned societies, the Prime Wardens or Masters of most of the City companies, besides other personages of distinction. Covers were laid for fifty-two. The company included Mr. Baron Bramwell and Mr. Justice Mellor, Colonel Hogg, M.P., the Chairman of the City Commissioners of Sewers, General H. Y. D. Scott, C.B., Colonel George Chesney, R.E., Dr. Guy, Dr. Percy, Dr. Farr, Mr. Bessemer, Mr. Dowdeswell, Q.C., Mr. Webster, Q.C., Mr. Clerk, Q.C., Mr. Richards, Q.C., Mr. Horace Lloyd, Q.C., &c., with Mr. Charles Manby, F.R.S., Hon. Secretary, and Mr. Forrest, Secretary.

DIVING APPARATUS IN MINES.

On this subject, which becomes of the utmost importance for the safe working of mines, particularly of coal mines, Dr. Ad. Gurlt read a lecture at the Lower Rhenish Society for Natural and Medical Science, at Bonn, of which the following is an abstract. It appears that the art of living under water by means of air chambers has been developed only since the beginning of the 16th century; Aristoteles, however, in the 32nd book of his Problems, speaks of the custom of the Greek divers to take a kettle (λέβης) with them under water to help them in prolonging their stay there, it being supposed that they descended with the kettle inverted over their heads, and thus carried down with them a limited supply of air. Other reports of the use of diving apparatus in ancient and mediæval times seem to be wanting entirely. Only John Taisner states that in 1538 he saw at Toledo, before Charles V. and many thousand spectators, two Greeks with a burning light descend in water in a large kettle and return with dry clothes. Somewhat later diving apparatus are more frequently mentioned; thus in the time of James II., when an American, William Phipps, on the coast of Hispaniola, or Domingo, recovered bars of silver from a sunken Spanish ship worth 300,000*l.*, for a company of shareholders and from a depth of 6 to 7 fathoms. Complete essays on the art of living under water, by Edmund Halley, secretary to the London Society, may be found in the "Philosophical Transactions" of 1717 and 1721; here Halley describes his improved diving bell, with which he could stay 5 to 6 hours at a depth of 9 to 10 fathoms. The air supply was managed with air-tight leather bags, which were lowered when needed; Halley had also invented a diving helmet of lead with a leather hose, by means of which he was enabled to leave the bell and to move some distance on the bottom of the sea. In 1736, the Swede, Martin Triewald, invented a light diving bell made of copper, with several improvements, which he described in a book, "Konst at Lewfa under Watnet," Stockholm, 1741. He also received his air supply from bags, air pumps having only come into use at the end of last century for the direct supply. In Martin's "Philosophia Britannica" there is mentioned a diving dress which allowed independent locomotion under water. It is stated that about the year 1730 an Englishman invented a stout leather dress which could hold half a hogshead of air, and by the use of which he was enabled to enter the holds of sunken ships.

For use in mines the bell-shaped diving apparatus is of little service, as independent locomotion in a narrow space is generally a necessity. Two forms of diving dress are therefore generally used. The English apparatus, or Scaphander, is in direct communication with the air pumps, and is entirely inflated with air, while with the Rouxquayrol-Denayrouze apparatus the diving apparel is only intended as a guard against cold and water, while the air vessel, from which the diver draws his supply, is borne independently on the back. With such apparatus several operations, such as repairing pumps, have been done in pits at a depth of above 40 metres below the water level, as in the instance of the Caroline and Wiendahlsbank collieries, near Dortmund, in Westphalia, at the Zincare mine, Krug von Nidda, near Iserlohn, at the Britannia coal mine, near Mariaschein, in Bohemia, and other places, and quite recently in Westphalia; while at Saarbrück miners have been instructed and drilled as divers for such work. The depth of most mines, and the increasing pressure of the water, however, permits the work of divers only to a limited extent, 60 to 70 metres being probably the maximum. But the use of the diving apparatus in irrespirable air has of late become of the utmost importance for mines, as it affords a much greater security in working them, and in rescuing lives after an explosion of firedamp has taken place and the ventilation of a mine has become deranged.

It is no new idea to stay and work in an irrespirable atmosphere, while the lungs are supplied with air from another source. Pilatre de Rozier, 80 years ago, proposed a mask with hose to be borne as a respirator, and Alexander von Humboldt invented an apparatus, filled with compressed air, which could be carried upon the back, and was provided with a breathing tube and a mouthpiece with double valves, so that the fresh air was admitted from the vessel and the consumed air discharged into the irrespirable atmosphere. This apparatus was then improved by Boisse and Combes and later by M. Rouxquayrol, mining engineer, of St. Etienne, and M. Denayrouze, manufacturer, of Paris, to such a degree, that we now possess an entirely reliable arrangement, both for diving in water and foul air, and which at the same time will supply a submarine lamp or a Davy safety lamp with fresh air. The apparatus used in German mines are of several kinds. A water-tight dress with helmet and the air regulator serves for diving in water, or the latter is used alone in combination with a nose-squeezer. In irrespirable or explosive air the latter alone is employed, either as a low-pressure apparatus, when the diver remains in connexion with the air pump through a hose, or as a high-pressure apparatus, when air compressed to 25 atmospheres is carried on a barrow in strong steel cylinders, which will make the diver and his light independent for three hours. The regulator is of a very ingenious construction, and expands the compressed air just as much as the pressure of the surrounding atmosphere will allow, and no high-pressure air can ever enter in the lungs and endanger the life of the diver. The physiological effect of compressed air upon the human body has been noticed by Edmund Halley, who complained of pains in the ears when going too quickly under water. Some divers in German mines noticed below water a slight giddiness and pains in eyes and ears, at a depth of only 9 metres, though many have descended over 40 metres. Professor Rameaux, of Strasburg, supposes that the blood gases, carbonic acid, nitrogen, and oxygen, are strongly compressed by the pressure upon the lungs and blood vessels, and when this pressure suddenly ceases they will at once expand and act just as air bubbles, which are introduced in the air vessels, viz., they will cause pains, fits, or death. Dr. P. Bert has confirmed this view through experiments which he made with animals. He concludes from them that a diver can be exposed without danger to a pressure of 5 atmospheres or 40 metres of water, while at 70 to 80 metres danger becomes imminent; and Doctor A. H. Smith, of New York, examined quite healthy men with the sysmograph, after they had been exposed one to one and a half hours to 15 to 17 lb. pressure of air in caissons; he found that the beats of the heart had increased from 82 to 84 up to 114 and 126 per minute, that the volume or intensity of the pulse, however, had greatly diminished. The men also perspired freely, which, however, was probably due to the very moist, almost saturated, air of the caissons. Under all circumstances, only perfectly healthy persons should be admitted to work in highly compressed air.