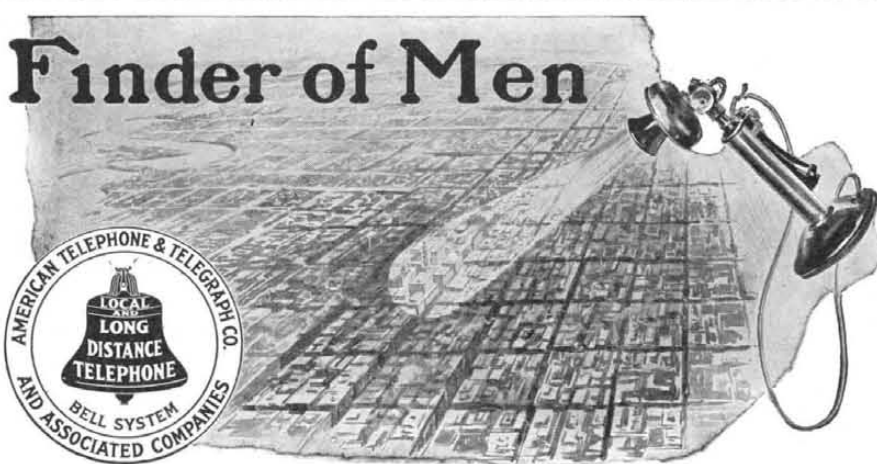


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(Continued from page 172.)

which governs the greater portion of our industrial life, new processes, new methods, short cuts, labor-saving devices, new inventions, are all eagerly sought by the employer of labor. Some of these are revolutionary in their effects. They call for a readjustment of the whole plant. When that readjustment comes, the older men are invariably dropped. In short, the avenues which lead to employment, for all highly specialized labor, are practically open now only to youth. The middle-aged man enters with difficulty, and the man past middle life substantially cannot enter at all. The man who did many things, none of them highly specialized, from twenty to sixty-five, is likely never to become entirely dependent upon society. The man who did some highly specialized piece of work which involved only a part of some specific thing, or even a part of a part, may be forced into the dependent class before he reaches old age, and when he joins that class he is much more helpless than the man who has done many things. It is probable that the specialist, although he labored fewer years, rendered society the more valuable service of the two, and that therefore he has, morally at least, a clearer title to consideration. But however that may be, he is the inevitable product of the whole plan of society and business, and the obligation of the man who employs him, and the interest of general society in what finally becomes of him, are clear and unavoidable. That this class must be shown how to protect itself against the menace which it constantly faces or that it must be helped outright after disaster or age come, are compelling facts in the sociology of the times.

There can be no question that a system which teaches these people how to protect themselves against this menace, is more in harmony with the genius of our institutions than a system which coerces them into action or a system which finally places the burden of their support and care upon general society. It does not follow that a system which works well in Germany would work well here; or that a system which appeals to the needs of the people of Great Britain will answer here. There are distinct advantages in the German plan,—chiefly that it is compulsory and that the laborer is forced to make provision for certain benefits even though he may have no very intelligent understanding of the wisdom of the plan or its effects on society. There is a difference between the compulsion of government, which tells the workman that certain things must be done, and the proposition of a corporation which tells a man what the conditions of his hiring are.

If the conditions named by the employer involve some system of life insurance, some system of deferred annuities, a man can study the question and take a position or leave it alone because it recommends itself to his judgment or otherwise. This is a slower process than the German method, and probably for a good many years will be more expensive; but it seems to me to be in harmony with our notions of individual responsibility and the rights as well as the obligations of American citizenship.

The efficient employee, in specialized labor, has a fair claim to something beyond the returns contained in the ordinary contract of hiring. This right may be strengthened and its realization advanced, but it cannot directly be met, in this country, by governmental action. The capable worker deserves and should demand a programme of hiring under which he shall be entitled—and entitled by contract, not by the grace of his employer—to certain protection for his family if he dies prematurely, and to certain protection for himself if in the vicissitudes of industrial war he is shelved and wholly or in part compelled to join the dependent class.

There are sound reasons why corporat (Concluded on page 174.)

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Wrench, F. Knobel.....	948,332
Wrench, L. L. Barrick.....	948,970
Wrench, C. Wittmann.....	948,973
Writing machine, E. B. Hess.....	948,973
Zinc from zinciferous materials, obtaining, H. Pape.....	948,740

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AN ELECTRIC CHIME AND HOW IT MAY BE CONSTRUCTED AT HOME, is described in **Scientific American Supplement 1566.**

THE CONSTRUCTION OF AN ELECTRIC THERMOSTAT is explained in **Scientific American Supplement 1566.**

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EXPERIMENTS WITH A LAMP CHIMNEY. In this article it is shown how a lamp chimney may serve to indicate the pressure in the interior of a liquid; to explain the meaning of capillary elevation and depression; to serve as a hydraulic tourniquet, an aspirator, and intermittent siphon; to demonstrate the ascent of liquids in exsiccative tubes; to illustrate the phenomena of the bursting bladder and of the expansive force of gases. **Scientific American Supplement 1583.**

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A CHEAP LATHE UPON WHICH MUCH VALUABLE WORK CAN BE DONE forms the subject of an article contained in **Scientific American Supplement 1562.**

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(Concluded from page 173.)

tions should avail themselves in this work of the highly developed system of insurance and annuities presented by the responsible insurance institutions of this and of other States. Any effective system if established by corporations independently, will be based on the principles and methods used by the insurance companies, and therefore the work for obvious reasons is in the end likely to be more effectively and more economically done by men who are experts and specialists than by men who undertake it with no special training and with minds chiefly occupied by the demands of other lines of work.

I shall therefore assume that life insurance, and probably other types of insurance, including accident and sickness insurance, as represented by existing corporations, is not only well equipped to help in the solution of this problem, but is a part of the evolution of the times which has produced the problem itself, and is another illustration of the curious fact that in the processes of evolution a solution of a problem often appears at the same time the problem itself is evolved. For example, what might have happened in the enormous industrial activity of the United States and its necessary output of securities seeking purchasers if millions of people combining their small savings in the reserves of the great life insurance companies had not appeared upon the scene contemporaneously seeking securities in which to invest their money? The function of life insurance and of other types of insurance on the one hand, and the obligation of the employer of labor to his employees on the other, bear, it seem to me, an identical relation.

Life insurance is already effectively at work. While the employer of labor has only in the most limited way used the idea or appreciated its beneficence, progress has been made toward the solution of this problem. Eliminating industrial companies and including only those companies whose business is supposed to be confined to people of means, we find the average policy the country over is a little under \$2,000. In other words, the mass of so-called regular insurance is held by people of small means. If now we add to these the millions who carry what is called "industrial" insurance, and the other millions who have so-called "fraternal" insurance, we have covered substantially the whole insurance field. We comprehend an interest whose accumulations surpass those of any other single line of human endeavor, except the accumulations of savings banks, and yet we have not gone outside of what may properly be called the laboring class. The energy of life insurance management, in other words, and the obligation which the laboring man feels toward his family, have in their development far outrun the sense of obligation of the employer. We have now reached the point when the employer is beginning to do his part—but as yet he has only made a beginning. That he will do more is certain; that he will do much is almost equally certain. That existing insurance institutions will be utilized is, I believe, a necessity.

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(Concluded from page 174.)

melting at a lower temperature than the melting point of the most fusible component. By compressing zinc and copper powders, Spring obtained a conglomerate which was distinguished from brass only by its slightly darker color.

In spite of these partial results the problem had not so far been definitely solved. It remained in fact to be seen whether, by augmenting the speed of fusion of the mixed metal powders, pressure really favors the formation of those compounds which are characteristic of alloys obtained by melting. This question is answered by Prof. G. Tammann on the basis of recent experiments by G. Masing.

When submitting a mixture of filings of two metals forming neither a chemical compound nor mixed crystals (e. g., zinc and cadmium or copper and silver) to a pressure of 4,000 atmospheres, and heating the conglomerate thus obtained, the rising curve of temperatures is seen at a given point to slacken down, after reaching a temperature 10 1/2 deg. C. higher than that at which the whole is found to melt. As far as its thermal properties and its structure are considered, this conglomerate is practically identical with alloys obtained by melting.

Again, by compressing under high pressure the powders of two metals forming a definite compound and capable of mixing in all proportions in a liquid condition, and by heating the conglomerate thus obtained, two stopping points are found in the curve of temperatures. The first of these points corresponds with the melting of a compound formed at the surface while the other corresponds with the formation of the alloy. This is the case, for instance, with mixtures of magnesium with zinc, lead, tin or bismuth. The conglomerate composed of magnesium and antimony has only a single stopping point situated at 300 deg. C. below the melting point of antimony. This corresponds with the formation of the compound Mg₂Sb₂.

The temperature then rises very rapidly in order to eventually fall down to the melting point of the alloy. The third case investigated by Masing relates to the conglomerate of two metals forming an uninterrupted series of mixed crystals, such as magnesium and cadmium on the one hand and lead and thallium on the other. When heating such conglomerates, only a single stopping point is observed corresponding to the melting point of the most fusible component. The form then assumed by the curve depends on the diffusion of the two components into one another.

The conglomerates obtained merely by compression do not contain any trace of mixed crystals. Microscopical examination thus only shows the existence of grains of copper and tin in recently prepared conglomerates. If, however, these mixtures be heated to 200 deg. C. (i. e., below the melting point of the tin) there are found between the grains of copper and tin, two layers corresponding to the compounds Cu₃Sn and CuSn respectively. If these conglomerates be heated during 20 hours to 400 deg., a layer of mixed crystals, corresponding to the formula Cu₃Sn₂, is found. This proves that compounds of these metals are permeable to their constituents.

The following conclusions are derived from these experiments:

The compression of two metals at ordinary temperatures will yield conglomerates containing only the pure metal, i. e., neither compounds nor mixed crystals as characteristic of alloys obtained by melting. Mere compression thus does not activate diffusion sufficiently to bring about combination or the formation of mixed crystals. If, however, heated metals (i. e., with increased speed of diffusion) are submitted to pressure, there is obtained not only a more coherent mass, but a portion of the metals is found to form compounds and mixed crystals, so as to produce a conglomerate which is very much like a real alloy.

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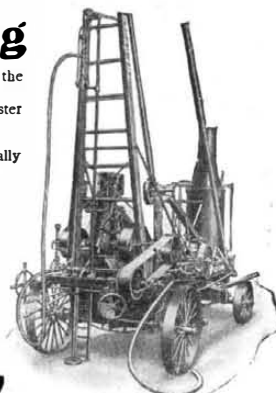
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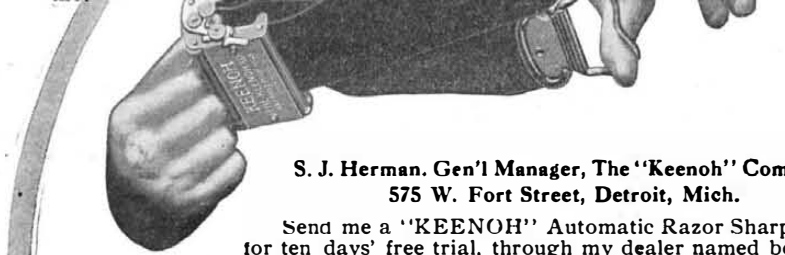
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