Man's natural satisfaction in finding that he could make machines which would do the work his hands had once done has always been tempered by discovering that he was a victim as well as a beneficiary of his creations. In the last one hundred years, particularly, glaring evils have trailed along with the amazing benefits by which his inventions have enriched the world. The total result of his machine age to date is a baffling economic disorder which keeps him in a perpetual fret and worry.

There have always been men who declared that this bitter-sweet result could be corrected and have sought at one or another point to create order by planning and controlling hoping to develop an industrial system which would give the maximum of good and the minimum of evil. A planned and controlled industry has been the object of all our great monopolistic business leaders, planned and controlled for the benefit of themselves and their groups. But that was not what man wanted. He was
after a more general distribution of the benefits, a
more general elimination of the damages of industrializa-
tion.

Without underestimating the contributions
that have been made in our times by many men to this end,
one contribution in particular stands out - the code of
principles with methods for applying them developed
between 1880 and 1915 by Frederick C. Taylor and best known
to the world as the Science of Management.

It is well at this particular moment of our
national evolution that attention should be called to
Taylor’s achievement as the Stevens Institute of Technology
is doing on December seventh - the celebration of the
fiftieth anniversary of the man’s graduation from the school.
Taylor was twenty seven years old at the time - 1883 - and
already a mechanical engineer and a shop manager who had
forced the attention of his superiors by his challenging
attacks on the machines they used and on their ways of
managing men.

From the outset of his career as a worker at
a machine Taylor had broken with the prevailing industrial
philosophy of both management and men. It was based on
fear of over-production. Make too much and prices will go
down, said the employer - make too much and work will not
go around, said the men. Taylor argued otherwise. Make all you can; the world's power of consumption is limitless; develop consumption as you develop production - keep the two in balance. To give the world all it needs is the mission of industry. Make it worth while for men to get out of machines what is in them and they will do it.

Abundance for all, not wealth for a few is your business. Find a way to achieve that and you end the harm machines are and always have done men. Achieve that and you need fear over-production. It was not wealth Taylor was attacking, only its congestion. Over-rich men were more hurt than benefited by their possessions, he claimed. They were dehumanized in spite of themselves. He was consistent. He might himself have been a very rich man but at forty-five deliberating stopped all money-making, devoting himself to the spreading and interpreting of his gospel of abundance for the world through a planned and controlled production. It was with good reason that Lenin in the early days of the Russian Bolshevik Revolution told his floundering disciples to study the principles and methods of Frederick Taylor's science of management.

It looks as if President Roosevelt might have something of the kind in mind for in the group about him
working on his program of Restoration and Correction
are many men who are followers of Taylor.

What are the principles on which he built
up his science? I can only touch certain of them which
seem to me particularly useful at the moment. Take what
Taylor came to accept as a first principle. Whatever you
are undertaking, said he, find out what others have done
before you and begin where they left off. He declares that
his greatest failures came from incomplete study of what
had already been tried, not knowing that he simply repeated
failures. A classic example of his method in avoiding
this common pitfall was his building of a steam hammer
which would not batter itself to pieces in a few months.

He hated any work which seemed to him unnecessary.
Steam hammers ought to stand up to their job. None ever
had. Why didn't they? He began to study them, gathering
data from all the industrial countries of the world. He
soon discovered that each design he studied had some one
part which had proved unbreakable. At the end of two years
investigation he found he had within one of enough un-
breakable parts to make a hammer - one part there was that
had always given out. It was on that he concentrated
attention until he evolved a principle of construction which
he believed would insure its life. He had solved the
problem. The hammer he built ran for many years without a hitch, not only that it did its work with greater power and rapidity than any steam hammer in existence. It was a triumph for his conviction, that the place to begin an improvement is where others have left off.

He spent two years discovering how to build a steam hammer; he spent twenty-six years in developing his art of cutting metals; twenty-six years in which time he made forty thousand experiments. Nobody before him had ever made more than two or three hundred. The result was, as one famous master tool-maker has said, "a greater advance in that art of cutting metals which underlies all the metal industries than has been made during all the previous ages since the days of Tebal Cain."

Taylor once set down the way a man should go about improving that which he doesn't like - building a good thing to replace what he thinks is a poor one. I do not know a better code for achievement.

1. "Question everything - question the simplest, most self-evident, most universally accepted facts, prove everything.

2. "Only one variable at a time. Difficulty in getting down to the real variable. Great temptation to experiment
with more than one variable in order to get quick results.

3. "Perhaps the greatest difficulty of the experiment is to hold the surrounding conditions constant and uniform while the variable is experimented with, that is to standardize surrounding conditions."

It was this code Taylor followed in founding that science of management for which he is best known. He came to this undertaking in much the same way he had to the two undertakings I have mentioned. Back of his attack on the steam hammer was a contempt for a thing which couldn't be relied on to do its job; back of his attack on metal cutting was irritation at the way the best tools to be had chipped, dulled, had constantly to be sharpened, re-shaped, replaced. He wanted tools, steel that stood up. It was his dissatisfaction with the hit-and-miss habits of the men and the management in the shop where at seventeen he began to learn the trade of a machinist that aroused a determination to see what he could do to improve things. Above all he hated the suspicions, the malingering, the militancy he detected on both sides. The atmosphere was stultifying, unworthy of the fine fellows about him.

Taylor had a deep natural respect for men who labored. When he talked about the dignity of labor he meant
it. The men about him were real people each doing a worthy thing, but in an unworthy position. What was the matter with shop management that men were provoked to malingering, incited to suspicion and resentment?

Advanced in time to the position of foreman in the machine shop of a leading steel plant, he determined that the men he directed and hired got from their machines a full day's work. But what was a full day's work? What could a particular machine do? He didn't know—nobody knew. He set to work to find out. By dividing the job into its parts, analyzing it as he would a bit of metal, he began to pick out wastes of time and motion.

They were not by any means all in the men; they were in their machines, their tools, the shop conditions, the ways of the management. Everything must be changed if he was to get the full day's work he sought.

A chorus of doubts and jeers from above and of below greeted his unheard-attempt to apply science to labor. Science was something for professors in laboratories. What had it to do with the way men worked? It certainly did seem a bizarre performance to apply it to the act of shovelling slag, dirt, ashes, but Taylor did it and by demonstrating that shovelling was an operation which could be reduced to a formula which could be taught to a man to his own and his
employers' profit, he dealt a blow to the prevalent contempt for unskilled brute labor which if it has not yet finally finished it has opened the road to its finish. What Taylor was working towards was the best way to do each operation under his control from the simplest to the most complex. He was doing this by a steady attack on rule-of-thumb, that mighty rule that holds men back not only in industry but in politics, journalism, religion, science itself.

Finding the best way to do a thing was his first task. Persuading men to learn and follow the formula was a second and far more difficult one. Naturally enough the men looked with suspicion on the strange attack on their jobs. It was a new form of exploitation. The union leaders told them. It looked like it, but always there were men who loved their trades and their machines, who became interested, wanted to understand what this likable democratic boss of theirs was trying to do. He certainly had changed many things in the shop to their greater comfort and convenience. Perhaps he did know what he was doing and so gradually with many heart-breaking disappointments for Taylor in began to bring men and
best way to do a job and that was first-class workmen.

It was not alone men and machines he was revolutionizing. It was management as well. He soon found that the chief obstacle to that full day's work he sought lay in management, in failure to plan and control production.

Machines lay idle because there had been no careful provision to keep them busy. Men stretched out a job because they had no assurance that when it was finished another would be ready for them. Taylor wanted a shop where the production never ran behind or ahead of a carefully reckoned demand.

You, too, he told management must submit to science as the men and machines are doing. But when he set out to reduce their operations to scientific terms he met an opposition stiffer than that of workmen. They were harder to convince, more stubborn in their resistance.

Chiefly they had to learn that the essence of the success of scientific management is cooperation—not formal but as Taylor said, "intimate and friendly."

This was not as difficult as it may sound. The business of management now was planning and controlling what they had planned. It was they who laid out ahead the day's
foreman, the clerk, the superintendent, the owner himself.
No matter who they were or what they did he loved to
work with them.

Combined with this ability and desire to work
with people went his real respect for their tasks, his
interest in what ever concerned those tasks. As far as they
could see he had the same deep interest in figuring out
the proper weight and reach of a shovel for a man of a
certain height and strength as he had in designing a machine
for some complex operation. Few men indeed were stubborn
and self-centered enough to resist such a combination.

Taylor saw this. It was a discovery of
importance. The full day's work he sought for his machines
not entirely to be sure, but chiefly
depended on winning the men who ran them. He must win the
consent - the participation of each. He could only do that
by understanding them, by finding out what they would and
wouldn't do, also what they could and couldn't do. He must
learn how to do away with their suspicions, awake their
curiosity, arouse their ambitions, make them want to go along.

You see he had passed entirely out of the field
the
of/mechanical, the study of machines and tasks, and had entered
the field of psychology and it looked as if in the long run
psychology might be of more importance in the science of
management than mechanics.
Trace his path. He had determined at the start to get a full day's work out of his machines, but nobody knew what that was. So he began questioning, experimenting, to find out. He did not know where he was going only that he proposed not to give up what he could do—what he had set out to do. He had the answer at last. He could get that full day's work if, and only if, he could get "intimate and friendly" co-operation.

This was no theoretical result. It had been reached by as many, perhaps more experiments than he had made for his art of cutting metals—only the experiments were with human beings, not metals. The route he had followed was now chartered from beginning to end. No one who accepted and followed his science of management could fail to reach his conclusion. Scientific management depends on co-operation—without it the thing is only another mechanism.

Time has emphasized the soundness of Taylor's principles. They have been tested by followers who have done what he would have wished, began where he left off, expanded, extended them. By their vitality they have spread to every land where men are struggling for an orderly, economic life.
Corrections for article - "The Father of the Science of Management."
By - Ida M. Tarbell
120 East 19th St.
New York City.

Page 1 - line 5 - flaring should be glaring
Page 1 - second paragraph, line 4 - comma after word controlling
Page 2 - line 18 - machine should read machines
Page 3 - line 10 - you need fear should read you need not fear
Page 3 - line 15 - deliberating should read deliberately
Page 4 - line 14 - work should read waste
Page 5 - line 4 - correction should conviction
Page 5 - line 14 - Tribal should read Tubal
Page 7 - line 2 - position should read way
Page 7 - line 12 - waste should read wastes
Page 7 - lines 23 - drop was an operation which could line should read - shovelling could be reduced to a
Page 7 - line 24 - which could be should read and that formula
Page 8 - last three lines should read - science together. Converts multiplied as men realized that their efforts were rewarded, their work more interesting. There were no longer reasons for malingering, sabotage. There was indeed every reason to become what Taylor so persistently sought, first-class workmen.
Page 9 - drop first line.
Page 12 - line 5 and 6, drop he could do, what