

## History

By E. A. Marsh

*This is the complete text of Waltham Watch Company Collection, Vol. RC-2, Baker Library, Harvard Business School, Boston, MA. Published with permission of the Baker Library.*

*Although no author is given and undated, general opinion is that it was written by E. A. Marsh in 1921.*

*A number of hand-written corrections have been incorporated and a few spelling and typing errors have been fixed. Some notes in italics have been inserted for clarification.*

*I would like to thank the Baker Library, and Tim Mahoney in particular, for help with deciphering parts of the document which were very difficult to read.*

*Richard Watkins, 2006*

*Duplicate first page with different (earlier?) text:*

“a narrative of events”, “an account of that which is known to have occurred”. But as ordinarily used, the word is understood to include more than a simple statement of facts, in that there is an attempt to discern contemporary as well as previous conditions, as affecting the events which are narrated. For the real aim of History should be, not simply to gratify curiosity, but to inform the reader of actions, occurrences or events which have taken place, in connection with, or in consequence of, certain conditions, and thereby to serve as a means of instruction, as well as of information to the reader.

In the following pages the attempt of the writer will be to give a reliable statement of facts concerning the industrial organization now existing under the name and title of the WALTHAM WATCH COMPANY, but without attempting to ignore the modifying influences of varying political, industrial and commercial conditions, all of which combine to affect all human activities.

It is of course essential to the value of any history that the facts shall be reliably stated. It is naturally to be desired that so far as possible all statements of facts should come from individuals who have had opportunities for personal knowledge of the events concerning which they testify. Consequently it may be a matter for regret that permanent records were not made concerning the

# HISTORY

## Foreword

---

A bald definition of the word "History" would be - "a narrative of events", - "an account of that which is known to have occurred". But as ordinarily used, the word is understood to include more than a simple statement of facts, in that there is an attempt to discern contemporary as well as previous conditions, as affecting the events which are narrated. For the real aim of History should be, not simply to gratify curiosity, but to inform the reader of actions, occurrences or events which have taken place, in connection with, or in consequence of, certain conditions, and thereby to serve as a means of instruction, as well as of information to the reader.

In the following pages the attempt of the writer will be to give a reliable statement of facts concerning the industrial organization now existing under the name and title of the WALTHAM WATCH COMPANY, but without attempting to ignore the modifying influences of varying political, industrial and commercial conditions, all of which combine to affect all human activities.

It is of course essential to the value of any history that the facts narrated shall be reliably stated. It is naturally to be desired that so far as possible all statements of facts should come from individuals who have had opportunities for personal knowledge of the events concerning which they testify. Consequently it may be a matter for regret that permanent records were not made concerning the early days in the planning and the initial work of establishing the first complete institution for the manufacture of pocket watches in America - if not the world.

Years ago a writer, as a method of asserting valid grounds for accepting the reliability of his statements, declared that he wrote of things which he said "much of which I saw and a part of which I was".

The writer of this is now one of the very few persons who is competent to make use of those words, and it is a matter of regret that a more able writer has not undertaken to tell the story of the days beginning about 1848.

## Preface

The following pages are an attempted history of an enterprise which was conceived and inaugurated for the manufacture of Pocket Watches, as instruments for the accurate measurement of Time. Will it not therefore be well to give a brief consideration to the matter of Time itself, so that we may realize and appreciate the magnitude of that undertaking?

It is easy and probably common for us to speak of matters or of subjects and things which are familiar, yet not easy of definition. The subject of time is of such a character, in that while it influences such a large proportion of human activities, Time itself as a subject is seldom seriously considered, nor is it easily defined, for "Time" is not an object; it can not be handled nor described nor can it be seen, for it is not material. As a definition the following may suffice :- "Time is that portion of Duration which can be measured". Measurement is the comparison of objects, or matters, with a recognized or established Standard, or Unit. The universal standard of a Unit of Time is a Day. Instruments for the measurement of Time are often designated as "Timekeepers", but inasmuch as nothing can keep time, such a designation can not be quite correct. Clocks and Watches are really mechanical devices for the measurement of time, and within a few years they have been so scientifically designed and so accurately manufactured as to register time with variations of a small fraction of a second in twenty-four hours.

The story of the accomplishment of this wonderful achievement by the Waltham Watch Company is attempted in the following pages, yet much of the biographical information was contained in a booklet entitled "A Pioneer", published in 1905, by Hazlitt & Walker, of Chicago, Ills., which was intended to form a leading part of a contemplated History of the Watch Factories of America.

---

We have defined "Time" as being "that portion of Duration which can be measured". As an introduction to the story of the making of Time Measures, in Waltham, it may be well to very briefly recall the early sub-divisions of time, and also to make mention of the means used, to measure the designated time intervals.

The earliest mention of the subject of time, and also of the unit of time, is found in Genesis - "and the evening and the morning were the first day." A little later there is mention of the "day" and the "night" and the "month", the summer and winter, the seed time and harvest, and last, the "year", - all of those made up of a succession of "days". Of the sub-divisions of the day into "hours" and of the night into "watches", there is very little definite mention, but there seems to have been four principal ones of each, which in the aggregate comprised a day. But nothing is known concerning the means for defining the limits of any of these divisions, till we find in the Book of Isaiah 38:8 it speaks of the "Sun Dial" of Ahez.

(Picture of Sun Dial)

According to Chronology Ahez was King of Israel, and reigned from      to      B.C. Manifestly a device like that shown in the above could serve only in direct sunshine and indicates the approximate point of the day, and that point was a constantly varying one, - according to the season of the year. Yet without doubt it was sufficiently accurate to meet the requirements of those early days, when for ordinary purposes definite points of time were needless. Train schedules and factory working hours were thousands of years in the future. Time indication by shadows was a phenomenon of Nature, then just beginning to be utilized. Nature furnished the requisite means and man only needed to adopt the shadow of a rock or a tree and simply graduate the surface of the ground for his dial. But, as has been suggested, the shadows on the dial were subject to continued changes. Yet notwithstanding that imperfection and the further limitation to clear weather, it sufficed for the requirements or conveniences of those days.

(Chart showing continued changes in relative length of days throughout a complete year)

From Photo for Lantern Slide copied from "Fact Book"

History reveals very little progress in the direction of Time Measures during the centuries preceding the Christian Era. Yet there were not wanting evidences that there was desire for some reliable measure of time intervals, and a realization that such a measurement must be obtained through mechanical means, - through the employment of one or more of the natural forces which are ever present, and of ceaseless potency. Of these natural forces that of Gravitation evidently lends itself most readily, and History shows that water was the element first employed in conjunction with the force of gravity to indicate the lapse of time. The device shown in Illustration 3 reveals the structure and operation of one of the earliest known forms of what is properly known as the "Clepsydra", - water thief, (from Klept, thief and hydra, water.)

Illustration #3

The simplicity of this device makes needless any explanation. Other and more elaborate forms of time measures, which employed escaping water, might be mentioned, but as we have to consider particularly the history of the making of timepieces in Waltham we will merely remark that with the spread of civilization and the continued development of the people of the western nations of the world, there came a desire for improvement in Time Measures. Particularly is this true of the British nation. Probably it would be correct to state that the status of any nation or people could be determined by its evident regard for time and its importance. Could we imagine any of the Orientals as having originated the significant phrase "Time is Money"?

Quite an extensive and detailed history has been written and compiled relating to "Early Clock and Watchmakers and their Work," in which is shown the ingenuity as well as the manual skill of those pioneers in Horology in England, in France and in Germany, but none of those skillful men seem to have had any realization of the possible extent of the demand for accurate time measures which would follow their reliable production. As a matter of fact very few of the interesting old timepieces which now exist were, or, from their nature and construction, could have been very accurate time "measures". Yet as specimens of the jeweler's art they are interesting and some even elegant pieces of workmanship, therefore fulfilling their real design. Without doubt it was never imagined that the possession of timepieces could become popular, as indeed it could not be without a radical modification of their form and character.

Nevertheless, the essential elements of the coming popular timepiece were successively being worked out by those skillful workmen who were also diligent students. The force of gravity, as represented by the use of water, and later by the substitution of some form of suspended weight which should serve to actuate varying forms of mechanism, was conditioned by the requirement of stability. In other words, gravity could not serve to actuate a portable timepiece. Nevertheless, another vital requisite for increased accuracy had been devised and applied to the early forms of timepieces actuated by gravity. A crude form of Escapement had been devised and was used by

The purpose of this writing is not to serve as a study of the various forms of time measuring instruments which have been produced during the past thousand years; however interesting such a study might prove, but to tell the story of one enterprise which had the fortune to be the first of its class - in the matter of originality and mechanical excellence in construction, as well as of scientific accuracy in performance of its product.

The Waltham Watch Company attained its present high rank as the leading watch producing organization of the world, because of its independence of traditional methods in manufacturing, its constant determination to strive for a growing excellence of product, and a maintenance of reasonable prices, and the production of a variety of grades of watches, with prices to correspond, all of reasonable amount, thereby making it possible for the mass of people to possess timepieces of reliable quality.

Like all enterprises the Waltham watch factory is the outgrowth of an idea, which was that methods and means, which had been found practicable for the systematic fabrication of various forms of mechanisms of larger dimensions might be adapted to the production of the delicate mechanism of watch movements.

This idea, in the mind of a young watch repairer working in Boston, Mass. in 1849, expanded and ripened, and in the Fall of that year was imparted to Mr. Edward Howard, of the firm of Howard & Davis, who were engaged in the manufacture of Standard Weights and Measures, having their factory in the adjoining City of Roxbury, now forming a part of the City of Boston. Mr. Howard's experience in dealing with the delicate and exacting requirements of his own line of work enabled him to take a sympathetic interest in the scheme and proposals of Mr. Dennison, and together they undertook to demonstrate the practicability of what seemed to be a plausible scheme of productive manufacture.

Mr. Dennison had made repeated visits to the United States Armory, in Springfield, Mass., and had seen demonstrated the ability to produce large numbers of constituent parts of Army Rifles, so identical in form and dimensions as to be readily interchangeable. He felt confident that a like result could be obtained in the production of the more delicate members of the mechanism of watches. Of course the first thing to be determined as a basis on which to work, was the creation of a satisfactory model for reproduction. It was natural that, in designing this important model, there should be an endeavor to devise a watch which should possess some new and attractive features. Lacking the judgment, which years of experience would have developed, the two young men decided to create a movement which would run eight days with one winding. Such a model was made, indeed several reproductions were made, but a brief trial sufficed to demonstrate the fact that owing to the varying power of the mainsprings (of which two were provided) it was found impossible to secure a constant rate of motion throughout the long interval between windings.

The impracticability of the 8-Day watch being demonstrated at the first attempt, it was wisely decided to adopt a form of watch which seemed best adapted to the possibilities of being fabricated by specially designed machines. This consideration doubtless led to the adoption of the sturdy, though somewhat heavy, form of the "English Lever". But the freedom from the conservatism which so characterizes our English cousins, permitted the American to discard the "Fusee and Chain" feature which the English watchmakers continued to regard as an essential feature of any timepiece having a spring as a driving power.

The model which was adopted was a 18 size "Full Plate Key Wind" Model, having a "top plate" and a separate barrel bridge supported by four pillars. The "balance cock" and the "potence" were attached to the top plate. The Balance Wheel was arranged to vibrate four times per second, or 14,400 per hour, and is now designated as a "slow train", as distinguished from the "quick train" of five beats per second, 18,000 per hour, as almost universally used in modern construction.

With only slight modifications this model was continued until 1877. At that time Mr. C. V. Woerd changed the form of the Top Plate and Barrel Bridge, moved the location of the Barrel Arbor and also the dimensions of the barrel and substituted three pillars for the four which formerly had been used. The movements of this "three pillar" model of 18 size were designated as "New Model" and in the factory records were booked with a suggestive "N", indicating "New Model".

Having determined on a model the practical reproduction of large numbers of such movements on the proposed interchangeable plan was undertaken. It is said that Mr. Dennison had designed some special machines for the performance of certain operations in fabricating some of the individual members of the mechanism, but that when put to practical use, they proved unsatisfactory in

performance. It should not be regarded as strange that this should have been the case, for the field of design of such machinery was new, its demands were exacting to a degree which had been hitherto uncalled for. But the designing and building of those machines cost considerable money. Money in hand was small in amount, and consequently the meager capital rapidly dwindled. But in a short time a capitalist was found, in the person of Samuel Curtis, who invested \$20,000 in the enterprise. At that time the active members of the company were Mr. Aaron L. Dennison, Mr. Edward Howard (and possibly Mr. Howard's partner in the Scale and Clock business - Mr. D. P. Davis and Mr. Curtis.) They adopted the firm name of "The American Horologe Company", which name was after a short time changed to "The Warren Manufacturing Company" and it is said that the first hundred watches produced bore that name, and that they were put on the market in 1853. The next four hundred watches bore the name "Samuel Curtis". Mr. Curtis' only return for his \$20,000 investment was the publication of his name on a creditable American product, and the contribution of an amount of capital at a critical time to a worthy enterprise which has now achieved world wide distinction under a later name of the Waltham Watch Company.

The name "Warren" was doubtless suggested by the proximity of their factory to Warren Street, so named in honor of Major General Joseph Warren (who was born in Roxbury and who was shot down at the battle of Bunker Hill on June 17th, 1775, while serving as a private soldier). The name "Warren" was discontinued after a short time, as not being suggestive of the company's business. A few movements bore the name "Samuel Curtis" and then the more significant name "Boston Watch Company" was adopted and retained until 1857. The few hundred watches which were produced in Roxbury were all of the original "18 Size Full Plate Model" and were sold in the market for \$40.00 each.

(Cut 57 Model)

Aside from those bearing the names above mentioned work was commenced upon a lot carrying the name "Dennison, Howard & Davis".

Three years of initial experience in watch making in the original Roxbury factory convinced Mr. Dennison that the location was unsuitable for a permanent factory, by reason of the serious prevalence of dust, especially in summers. He therefore endeavored to discover a location which would be free from that very serious annoyance, and which would allow room for possible enlargement of a factory and also for the erection of houses for the anticipated increasing number of workmen. It was recorded that in his search for a more suitable factory location, Mr. Dennison visited Waltham and that at the extreme western border of that town he discovered a location which pleased him. It was at what is now known as "Stony Brook" and was the property of Mr. N. L. Sibley who owned and operated a Machine Shop, whose power was derived from the brook of that name. The location was satisfactory to Mr. Dennison, but the price at which Mr. Sibley would consent to sell was so great that it could not be considered, and Mr. Dennison returned to Waltham to take a train for Boston. While waiting for the arrival of his train he met an acquaintance, a Mr. S. Payson Emerson, who was the foreman of the Machine Shop of the Mill of the Boston Manufacturing Company, which was located near the R.R. Station. Mr. Dennison told Mr. Emerson of his errand in Waltham and of his failure to secure the desired location for his projected watch factory, and Mr. Emerson responded very promptly that he could show him just the location he wanted, and together they left the station and Mr. Emerson directed Mr. Dennison's attention to the vacant farm land lying about the south bank of the Charles River, about three-quarters of a mile distant. The prospect "looked good" to him, but whether he visited the locality that day or not, it is quite certain that he had seen what was attractive and gave great promise of complete satisfaction, and steps were taken to secure the property. At the suggestion of Mr. Dennison a stock company was formed to purchase the property and this company was known as "The Waltham Improvement Company". This company was incorporated with a capital stock of \$100,000, the Boston Watch Company owning thirty shares of \$100 each.

In his efforts to secure this promising location on which to build a new and convenient factory, and in connection with it to also make provision for creating homes for the people who would be needful to

carry on the contemplated enterprise, Mr. Dennison soon came in contact with Mr. Wm. H. Keith, and as Mr. Keith soon became a prominent participant in the coming events it seems well for us to quote verbatim from his written account of the transactions which were immediately connected with this important portion of these historical events. At some later time, when the watch factory had become an institution giving prominence to the name "Waltham" as a town of special importance, he very wisely made a record of his connection with these events, in a volume having the title "A Family Tale", from which we copy the following:-

"Near the close of the month of October, 1853, Mr. Aaron L. Dennison called at my house (Wm. Keith) in Waltham. He informed me of the difficulties he and his associates of the Boston Watch Company experienced from the dust and confusion around the present factory. He said his company desired to find some country location where there was land enough for the buildings of a factory and for dwellings for their work people; the same to be easily accessible to Boston by rail and a pleasant and salubrious location. The farm there open before us would be a good property for their purposes, but it had been sold on the first day of the month to James Brown of Boston. But I told Mr. Dennison I thought it would be best to see Mr. Brown and listen to any proposition he might offer. Little time elapsed before I called on Mr. Brown at his book store in Boston. He said he was not anxious to sell, yet, as he thought the object to be accomplished by the formation of a company for the achievement of an industry so important to this country, and that so commendable in itself, that he would give to such a company a deed of said property; if it would assume the prompt payment of his notes, and in addition give him a bonus of five thousand dollars, which might be put in two notes payable one in eleven and the other in twelve years; and that he and his father-in-law would probably take some shares of the Company's stock. I accepted his offer provided he would give a bond for a deed on the first day of April following to Wm. Keith and Aaron L. Dennison and their associates. One hundred thousand dollars was fixed as capital stock of the company and divided into one hundred shares of one thousand dollars each. Wm. Keith wrote a pamphlet of the value of the Bemis farm and the Lanton lot and distributed it among people who he thought able to engage in such an adventure. The pamphlet produced marked sensation among real estate owners in Waltham. The piece of land was seen to be proportionately low compared with the prices of land locally much inferior in every respect. The one hundred shares were subscribed for within ten days.

"The next effort to complete the organization of the company was to obtain an Act of Incorporation. A petition was drafted and a suitable number of signatures procured and presented to the General Court when in session, adopting the title "The Waltham Improvement Company". The Act is as follows:-

Section 1. Edward Howard, James Brown and Wm. Keith and their associates, successors and assigns, are hereby made a corporation, by the name of the "Waltham Improvement Company" in the town of Waltham, for the purpose of establishing the manufacture of watches, and the finer articles of brass, steel and iron, etc.

Section 2. Said corporation shall have power to purchase, hold and possess, in fee simple, or otherwise, ..... certain lands. And said corporation shall have power to grant, sell and convey, in fee simple or otherwise, the said property or any part thereof, and to lease or otherwise manage the same.

Section 3. The stock and property of said corporation shall be divided into shares, not exceeding three hundred in number, and shall not be liable to assessments exceeding the sum of one thousand dollars on each share, "etc."

The Bill was reported to the House but was met with much opposition. At length after being thoroughly debated the Act was passed with a very fair majority."

A meeting of the stockholders of the Waltham Improvement Company was called in the hall of the Waltham Bank on Thursday, March 30th, 1854. Horatio Adams, Esq. was chosen moderator

and Wm. Keith Secretary. The stockholders accepted the Act of Incorporation. The capital was fixed at \$100,000. A President and Treasurer, Board of Directors and Clerk were chosen. Dr. Horatio Adams for President, Wm. Keith, Treasurer and Superintendent, Thos. J. Marsh, Clerk, and Reuben P. Davis, James Brown, Samuel Curtis, Edward Howard, Wm. B. Fessenden as directors. The President and Treasurer were Ex-Officio directors. A code of By-Laws was adopted and the first meeting of the Company dissolved.”

It was but natural that the securing of a satisfactory location for the projected watch factory should waken a hopeful spirit, in the Projectors of the enterprise, and as rapidly as possible building plans were prepared. It can readily be realized that Waltham possessed a special attraction, as a place well worth visiting, by people living in a certain district in Roxbury. The writer recalls being told by Mr. James Baker, who was at that time working for the Boston Watch Co., of a visit to this vicinity in company with a few other men under the guidance of Mr. Dennison, of how they crossed some of the vacant fields of the “Bemis Farm” and that at one spot “Mr. Dennison climbed to the top of a stone wall and waived his long arms, and pointed toward a place near the river, and said: There, Gentlemen, just about there a watch factory is going to be built”.

The actual work of erection of the factory began in the Spring of 1854, and in October of that year was so far completed and equipped that the tools and materials, which had been accumulating in the Roxbury factory were transferred to the new factory.

The center, or office building of this original group, was built on the ground now occupied by the North Tower of the present factory. Its location was directly in the rear of the Bemis Farm House about 400 feet nearer the Charles River. At that time, or a little later, Crescent Street was extended and terminated at the front of the Factory, but a few years later it was still further extended into and through the woods and curved until it found its other end at Moody Street, at a point about three-quarters of a mile from its beginning.

Although the ownership of the property of the Watch Company had passed to the Waltham Improvement Company, the name of the new owners did not appear on any of the watches produced in whole, or in part, at the Waltham Factory. A few hundred movements had been started in the Roxbury plant, but most of them were completed in Waltham and bore the name Dennison, Howard & Davis.

The buildings which were erected to serve as a factory were somewhat experimental in their method of construction and might be regarded as an initial step in the direction of the present concrete construction, indeed their material was a “concrete”, but instead of being composed of hydraulic cement, sand and crushed stones, as now employed, the concrete then used was a mixture of common gravel (dug from a bank opposite the site for the new building) and lime mortar. These buildings were later known as the “Mud Wings”. The last of them was demolished in 1879.

In the vicinity of the factory the land was carefully surveyed and laid out into streets and divided into house lots. Shade trees were set out, and a few dwelling houses were erected. There is mention made to the effect that a store, Office and Hall building was built on Moody Street, which was the direct avenue from Waltham to West Norton; also that the “Boston Watch Company took land for a double house, and twelve other parties bought land, and with the assistance of some money erected comfortable dwellings. Mr. Dennison made his home in the old Bemis Farm House.

#### Picture of Farm House

Concerning the streets which were at last laid out at that time, it is noted that with one or two exceptions, the plan was adopted of naming the streets after those of different trees, or wood. By this plan the first street, running from Moody Street toward the river, and next to Crescent Street, was called Spruce, next came Walnut, beyond that was a street which had previously been laid out and named “Nelson”, This was re-named Chestnut. Then came Maple and Cherry. With the exception of Chestnut Street all of the foregoing streets extended from Moody Street to Crescent Street which ran parallel to the curve of the river till near Cherry Street. At that point Crescent Street ran for several

hundred feet parallel with Moody Street. The next street was called Ash, and on the land on the border of the river between Cherry and Ash Streets was located the new factory.

It is not at all strange that at this early date there was no comprehension of the future magnitude of the business which was to be developed. If the future could have been imagined, the factory doubtless would have been built on the opposite side of the street, where there would have been plenty of room for future enlargement, and a beautiful park could have been developed on the border of the river. Only one additional street was laid out beyond Ash Street, and that was named "Brown Street", probably in honor of the man from whom the Bemis Farm was purchased. Beyond Brown Street all was bare forest.

Having now announced the erection of a building designed for the manufacture of Pocket Watches by methods not yet completely demonstrated, it may be well to pass for a brief glance over some events which have to do with the future home of this hopeful industry, now located on the south bank of the Charles River. Rivers are notable features in the character, as well as the appearance, of any given locality, sometimes serving to give variety to the outlook - and beauty as well. In other places they may serve as avenues of commerce. It is related as an announcement of one visitor from abroad that in his travels in America he had made the curious discovery that a great many of our rivers ran past large and important cities. The Charles is not without at least some of the characteristics of rivers in general, one of which is that they often serve as natural boundaries or separators between adjacent towns or cities. This river is neither very large nor very long, and certainly it is far from being straight, so that after its course of about forty miles it empties its waters into Boston Harbor at a point about fifteen miles from its source. In the latter part of its flow it has served as a boundary to separate Newton from Needham, Wellesley, Weston, Waltham and Watertown, and then to separate Cambridge from Brighton and Boston.

Just about the same time that Aaron L. Dennison began to concentrate his thinking on the idea of manufacturing watches on the interchangeable plan, there arose a controversy between the town of Newton and the town of Waltham, adjoining it on the north side of the Charles River, relating to the payment for needed repairs to the connecting bridge at Moody Street, near the Cotton Mill. After years of negotiations the matter was settled in 1849 by the concurrent votes of the two towns, and a special act of the State Legislature, by which the town of Newton, in consideration of the payment of \$1000 by the town of Waltham, transferred the tract of land which bordered upon the Charles River, so that the river no longer serves as a boundary between Newton and Waltham, but instead it serves to divide Waltham itself into what is commonly called "The North Side" and "The South Side", (see accompanying map of Waltham at the present time).

#### Map

(Note that the boundary line starts at the southwest corner, where Newton joins Weston, very near Norumbega Tower and runs easterly in a straight line striking the Charles River just at the boundary line between Waltham and Watertown, so that between the two points the Charles River is entirely in Waltham. But for this change in town boundaries the watch factory would be on Newton territory and Waltham would not possess its world-wide reputation as the "Watch City of the World". Waltham certainly got the best of that bargain, yet it at once proceeded to even reimburse itself by securing the \$1000 which it had paid for the control of, by assessing additional taxes on the newly acquired territory. The territory over which it had thus acquired jurisdiction was but sparsely inhabited, the land for the most part being pasture and woodland, although some farming was done and there were possibly twenty houses. There was, however, one industry whose plant covered considerable ground, about sixty acres, although employing a relatively small number of people, - The Newton Chemical Company - which was engaged in the production of Sulphuric Acid. This plant was located near the river, and at some distance east of Moody Street and about three-quarters of a mile east of the watch factory. Originally this business started in 1819, on the opposite side of the river at its junction with Beaven Brook, but in 1825 was transferred to land on the South side of the river and in Newton. The

business continued till 1872 and as other similar organizations had been established elsewhere this plant was abandoned.

The actual erection of the watch factory, although financed by the Waltham Improvement Company, was allowed to be directed by its subsidiary, the Boston Watch Company, and therefore the peculiar ideas of Mr. Dennison were adopted. It is not now evident what was expected to be gained by the plan which was adopted - of constructing the two abutting wings half a story lower than the central building with which they were connected by stairways, yet they were so built. The organization of The Improvement Company at this time was as follows:- DR. Horatio Adams, President; Wm. Keith, Treasurer and Superintendent; Thomas J. Marsh, Clerk, Reuben P. Davis, James Brown, Samuel Curtis, Edward Howard and Wm. B. Fessenden, as Directors. The foregoing were chosen on March 30th, 1854.

Of the capital stock (100 shares at \$1000 each) the Boston Watch Company held thirty shares. When in complete operation in its permanent location about ninety people were employed, and with the limited amount of machinery then in operation they were able to complete only about thirty watches per week, or one watch per day for each eighteen workmen. But it is to be remembered that several portions of the movements were procured from Europe, such as dials, hands, mainsprings, hairsprings, balances and jewels. At that period there existed in the minds of the purchasing public a natural prejudice against American Watches, or any attempt to produce them as competitors with those of foreign makers. It proved to be a very unfortunate time for the launching of a new business, especially of the character of this one. Commercial matters in the United States were becoming involved. The whole nation, indeed, was "throbbing with political excitement". Anthony Burus, a fugitive slave, had been captured, and by the authority of the Fugitive Slave Law, had been delivered to the United States official on board a waiting vessel in Boston, to be taken to Norfolk, Virginia, for delivery to his master. This incident naturally served to add fuel to the fire of national politics which was raging throughout the entire North and South. It was the period of this intense struggle for the extension of slavery into the new States and Territories of the country, the struggle which centered in the proposed State of Kansas, to which thousands of people from New England, and other parts of the North, had emigrated in the hope and endeavor to establish a bulwark against the further extension of that inhuman institution. It was in May, 1856, that Senator Charles Sumner, of our State of Massachusetts, was brutally assaulted while at his desk in the Senate Chamber. Events of this character served to feed the fires of sectional hatred which were soon to burst into the flames of the War of the Rebellion. This was the time of the Crimean War, also, and with political conditions in our own country so disturbed, and with the constant uncertainty as to the immediate future, it could not otherwise than that productive industry should languish. It may be that the fact that the country was absolutely without any reliable financial system was the great underlying cause of the increasing monetary troubles. Two years of such widespread unrest culminating in the universal financial panic of 1857, when multitudes of business organizations, as well as hundreds of individuals, were forced to suspend their business activities, were more than this new enterprise could withstand, and in the Spring of 1857 the Watch Company made an assignment. At that time it was estimated that this expenditure amounted to \$150,000, or with a shrinkage in value of \$90,000. The Assignee offered the property for sale at Auction, and "on a day in May 1857, in which the skies wept tears of sympathy" the sale proceeded, and the auctioneer announced the sale of the entire property for the sum of \$56,000. (Note: There are some discrepancies in the several accounts of this sale, as to the exact amount which was to be paid for the entire property, but otherwise all accounts are in accord. In the purchase of the entire property Mr. Royal E. Robbins, of New York, was the active participant. In his action he represented the firm of Tracy, Baker & Co., of Philadelphia, creditors of the Boston Watch Co., to the amount of several thousand dollars, on account of watch cases which they, as case makers, had supplied the Boston Watch Co. Individually, Mr. Robbins had loaned \$35,000 to the Philadelphia firm in aid of the purchase. It is of interest to have the story of this crisis given in Mr. Robbins own words in an address at an annual banquet of the Watch Factory Foremen's Association in Boston, in which he recalled

“that day in April (?) 1857, when an auctioneer stood within the little quadrangle formed by the four walls of the little wood buildings which were called the “watch factory”, and offered for sale in hopeless bankruptcy those wretched buildings and their meager contents. The first bid, I believe, was \$5000, made by the late Charles Rice, the assignee. Acting for Tracy & Baker of Philadelphia I bid a hundred dollars more. A hundred dollars more was offered on the other side, and so the bidding proceeded by a hundred dollars at a time, until my principals, much to their alarm and disgust, became the owners, at the price of \$51,000, I believe, plus a mortgage of \$7,500. We found we had got the wooden buildings, but not much besides ... However, with a few grimaces, we shouldered our burden and determined to make the best of it. Tracy & Baker at first undertook the management. It soon became necessary for me to help. In fact, I, who had no idea of doing anything in the business except to lend \$35,000 toward the original purchase, found myself, much against my will, obliged not only to take an active part in the management but to put more money in if I would save the loan. At the end of three or four months Tracy & Baker, perhaps sniffing the financial storm just ahead, abandoned all the capital, some \$15,000 they had put into the venture, and in fact abandoned, by agreement, the whole enterprise to me just on the eve of the great crash, which, you will remember, occurred in the end of that year. With the aid of Robbins & Appleton, I kept the factory going, principally in the construction of tools and machinery, till late in the year. When the condition became serious. I had used up all my money and was well in debt. We had produced but few goods, and there was absolutely no sale for these. The firm had advanced all it was convenient or possible to do. Their customers were falling in every direction, money was 2% a month - when it could be had at all. It was a time of “general panic”, never equaled before nor since in this country. I remember one cold night, - I think late in November - I called a meeting of all hands at the factory and explained to them the situation. I told them I was almost at the end of my resources, but rather than shut down I would make an effort to run through the Spring if they would accept half pay. It was a cold cut of 50%, but every one accepted my proposal. Many of them were already working “by the piece”, and very soon, by making extra exertions, they made fair wages, while the cost of goods was of course largely reduced. The pay roll was getting heavy and still there were no sales. I consulted my early and good friend, the late George Batey Blake. Such paper as I could offer being unsaleable at that time he gave me a letter to two rich Boston merchants, and suggested to them to let me have money on a pledge of my watches. Both of them made me such loans, at the moderate rate of 19%, and I deposited from time to time many boxes of watches in their State Street Banks. Mr. Appleton reminds me today that in order to assist me at that time he took boxes of watches to Portland and Providence and sold them at auction. Thus, by all sorts of efforts, we kept going. We not only did not stop a day, but we drove the works to their utmost, I felt certain of the result.”

From September 1st of that year the business was conducted under the name of Appleton, Tracy & Co.

Quoting further from Mr. Robbins’ narrative he adds that -

“Towards Autumn, in 1858, trade revived somewhat and the goods began to move. I then proposed a consolidation with the Waltham Improvement Company which had a valuable charter for making Watches and owned all the land about there. That Company had, in fact, been founded for the purpose of assisting Dennison, Howard & Davis in the establishment of the manufacture at Waltham, but by the failure of that firm and their successor, The Boston Watch Company, they had become greatly discouraged and were themselves placed by these misfortunes in a bad position. By this time however their faith had revived. They saw that a success was really going to be made of the business and wisely concluded to renew their relations with it”.

The Waltham Improvement Company, at a shareholders’ meeting held August 26th, 1859, voted to buy the Watch Factory property, real and personal, excepting the stock of finished goods, then owned

by Royal E. Robbins, for the sum of \$100,000 and a bonus of \$20,000 and therefore voted to increase the capital stock of the Company to \$200,000. The officers of the corporation were -

Horatio Adams MD	President
R.E. Robbins	Treasurer
W.H. Keith	Clerk

Resuming, Mr. Robbins said -

“I sold out to that Company, which shortly afterward enlarged its capital and changed its name to American Watch Company. I took payment in the shares of the corporation, reserving my stock of watches to be sold by myself. By degrees all these were withdrawn from pawn and marketed, my debts were paid off and I found on settling my accounts that, estimating my shares at par, I had not only saved my capital, but, as the miners say, “cleaned up” a moderate profit for two years work. This finished my experience as a watch maker for individual account. It was valuable to me, as you have seen, but much more valuable to the Company which followed me. Adversity had taught us in a degree how to make watches, and how to make them well, and at a lower cost, considering the general market for watches at the time. Prices were four times the prices of the present day, for the same quality. While we were stimulated, the operatives were taught by necessity the trick of rapid manipulation, so that on the return of better days it was not necessary, in most cases, to advance piece prices. Day wages were of course restored to proper rates. Such accomplished workmen as A. T. Bacon, our late Superintendent, who was a “Springer” at that time, could not be kept on the 75 cents a day he had received during the winter.”

With the sale of the factory and its business to the Waltham Improvement Company, the firm of Appleton, Tracy & Co. disappeared, but the name as a trade mark had become a popular one, because of the excellence of the watch movements bearing that name, for that reason it was retained and is still in use.

When the Waltham Improvement Company was originally organized its object was to aid the Boston Watch Company in its undertaking to manufacture watches, yet its charter, granted by the State Legislature in 1853, gave it permission “to purchase, hold and possess in fee simple or otherwise ... certain lands, etc.” It was also “for the purpose of establishing the manufacture of watches, and the finer articles of brass, steel and iron,” etc. The manufacturing of watches had been carried on, however, by the distinct company, The Boston Watch Company, aided by the Improvement Company, until the failure and sale of the Watch Co. in 1857.

The failure of the Watch Co. inevitably brought temporary disaster to the Improvement Co. But when Mr. Robbins had, by his strenuous exertions, established the manufacture of watches and desired to increase that business, it was needful to obtain additional capital to do so. It seemed wise to adopt his suggestion to purchase from him the factory, and to unite the manufacturing interest with the real estate holdings. Having decided to do so it was voted to petition the Legislature to amend their charter. The petition was presented in January 1859 and it set forth as follows:-

“Whereas by law of the Commonwealth, approved March 23rd, 1854, a corporation was established under the title of the “Waltham Improvement Company”, in the town of Waltham, with authority to issue shares not exceeding three hundred in number and liable to assessments not exceeding one thousand dollars on each share. Now therefore the undersigned respectfully represents that the said corporation, by vote of its proprietors has declared that its convenience and interests will be promoted by a change of title to that of the “American Watch Company” with permission to issue shares not exceeding three thousand in number and to be assessed not exceeding one hundred dollars on each share.”

The act was passed by the Legislature on February 6th, 1859, and read as follows:-

“The act to amend the charter of the Waltham Improvement Company.

Section 1. Be it enacted the "Waltham Improvement Company" in the town of Waltham may take the name of the "American Watch Company".

Section 2. The said company may issue shares not exceeding three thousand in number, which shall not be liable to assessment exceeding one hundred dollars on each share.

Section 3. The liabilities and privileges of said corporation shall remain unaltered except to conform to the provisions of this act.

Section 4. ... This act shall take effect from and after its passage.

The \$300,000 capital authorized by the charter of the American Watch Company had been obtained by May 19th 1860, so that there seemed nothing to interrupt an extensive business, except the dark political clouds rising in the South. But in less than a month from that day came the National Republican Convention in Chicago, viz. - on June 16th 1860. At that Convention Abraham Lincoln received a unanimous nomination for President. The National Election came in the succeeding November, and Abraham Lincoln received 180 electoral votes; Mr. Douglas 18; Mr. Breckenridge 72; and Mr. Bell 30 - a handsome majority, too large to be disputed. But while it could not be disputed, it could be denounced, and it was. Four days after the election a bill was introduced in the South Carolina Legislature calling out ten thousand volunteers, her two Senators in Congress resigned their seats, and a convention was called to pass an Act of Secession. On the 27th of December Fort Moultrie and Castle Pinckney were seized and a revenue cutter was taken possession of in Charleston. In various other of the Southern States similar actions were taken, and on December 17 a convention in South Carolina declared the Union was dissolved and that Carolina was a free, sovereign and independent State. The entire country was roused as never before, nor since.

It could not be otherwise than that Northern business should become paralyzed. What hope could there be that such a business as the making of watches could possibly continue! It did not continue. On April 12th, 1861, actual war was inaugurated by deliberate attack upon Fort Sumpter.

Let us quote once more from Mr. Robbins' narrative -

"During that year came the outburst of Civil War, which brought the business to a standstill and threatened to again bankrupt the enterprise. There was little hope of finding a market for the factory product, unless it should be so reduced in quantity as to be manufactured at a loss. It was therefore decided to reduce expenditures to the lowest point, but to keep the factory in operation to such an extent as to hold the leading operatives. The hours of labor were therefore reduced, and some of the machinists were employed in the manufacture of small lathes, for which a market was found. Some of the workmen enlisted in the Volunteer Army, others were discharged, and a very few were kept at work on movements and cases. Nothing was thought of but preparation for war. Our men dispersed; many of them enlisted. Robbins & Appleton and I, finding our occupation gone, took a contract to feed troops on Staten Island. Dan Sickles' Brigade and Billy Wilson's Zouaves were among the soldiers to whom we dealt out our beef and bean soup."

\*\*\*\*\*

But the calamity of war, from which so much was feared, became the occasion of great prosperity; for the soldiers in the army wanted watches and the watch company exerted itself to meet the demand. In common with everything else the prices of watches at that time were high, perhaps relatively higher than at any time in the history of American watchmaking"

At that time Mr. Dennison arranged a somewhat cheaper grade of watch as being suitable for the use of the volunteer soldiers. To this grade of watch he proposed to give the distinctive name - "Wm. Ellery", who was one of the signers of the Declaration of Independence, from the State of Rhode Island. His suggestion was opposed at first, but was subsequently adopted. Another trade name was also adopted - "P. S. Bartlett", which was the name of the Foreman of the Plate Making Department of the factory. This was designed for a medium grade movement, and has been continued through all the

succeeding years, because of its reliable quality and corresponding price. It is not unlikely that it has been one of the most popular movements ever made..

Even though the original group of buildings seemed quite extensive at first, it was soon evident that some additional room was needful for the convenience of one or two branches of the work. To meet this requirement a small wing was built facing the street and connected with the north wing of the original building. The basement of this new wing was used as a Gilding Department.

(See picture of Flag Raising in 1861.

The financial tornado of 1857, which witnessed the collapse of the Boston Watch Company, wrought equally severe havoc with many another promising enterprise in our industrious country. We may mention one of these unfortunate undertakings which came to a sudden termination, because its abrupt ending brought about certain changes in the lives and careers of individuals and led them to Waltham and to its young and promising industry.

In the year 1855, or thereabout, there was organized in the City of Springfield a Company for the manufacture of Machine Tools, particularly a new pattern of Turning Lathes, which embodied some new features, designed and patented by a very bright mechanic, by the name of Chester Horne. The writer of this entered the employ of that new company in the capacity of an apprentice, to learn the trade of Machinist. His first job of work was given him by a young man who was one of a very few young men who had the opportunity of serving their apprenticeship in the machine shop of the Springfield Armory. Possibly he may have met Mr. Dennison there on the occasion of some of his visits for study of the interchangeable system of manufacturing . A short time after the closing of the "Springfield Tool Company" this young man - Ambrose Webster - entered the employ of Mr. Robbins as mechanic in the watch factory which he had just purchased. Aside from Mr. Webster's abilities as a machinist, he possessed the valuable qualification or ability to realize the imperative need of "system" in creating and maintaining a successful manufacturing enterprise.

Here he had his first opportunity to urge the adoption of an initial system, in the work belonging exclusively to the machine shop in which he was employed. That led to the standardizing of sizes of certain "spindles" and "bushings" which were common to a variety of uses. He also endeavored to emphasize the vital dependence of the entire factory to the Machine Department, and to demonstrate the fact that that department should not be regarded as a burden which had to be carried, but rather as the means through which the entire factory could be made productive.

Notwithstanding the fact that the product of the factory was but small, it was the feeling of the Company's Selling Agents, that they should seek for foreign markets, and Mr. Robbins spent the latter part of the year 1861 in England attempting to interest English merchants in our watches. In the meantime the home market was improving, and the number of operatives was increased, and the rate of pay was somewhat increased. There was an unfortunate lack of harmony between Mr. Dennison and the foreman of one of the departments which failed to furnish the required quota of material, thereby curtailing the number of complete watches desired. Yet the year was a successful one, and as a result a dividend of five per cent was declared, the first return from American watch manufacturing.

The unexpected sale of watches came as an incident of the civil war, through the demand of the Volunteer Soldiers for watches and of their consistent desire that they be of American manufacture.

Before the success of the Waltham experiment had been made even reasonably sure, under Mr. Robbins direction, and with the renewed interest and assistance of the Waltham Improvement Company which had acquired the property through purchase from Mr. Robbins, and consolidation of interest, there seems to have been, on the part of some of the men employed, a feeling of confidence that American watch making was sure to succeed. In this confidence, (in 1859) a number of the most able mechanics organized a second company, with a capital of \$100,000 which was obtained in Nashua, N.H. and a factory was established there. It was planned to manufacture a watch of a different model and of a more expensive grade, and of other sizes than those heretofore produced in Waltham. They therefore decided to adopt both a 16 size and a 20 size, and bravely commenced their

task. But in about two years their capital was exhausted. Finding it impossible to secure further funds they were compelled to abandon the enterprise. Subsequently the machinery and tools, together with the entire stock of about 1000 incompleated watches were purchased by Mr. Robbins, and in 1862 or 1863 were removed to the Waltham factory.

~~The acquisition of the Nashua machinery, and its removal to Waltham~~ The gradual increase in new machines and the corresponding force of operatives, involved the enlargement of the factory buildings to an extent sufficient to receive and operate this new machinery, and also to provide room for the Counting Room and also for the Treasurer's office. Accordingly a second wing was constructed, parallel with Crescent St., and adjoining the main, or corridor, building, on its south side. This new wing was about 120 feet long and two stories high, and while resembling the original buildings was entirely different in the character of construction. Instead of being of solid concrete walls it was made with a skeleton frame of light timber filled in with brick masonry, so as to form a "slow burning construction", yet allowing of plenty of windows to admit light and air. This building was, like the original factory, of two stories in height, and is shown in the illustration below.

(Photograph of rear "About 1862".)

The transfer of the Nashua machinery to Waltham included the return to the factory of the founders of the Nashua experiment, together with a few other employees of that factory. Most of these people were of superior ability, and, in order to utilize their diversified talents, good positions in the factory were provided for them. Among them were Mr. Nelson P. Stratton, who was one of the original force of workmen in the Roxbury and the Waltham factories, and after his return from Nashua served the Waltham Co. as purchasing agent in England. Another of the Nashua force was Mr. Charles S. Moseley, (See biographical sketch) who also was of the Roxbury force. His particular talent lay in the designing of machines, many of which, like the semi-automatic Staff Turning Lathe, came into extensive use. With him came Mr. Charles Vander Woerd, who had been Draughtsman at the Nashua Factory. Two other men were - Mr. J. B. Gooding, who was soon given charge of the making of the Compensating Balances, and Mr. Thomas Lovell, who acted as Purchasing Agent for the Waltham Company for several subsequent years.

During the year 1863 the factory produced 38,000 movements, bringing the total number, since Mr. Robbins purchase of the factory, to about 90,000. At this time about 350 operatives were employed.

In a copy of the Scientific American, of date April 11, 1863, is found a lengthy article relating to the Watch Factory, and a brief but appreciative mention of the delicate machinery employed therein.

In the laying out of the land surrounding the factory it had been planned to reserve in front of the factory buildings, a special Space or Park for the two-fold purpose of providing an attractive outlook in front to supplement the rear view, of the river and the hills in the background, and also of avoiding the annoyance of street dust. Up to this time However, the "Park" was still simply a "location", but not a fact, being simply a portion of vacant land, in the center of which was an excavation from which had been taken the sand and gravel used in the construction of the walls of the original factory buildings. But about this time (1863) the work of grading the land and the setting out of shade trees was commenced.

The fact that the factory product had found ready and profitable sale, doubtless warranted the expenditure of the requisite amount of money for that purpose. So profitable had the business become in 1864 that quite a surplus of profit warranted an increased dividend, to double the amount of the previous year, and also led to a petition to the Legislature for leave to allow an increase of capital to \$..... . This increasing prosperity, however, led to a second exodus of some of the leading employees, and in 1864 a small colony "swarmed" and found a home in Elgin, Illinois. This second offshoot was more successful than the first, for it was able to secure the financial backing of a number of able business men of Chicago who possessed capital and were persuaded to invest a portion of their acquired surplus in the attempt to establish another factory for the making of American watches. (It

may be said just here that while their enterprise eventually became a financial success it did not become profitable till after about ten years of laborious effort).

Mr. C. S. Moseley was the only one of the Nashua colony who joined this second group. Others who migrated at this time included Mr. P. S. Bartlett, who was foreman of the Plate Making department, Mr. Webb of the Dial department, Mr. Hartwell of the Pattern Making and Mr. George Hunter of the Machine department. Some other foremen of the Waltham factory considered the question of joining the colony, but decided to remain with the parent company.

In this year, 1864, the dividend was increased again, and it was also decided to make further enlargements of the factory. This extension was toward the South, and included a second corridor building of brick construction joining the 120-foot wing which had already been built. Beyond this corridor building extended still another wing similar to the previous one. In this wing was established the Nashua machinery which was put in charge of Mr. Woerd. This machinery and its product were regarded as a distinct "department" of the factory and was in general charge of Mr. C. W. Fogg as Superintendent, and was commonly mentioned as the "Nashua Part"; nevertheless, its tool equipment was quite limited, but was supplemented by its use of the tools of the Machine department of the older factory.\*

*\* Hand-written insert on a separate page:* In this way was established the Nashua machinery, which was put in charge of Mr. Woerd, and thus a new and distinct "department" of the factory was created. Commonly mentioned as the "Nashua P... and was in general charge of Mr. C. W. Fogg as Superintendent. Its tool equipment was quite limited but was supplemented by its use of tools of the Machine Dept of the ... factory.

To meet the requirement for sufficient driving power to actuate the newly installed machinery from Nashua and the consequently increasing number of other new machines, it was necessary to duplicate the power plant. Accordingly a new Engine House, Boiler House and Chimney were built in the rear of the new Corridor Building and near the river. Subsequently an underground flue was made from the original boiler-house to connect with this new chimney and allow the removal of the old chimney.

On January 31st, 1865, a Bill was reported to the Massachusetts Senate and on February 9th was approved, by which the American Watch Company was allowed to increase its capital from \$300,000 to \$750,000. On February 10th a meeting of the shareholders was held, at which a dividend of \$150 was [blank space], which was distributed in the form of additional shares of stock. During this year quite extensive additions to the factory buildings were completed and the unfinished watch movements, included in the Nashua factory purchase, had been gradually completed and put on the market.

(Photo of Factory in 1865)

One of the original considerations relating to the establishing of the watchmaking plant in the country, rather than to continue it in the city, was the ability, or opportunity, to secure land on which to erect houses and create homes for the operatives in the new factory. As an introduction to that work the Watch Company selected house lots located on a number of the newly made streets, upon which a variety of modest houses were built. A majority of these were of one and a half stories in height, about half of them being single tenements; others were double houses. In addition to these a few groups of two story houses, to accommodate four small families, were built. Land was also sold to the operatives who desired to build for themselves. For a few years this plan was sufficient to meet the requirements, but with the increasing proportion of female operatives, there arose the necessity of an adequate provision for the comfortable housing of the girls.

In connection with the erection of the original factory, in 1854, a Boarding House was built, quite near the factory and on Crescent Street. This accommodated a few married couples, as also a few unmarried men and women. This house was subsequently enlarged several times, but a more adequate provision was needed.

In the spring of 1865 a new and more stylish-looking house was erected on the corner of Maple and Adams Streets and was given the name "Adams House" in memory of the former President of the Company. This house also was repeatedly enlarged until now (1921) it sufficed to house about 125 girls, and with adequate equipment for feeding about 300 persons. In establishing this house it was the purpose of the Watch Company to provide comfortable quarters for its female operatives, but also to guard against any excessive prices for board, being made by outside parties. To that end the Company managed the house through competent Agents, but on a scale so liberal that it could not be a source of any direct profit. On the other hand, it has provided a home for hundreds of girls who needed such a provision and especially in later years the Matrons have exercised even a motherly care for the inexperienced youth. (*Hand-written note: Present Newton Dexters Gift of library, 1913.*)

In this year the 10 size watch train was also put in larger plates and issued as a 12 size watch. But neither the 10 nor the 12 size endured very long. These movements were of higher grade than those of the "full plate" model heretofore issued, and were made in two grades, the higher of which were engraved "American Watch Co."

Mr. William H. Keith, who had held the office of President since the death of Dr. Adams, in 1861, resigned his office in May 1866, and was succeeded by Dr. J. W. Milliken, who held that office till April 3, 1873. He was followed by F. N. Stone, on March 26, 1874.

On February 9th, 1866, there was organized among the factory employees an Association for mutual helpfulness in case of sickness or need. It was called The Watch Factory Mutual Relief Association, and during its first year it paid out \$945.00 in claims. In 1880 the name of the organization was changed to Mutual Benefit Association.

The Tremont Watch Company, which was organized about 1861, built a factory in Melrose, Mass., with the aid of Mr. Dennison, had run its race, and by 1866 went into liquidation and its tools were scattered. A few of them were purchased by the Waltham Company, but many of them went to Birmingham, England.

When Mr. Dennison's connection with the American Watch Co. occurred in 1861, he soon became interested in a similar enterprise which was located in Melrose, Mass. under the name Tremont Watch Co. That company undertook to procure watches by a method unlike that which was pursued by the Waltham Company, in that instead of manufacturing the complete watch, this new company planned to have the watch "trains" produced in Switzerland and have the plates made in Melrose, where the trains were to be assembled and the watches completed for the market. Accordingly, Mr. Dennison took up his residence in Zurich, Switzerland, in order to supervise the manufacture of the watch trains and forward them to Melrose. This method of divided production, however, was not successful, and the end of the Melrose experiment was soon reached. The Tremont Watch Company went into liquidation. Its tools were scattered, a few of them came to Waltham, but the bulk of them were probably sent to Birmingham, England, whither Mr. Dennison also went, probably about 1867.

Travel, or Transportation - Boats, Barges, Footbridge, Street Car, Bicycles, etc.

The original location of the factory being remote from dwelling houses made it needful for the operatives to walk to and from their work. Gradually came the purchase of house lots and the erection of homes in convenient distances from the factory. But by no means was the housing requirements met by erection of near-by houses. Nor did all employees desire to locate their homes in the new territory, preferring to domicile in the older and more closely settled part of the town. Many such localities were reasonably near the factory, yet because of the intervening river involved quite a long walk. To obviate that difficulty a good many of the men provided themselves with row boats, and not only saved themselves the otherwise long walks, but were able to extend the boat service to the accommodation of a large number of their fellow workers who willingly shared the burden and the expense. So that a flotilla of boats of various sizes made their periodic voyages across the river bearing their human freight. When navigation was closed by the advent of winter that method of travel was of course suspended until the continued cold had made safe passage on the ice. This recurring interruption of

this method of diversified travel was of necessity quite annoying, and one way of remedying the evil would be the erection of a foot bridge. Drawings for such a bridge were prepared by the Watch Company and the matter was considered at the legal town meeting in 1870, and the bridge was built in the year 1881 or 1882, the town having appropriated \$5000 for that purpose

#### Cut showing Foot Bridge

At that time a good sized steamer made regular trips during the summer months from the Moody Street bridge in Waltham to the Weston Bridge, which served to connect the towns of Weston and Newton. The route of this excursion steamer extended about three miles up the river, winding between the low lying banks of diversified character, past historic monuments relating to the distant past, as well as the organized activities of the present; past the silent resting places of the dead and the recreation spots of the living. To allow of the passage of this excursion steamer the foot bridge was provided with an opening "draw". This footbridge continued in use until ---- when it was displaced by a substantial bridge of concrete, which connected Maple Street on the south side of the river with Prospect Street on the north, which street was extended to the river, passing under the tracks of the Fitchburg R.R. The writer recalls that in his earlier visits to Waltham he came by way of the Boston & Albany R.R. to West Newton, where it was possible to connect twice a day with a "Hack" which made regular trips to Waltham for a fare of \$1.00 for the two miles.

About the year 1866 a Horse Railway was projected to extend from the Charles river in Waltham to the section of the B. & A. R.R. in West Newton. This was known as the Newton and Waltham Street Railway. In order to accommodate the employees of the watch factory Mr. Robbins arranged to have the route of that railway extend the entire length of Crescent Street, and in order to secure that location he subscribed for a liberal share of the capital stock. It was wise that that route was adopted, for its principal income came from the watch factory patronage. Some years later the road was extended across the river at Moody Street and to the upper end of Main Street and the car barn was removed from the former terminus on Moody Street to the new terminus. In 1890 the propulsive power of the road was changed from horse power to the electric drive, this being one of the first of the suburban roads on the State to adopt that method. The transportation problem having been successfully solved, Mr. Robbins disposed of the watch company's holdings of stock to the newly organized company, which greatly extended the Newton end of the line by running north and west from West Newton.

By the year 1871 the repeated increases in the Capital Stock had brought the amount to \$1,250,000. All enlargements of the factory buildings after 1870 employed as material for their walls red brick, with brown stone trimmings and truss roofs with slate coverings. The first building of this form of construction was built to replace the first addition to the original factory, but was larger in every direction than the displaced wing. It had been felt that possibly if the future growth and extent of the factory could have been anticipated at that time a somewhat modified beginning would have been made. The land on which the original factory was built had quite a decided slope from street level in front down to the river bank at the rear. It is probable that this fact led to the making of the floor levels of the main wings running toward the river about half a story lower than those at the front, consequently involving the climbing of stairs when passing from one work room to the adjoining one. When this brick wing was built an improved design was planned so that in order to avoid the annoying use of stairways, the floor levels should hereafter coincide with those of the main or corridor building. But in order to secure a basement story it was decided to excavate still deeper. Having made this decision and built this first permanent additional wing, that plan has continued and has consequently compelled the regrading of the ground in front of the entire factory, in order to secure proper light for the basement workrooms; but that in turn involved very extensive excavations in order to secure adequate room for placing needful piping for the distribution of steam, water and gas, so that the excavations are now practically on a level with the adjoining river. But probably no one anticipated the future extent of the factory's growth.

That first brick wing was about 90 feet long, and contained three floors. A fourth floor was added a few years later, and in 1881 an Executive and Counting House building was erected and the brick wing was extended to meet it.

Until the year 1868 the entire output was of "movements" of the ordinary "key wind" construction, but in that year there were issued the first stem winding watches of American construction. Only a few of them were made, however, and they were of somewhat primitive arrangement. They were of 16 size (?) and quite unlike the modern American interchangeable construction.

The 18 size full plate movements continued to be the popular movement for men's use for about half a century, although for professional use or for people of refined tastes the 16 size  $\frac{3}{4}$  plate watch grew in favor, as it was both smaller and thinner than the full plate model. Also the 10 size "Ladies watch" continued to be a standard size, though there was a growing tendency toward the use of a less bulky ornament.

It must be evident to any thoughtful person that in order to successfully and continuously manufacture the various members of a combined mechanism as diverse in form and as exacting in accuracy as the numerous portions of a complete watch movement, there must be a standard unit of measurement. This unit of size should be suitable for application to the special product on which it is to be used. Also it should be capable of being simply expressed and easily sub-divided. In order to compare the individual pieces of each form with the standard, or model form, there is required a variety of testing gages each of which is adapted to indicate a definite relation to the Standard Unit.

For ordinary mechanical purposes, the English "feet and inches" are convenient and practicable. But for the expression of the very minute dimensions pertaining to watch work, the "inch" as a unit, is altogether too large. A careful study of the "Metric System" and its decimal system of sub-division and graphic expression, led to its adoption as ideal for use in measuring the several parts of watch movements, and also as well adapted for the machine shop use in the construction of the special watch-making machines. One modification seemed to be needful to completely adapt the system to the practical needs of the factory. This change was to take, as the unit, not the "Meter", but one-one-hundredth of a meter, i.e. - one "Centimeter". By the decimal system of notation the Centimeter is readily divided into 1000 parts, and any number of those parts easily expressed by the use of a dot and three figures.

Having decided upon the adoption of this "Metric System" the first thing to be done was the actual creation of the standard "centimeter" which in itself was no slight task. Many months of careful work were required to prepare for the complete change to this new standard, but in 1868 the change was made. And this factory is supposed to be one of the first American manufacturers to adopt it.

In 1873 the company issued an 8 size movement having an irregular shape of top plate, and exposing to view several of the train wheels. For several years the factory had maintained a gradually increasing output, consequently its productive force was enlarged to a corresponding degree, so that in 1873 there were 1000 employed at work, and the total number of movements produced since 1857 was nearly 800,000.

It may be as well to consider at this point, as at any other time, the question - What constitutes successful manufacturing? Is it sufficient to be able to do enough business to keep a factory in continuous operation, and thereby earning sufficient return on the financial investment to make possible the payment of a fair annual dividend? Is not progress in all directions an important factor in permanent success? Is expansion in volume of business always desirable? or may not an extreme conservatism be very unwise, or possibly fatal to permanent success?

If mankind were endowed with the power of prevision, it would probably be possible to avoid many errors and miscalculations and save a great many changes in plans and much labor and expense involved in remedying mistakes.

If the builder of the original Waltham watch factory had known what was learned by a few years of experience, it is quite probable that the factory would not have been located as it was. One of the

reasons for locating in the country, rather than in the city, was to escape from the annoyance of floating dust incident to street travel and traffic. Another reason for a country location was to secure plenty of room for enlargement, whenever it might be desired. As a matter of fact neither of these advantages were completely attained, for by building between the street and the river they were restricted from more than a very limited extension toward the river. Nor could there be made any extension in front, for there were only a few feet reserved between the buildings and Crescent Street, - not sufficient to escape from the annoying street dust. Fortunately the original reservation of the land opposite the factory for park purposes had prevented the erection of dwelling houses on that side of Crescent Street; this being the case it was decided to extend the factory premises in front, by moving the location of Crescent Street fifty feet. The town (in 1871) having voted to allow the relocation and widening of the street that work was carried out, greatly to the advantage of the factory, although it involved the reduction of the area of the three parks. On the completion of the new street a substantial fence of neat design was erected along the entire front of the factory land. Also a neat fence to enclose the park directly opposite the factory.

It is proper to regard the use of watches as being, to some extent, in the nature of a luxury, and therefore an unreliable index concerning sound business conditions.

If conditions controlling demand could remain stable, the work and care of constant productive manufacture would be comparatively simple. Unfortunately the exact reverse of this simplicity seems inseparable from watch manufacturing, for the two potent facts of the uncertainty as to the line of product which the need, or the whims, of the Public will demand, and further, the length of time required to supply a new line of product

During the fifteen years from 1858, in which the first 800,000 watch movements had been made, there had been very few radical changes in the sizes or style of the watches called for, but from that time commenced a more complicated or varied output. In 1872 came the adoption of stem winding mechanism as applied to Waltham watches. This early form of mechanism was by no means so simple in operation as is the modern form now in general use in nearly all American watches, and which was originated in the Waltham factory, but it was a step in that direction.

Mention has been made of the plan of providing a permanent and adequate open space in front of the factory which should be kept free of all buildings. This plan had not been carried out until 1875, when the first of the trio of Parks (now completed) was finished by the laying out of symmetrical walks, or paths, and the planting of an abundance of shade trees. Several years later there were erected, on the edge of the park near Crescent Street, a line of substantial seats, which still remain.

The approach of the Centennial of the Declaration of American Independence, and the decision to celebrate and commemorate that important event by the establishment of a World's Fair to be held in Philadelphia during the summer of 1876, afforded an opportunity for the Watch Company to bring to the American Public, and to quite an extent the representatives of other nations, the claims and excellencies of Waltham Watches. It was wisely decided that this rare opportunity for publicity ought not to be neglected, but rather to be utilized to its full extent. With this purpose in view the latter part of 1875 and the first of 1876 were occupied by workmen in the Machine Department in building a Mechanical exhibit which included a number of representative automatic machines, together with the requisite driving shafts, so as to form a small industrial group, with skilled operatives to keep the various machines in productive operation, and to impart desired information to the throngs of interested visitors. In the near vicinity of this mechanical exhibit there was located a large show case containing 2200 watch movements some of which were enclosed in cases, either of gold or silver. These 2200 movements represented the product of six working days of the Waltham factory. In addition to these visible displays there were a number of watches entered for competition, with the products of all other exhibitors, for excellence in time-keeping rates. Waltham watches were given the highest award, by a trial jury, after a series of severe trials extending over eleven weeks.

(Centennial Exhibit)

Naturally the results of this award, and the interest awakened by our extensive exhibit, were certainly encouraging to the Waltham Company, and as surprising to the European exhibitors, as well as to the numerous Swiss watchmakers who did not exhibit.

Two years after the Centennial Exposition there was in Paris a Universal Exposition, at which the Waltham Company exhibited finished watches and unfinished movements, and were awarded a Gold Medal - the highest award to any Exhibitor in Horology.

Until this year (1878) the making of 16 size movements was segregated, and designated as the "Nashua Department", which was in charge of Mr. Charles V. Woerd, as the manufacturing head, while Mr. C. W. Fogg superintended the assembling and adjusting of its high grade product.

After the retirement of Mr. Dennison from the factory, in 1862, and Mr. Stratton's transfer to London as Purchasing Agent for the Company, Mr. Albert T. Bacon became factory superintendent. His qualifications and interest were however restricted to the care of the finishing of the watch movements, while the care of the Plant and the building of the needful machinery and tools were delegated to Mr. Ambrose Webster, the Master Mechanic. But in 1872 Mr. Webster was made Assistant Superintendent of the entire factory. In 1874 Mr. Woerd became Mechanical Superintendent, Mr. E. A. Marsh continued as head of the Machine Department, with Mr. W. H. Wrenn as Assistant Foreman. Mr. Webster held the position of Assistant Superintendent until 1876, when both he and Mr. Bacon resigned their positions as Superintendents and retired from the factory, and Mr. Woerd was made General Superintendent, with Mr. George H. Shirley as his assistant.

Mr. Woerd, while possessing good mechanical ability and also inventive talent to some extent, was not an experienced watchmaker, and naturally failed to realize that while the watch is a machine, it can not be designed and constructed exactly in the same manner and proportions as larger machinery. Consequently his attempts to remodel the original form and arrangement of the 18 size movement, so as to incorporate a stem-winding mechanism, were very unsuccessful, and the watches, which embodied his mechanism proved very unsatisfactory, - so much so that it was evident that unless a radical improvement could be made, the market for Waltham watches could not be retained.

In the endeavor to remedy that serious situation Mr. Robbins, with the cooperation of the Selling Agents in New York and Chicago, secured the services of a very able and skillful watchmaker, in the person of Mr. Duane H. Church, then in the employ of Matson & Co. of Chicago. Mr. Church came to the factory in 1882 and was given a small room in which to work, and permission to make use of whatever mechanical equipment the factory possessed, to aid his work. He was able to make some improvement in the Woerd Model watches, but better still he produced an Open Face movement of a greatly improved model, which contained a Pendant Winding and Hand Setting mechanism so designed as to allow interchangeability of cases. This mechanism was patented, and since the patent expired has come into general use in America. The valuable work of Mr. Church, and the adoption of his improved model movement, naturally aroused the antagonism of Mr. Woerd, and Mr. Robbins, realizing that a resident manager of the factory was now a necessity, endeavored to fill that position by securing one of the firm of the Selling Agents in New York, Mr. Ezra C. Fitch, who, much against his personal inclination, transferred his activities and talents from the commercial to the productive branch of the business. It was a time to be remembered, when his advent in Waltham turned the tide of matters at the factory from discontent and impending disaster to courage, enthusiasm and hearty cooperation. Shortly after Mr. Fitch's arrival as General Manager Mr. Woerd's connection with the factory came to an end. Mr. Shirley continued to act as Assistant Superintendent till 1893, having oversight of the watch production.

*Hand-written insert:* 1885. The industrial and financial success of the American Watch Company and the splendid reputation which the excellence of its products had earned, had served to make the name "Waltham" favorably known over the entire world, so that when associated with the production of timepieces it became almost a synonym for excellence. One result of this acquirement was to lead to the establishment of additional factories in Waltham for watch production, - doubtless with the confident hope that association with the name "Waltham" would

be of great commercial value. In addition to the value of the name, it was felt that there would be an advantage in locating a factory in a community containing an aggregation of competent workmen of a common ability. This would naturally attract other workmen of like character.

For more than twenty years factories had been located in Waltham for the special production of tools and machines designed for watch making. This fact also tended toward the popular thought of Waltham as synonymous with "the Watch City". The first of the enterprises to yield to the "Waltham lure" was an offshoot of the "Waterbury" cheap watch factory which attempted to manufacture a watch of about the quality of the famous "Three Dollar Waterbury". This aspirant adopted the name "Suffolk". It was also for a time known as the "Columbia", but later the name and such fame as it possessed disappeared, and a new and more aspiring enterprise absorbed whatever of value remained. Mr. Vander Woerd, who on leaving the American Watch Co. in 1882, engaged in the building of screw making machinery, was able to interest a capitalist in the plan for building watches, as well as machinery and absorbed the cheap watch enterprise. In its new and enlarged form it took the name United States Watch Co. and in time they were able to place watches on the market. Naturally they were hoping to prosper through their location in Waltham. However it developed in a short time that their customers supposed that in purchasing watches made in Waltham they were securing watches made by the well known American Watch Co. and sent their watches to

Mr. Fitch assumed his new duties at Waltham about June 1st, 1883, but Mr. Robbins continued his oversight of the progressing changes and enlargements of the factory buildings and of the power plant. Early in this year the foremen of the various departments organized the "Watch Factory Foremen's Association" for mutual helpfulness in the production of movements and cases, also for social functions if desired. Mr. Henry N. Fisher, of the Escape Department was elected President and Mr. E. A. Marsh as Secretary. This Association received the endorsement and the cooperation of Mr. Robbins and Mr. Fitch, and it well served as a means through which a closer touch could be secured between the executives and the great body of employees. It was the custom of this Association to have an annual banquet, usually at some hotel in Boston. On those occasions the officers of the Watch Company were usually present as honorary guests of the Association. Sometimes the Company's Selling Agents were also invited. On one occasion they were honored by the presence of Mr. Aaron L. Dennison, who came from Birmingham, England, to visit his American relatives and friends, and spent several days in looking through the factory which he had initiated. On one or two occasions the Selling Agents entertained the Foremen at similar banquets. It is felt that the effect of such meetings was reciprocal in its tendencies. Yet nothing is permanent, Conditions are constantly changing. Individuals pass away; industrial demands take new forms and call for appropriate treatment. Experience often demonstrates that not all changes in business methods result in improvements. Yet the converse is sometimes equally true. Persistence in the use of old methods may be extremely foolish.

The continued success of this original American Watch Factory had encouraged many attempts to inaugurate like enterprises in various localities in the United States, but with the result of heavy financial losses in all but a very few of such attempts. A list of such undertakings will appear later in this narrative.

The year 1884 saw the final stage in the experience of one such (The Auburndale watch Co.) and a few months later came the organization of another one, each of them located within two miles of the "Original" Waltham factory, and both of them brought on the financial ruin of their heaviest investors.

The thirty years following the coming of Mr. Fitch to assume the management of the factory were years of growth and progress, with occasional periods of commercial depression which of course resulted in temporary reduction in the factory production, and in one instance - (the months following the close of the Columbian Fair in 1893) the "laying off" of about 50% of the operatives caused some actual hardship.

Returning to consideration of conditions in 1883, we note that in that year there were employed 2200 people, and the factory had at the close of that year reached a total product of 2,150,000 watch

movements. The area of the factory had reached 4.83 acres of floor space, with a total of bench space about 3½ miles in length. At that time about 200 incandescent electric lamps had been established and about 3500 gas lights were in use; also there were in use 38 gas furnaces; and of iron piping for steam, water and gas distribution there were 22½ miles in use. As an advertising feature for special use there was made by the skillful Pattern Maker a fac simile model of the buildings and grounds of the factory. This was made on an accurate scale of ⅛ inch to 1 foot, showing that the grounds were 924 feet long on the street front, and in its greatest depth 320 feet from Crescent Street to the river. Since that time extensions have been made at each end of the grounds, of the buildings also, which now show a continuous frontage of a little more than 1000 feet. This fac simile model formed a part of an exhibit in New Orleans, together with a display of watch movements and complete watches, and secured five first prize medals.

(Picture of 1884 Exhibit N.O.)

Mention has been made of the sale of the tools and machines of the defunct Auburndale Watch Co. This was in January, 1884, and in the month of August following the Lancaster Watch Co., of Lancaster, Pa., made an assignment, with liabilities put at \$77,000. These experiences were repetitions of former similar ones, and precursors of many others; for the failures in attempts to establish watch factories in America far outnumbered the successes.

The Waltham factory has been honored by visits from very many distinguished individuals, as well as from representative bodies, foreign delegates, etc. About the year 1867 Hon. Anson Burlingame, who had represented the U.S. Government in China, came with members of a Chinese Embassy. In 1876 General U.S. Grant spent a few hours in the factory. Several of the Governors of our State and members of the Legislature have visited us. In the year 1884 came an Embassy from Siam, in company with the Mayor of Boston and members of the City Government. In later years Chambers of Commerce and other representative bodies, both foreign and domestic, have come to us. Royalty also has honored us more than once. The King and Queen of the Sandwich Islands and Princess Lilleokalani spent several hours in sight seeing here.

In 1885 there was held in the Crystal Palace, near London, an extensive exhibition known as the "Invention Exposition". The American Watch Co. accepted an invitation to participate in that enterprise, and created a representative exhibit in which were employed quite a variety of machines, which were engaged in producing parts of the mechanism of a watch movement from blank material sent from the factory. This exhibit obtained first prize - a Gold Medal.

(Inventions Exhibition)

Watch movement numbered 1,000,000 was produced after 20 years of work in the factory. Watch #2,000,000 represented an additional five years labor, while movement #3,000,000 called for a celebration on its completion in 1886. This celebration was held at Young's Hotel in Boston, by the Foremen's Association, with a few invited guests. This watch was donated to the Association, to be worn for a period of three months each by members successively determined by lot. Foreman Haines of the Finishing Department won the first period.

The increasing productivity of the factory, and the purpose to maintain the high quality of the output, led the Management to adopt an additional means to secure that object. This new agency was the employment of a General or Chief Inspector to whom should be referred all matters of quality of material, finish and performance. To fill the duties of that position Mr. D. W. Eldridge was detached from the Boston Office of Robbins, Appleton & Co. That supervision of inspection has been continued, though with a succession of Chiefs. During the period of about twenty years before and after the year 1887 there was almost continuous change and extensive enlargement of the factory buildings, as well as an increase in the productive force, and the mechanical equipment of the factory and safety provisions for the entire plant. During this same period the Labor Agitators of the country were active in propaganda and in personal appeal for membership in local organizations. Repeated efforts were made to organize the operatives of the watch factory into a local union. It is a notable fact, however,

that the agitators were unable to present sufficient arguments to convince the employees that anything could be gained, or that there existed any sound or sufficient reason for the establishment of any labor union, inasmuch as the officers of the watch company endeavored at all times to avoid giving any ground for complaint in their dealings with the employees. Feeling confident of continuing to receive fair and considerate treatment at all times the workmen have continued to "avoid entangling alliances" and have chosen to retain their independence.

In the year 1887, Mr. John Swinton, of New York, one of the leading Labor Reformers, came to Waltham to investigate labor conditions from the angle of the Reformers. He was welcomed by the watch company's officials and was given entire freedom to mingle with the operatives, both industrially and socially. He freely expressed his amazement at what he saw. He came to criticize, but returned to praise, - evidently finding a group of workers of unexpected intelligence.

During the summer of 1888 a project was started, and promptly carried out, for the presenting to the City of Waltham of a life-size oil portrait of Treasurer Royal E. Robbins, by employees and stockholders of the Waltham Company. This excellent portrait is hanging in the Council Chamber of the City Hall. A faithful copy of it also hangs in the President's Room at the factory, and near it hangs a portrait of Ezra Charles Fitch, who has been the Company's President since 1886. Both of these portraits are the work of the Artist, Mr. Joseph DeCamp of Boston.

The continued increase in the product of watches, demanding so much of delicate steel work, which required careful tempering, had led to a heavy increase in the use of illuminating gas as a fuel. Attempts to obtain any considerable reduction in the price of gas by the local Gas Light Company led the officers of the Watch Company to consider the use of a cheaper form of fuel gas. Careful investigation of the claims of the Loomis System of "Water Gas" led to its adoption. In 1888 an addition to the Boiler House was built, and in it were installed two Producer Gas Generators, which were so arranged and connected that the gases, generated during the process of raising fires to incandescence, would be thrown under the boilers and consumed in the form of "Producer Gas" and then when the mass of coal in the generator was sufficiently hot, the pipes to the boiler fires were closed and steam from the boilers was driven through the hot coal and thence to a 16000 feet "Water Gas" holder and from there distributed to the numerous furnaces throughout the factory - for the melting of various metals, the making and fusing of enamel for dials, as well as for annealing and tempering watch parts of steel.

The year 1889 saw the establishment of quite a variety of accessories in the direction of useful conveniences. The continued enlargement of the factory both in length and height has of course involved corresponding work in the transportation of material and of persons also. As an aid in this direction a power elevator was installed in the north corridor suitable to transport about five passengers, or their equivalent. A water purifier was also placed in the basement and needful piping to distribute drinking water to all parts of the factory. Since the establishment of the factory in 1854 all of the coal required for factory use has been temporarily stored. These storage sheds, or yards, were naturally adjacent to the tracks of the rail road, and for many years their location compelled the teaming of the coal for a distance of about a mile. The continued enlargement of the factory made needful a corresponding amount of fuel. To provide storage for this increased quantity, and also to reduce the expense for cartage, a lot of land adjoining the main tracks of the Fitchburg rail road was purchased. The building of the Prospect Street bridge, near the factory, made possible the desired "short haul" of the coal by team. In this year (1889) a coal shed was built on the lot located on Prospect St. and, under the direction of the Engineers of the R.R. Company, a trestle and side track were built. Quite near the Prospect St. bridge the R.R. Co. established a new station called "Riverview", which was a great convenience for people living in its vicinity, as well as for visitors from Boston and vicinity who visited this portion of the Charles River for recreation. In later years, owing to adverse conditions of the Rail Roads, and general business depression, the station was discontinued.

When Mr. Church's Pendant Setting and Stem Winding device was adopted and patents therefore were obtained, the control of those patents was committed to two trustees, viz. Mr. Royal E. Robbins,

Treasure of the American Watch Company, of Waltham, and Mr. T. M. Avery, President of the Elgin National watch Company, of Elgin, Illinois. The evident superiority of the Church device was so marked that several of the other American watch companies deliberately infringed the patent, and were compelled to defend themselves in suits brought by the Trustees. The patents were sustained in every case and damages were awarded, but none of the infringing companies were able to pay, and so, being insolvent, they ceased to do business. This individual result, in the case of the Aurora Watch Company, of Illinois, was one of the historical events of record in 1889.

The introduction and adoption of electrical generators, and motors during the early days of their use, caused serious trouble with watches, by reason of the imperfect design of those machines because of their extended magnetic field and strength of the disturbing force which interfered with the normal vibrations of their balance wheels. This disturbing force was so disastrous to correct time-keeping that some remedy was imperative. The Waltham Watch Company therefore undertook to solve the problem, and, as a result of months of costly experiments, they evolved some metallic alloys from which to construct the balances and hairsprings which were able to resist the disturbing influence of electricity. So gratifying was their success that it was the occasion of a celebration at a meeting of the Foremen's Association, held at Young's Hotel early in this year.

It should be said that the Electric Engineers, after further experience, have so improved the design and construction of their machines that their disturbing influence is no longer serious, except in conditions in which the watch is brought quite near to an electric machine having a strong magnetic field.

At the annual banquet of the Foremen's Association in 1889, the post prandial exercises assumed the nature of a glorification of the Non-magnetic achievement by the Waltham Watch Co. (*hand-written note: Present history*)

In September of that year this Company had the honor of receiving the first of a series of visits arranged for the Pan American Congress.

From the opening of the factory in Waltham in 1854, the watch company continued to manufacture a portion of the silver cases required to accompany its movements, and in erecting its buildings of later design provision was made to continue that branch of the product. For about twenty years it also maintained a factory for producing gold cases, in New York City. In the then existing conditions and character of the watch business there were some advantages in furnishing the trade with complete watches. Watch case manufacture was comparatively a simple business, contrasted with movement making, so that numbers of "Case Factories" were organized. And although, in 1890, the capital stock of the watch company had amounted to \$3,000,000 it was all needed to finance the movement manufacture. Moreover, the rooms which had been used in case-making were wanted for movement production. Under these conditions it was decided to discontinue the silver case department, and the tools and machinery were sold to The Crescent Watch Case Company, of Newark, N.J. At this time the number of employees had become about 2800, and movements in five sizes, and of various grades in each size, making a total of about 1600 movements per day.

The continuous extension of the factory front toward the south-west had carried it beyond the front of the opposite park. Continuation of the plan, adopted at the building of the original factory, for maintaining an open space on the street opposite the factory, compelled the removal of the old boarding house on the corner of Brown and Crescent Streets which had for so many years been familiarly known as the "Shawmut House", and in September 1891, the two tenants of the house were notified to vacate the building so that it might give way to an additional park. One of the tenants - Mr. F. F. Martin - decided to accept the liberal offer of the Watch Company, and purchased the Shawmut House, which was moved to Brown Street and somewhat re-modeled, and re-opened with some ceremony, on October 20th, 1892.

This disposed of Shawmut House, and on the sale and removal of the double cottage adjoining on Ash Street, cleared the ground for the making of the proposed additional park which received the appropriate name "Fitch Park".

After two additional years of operating the New York Gold Case factory, following the sale of the Silver Case machinery, it was decided to dispose of the Gold Case Factory also. The merger of the Crescent Case Co. and the Keystone Case Company gave the opportunity for that combined company to acquire the remaining case business of the American Waltham Watch Company. Since that sale the making of watch cases has been abandoned by the Waltham Company.

The year 1892 witnessed the unusual activity of thousands of people in the employ of hundreds of manufacturers, as well as the U.S. Government itself, all busily engaged in preparations for the Columbian Fair, to be held in Chicago in the following year. The American Waltham Watch Company decided that it would be most appropriate that it should participate in that exhibition, and with that purpose designed and prepared a very interesting exhibit, which proved to be one of the most attractive ones to be seen in the entire "Manufactures and Liberal Arts" building.

(Columbian Fair Exhibit)

The high reputation of the Waltham Watch Company, not only in America, but in the watch-making countries of Europe as well, naturally led the foreign watch producers to contribute to this World's Fair, specimens of some of their most beautiful workmanship, in their product of Pocket Time Pieces. Doubtless they also expected to win high awards for the superiority of their watches as accurate timekeepers. But the highest award by the Judges of this Exhibition was given to the American Waltham Watch Company, Seven Medals being given.

While the preparation and maintaining of this exhibit involved quite a considerable expense, the educational results were so evident that the expense was manifestly justified. Yet it certainly was a matter of exceeding regret that such a wonderful and successful exposition be immediately succeeded by a general prostration of business.

Early in the summer of 1893 it was unmistakably evident that general business throughout the United States was entering upon a period of severe depression, and as it could not be expected that an active demand for watches would continue during any "general dullness" in business it was decided to greatly reduce the manufacturing expenses by extending the annual vacation. Accordingly, on May 25th, a notice was posted in the factory announcing that the annual vacation would commence on June 1st and continue until August 1st. But as the time announced for re-opening approached it became painfully evident that it would be impossible to continue to manufacture on the previous scale of production. Immediately the endeavor was made to inform the scattered employees of the impossibility of resuming immediate employment to the entire working force; in the hope that as many as possible might secure other employment. This effort was only partially successful, for very many of the scattered workers failed to learn of these serious conditions, and on arriving at Waltham found themselves without employment and with no definite prospect of finding work of any kind. Some even arrived with no money, - not even sufficient to return to their homes. To relieve this unfortunate situation the Company advanced money to large numbers of persons sufficient to enable them to return to their homes. Others were given free board at the Adams House until they could secure work elsewhere. The entire community exerted itself to secure employment for the needy ones until business should revive. The succeeding winter was a very trying one. Less than one half of the usual number of people could be employed in the factory, but gradually business improved and the waiting employees were reinstated.

This period of stagnation gave convenient opportunity for a re-organization of several of the manufacturing departments, and of a measure of consolidation of some others. So that when business revived and became normal the factory was in condition and arrangements better able to respond to increasing orders. The Machine Shop was producing new automatic machines of great productivity and of wonderful uniformity in product. Additional sizes and models of movements were brought out. The

Rail Roads of America had come to a more complete realization of the vital need of accurate Timepieces, not only in their local offices but still more in the pockets and hands of the trainmen.

In 1892 Mr. Church designed and constructed an 18 size Full Plate movement, which by means of its improved model and its careful workmanship and thorough adjustments was specially adapted to meet the exacting demands of R.R. work. The Time Service Departments of the principal Railways were not slow to recognize and appreciate the excellencies of this new model, and it soon became one of the most popular watches for railway service, not only in the United States but in Canada also, and for their special use several forms of 24 hour dials were created.

Perhaps it might be well to make mention of the subject of Dials at this point in our narrative, for while the dial is one of the essential features of all forms of watches, it is not one of the active members, but is rather a silent authority to which all else must conform. Yet it is passive in its function. So that while its essential features are fixed, its appearance may undergo changes. Just this is constantly occurring. For hundreds of years ordinary watch dials had been constructed in the form of metal discs ordinarily of copper upon the surfaces of which is fused a covering of enamel, and upon the front surface are made the desired graduations and the desired figures, or letters, to indicate the several hours of the day. For some hundreds of years the graduating and indication marks were applied by skillful hand work, aided to some extent by a few simple tools. About forty years ago there was introduced a process of photographing the desired markings, and by the use of transparent negatives upon the chemically covered surface of the enamel, upon which was dusted the pulverized dry paint, which was subsequently removed by careful washing, with the result that the paint would adhere to the surface which had been affected by the action of light in the photograph process. As in the older process of hand painting, the paint was fixed by a firing process. This method of applying the figures was quite an improvement in the direction of economy. Yet the system had serious objectionable features, so that for regular production it has been superceded by a much simpler method which involves no special preparation of the enamel surface of the dial and involving no extensive waste of paint.

The desire to reduce the total thickness of the complete watch movement has led to substitution of plain metallic discs. These plain discs, instead of being formed of soft copper, are made of brass or of bronze. Ordinarily the paint, instead of being applied by means of delicate "camel's hair brushes" in the hands of skillful workmen, or of being dusted on to a chemically printed surface, is lifted bodily by a special "pad" from properly located recesses made in hardened steel blocks and deposited in the exact places on the blank surface of the plain dial blanks.

Another, and still more delicate or refined process, is to engrave or stamp the lines and figures in the exact locations required and fill these recesses with the paint and after it has been properly baked, to finish and polish off the entire surface of the dial.

Returning from this digression, let us say that as the Waltham Factory inaugurated the scheme of systematic watch making, and devised the first special machines for producing the various component pieces of the watch, so that it is natural that this factory should continue to lead in the development of the industry, in the direction of the character and variety of its products and also in the means and methods of its production.

We think it will be readily conceded that while there have been several able mechanics and inventors who have contributed to the progress and success of the watchmaking industry in America, the most prominent of that number was Mr. Duane H. Church.

#### Photo of Mr. Church

The fact that he entered the industry after it had acquired about thirty years of experience, of both success and failure, gave him the advantage of freedom from much of tradition, so that he was free to attempt the employment of new means and methods. Moreover his evident abilities had inspired a degree of confidence which gave him the privilege of exercising a "free hand" as no one could previously have done.

As a matter of fact, most of his mechanical designs were successful, although a few proved disappointing. Yet many of his machines were marvels of accuracy and productiveness. One of the earliest, and eventually, most successful of his automatic machines was designed for the forming of complete Balance Staffs before severing it from the piece of steel from which it was made.

Photo of Balance Staff

Other successful machines were those for the production of watch plates, and also some for the turning of the variety of Pinions and Staffs. In the latter part of Mr. Church's life he was greatly troubled by an affection of the heart, which eventually ended his life, on August 1st, 1905.

During his last years he was greatly assisted, in the development of his mechanical devices, by Mr. Charles A. Whitney, who on Mr. Church's death was promoted to succeed him and was given the title of Master Mechanic. He died in 1909.

Photo of Mr. Whitney

Mr. Whitney was the son of Mr. Samuel Whitney, who was one of the Directors of the Watch Factory in its early days. Beside his son Charles, he had two talented daughters, one of whom was a Physician and another - Mary - is an astronomer and connected with Vassar College.

The years from 1883 till about 1910 saw a series of changes in the factory buildings, principally in the direction of enlargement. One form of enlargement was accomplished in connection with the abolition of the slate covered pitch roofs, which were recommended by the Insurance Companies, as a matter of improved fire protection. In making this change there was obtained a fifth story, on nearly every wing of the factory. To attain this improvement there was adopted a change in the character of the construction, which was accomplished without greatly modifying the exterior appearance of the buildings, yet adding some superior work rooms. Both for an architectural effect and manufacturing convenience, there were additions made to the several Tower fronts. The first of these front extensions was made in the year 1900, and was to the "North Tower" - the location of the original factory. As this year was the fiftieth year since the enterprise of American watchmaking was inaugurated, it was thought appropriate to combine this particular work with a brief ceremony, and also to lay a "corner stone", in which was deposited a sealed box containing a few papers which it was hoped might be found interesting to some future generation. In the belief that it might be of interest to the readers of this brief history to know the contents of this hidden box it is decided to give herewith verbatim copy of the special message to the future generation who may witness its resurrection in the unknown hereafter: This brief ceremony took place on June 20th, 1900 A.D.

"It seems eminently proper that advantage should be taken of the circumstances of the extension of a building standing on the site occupied by the main building of the original Waltham Watch Factory, to deposit certain papers in a securely sealed receptacle, so that a coming generation may learn of conditions as they now exist in connection with this, the oldest watch manufactory in America, and at the present time the largest factory of the kind in the world. The occasion is the more interesting from the fact that it is now fifty years since the inaugurating of the enterprise which has grown to such large proportions.

"A brief history of this enterprise was written in 1890, by E. A. Marsh, then holding the position of Master Mechanic of the factory. That historical sketch was incorporated into the history of Waltham and formed Chapter L of the History of Middlesex County, published in three volumes by J. W. Lewis & Co., Philadelphia, Pa. to which the reader of these lines is referred. Within the last decade very radical changes have been made in the system and methods of manufacturing watch movements and the making of watch cases has been abandoned by this Company, which now devotes its entire energies to the manufacture of watch movements and mainsprings, and the material for pendant setting watches which forms part of watch cases.

"At the present time the factory is delivering nearly twenty-two hundred finished movements, and possibilities for the manufacture of twenty-five hundred per day are being provided as

rapidly as possible, so that within a year it is hoped to reach a production of more than four watch movements per minute of working time.

“During the period embraced within the history of this Company, many wonderful discoveries and inventions have been made, among which are the ocean telegraph cable, the electric telephone, the electric generators and other machines for producing electric light and power transmission. Within the last five years Prof. Roentgen has discovered what is commonly known as the X rays. Liquid Air has also been produced, but has not yet been put into actual practical use. Compressed Air is however coming into extensive use, and this factory employs compressed air to operate portions of its mechanism. The practical use of the metal Aluminum is now becoming quite extensive. Within the past ten years the manufacture of bicycles became one of the most prominent industries, but the business was overdone and many concerns engaged in that manufacture lost money and abandoned the business. Following that came the introduction of Horseless Vehicles, employing as a motive power engines driven by Steam or Gasoline Gas, or Motors driven by Electricity from storage batteries. Acetylene Gas is just coming into practical use as an illuminant. Typewriting is now almost universal for business purposes, and machines for that purpose are manufactured in large numbers and in a great variety of forms. Sewing machines are now in almost universal use for domestic as well as manufacturing purposes. These few things are mentioned to show the present state of progress, but it is expected that coming years will witness as much advance in all these directions as has marked the last half century.

“Very early in the history of this Company came the War of the Rebellion and within the last two years the Cuban War, and as one result of that has followed what is known as the Philippine War. At the present moment there is great disturbance in China caused by the bitter anti-foreign feeling in portions of that Empire. England is also engaged in the Boer War in South Africa.

“Today there is in progress in Philadelphia the national convention of the Republican Party to nominate a Presidential Candidate. It is understood that President William McKinley will be renominated but the great struggle will be on the nomination of Vice President, Governor Theodore Roosevelt of New York being the most prominent candidate, but he will refuse the place if it is possible for him to do so. The present Secretary of the Navy, Ex. Governor John D. Long of Massachusetts, is also a prominent candidate (See newspapers enclosed).

“The watch factory buildings were built in Waltham in 1854, but within three years the company became insolvent, and the property was sold in 1857 and soon passed into the sole control of Royal E. Robbins, and subsequently when the business was incorporated Mr. Robbins became Treasurer and has held that position to the present time. He is however now in delicate health and feeling the infirmities of age. The active duties of his position are now being faithfully performed by his eldest son, Royal Robbins.

“The general superintendence of the factory is in the hands of Mr. Ezra C. Fitch who has held that position since 1883, and has also been President of the Corporation since 1886. He is also a member of the firm of Robbins & Appleton who have for nearly forty years been the selling agents for the company.”