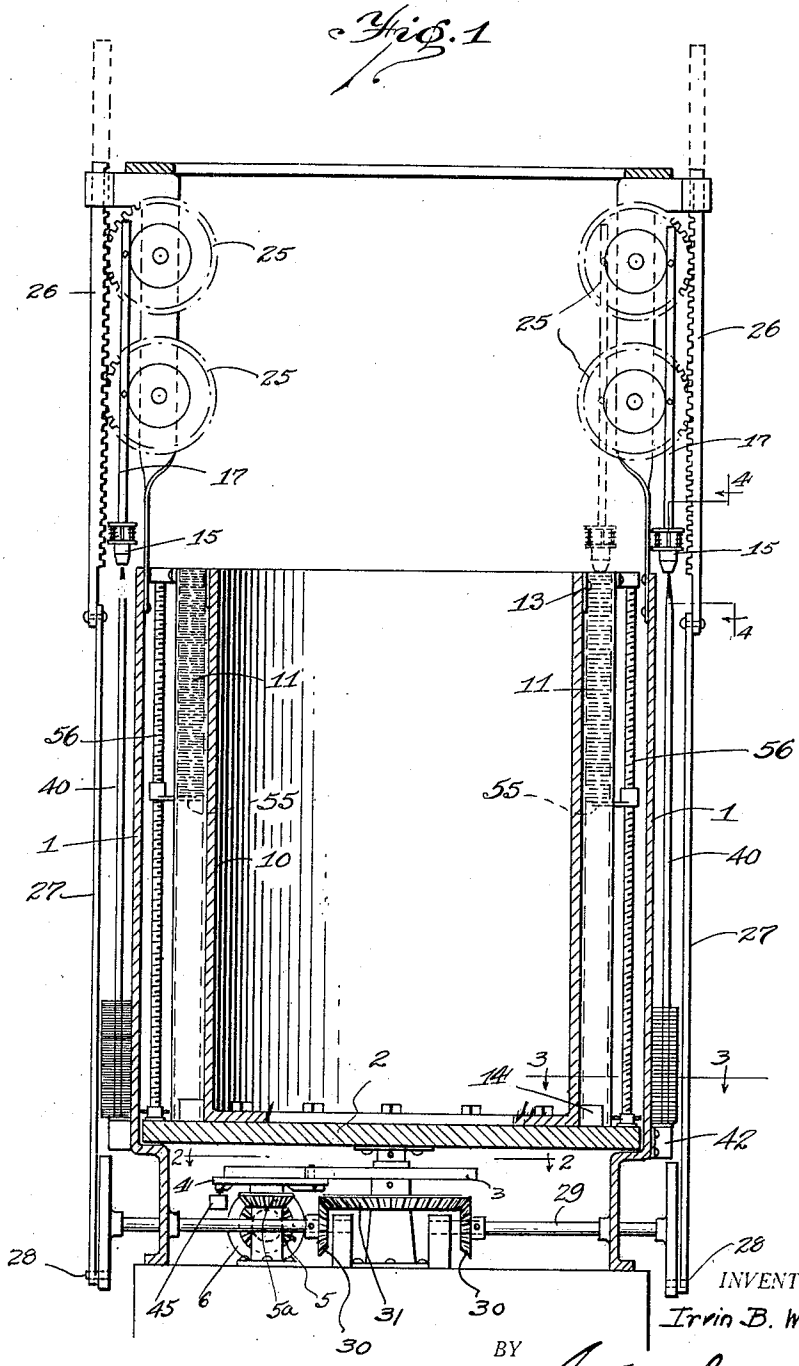
March 4, 1930. I. B. WINSLOW 1,749,620

APPARATUS FOR ASSEMBLING SHIMS

Filed Dec. 19, 1927 3 Sheets-Sheet 1

Fig. 1.



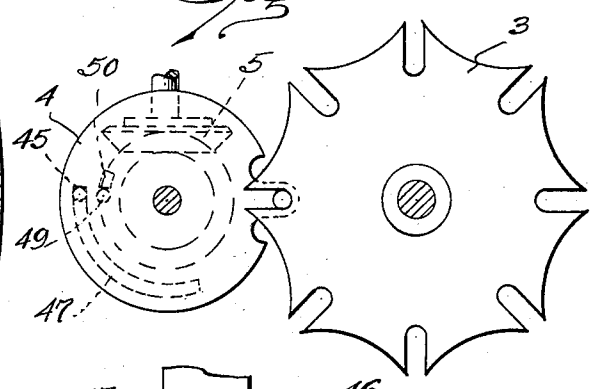
INVENTOR.
Irvin B. Winslow
BY
Stuart C. Barnes
ATTORNEY.

March 4, 1930. I. B. WINSLOW 1,749,620

APPARATUS FOR ASSEMBLING SHIMS

Filed Dec. 19, 1927 3 Sheets-Sheet 2

Fig. 2



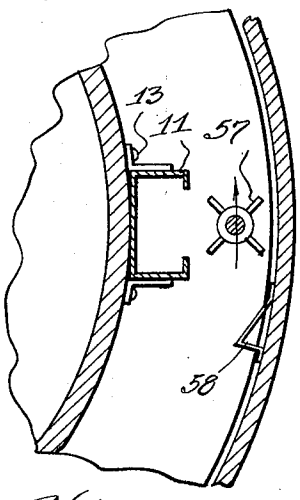


Fig. 3

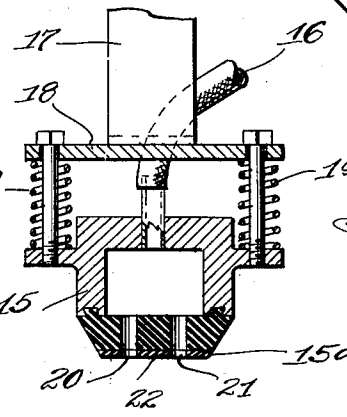
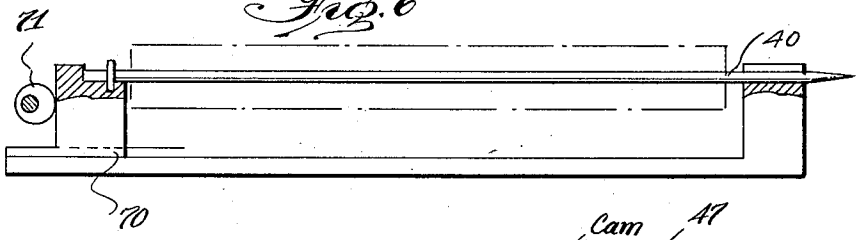


Fig. 5



Fig. 4

Fig. 6



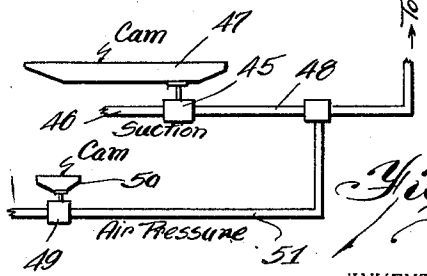


Fig. 9

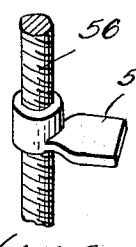


Fig. 7

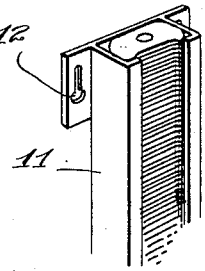


Fig. 8

INVENTOR.
Irvin B. Winslow
BY
Stuart C Barnes
ATTORNEY.

March 4, 1930. I. B. WINSLOW 1,749,620

APPARATUS FOR ASSEMBLING SHIMS

Filed Dec. 19, 1927 3 Sheets-Sheet 3

Fig. 12

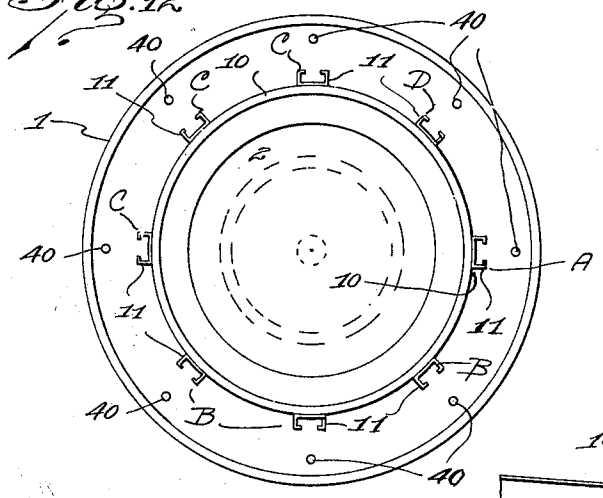


Fig. 15



Fig. 16



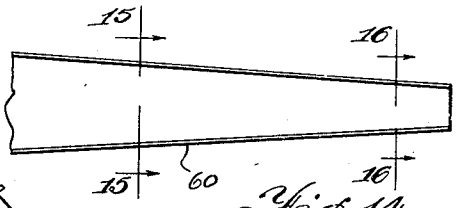
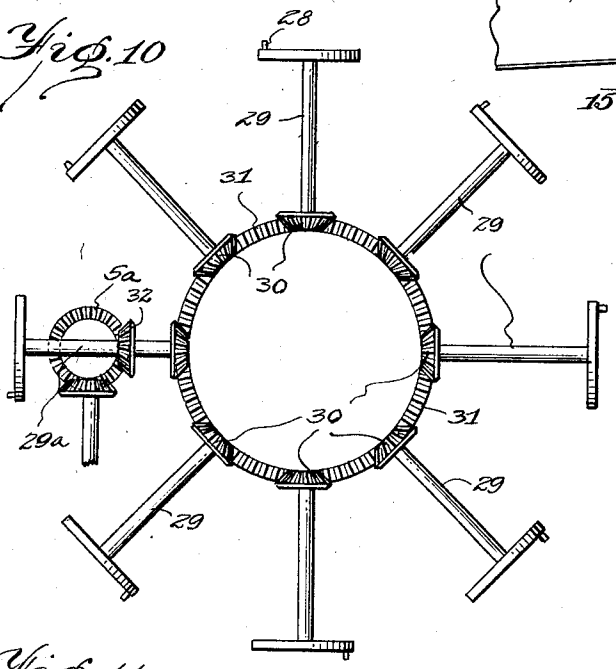


Fig. 14

Fig. 10



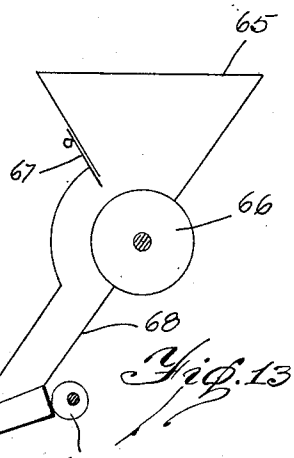
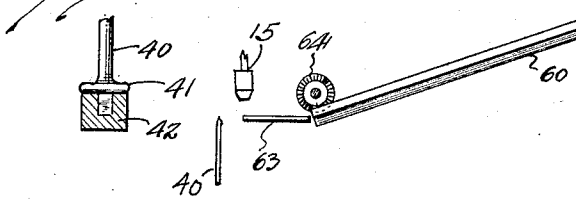


Fig. 13

Fig. 11



INVENTOR.
Irvin B. Winslow
BY
Stuart C. Barnes
ATTORNEY.

Patented Mar. 4, 1930 1,749,620

UNITED STATES PATENT OFFICE

IRVIN B. WINSLOW, OF DETROIT, MICHIGAN

APPARATUS FOR ASSEMBLING SHIMS

Application filed December 19, 1927. Serial No. 241,057.

This invention relates to an apparatus for assembling shims such as are used in conjunction with crank shaft and connecting rod bearings of an internal combustion engine.

In engine manufacture the main bearings of a crank shaft and the connecting rod bearings include a cap which forms half of the bearing and which is bolted in place. The practice of placing shims, which are thin metallic spacer members, between the cap and the other half of the bearing is followed by many manufacturers. Thus, when the bearing needs to be tightened one or more of the shims can be removed. When an engine leaves the factory it is common that bearings are equipped with a uniform shim assembly; for example, one shim assembly may consist of two relatively thick shims, say of .050 of an inch in thickness, three shims of .005 of an inch in thickness and three shims of .003 of an inch in thickness, with the thin shims disposed between the thick ones.

Heretofore such a shim assembly has been accomplished by hand; in other words, an operative selects a thick shim, and then a requisite number of the thin shims of different sizes, finally another thick shim to make one assembly, and repeats the operation for succeeding assemblies. These shims may be placed upon a rod, there being a bolt hole in the shim, and a multiplicity of shim assemblies built up on this rod.

This hand assembly operation of the shims is a slow one and an expensive one from a standpoint of consuming time. The present invention aims to provide an apparatus for assembling the shims, and which apparatus is arranged so that a succession of shim assemblies is provided. The apparatus shown and described herein is one suitable for assembling shims wherein one complete assembly consists of eight shims, as above pointed out, but it is to be understood that the invention can be utilized for assembling shims wherein a different number of shims go to make up one assembly.

In the accompanying drawings:

Fig. 1 is a sectional view taken through an apparatus constructed in accordance with my invention, showing the manner in which the shims are held in tubes or magazines, and how they are transferred from these magazines automatically to an assembly rod.

Fig. 2 is an enlarged detail, on section line 2—2 of Fig. 1, showing a Geneva movement employed for operating the device with intermittent movements.

Fig. 3 is an enlarged detail in section, on line 3—3 of Fig. 1, showing a construction for feeding the shims lengthwise of their magazine.

Fig. 4 is an enlarged sectional view on line 4—4 of Fig. 1, showing details of a shim transferring head.

Fig. 5 is a perspective view of a conventional form of shim.

Fig. 6 is a side elevation, with parts cut away, showing a vibrator device which may be used for properly lining up a multiplicity of shims carried by an assembly rod.

Fig. 7 is a detail perspective showing the magazine feed for the shims.

Fig. 8 is a perspective view of the magazine indicating how the same may be removably held upon the apparatus shown in Fig. 1.

Fig. 9 is a diagrammatic view of the valve and valve operating means for successively effecting suction and air pressure in a shim transferring head.

Fig. 10 is a plan view somewhat in diagrammatic form showing how the several shim transferring devices are operated.

Fig. 11 is a detail in section showing how an assembly rod may be removably held upon the machine.

Fig. 12 is a diagrammatic plan view of the assembly machine, showing the arrangement of the several magazines and assembly rods.

Figs. 13 and 14 are diagrammatic views in side elevation and in plan, respectively, showing a construction by means of which shims of a given size contained in a pan or hopper may be originally lined up and placed on an assembly rod prior to being placed in a magazine on an assembly apparatus shown in Fig. 1.

Figs. 15 and 16 are views taken on corresponding section lines of Fig. 14.

Referring to Fig. 1, it will be seen that the apparatus consists of a stationary frame construction 1, and a rotatable table 2. This table is rotated with intermittent steps, as by means of a Geneva movement 3 (Fig. 2). The member 4 is rotated by a suitable connection, such as intermeshing pinions 5 and 5ª by a motor or other suitable power means 6.

Mounted upon the rotating table 2 are uprights 10 for the purpose of carrying shim magazines 11. The magazines are preferably removably secured so that from time to time empty magazines may be taken off and new ones placed on the machine, and for this purpose the magazines may be provided with key-hole solts 12 for fitting over a stud 13 on each upright. A socket-like arrangement 14 may be provided for engaging the bottom of the magazines to hold them in place.

As will be seen by reference to Fig. 12, there are eight magazines carried by the table, for providing shim assemblies embodying eight shims. The number of magazines could be varied for putting up shim assemblies utilizing any number of shims in an assembly. These eight magazines are each filled with shims of one kind; for example, the magazine marked A is filled with shims of .050 of an inch thickness; magazines B, three in number, contain shims which are .005 inch in thickness; and magazines C, three in number, shims of .003 inch in thickness; and finally, magazine D, shims of .050 inch in thickness.

The table of the construction thus described makes one complete cycle in eight intermittent movements, and at each of the eight stations of rest means are provided for removing a shim from a magazine. Such means may take the form of a shim transferring head 15, as shown in Fig. 4. This head is hollow, and leading into the head is a flexible tube 16 so that suction and air pressure may be alternately set up in the head by means soon to be described. This head is carried by support 17 through the means of a cross head 18, and interposed springs 19. It will be noted that the transfer head is provided with two openings 20 and 21 which are spaced somewhat from each other, leaving a central mass of material 22 in the head. A shim to be transferred, as shown in Fig. 5, is referenced 23, and this shim has a central opening 24 for the purpose of permitting a bearing bolt to go therethrough. When the head fits down over a shim to lift the same by suction, the opening 24 is underneath the central mass of metal 22 so that the shim can be lifted by suction. The head is preferably faced with a relatively soft material 15ª such as rubber.

Each of the transferring heads is caused to move to lift a shim out of a magazine and place the same on an adjacent stationary part of the machine, and for this purpose the support 17, see Fig. 1, is carried by a pair of geared wheels 25, which are oscillated by a rack 26. The rack is reciprocated by means of a rod 27 connected to a crank 28 on rotating shaft 29. Each shaft 29 has a pinion 30 which meshes with a ring gear 31 (Fig. 10). One of the shafts, referenced 29ª, is driven by means of a pinion 32 which meshes with a power driven pinion 5ª. By this construction it will be seen that the transfer heads move in an arc back and forth, to and from the two positions shown at the right hand side of Fig. 1, the one position being shown in dotted lines at which point a shim is removed from the magazine, and the other position being shown in full lines wherein the shim is released from the head.

At each transfer head station the stationary part of the apparatus is provided with what may be termed an assembly rod 40. These assembly rods may be provided with a shoulder 41 and arranged to fit into a socket 42 (Fig. 11) and the adjacent transfer head transfers a shim from a magazine on the rotating table and deposits the same over the adjacent assembly rod.

In the operation of the machine thus far described the several magazines on the table are each filled with shims of a given size. During each period of rest, of the intermittent movement of the table, the transfer heads, which operate in properly timed relation, are caused to move over and engage the top shim in each magazine. The transfer heads then move back to a position immediately over an assembly rod. When the transfer heads are contacting with the top shim in the magazine, a partial vacuum is set up in the head. This may be done by a valve 45 connected by the conduit 46 to a suitable vacuum creating means (Figs. 1, 2, and 4). For operating this valve, a cam 47 may be placed on the member 4 of the Geneva movement with the valve positioned so as to be acted upon by the cam (Fig. 2). A conduit 48 leads from this valve to the flexible tube 16 which communicates with the suction head. This cam 47 is of such a length as to maintain the partial vacuum in the head until the head is moved back over the assembly rod, at which time the cam permits closing of the valve 45. Substantially simultaneously with the closing movement of this valve, valve 49 connected in an air pressure line, is opened by cam 50 also on the member 4, and this valve is connected by conduit 51 to the transfer head. This communicates air under pressure to the transfer head and removes the transferred shim from the head onto the assembly rod.

It will be seen, therefore, that in each period of rest a shim is transferred from each of the eight stations; in other words, the number of shims transferred are equal to one assembly. Considering any one of the

transfer heads and assembly rods, the several magazines pass this transfer station in proper rotation so that in one complete cycle of movement an assembly of eight shims is placed upon the assembly rod, and in successive cycles of movement a multiplicity of shim assemblies are placed upon the rod. Inasmuch as each assembly is defined by thick end shims, it is a comparatively easy matter to remove the shims from the rod in units of one assembly each.

It is necessary to provide means so that the shims in the magazines will be near the top of the magazines in order to be near the transfer head. For this purpose each magazine is provided with a shim support 55 (Figs. 1 and 7) which is carried by a screw 56. This screw is provided with a number of projecting devices 57 (Fig. 3) which strike an abutment or stop member 58 as the table revolves, thus to rotate the screw and lift the shim support 55. The pitch of the several screws can be varied for shims of various thicknesses in order that the shims are lifted a proper distance each time. The screw is given a rotational movement. In case the topmost shim in a magazine is not precisely in proper position the manner in which the transfer head is mounted on springs will accommodate for this inaccuracy. In other words, the arrangement is such that when a shim is in proper position the springs 19 in the transfer head are compressed somewhat when the head moves down over a magazine of shims, with sufficient lee-way on either side of this point to effect transfer of a shim even though the level of the shims is lower or higher than the theoretically correct point.

As stated before, when operation is begun, the magazines are filled with shims and the assembly rods are free of shims. There are sufficient shims in the magazines to permit operation of the machine for a considerable length of time, and when the shims in the magazines are exhausted, the assembly rods contain the shims which are arranged in units of assembly. Refilled magazines can now be placed on the machine together with a new set of rods. This is done by merely taking off the magazines and placing on filled ones and by removing the filled rods. The filled rods may now be given to an operator in the assembly line who can pick off the shims in assembly units and place them in proper position in the bearings.

This invention also contemplates means for aligning loose shims so that they can be placed in the magazines. Ordinarily the shims after being made are contained loosely in containers but of course shims of various thicknesses are kept separately. I provide a hopper 65 for holding loose shims and this hopper may be of the roll feed type, a feed roll being shown at 66. An adjustable gate 67 may be provided, and with this hopper the rate of feed can be controlled both by adjustment of the gate and by the adjustment of the speed of the feed roll. The shims are fed down an inclined chute 68. This inclined chute feeds the shims into the upper end 61 of a chute 60. The angularity of this chute is such that shims will not slide down the chute by gravity alone, but in order to produce feeding movement of the shims down the chute, a vibrator 62 is applied to the chute for vibrating the same, thus to aid in the movement of the shims down the chute. This chute is provided with side walls and the bottom thereof is perfectly slanting from one side to the other, as shown in Figs. 15 and 16. Also, the chute grows smaller near its lowermost end, until at the extreme end it is preferably a little wider than the width of the shim but not so wide as the length of a shim.

The shims slide down this chute, due to the vibration of the chute and they also tend to fall into the lowermost side of the chute, and due to the decrease in width of the chute the shims are caused to be positioned lengthwise of the chute, although some may be reversed side for side. When the shims reach the end of the chute they are fed onto a stationary support 63, and for this purpose a rotating brush 64 may be provided for brushing the shims onto the support as they are fed down the chute. As the shims progressively reach the support they may be transferred onto an assembly rod, such as one of the rods 40, and this may be accomplished by means of a transfer head, as shown in Fig. 4, and above described. When a sufficient number of shims are placed on a rod, they are all lined except that some of the shims may be disposed side for side. In order to place all the shims in the same position this rod may be placed on a vibrator frame 70 (Fig. 6) which is vibrated by a suitable vibrator 71. The shims are more or less loosely carried by the rod and upon the vibration of the frame, the heavy side of each shim seeks the downwardmost position under the action of gravity. As all the shims are identical in shape, they are soon lined up and then can be transferred into a magazine from the rod.

There will be, of course, hoppers and chutes as just above described, for each size of shim, inasmuch as the shims are not mixed up but are kept separately until assembled into proper groups. There is a manual operation involved in transferring the rod of shims from the feed chute onto the vibrator, and also in occasionally replacing magazines and rods on the assembly machine. Due to the fact, however, that the rods and magazines are all of considerable length, and also due to the thinness of the shims, the manual operations come at relatively remote times. Accordingly, a single operator, with such a mechanism, can perform the various manual

operations and assemble a greater number of shims in a given period of time than can quite a number of workmen assembling the shims by hand.

What I claim is:

1. A shim assembling machine, comprising in combination means for holding a plurality of magazines each containing shims of a given thickness, means for successively removing shims from the magazines and for assembling shims into groups each consisting of a predetermined number of shims of different thickness and in a predetermined arrangement as regards thickness.

2. An apparatus for assembling shims into unit groups wherein each group consists of a predetermined number of shims of different thicknesses, comprising a plurality of magazines each holding shims of a given thickness, means for successively removing a shim from each of the magazines and assembling them in the grouped units with the shims in a predetermined arrangement in the groups as regards thickness.

3. An apparatus for assembling shims into unit groups wherein each group consists of a predetermined number of shims of different thickness arranged in a predetermined manner, comprising a plurality of shim magazines the number of which corresponds to the predetermined number of shims in one assembly, and means for successively removing one shim from the magazines and for depositing the shims in assembled shim groups.

4. A shim assembling machine, comprising in combination, a rotatable table, a plurality of shim containing magazines on the table, means for rotating the table with intermittent movements, and shim transferring means positioned at the stations of rest of the rotatable table.

5. A shim assembling machine, comprising in combination, a rotatable table, a plurality of shim containing magazines on the table, means for rotating the table with intermittent movements, shim transferring means positioned at the stations of rest of the rotatable table, and means operating the transferring means to remove a shim from each magazine at each station of rest.

6. A shim assembling machine, comprising in combination, a rotatable table, a plurality of shim containing magazines on the table, means for rotating the table with intermittent movements, shim transferring means positioned at the stations of rest of the rotatable table, means operating the transferring means to remove a shim from each magazine at each station of rest, and means for receiving the transferred shims.

7. A shim assembling machine comprising in combination, a stationary supporting means, movable supporting means, magazines containing shims on one of the supporting means, shim receiving devices on the other of said supporting means, said movable supporting means moving with intermittent movements with periods of rest with the magazines disposed in close proximity to the shim receiving devices, and shim transferring means for transferring a shim from a magazine to a receiving device.

8. A shim assembling machine comprising in combination, a rotatable table support, means for rotating this table with intermittent movements, a stationary support positioned around the table, a plurality of shim containing magazines, a plurality of shim receiving devices, the magazines being on one support and the devices on the other, said magazines and devices being in close proximity to each other during each period of rest of the intermittent movement of the table, and shim transferring means, one for each magazine for transferring a shim from a magazine to the receiving device.

9. A shim assembling machine comprising in combination, a rotatable table, a plurality of shim containing magazines on the table, means for rotating the table with intermittent movements, shim transferring means positioned at the stations of rest operable to remove a shim from a magazine during the periods of rest, and stationary rods positioned at the stations of rest upon which the shims are deposited.

10. A shim assembling machine comprising in combination, a rotatable table, a plurality of shim containing magazines on the table, means for rotating the table with intermittent movements, shim transferring means positioned at the stations of rest operable to remove a shim from a magazine during the periods of rest, and stationary rods positioned at the stations of rest upon which the shims are deposited, said magazines and rods being removably held on the machine.

11. A shim assembling machine comprising in combination a rotatable table, a plurality of shim magazines on the table, means for rotating the table with intermittent movements, shim transferring means operable to remove the shims from the magazines during each period of rest, and means for feeding the shims in the magazines.

12. A shim assembling machine comprising in combination a rotatable table, a plurality of shim magazines on the table, means for rotating the table with intermittent movements, shim transferring means operable to remove the shims from the magazines during each period of rest, a supporting device in each magazine for supporting the shims, and means for progressively raising these supporting devices in the magazines as the shims are removed therefrom.

13. A shim assembling machine comprising in combination a plurality of shim containing magazines for containing shims of various thicknesses, a plurality of shim re-

ceiving devices, means for effecting relative movement between the magazines and devices with periods of rest when the magazines and devices are in close proximity, and a plurality of movable transfer heads which move to and from the magazines and receiving devices for transferring the shims.

14. A shim assembling machine comprising in combination a plurality of shim containing magazines for containing shims of various thicknesses, a plurality of shim receiving devices, means for effecting relative movement between the magazines and devices with periods of rest when the magazines and devices are in close proximity, and a movable transfer head for each device which moves to and from the magazines to the receiving device for transferring the shims, and means for effecting a partial vacuum in the head to lift a shim thereby said shim magazine being so that shims of various thicknesses are transferred in a predetermined sequence.

15. A shim assembling machine comprising in combination a plurality of shim containing magazines for containing shims of various thicknesses, a plurality of shim receiving devices, means for effecting relative movement between the magazines and devices with periods of rest when the magazines and devices are in close proximity, and a movable transfer head which moves to and from the magazines to a receiving device for transferring the shims, means for effecting a partial vacuum in the head to lift a shim thereby, and means for effecting air pressure in the head for ejecting the same, said shim magazines being so that shims of various thicknesses are transferred in a predetermined sequence.

16. A shim assembling machine comprising in combination a plurality of shim containing magazines for containing shims of various thicknesses, a plurality of shim receiving devices, means for effecting relative movement between the magazines and devices with periods of rest when the magazines and devices are in close proximity, and a movable transfer head which moves to and from the magazines to a receiving device for transferring the shims, and means for alternately setting up a partial vacuum and air under pressure in the head whereby the shim is lifted from the magazine by vacuum, transferred from the magazine to the receiving device and ejected by air pressure said shim magazines being so that shims of various thicknesses are transferred in a predetermined sequence.

17. A shim aligning apparatus comprising a hopper for containing a plurality of loose shims including means for feeding the shims from the hopper, an inclined chute into which the shims are fed, means for vibrating the chute to cause the shims to slide down this inclined chute, said chute being also inclined from one side to the other whereby the shims are caused to take a position along one side of the chute, such chute progressively diminishing in width until at its outlet end it is of a width less than the length of a shim, whereby a shim is caused to be positioned lengthwise in the chute.

In testimony whereof I affix my signature.

IRVIN B. WINSLOW.