July 7, 1964 R. L. GOLDEN 3,139,933

JARRING TOOL

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Fig. 1

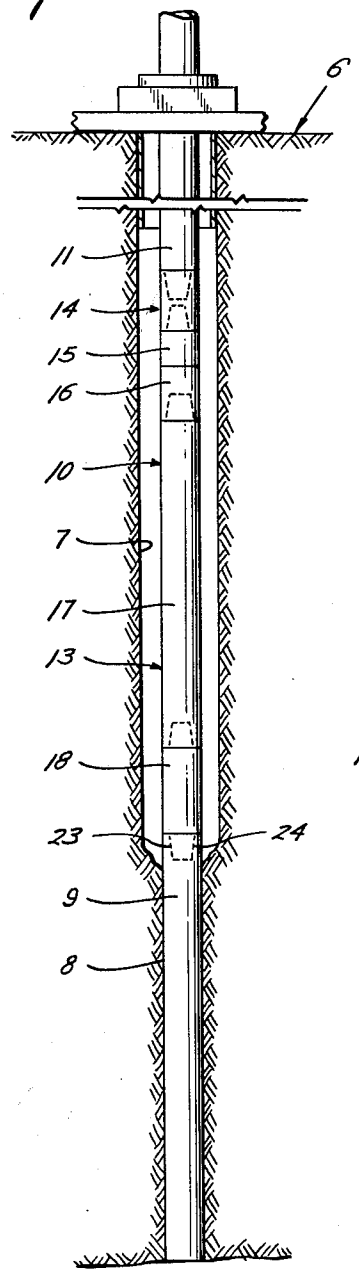

Fig. 3

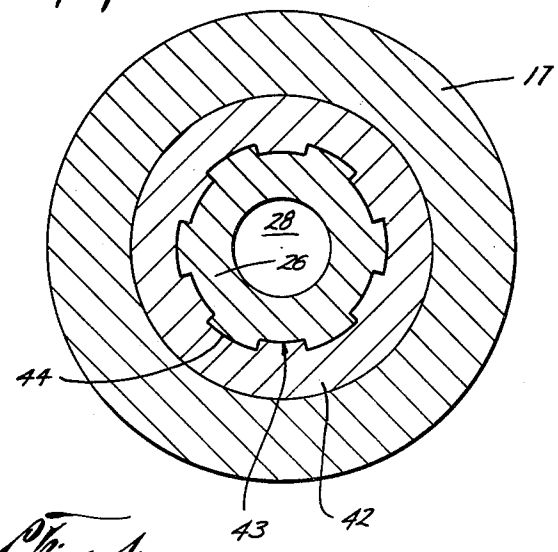

Fig. 4

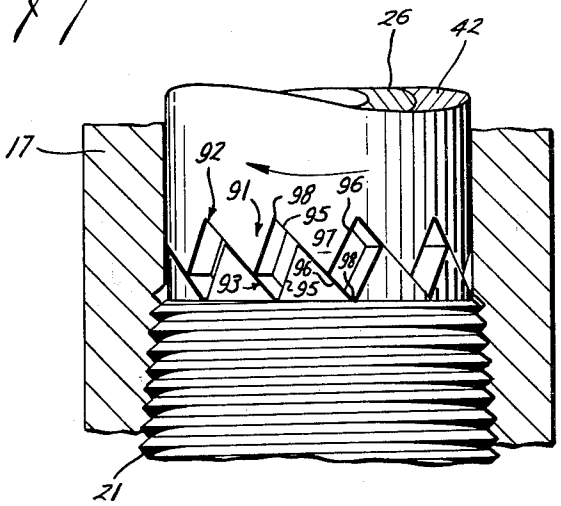

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Fig. 2B

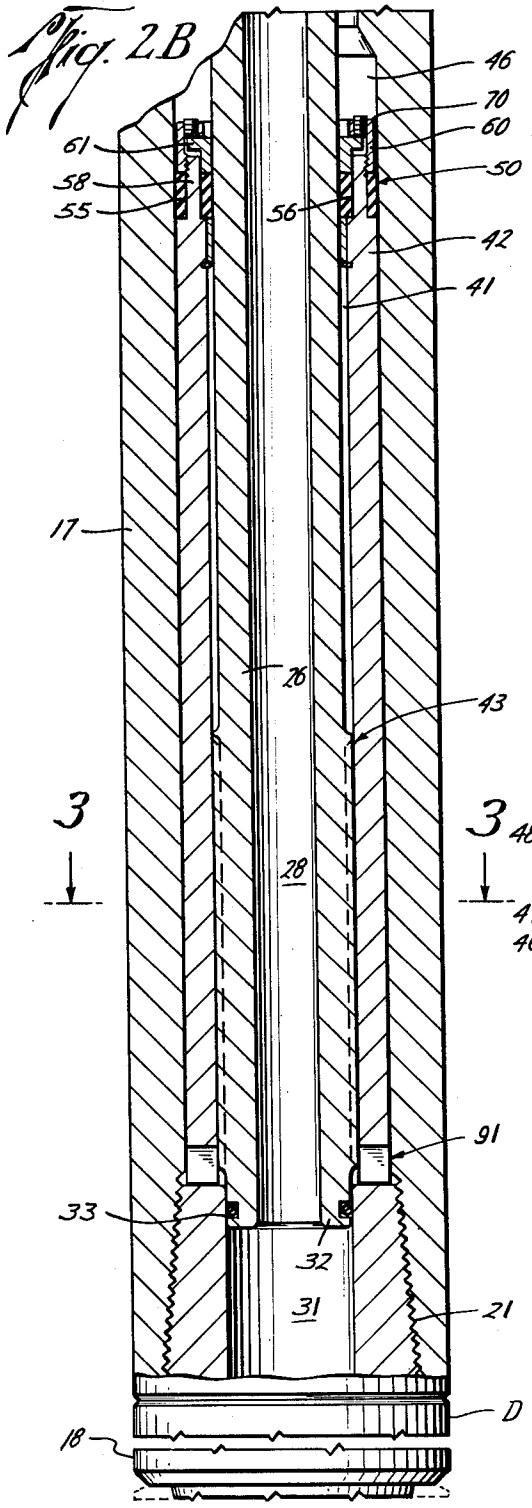
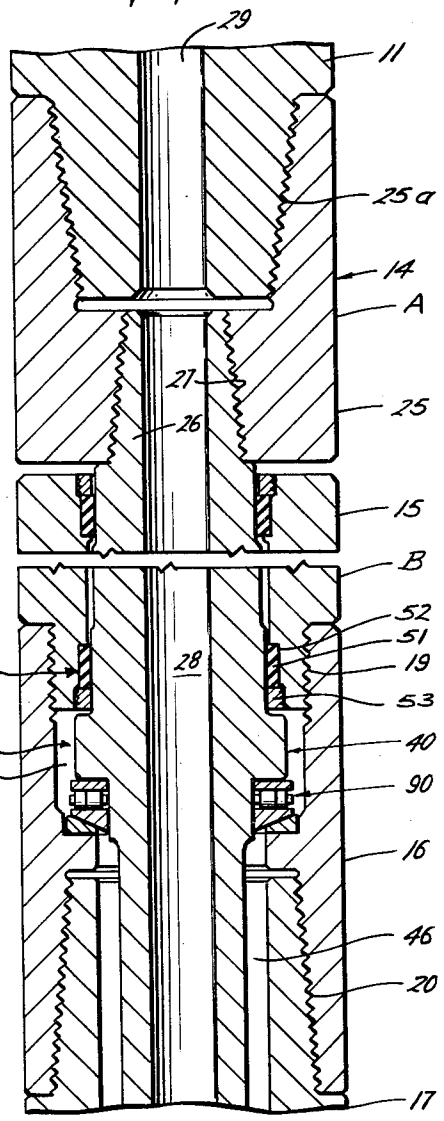


Fig. 2A



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JARRING TOOL

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The present invention relates to a well tool, and more particularly to a fishing tool for connecting with and releasing stuck pipe in a well bore.

During drilling operations by the rotary method, the drill pipe occasionally becomes stuck in the well bore due to a cave-in of the surrounding earth formation. It then becomes desirable and necessary to endeavor the release of the trapped drill string and recover it so that drilling operations may continue, or for reuse of the drill string at other locations.

Normally, a portion of the drill string above the point in the well bore at which the drill string is stuck is unscrewed by means well known in the art and retrieved from the well bore. Thereafter, efforts are made to release the stuck portion of the drill string and bring it to the earth's surface.

The present invention provides a device whereby the stuck portion of the drill pipe may be engaged and hammer-like blows delivered to the stuck pipe in an effort to release it.

Still another object of the present invention is to provide a fishing tool for connecting with stuck pipe in a well bore, the fishing tool being constructed and arranged so that a repetitive series of hammer-like blows may be delivered to the stuck pipe merely by rotating the well string at the earth's surface.

Yet a further object of the present invention is to provide in a fishing tool adapted to be connected with a stuck pipe in a well bore an arrangement for delivering a repetitive series of hammer-like blows to a stuck well pipe, the tool being constructed and arranged so that the operating portion which delivers the hammer-like blows cocks itself and releases itself to deliver a blow merely by rotating the well string in which the fishing tool is connected.

Yet a further object of the present invention is to provide a fishing tool of relatively simple construction for connecting with a stuck pipe in a well bore the fishing tool having means whereby rotation of the well pipe with which it is connected effects repetitive blows on the stuck well pipe in a circumferential direction to aid in releasing the pipe stuck in the well bore.

Other objects and advantages of the present invention will become more readily apparent from a consideration of the following drawings and description wherein:

FIG. 1 is a sectional view illustrating a portion of a well bore with the present invention connected in a well pipe and connected with a pipe stuck in the well bore;

FIG. 2A is a sectional view of the upper portion of the preferred embodiment of the present invention;

FIG. 2B is a sectional view and continuation of FIG. 2A illustrating the middle and lower portion of the tool;

FIG. 3 is a sectional view on the line 3—3 of FIG. 2B and illustrates certain structural details of the form of the invention shown in the drawings; and

FIG. 4 is a side view, partly in section and enlarged, illustrating a form of the surface means of the present invention whereby a jarring action or hammer-like blows may be delivered to the stuck well pipe.

Attention is first directed to FIG. 1 of the drawings wherein the earth's surface is represented generally by the numeral **6**. A well bore **7** is shown as being formed in the earth and having a portion thereof as illustrated by the numeral **8** which is caved in around the drill pipe which is represented by the numeral **9**.

The present invention is represented generally by the numeral **10** and is shown as being connected in a well pipe **11** which extends upwardly to the earth's surface whereby rotation may be imparted to the present invention in order to operate the tool as will be described in greater detail hereinafter.

The invention **10** includes one member or means **13** which will connect with the stuck well pipe **9** when the tool **10** of the present invention is lowered on the pipe **11** into the well bore, as will be explained in greater detail hereinafter, and another member or means **14** for connection with the well pipe **11**. As illustrated in the drawings, the member **13** includes the separate portions or subs **15**, **16**, **17**, and **18** which are shown in FIG. 1 and are also illustrated in FIGS. 2A and 2B in greater detail. It can be appreciated that the separate portions **15**, **16**, **17**, and **18** of the member **13** are provided for ease of connecting the tool parts together. As shown in FIGS. 2A and 2B, the subs or separate members **15**, **16**, **17**, and **18** are connected together by means of the threads **19**, **20**, and **21**, respectively, to provide a member **13** which extends longitudinally from the upper end of the member **15** to the lower end of the member **18**. The lower end of the member **18** is formed with a downwardly projecting threaded portion shown in dotted line at **23**, and normally termed a "pin" in the art, such pin being adapted for connection with the threaded portion designated by the numeral **24** and termed "box" in the art and is shown in FIG. 1 in dotted line on the upper end of the stuck well pipe **9** in a manner well known in the art.

The member **14** includes the sub **25** and the mandrel **26** secured thereto by means of the threads **27**, the mandrel **26** extending longitudinally of the member **13** as shown in the drawing. A fluid conducting passage **28** is provided in the mandrel **26** for receiving fluid from the fluid passage **29** of the drill string **11**, and the sub **18** of the member **13** is also provided with a fluid conducting passage as shown at **31**. The lower end **32** of the mandrel **26** terminates within the fluid conducting bore **31** as shown in FIG. 2B, and suitable seal means **33** is provided on the mandrel **26** for sealing off with the wall of the fluid passage **31** in the member **18** as shown in FIG. 2B.

The mandrel **26** is connected to rotate with the drill string **11** by means of the sub **25** which is threadedly connected to the drill string **11** as indicated at **25***a*.

The member **13**, as shown in the drawings, provides a tubular body which extends longitudinally and surrounds the tubular mandrel **26** as shown in FIGS. 1, 2A, and 2B of the drawings. The mandrel **26** is reduced in diameter relative to the bore which is formed within the tubular body or member **13**, thereby forming a chamber designated generally by the reference numeral **40** extending longitudinally between the members **13** and **14** as shown in the drawings. The chamber **40** varies in size from one end of the body **13** to the other as illustrated in FIGS. 2A and 2B of the drawings, and in the lower part **41** of the chamber **40**, there is provided a piston member **42** which is slidably received on the mandrel **26** and mounted to rotate therewith by the means designated generally at **43** as shown in FIG. 2B and FIG. 3 of the drawings. The means **43** is formed by the splined arrangement **44** which permits free longitudinal movement of the piston member **42** relative to the mandrel **26** and body **13** in a manner as will be described in greater detail hereinafter, but which splined arrangement prevents relative rotation between the tubular mandrel **26** and the piston member **42**.

The portion **46** of the chamber **40** above the piston member **42** defines a reservoir designated generally by the numeral **47** for receiving and containing a pressure fluid therein. More particularly, the reservoir **47** extends from the seal means designated generally by the

numeral 48 in FIG. 2A to the seal means designated generally by the numeral 50 formed on the top of the piston member 42.

The seal means 48 may be of any suitable form, and as illustrated in the drawings, includes a resilient packing ring 51 received in an annular recess 52 of the sub 15 and held in position by means of the threaded ring 53 abutting against one end thereof.

The seal means 50 formed on the upper end of the piston member 42 includes the annular resilient seals 55 and 56 which surround each side of the annular projection 58 formed on the upper end of the piston member 42. The seals 55 and 56 are retained in position by means of the rings 60 and 61, respectively. It is to be noted that the ring 60 is threadedly secured on the outer surface of the projection 58, and that the ring 61 is abutted against the top of the seal ring 56. An Allen screw 70 is threadedly secured through the seal ring 60 at the upper end thereof and abuts the top of the seal ring 61 to retain it is position against the seal 56 as shown in the drawings.

Suitable opening means in body 13 (not shown) is provided for charging the reservoir 47 with pressure fluid. It can be appreciated that the amount of pressure to be received within the pressure fluid containing reservoir 47 will depend upon several factors. For example, the pressure fluid in the reservoir 47 acting on the exposed surface of the piston member 42 must be sufficiently strong so as to cause the member 42 to move longitudinally between the members 26 and 13, as will be described in greater detail hereinafter and strike the member 18; however, the pressure fluid in the reservoir 47 acting on the exposed surfaces of the member 42 should not exceed the pressure at which the stuck drill pipe might twist off.

It will be noted that the mandrel 26 and body 13 are supported by suitable means such as the bearing designated generally at 90 whereby rotation of the member 26 may be effected by the pipe 11 after the member 13 has been engaged with the stuck well pipe 9.

Also, suitable means designated generally by the numeral 91 in FIG. 4 are provided to deliver an impact to the stuck well pipe 9, such means 91 including the surface arrangement designated generally by the numeral 92 on the lower circumferential edge of the member 42 and the surface means designated generally by the numeral 93 formed on the upper end of the sub 21, which sub in turn is threadedly secured to and forms a part of body 13.

The surface means 92 and 93 are illustrated as being in the form of serrations which extend circumferentially. The serrations are formed by the surfaces 95 and 96 which are inclined relative to the longitudinal axis of the member 42 to form the spaced projections 97 and the recesses 98 between each projection. It will be noted that the circumferentially spaced projections 97 formed on the member 42 fit within the spaced recesses 98 on the member 21, and similarly, the spaced projections 97 formed on the member 21 fit within the circumferential recesses formed on the piston member 42.

It can be appreciated that the surface means 92 may be varied in arrangement without departing from the scope of the present invention.

While it is believed that the operation of the present invention is apparent from the foregoing description, to further amplify and describe, it will be assumed that the invention 10 has been lowered by the drill pipe or well pipe 11 into the well bore 7 so that the pin 23 is threadedly engaged with the box 24 of the stuck well pipe 9. The connection of the pin 23 and box 24 is accomplished by rotating the pipe 11 and tool 10 to thread pin 23 into box 24, and after this has been effected, the present invention is ready to be actuated to endeavor the release of the stuck well pipe 9.

After the tool 10 is connected with the pipe 9, the drill pipe 11 is rotated, which rotation is transmitted to the mandrel 26, and the mandrel 26 rotates relative to the outer tubular body 13. The tubular body 13 is connected to the stuck well pipe 9 since the sub 18 on which the pin 23 is formed is in turn connected to and forms a part of the outer tubular body 13. Rotation of the drill pipe 11 and mandrel 26 also effects rotation of the piston member 42 since it is mounted by the means 43 to rotate with the mandrel 26.

When the mandrel 26 and member 42 are rotated, the member 42 is forced longitudinally relative to the mandrel 26 and tubular body 13 and against the pressure fluid in the reservoir 47 to compress it. The longitudinal movement of the piston member 42 is effected by means of the spaced circumferential projections 97 on the piston member 42 which move upwardly out of the recesses 98 formed on the end of the member 21 as illustrated in FIG. 4 of the drawings. Continued rotation of the pipe 11 and mandrel 26 moves the projections 97 up over the projections 97 formed on the member 18 so that they are then aligned to move into the next recess 98.

The compression of the pressure fluid within the reservoir 47 by the longitudinal movement of the member 42 forces the member 42 longitudinally when the projections 97 on the member 42 are next aligned with the recesses 98 in the member 18 whereupon the member 42 strikes the end of the member 18 to deliver a blow thereagainst. It can be seen from FIG. 4 of the drawings that the surfaces 96 on the upper end of the member 18 are sloped so that the surfaces 95 on the member 42 impinge thereagainst. The relationship of the surfaces 95 on the member 42 and the surfaces 96 on the member 18 against which they strike is such that the force imparted by member 42 resolves into a circumferential component which tends to rotate the member 18 and the stuck well pipe or fish 9 with which it is connected.

It can be seen that continued rotation of the drill string 11 while the member 13 is connected to the stuck pipe 9 effects a series of blows by the member 42 against the member 18 so as to tend to release the stuck pipe 9 from its position in the well bore.

Broadly, the present invention relates to a well tool, and more particularly to a well tool for connection with a stuck pipe in a well bore whereby a plurality of blows may be delivered to the stuck pipe merely by rotating the well string in which the tool is connected.

What is claimed is:

1. A well tool adapted to be lowered in a well bore on a pipe string for engaging and releasing a stuck pipe by applying blows which have a circumferential component in a direction which tends to rotate the stuck pipe comprising,

(*a*) a mandrel having means for connection at its upper end to the pipe string,

(*b*) an outer body extending longitudinally of said mandrel and externally thereof,

(*c*) means on the lower end of said body for connection with the stuck pipe,

(*d*) bearing means between said mandrel and body for accommodating rotation by the pipe string of said mandrel relative to said body after said body has been connected with the stuck pipe and for imposing the weight of the mandrel and pipe string on the body during such rotation of the pipe string,

(*e*) a piston member slidable on and mounted to rotate with said mandrel,

(*f*) seal means between said body and mandrel and seal means on the upper end of said piston member which forms a reservoir for fluid pressure that normally urges said piston member longitudinally toward the stuck pipe connected with said body,

(*g*) serrations formed on the circumferential lower end of said piston member,

(*h*) serrations formed on said body above the stuck pipe which interengage with said serrations on said member,

(*i*) said serrations on said piston member and body being movable relative to each other and intermittently disengaging upon rotation of said mandrel and piston member to move said piston member away from the stuck pipe and compress the pressure fluid in said reservoir to in turn force said piston member longitudinally when said body and piston member serrations are aligned by further rotation of said piston member,

(*j*) said longitudinal movement of said piston member and engagement of said piston member and body serrations acting to deliver a blow to said body and the pipe connected thereto, the blow having a circumferential component in a direction which tends to rotate the stuck pipe.

2. A well tool adapted to be lowered in a well bore on a pipe string for connecting with a stuck pipe to deliver repetitive jars thereto in a circumferential direction to tend to free the stuck pipe comprising,

(*a*) a mandrel having means for connection at its upper end to the pipe string,

(*b*) an outer body extending longitudinally of said mandrel and externally thereof,

(*c*) means on the lower end of said body for connection with the stuck pipe,

(*d*) bearing means between said mandrel and body for accommodating rotation by the pipe string of said mandrel relative to said body after said body has been connected with the stuck pipe and for imposing the weight of the mandrel and pipe string on the body during such rotation of the pipe string,

(*e*) a piston member,

(*f*) a splined connection mounting said piston member on said mandrel to accommodate slidable but nonrotatable movement of said piston member on said mandrel,

(*g*) seal means between said body and mandrel and seal means on the upper end of said piston member which forms a reservoir for fluid pressure that normally urges said piston member longitudinally toward the stuck pipe connected with said body,

(*h*) cooperating surface means on the lower edge of said piston member and said body,

(*i*) said surface means being constructed and arranged so that upon rotation of said mandrel said piston member is forced longitudinally along said mandrel to compress the pressure fluid in said reservoir and said piston member and body surface means are spaced longitudinally whereupon continued rotation of said mandrel aligns said surface means on said piston member and body.

(*j*) said piston member upon alignment of said surface means being formed longitudinally by the pressure fluid in said reservoir to jar said piston member surface means against said body surface means which tends to free the stuck pipe.

3. A well tool for lowering in a well bore on a pipe string and connecting with a stuck pipe in the well to deliver a hammer-like blow to the stuck pipe comprising,

(*a*) an elongated mandrel for connection to the well pipe,

(*b*) a body having a portion thereof surrounding said mandrel and having means therewith for connection to the stuck pipe,

(*c*) said mandrel being rotatable relative to said body after it has been connected to the stuck pipe,

(*d*) a piston member slidable longitudinally of said mandrel and body mounted to rotate with said mandrel,

(*e*) a reservoir means between said mandrel and said body for containing pressure fluid in the tool and acting on one end of said piston member,

(*f*) interengaging serrations on said piston member and said body,

(*g*) said serrations acting upon rotation of said mandrel to force said piston member against the pressure fluid in said reservoir means acting thereon to compress it,

(*h*) said serrations being momentarily disengaged from each other and then re-engaged as the pressure fluid urges said piston member longitudinally,

(*i*) the engagement of said serrations causing a hammer-like blow to be delivered to the stuck pipe in the well bore, and

(*j*) means on said mandrel and engageable with said body during rotation of said mandrel relative to said body for transmitting the weight of the mandrel and pipe string connected thereto to the serrations on said body.

4. A fishing tool for jarring a stuck well pipe as the pipe on which the tool is supported in the well is rotated comprising,

(*a*) an outer tubular body having connector means for connecting the body to the stuck pipe,

(*b*) a mandrel rotatable relative to said connector means and connected to the well pipe for rotation therewith,

(*c*) a reservoir means in the tool for containing pressure fluid,

(*d*) a piston member slidable on and rotatable with said mandrel,

(*e*) said piston member being exposed to the pressure fluid in the reservoir means such that the fluid pressure therein can act on one end of said piston member so as to be urged longitudinally of said connector means and said mandrel by the pressure fluid in said reservoir means,

(*f*) serrations on said body and said piston member which upon rotation of said mandrel urge said piston member upwardly against the fluid pressure in said reservoir means to compress the fluid therein,

(*g*) means on said mandrel and engageable with said body during rotation of the mandrel relative to said body for transmitting the weight of the mandrel and pipe connected thereto to the serrations on said body, and

(*h*) said serrations on said piston member being circumferentially and longitudinally movable relative to the serrations on said body upon such rotation of said mandrel for obtaining alternate upward and downward longitudinal movements of said piston member upon continued rotation of said mandrel whereupon the fluid pressure causes said piston member to deliver successive jarring blows to said body to aid in releasing the stuck well pipe connected thereto.

References Cited in the file of this patent

UNITED STATES PATENTS

1,450,024	Edwards	Mar. 27, 1923
2,228,482	Prebensen	Jan. 14, 1941
2,389,710	Armentrout	Nov. 27, 1945